## HSPT® ${ }^{\circledR}$ <br> Mathematics and <br> Quantitative Reasoning: 1,300+ Practice Questions

Table of Contents
Diagnostic Practice Test ..... 4
Quantitative Reasoning ..... 4
Mathematics ..... 7
Problem Solving. ..... 8
Quantitative Skills ..... 12
Number Series (Sequence) ..... 12
Arithmetic ..... 12
Geometric ..... 13
Other. ..... 14
Geometric Comparison ..... 17
Angles ..... 17
Polygons ..... 18
Non-Geometric Comparison. ..... 20
Algebraic ..... 20
Counting ..... 20
Fractions, Decimals, Percent ..... 21
Graphs. ..... 21
Measurements ..... 22
Order of Operations ..... 23
Slope ..... 24
Number Manipulation (Reasoning) ..... 24
Fractions, Decimals ..... 24
Whole Numbers ..... 25
Mathematics ..... 27
Concepts ..... 27
Algebraic. ..... 27
Geometry ..... 28
Measurements ..... 31
Numbers \& Operations ..... 31
Problem-Solving Exercise ..... 34
Algebraic Concepts. ..... 34
Data \& Probability ..... 37
Measurements ..... 42
Numbers \& Operations ..... 43
Practice Test 1 ..... 52
Verbal Skills ..... 52
Quantitative Reasoning ..... 54
Reading Comprehension ..... 57
Mathematics ..... 62
Problem Solving. ..... 63
Language Skills ..... 66
Practice Test 2. ..... 70
Verbal Skills ..... 70
Quantitative Reasoning ..... 72
Reading Comprehension ..... 75
Mathematics ..... 79
Problem Solving. ..... 81
Language Skills ..... 83

## Diagnostic Practice Test

## Quantitative Reasoning

1. C. Each term in the sequence is double the prior term. Therefore, the next number in the sequence is 32 .
2. C. (I) has 11 blocks, (II) has 10 blocks, and (III) has 9 blocks. Therefore, I > II > III.
3. A. Simplify the problem: the difference of 60 and 25 is 35 , and 8 less than 35 is 27 . Then determine what adds to 14 to get 27 . To do so, subtract 14 from 27 , which gives a final answer of 13 .
4. C. (I) shows values of $5,6,5$, and 6 for a total value of 22 . (II) shows values of $5,3,4,4$, and 6 , for a total value of 22 . (III) shows values of $3,2,4,4,6$, and 1 , for a total value of 15 . (III) is less than both (I) and (II) which are both 15 and therefore equal.
5. D. Each number in the sequence is the preceding number times $\frac{1}{3}$. Therefore, the next number is $\frac{10}{27}$.
6. D. Simplify the problem: One-third of 27 is 9 , and 5 less than that is 4 . Then determine what subtracted from 38 gives 4 , and the answer is 34 .
7. C. Statement I is -15 . Statement II can be solved as $-(-7)=7$. Statement III is -7 . Therefore, $I$ is smaller than III, which is smaller than II.
8. C. This is an alternating sequence of adding 5 and subtracting by 2 . The last step was to subtract 2 from 11 to get 9 . Adding 5 to 9 gives 14 , then subtracting by 2 gives 12 , and finally adding 5 gives 17 as the final number.
9. D. Each of those values is 2 , so they are all equal to each other.
10. B. Any number to the 0 power is 1 , so $16^{0}=1$. The values of $2^{4}$ and $16^{1}$ are both equal to 16 .
11. D. Each number in the sequence is the preceding number multiplied by 7 . Therefore, the next number is 48.02 .
12. B. Statement I can be solved as: $2(5+7)=2(12)=24$. Statement II can be solved as: $-(4-28)=-(-24)=24$. Statement III can be solved as: $12+12=24$.
13. C. The slope described in I is -2 , the slope described in II is $-\frac{1}{2}$, and the slope described in III is -2 . Therefore, II is greater than III.
14. A. Simplify the problem: the product of 6 and 3 is 18 , and the difference of 34 and 18 is 16 . Then determine what adds to 15 to get 16 , and the answer is 1.
15. B. In a right triangle, the sum of the two acute angles is equal to 90 degrees, which is equal to $\angle C$.
16. A. Simplify the problem: the sum of 22 and 13 is 35 , and 10 less than that is 25 . Then determine what to add to 23 to get 25 . To do so, subtract 23 from 25 , which gives a final answer of 2 .
17. B. Because $c$ and $d$ are the acute angles in a right triangle, their sum is equal to 90 degrees. Therefore, the sum is equal to each angle of the rectangle, including $b$.
18. D. Before finding the percent, determine the difference: $15-5=10$. Then solve for $200 \%$ of 10 by multiplying the decimal form of the percent by the number: $2.0 \times 10=20$.
19. A. Each number in the sequence is the preceding number times $\frac{1}{4}$. Therefore, the next number is $\frac{1}{256}$.
20. B. Statement I is: $\frac{10}{2}=5$; statement II is: $\frac{10}{5}+2=4$; statement III is: $10-4-2=4$. Therefore, II and III are equal.
21. C. Multiply the base and height of each triangle and divide by 2 to find the area. Triangle I has a base of 8 and a height of 3 , giving it an area of 12 . Triangle II has a base of 4 and a height of 6 , also giving it an area of 12 . Triangle III has a base of 8 and a height of 3 , for an area of 12 . Therefore, all three triangles have the same area.
22. D. This is an arithmetic sequence in which each number is 8 greater than the previous number in the sequence. Adding 8 to 41 gives 49 as the correct answer.
23. C. Simplify the problem: $25 \%$ of 60 is 15 . Now determine what number divided by 5 is equal to 15 , or $\frac{x}{5}=15$. To solve, multiply 5 and 15 to get the correct answer of 75 .
24. C. Two nickels (I) are worth ten cents, which is equal to one dime (II), and both are less than a quarter (III).
25. B. Statement I is: $8-5+2=5$; statement II is: $\frac{5^{2}}{5}=5$; statement III is $2(5)-4=6$. Therefore, I and II are equal, and II is less than III.
26. A. The slope described in I is 2 , the slope described in II is -2 , and the slope described in III is 2 . Therefore, I is greater than II.
27. D. Statement I is: $3 \times 2^{3}=24$; statement II is: $2-6+1=-3$; statement III is: $\frac{6}{2}=3$. Therefore, I is greater than III, and III is greater than II.
28. B. Statement I is: $2(6)-3=9$; Statement II is: $3 \times 6=18$; statement III is: $7-6+4=5$. Therefore, II is greater than I.
29. A. (I) has 17 blocks, (II) has 15 blocks, and (III) has 12 blocks. Therefore, I > II > III.
30. B. This is an arithmetic sequence in which each number is 3 greater than the previous number in the sequence. Adding 3 to 86 gives 89 as the correct answer.
31. A. This is an arithmetic sequence in which each number is 5 greater than the previous number in the sequence. Adding 5 to 108 gives 113 as the correct answer.
32. B. I, II, and III each have 12 blocks.
33. C. When comparing fractions, it helps to find a common denominator and then convert into equivalent fractions. The common denominator of 3,4 , and 5 is 60 , so $\frac{2}{3}=\frac{40}{60}, \frac{3}{4}=\frac{45}{60}$, and $\frac{3}{5}=\frac{36}{60}$. Therefore, $\frac{3}{4}>\frac{2}{3}>\frac{3}{5}$.
34. B. When comparing fractions, it helps to find a common denominator and then convert into equivalent fractions. The common denominator of 3,6 , and 12 is 12 , so $\frac{2}{3}=\frac{8}{12}$ and $\frac{5}{6}=\frac{10}{12}$. Therefore, $\frac{2}{3}=\frac{8}{12}<\frac{5}{6}$.
35. B. In a right triangle, the right angle is always 90 degrees, and the sum of the two acute angles is also 90 degrees. Therefore, II and III are equal. Because $b$ is greater than $0, a$ has to be less than 90 , so I is less than II.
36. D. This is an alternating sequence of dividing by 3 and adding 6 . The last step was to divide 30 by 3 to get 10 . Adding 6 to 10 gives 16 as the correct answer.
37. C. Write each shaded region as a fraction of the circle. I is $\frac{2}{3}$, II is $\frac{4}{5}$, and III is $\frac{3}{4}$. Then to determine which is largest and smallest, you can convert each fraction into a fraction with the same denominator, which is 60 in this case. Therefore, $\frac{2}{3}=\frac{40}{60^{\prime}}, \frac{4}{5}=\frac{48}{60^{\prime}}$, and $\frac{3}{4}=\frac{45}{60}$.
38. B. (I) has 8 marks, (II) has 8 marks, and (III) has 9 marks. Therefore, (I) and (II) are equal, and they are both less than (III).
39. D. When comparing fractions, it helps to find a common denominator and then convert into equivalent fractions. The common denominator of 6,9 , and 18 is 18 , so $\frac{4}{6}=\frac{12}{18}$ and $\frac{5}{9}=\frac{10}{18}$. Therefore, $\frac{15}{18}>\frac{4}{6}>\frac{5}{9}$.
40. C. The values of $A$ are $3,6,9,8$, and 4 , for a sum of 30 . $B$ had a value of 6 each day, so its sum over five days was also 30 . Therefore, the sum of $A$ is equal to the sum of $B$.
41. A. This is an alternating sequence of subtracting 5 and multiplying by 3 . The last step was to subtract 5 from -6 to get -11 . Multiplying -11 by 3 gives the correct answer of -33 .
42. B. Simplify the problem: the product of 6 and 7 is 42 , and 12 more than that is 54 . Then determine what adds to 40 to get 54 . To do so, subtract 40 from 54, giving a final answer of 14 .
43. A. This is an alternating sequence of adding 3 and multiplying by 2 . The last step was doubling 17 to get 34. Adding 3 to 34 gives the correct answer of 37 .
44. B. II has 4 blocks, and III has 7 . Their sum is 11 , which is greater than the 9 blocks of I.
45. D. Examine the height of each bar to determine the value of electoral votes for each state. Texas has 40 electoral votes which is more than the 30 electoral votes that Florida has.
46. C. The slope described in I is 1 , the slope described in II is 3 , and the slope described in III is $-\frac{1}{3}$. Therefore, I is greater than III.
47. B. Before finding the percent, determine the sum: $12+20=32$. Then solve for $25 \%$ of 32 by converting the percent into a decimal and multiplying: $0.25 \times 32=8$.
48. B. (I) has 10 blocks, (II) has 12 blocks, and (III) has 12 blocks. Therefore, I < II = III.
49. A. Simplify the problem: $3^{3}=27$, and $\frac{1}{2}$ of $24=12$. Now find what subtracted from 27 is 12 , or $27-x=12$. Solving gives 15 as the answer.
50. C. This is an arithmetic sequence in which each number is 6 greater than the previous number in the sequence. Adding 6 to 44 gives 50 as the correct answer.
51. D. Simplify the problem: 6 times 9 is 54 , and 5 more than that is 59 . Then determine what adds to 34 to get 59 . To do so, subtract 34 from 59, giving a final answer of 25 .
52. C. When you have two parallel lines, alternate interior angles are congruent, and $\angle D$ and $\angle E$ are alternate interior angles.

## Mathematics

53. B. When we divide both sides by -34 to obtain $x$, we flip the inequality sign. Therefore, $x>-2$ is the correct answer.
54. D. Radius is half of the diameter. So, $13 \div 2=6.5$.
55. D. We first find the area of the square by dividing the perimeter by 4 to find that each side length is 5 , and then squaring the side length, resulting in an area of 25 . We then add the area of the two triangles to the area of the square: $25+5+5=35$.
56. D. If the area of the circle if $36 \pi$ square feet, then the radius of the circle is 6 feet and the diameter of the circle is 12 feet. Convert 12 feet into inches.
57. C. The lowest number out of the answer choices that 3,5 , and 6 all divide into evenly is 30 .
58. B. Simplifying the expression gives a number of 3,250 . The number in the hundreds place is 2 .
59. A. Add the areas of the two triangles together to determine the area of the square: $72+72=$ 144. Take the square root of the area to find the side length: $\sqrt{144}=12$. There are four sides to the square, so multiply the side length by four to find the perimeter: $12 \times 4=48$.
60. A. When you are multiplying exponential expressions with the same base ( 8 in this case), you simply add the exponents and keep the same base. Some students will multiply the exponents, which gives the incorrect answer of $B$. Other students will add the bases, which gives the incorrect answer of C.
61. C. The volume of a rectangular prism is given by $l x w x h$, where $l$ is the length, $w$ is the width, and $h$ is the height of the prism. Here this gives: $4 \times 3 \times 10=120$.
62. D. When you are dividing exponential expressions with the same base ( 2 in this case), you simply subtract the exponents and keep the same base. Some students will divide the exponents, which gives the incorrect answer of $2^{2}$. Other students will divide the bases, which gives the incorrect answer of $1^{4}$.
63. B. The 5 should go in the hundredths place, which is the second digit after the decimal point. A is incorrect, as the number 5 is in the thousandths place, making it five thousandths. C is incorrect, as that is five hundred, not five hundredths.
64. C. A hexagon has six sides, so the perimeter of the hexagon with a side length of 12 is: $6 \times 12=$ 72. The equilateral triangle also has a perimeter of 72 , and this shape has 3 sides of equal length. To find the length of each side of the equilateral triangle: $72 \div 3=24$.
65. C. The lowest number out of the answer choices that 4,8 , and 10 all divide into evenly is 40 .
66. C. Reduce each fraction and compare: $\frac{5}{20}=\frac{7}{28}=\frac{10}{40}=\frac{1}{4}$. The fraction $\frac{9}{32}$ does not reduce, and is not equal to $\frac{1}{4}$.
67. C. Simplifying the expression gives a number of 7,410 . The number in the hundreds place is 4 . Because students are used to these expressions going in order from thousands to hundreds to tens, they can sometimes be fooled by this kind of problem, where the expression is not in the usual order. Notice that the term for the hundreds $\left(10^{2}\right)$ comes before the term for the thousands ( $10^{3}$ ).
68. A. Reduce each fraction and compare: $\frac{6}{10}=\frac{9}{15}=\frac{12}{20}=\frac{3}{5}$. The fraction $\frac{4}{5}$ is different from the rest.
69. B. Factor each number and find what is common to them all. The first term: $5=1 \times 5$. The second term: $10=2 \times 5$. The third term: $15=5 \times 3$. The integer 5 is greatest term common to them all.
70. D. Surface area of a rectangular prism is given by $2(w l+h l+h w)$, where $w$ is the width, $l$ is the length, and $h$ is the height. Plug in the numbers from the given shape to get: $2(2 \times 20+$ $2 \times 20+2 \times 2)=2(40+40+4)=2(84)=168$.
71. A. Factor each term to its prime elements: The first term: $4=2 \times 2$. The second term: $9=3 \times 3$. The third term: $6=2 \times 3$. There are prime numbers common to all three. Therefore, the only common factor is 1 .
72. B. In a regular pentagon, all of the sides and angles have the same measure. This means that $\angle B$ has the same measure as the angle adjacent to $\angle A$, which would make $\angle A$ and $\angle B$ supplementary. So: $\angle A+\angle B=180^{\circ}$
73. C. Eliminate acres since this is a measure of land area and not distance. Eliminate inches because this is obviously too small of a unit. Eliminate square feet because this is a measure of area and not distance.
74. A. Eliminate millimeters since this is a measure of length and not temperature. Eliminate percentage because this is not a unit of measurement. Eliminate yards since this is a measure of length and not temperature.
75. D. In equilateral triangles, all the angles are equal.
76. B. B is the best description of the inequality because it includes the phrase 'greater than or equal to' and correctly describes $x-7$.
77. D. Two lines that are perpendicular have slopes that are negative reciprocals of each other. As the given line has a slope of $-\frac{5}{7}$ (the coefficient of $x$ ), the line perpendicular to that has a slope of $\frac{7}{5}$.
78. B. Two lines that are perpendicular have slopes that are negative reciprocals of each other. As the given line has a slope of -4 (the coefficient of $x$ ), the line perpendicular to that has a slope of $\frac{1}{4}$.
79. C. To convert a fraction into a percent, an easy method is to create a proportion, with the fraction on one side and $\frac{x}{100}$ on the other. In this case, the proportion would be: $\frac{8}{25}=\frac{x}{100}$. Therefore, $x=$ 32.
80. D. A number is divisible by 6 if it is also divisible by 2 and 3 . Only even numbers are divisible by 2 , so this gives only 1,010 and 1,110 as the possible correct answers. A number is divisible by 3 if the sum of its digits is divisible by 3 . Adding $1+1+1+0=3$; since 3 is divisible by 3 , the number 1,110 is also divisible by 3 . This means 1,110 is divisible by both 2 and 3 , and therefore also divisible by 6 .

## Problem Solving

81. D. In age problems, it is often easier to figure out who is the youngest person and have them be equivalent to $x$. In this case, Jason is the youngest, so his age is $x$, which makes Chris's age equivalent to $x+3$ and Tamara's age equivalent to $(x+3)+8$, or $x+11$. Then the algebra expression is $x+(x+3)+(x+11)=5 x$. Solving the equation gives you $x=7$, and Tamara's age is $7+11$, or 18 .
82. D. When you multiply two negatives, your answer is a positive, so $(-7) \times(-3)$ is 21 . Then $21 \times 5=105$.
83. A. There are 2 cups in every pint.
84. D. To add fractions, you first find a common denominator, which in this case is 40 . Then you convert to equivalent fractions: $\frac{3}{8}=\frac{15}{40}$, and $\frac{2}{5}=\frac{16}{40}$. Therefore, $\frac{15}{40}+\frac{16}{40}=\frac{31}{40} \cdot \frac{5}{13}$ is incorrect because you need to find a common denominator and convert to equivalent fractions before adding.
85. D. To determine an average, take the sum of the data and divide by how many pieces of data there are. Determine the sum of the test scores Frederick has so far by multiplying 88 and 3, which is 264 . Then find the sum of the data he needs to have an average of 90 by multiplying 90 and 4 , which is 360 . Subtracting 360 and 264 reveals what score Frederick needs on his fourth exam to reach that 90 average, which is a 96.
86. B. Simple probability is "correct" possibilities over total possibilities. In this case, there are 3 milk chocolates, so that is the number of "correct" possibilities. There are 15 chocolates altogether, so that is the number of total possibilities. That gives a ratio of $\frac{3}{15}$, or $\frac{1}{5}$.
87. B. Simplifying $\frac{1}{8} \times 12$ results in $-4 x=\frac{12}{8}$. Divide both sides by -4 to isolate $x$. This results in $-\frac{12}{32}$ which simplifies to $-\frac{3}{8}$.
88. B. $3^{x}$ means that 3 will be multiplied by itself a certain number of times to produce 27 . Since $3^{3}=$ $27, x=3$.
89. C. Pie charts are best for displaying percents of categories; therefore, the results of a survey would be best shown on a pie chart.
90. C. $3 \%$. If 1 cup is equal to 16 tablespoons, then Jenettta is using $\frac{1}{16}$ of a cup, so just convert $\frac{1}{16}$ to percent form: $\frac{1}{16} \times 100=6.25 \%$. Round this to the nearest tenth to get $6.3 \%$.
91. C. When you add those together, you get 3.94 , which rounds to 3.9. To save time when doing these problems, it helps to eliminate answers that you can tell immediately are wrong. For example, $3.07+1.13$ has to be greater than 4 , as $3+1=4$. Therefore, that cannot round to 3.9. Similarly, $1.48+1.36$ is less than 3 , as both numbers are less than 1.5 . It makes sense then to start with the other two answers, add those, and see which one rounds to 3.9.
92. B. Set up a proportion: $\frac{1 \text { inch }}{6 \text { feet }}=\frac{x \text { inches }}{45 \text { feet }}$. ross-multiply, resulting in $6 x=45$. Solving for $x$ results in 7.5 inches.
93. C. You begin by adding to get an answer of 6.776 . To round to the nearest hundredth, you look at the thousandths place. Since that is 5 or higher, you add one to the hundredths place, making that an 8 . Everything to its right turns to a zero. 6.77 is incorrect because it is rounded incorrectly. 6.776 is incorrect because it is not rounded. 6.8 is incorrect because it is rounded to the nearest tenth.
94. A. First, simplify $3 \sqrt{8}$, which is $3 \sqrt{8}=3 \sqrt{4 \times 2}=(3)(2) \sqrt{2}=6 \sqrt{2}$. This tells us that $6 \sqrt{2}=x \sqrt{2}$ which means that $x=6$.
95. C. A rectangular prism is a figure with 6 rectangular faces in which opposite faces are congruent.
96. C. Find the amount earned from the cupcakes and the amount earned from the cookies and add to find the total: $(4 \times 3.50)+(8 \times 1.25)=\$ 24.00$
97. B. We first convert 15 minutes to hours: 15 minutes $\times \frac{1 \text { hour }}{60 \text { minutes }}=\frac{1}{4}$ hour. We can then solve for distance: $D=\frac{1}{4} \times 24=6$ miles.
98. B. In a Venn diagram, the intersection of the two circles represents what is true of both circles. In this case, the " B " is at the intersection of English and math but does not intersect with science.
99. C. To find $160 \%$ of 90 , convert the percent to a decimal and multiply. This is $1.6 \times 90=144$.
100. D. Each pound has 16 ounces. Therefore, $4 \mathrm{lb} .6 \mathrm{oz} .=4 \times 16+6=70 \mathrm{oz}$.
101. B. In compound probability, determine the probability of two independent events both occurring by multiplying the probability of each event. The probability of Wesley choosing a whale in his first selection is 5 out of 10 , or $\frac{1}{2}$. Since he keeps the first card, the probability of Wesley choosing a whale in his second selection is 4 out of 9 , or $\frac{4}{9}$. Multiplying $\frac{1}{2}$ by $\frac{4}{9}$ results in $\frac{4}{18}$, or $\frac{2}{9}$.
102. B. If the population declines by $10 \%$ each year, then that means $90 \%$ of the deer remain each year. To find the deer population after two years do $(0.9)(0.9)(10,000)=(0.81)(10,000)=$ 8,100.
103. C. The $x$ on the outside of the parentheses means that it applies to both the numerator and the denominator. Recognize that $2^{3}=8$, and $3^{3}=27$. So $\left(\frac{2}{3}\right)^{3}=\frac{8}{27^{\prime}}$, since $\frac{2}{3} \times \frac{2}{3} \times \frac{2}{3}=\frac{8}{27}$.
104. D. When you subtract a negative number, it is the same as adding a positive. Adding those two numbers gives you the final answer of 18,200 . Some students will choose $-1,960$ or 1,960 because they mistakenly subtract the numbers. 18,100 is an incorrect answer probably caused by improper carrying.
105. D. Multiply 20 and 5 to get the total number of points Dyani needs, which is 100 . Then add what she already has: $18+10+21+17=66$. Subtracting 100 by 66 shows what she needs in her next game, which is 34 points.
106. D. Set up a proportion: $\frac{6 \text { tenors }}{5 \text { altos }}=\frac{x \text { tenors }}{30 \text { altos }}$. Cross-multiplying gives you $5 x=180$, so $x=36$.
107. B. A hexagon is a polygon with six sides.
108. B. If 3 seniors own neither, then 27 own a bike, a car, or both. Subtract the number who have a bike to reveal those who only own a car: 27-24=3. Create a Venn diagram:

109. B. $\sqrt{27}+\sqrt{75}=\sqrt{9 \times 3}+\sqrt{25 \times 3}=3 \sqrt{3}+5 \sqrt{3}=8 \sqrt{3}$.
110. A. Joe works Monday through Friday for two weeks, which is a total of 10 days. Multiply to find the amount of money earned: $75 \times 10=750$. Subtract to find the amount of money he still needs to earn: $850-750=100$. He earns $\$ 2$ for each plate washed, so divide to find the number of plates he needs to wash: $100 \div 2=50$.
111. A. We manipulate the distance formula to obtain speed: $S=\frac{D}{t}=\frac{400}{8}=50$ miles per hour.
112. A. On the left side, finding a common denominator and then summing equivalent fractions gives $\frac{10}{6}+\left(-\frac{7}{6}\right)=\frac{3}{6}$, or $\frac{1}{2}$. Isolate the term with the variable by subtracting $\frac{1}{4}$ from each side of the equation, which leaves you $\frac{1}{4}=-\frac{1}{3} y$. Then divide each side of the equation by $-\frac{1}{3}$ to get $y$ by itself. When you divide by a fraction, you can multiply by its reciprocal, so $\frac{1}{4} \times-\frac{3}{1}=-\frac{3}{4}$.
113. D. First, find $50 \%$ of $300: 0.5 \times 300=150$. Then find $20 \%$ of $150: 0.20 \times 150=30$.
114. D. One way to solve this problem is to start with the addition problem in the numerator: $0.6+$ $0.6+0.6+0.6+0.6=3$. Then you divide that sum by 5 , and $3 \div 5=0.6$. A common incorrect answer would be 0.48 , as a student might miscount how many terms are in the dividend and come up with a sum of 2.4 instead of 3 .
115. C. These two students were both absent once, making them the students with the fewest absences.
116. C. Since the number of nickels is the smallest, it helps to make that equivalent to $x$. Then the number of dimes is equivalent to $3 x$, and the number of quarters is equivalent to $2 x$. An algebraic expression is $x+3 x+2 x=12$. Therefore, $x=2$, and the number of dimes is 3 (2), or 6.


## Quantitative Skills

## Number Series (Sequence)

## Arithmetic

1. D. This is an arithmetic sequence in which each number is 12 greater than the previous number in the sequence. Adding 12 to 145 gives 157 as the correct answer.
2. C. This is an arithmetic sequence in which each number is 20 greater than the previous number in the sequence. Adding 20 to 98 gives 118 as the correct answer.
3. A. This is an arithmetic sequence in which each number is 7 less than the previous number in the sequence. Subtracting 7 from 23 gives 16 as the correct answer.
4. D. This is an arithmetic sequence in which each number is 9 less than the previous number in the sequence. Subtracting 9 from 100 gives 91 as the correct answer.
5. B. This is an arithmetic sequence in which each number is 4 less than the previous number in the sequence. Subtracting 4 from 23 gives 19 as the correct answer.
6. B. This is an arithmetic sequence in which each number is 3 greater than the previous number in the sequence. Adding 3 to -20 gives -17 as the correct answer.
7. C. This is an arithmetic sequence in which each number is 6 greater than the previous number in the sequence. Adding 6 to -16 gives -10 as the correct answer.
8. D. This is an arithmetic sequence in which each number is 4 greater than the previous number in the sequence. Adding 4 to -5 gives -1 as the correct answer.
9. A. This is an arithmetic sequence in which each number is 8 greater than the previous number in the sequence. Adding 8 to -28 gives -20 as the correct answer.
10. B. This is an arithmetic sequence in which each number is 15 greater than the previous number in the sequence. Adding 15 to -80 gives -65 , and adding 15 to -65 gives -50 . Theis means that -65 is the missing number in the series.
11. C. This is an arithmetic sequence in which each number is 3 less than the previous number in the sequence. Subtracting 3 from -11 gives -14 as the correct answer.
12. A. This is an arithmetic sequence in which each number is 7 less than the previous number in the sequence. Subtracting 7 from -36 gives -43 , and subtracting 7 from -43 gives -50 . This means that -43 is the missing number in the series.
13. D. This is an arithmetic sequence in which each number is 8 less than the previous number in the sequence. Subtracting 8 from 81 gives 73 , and subtracting 8 from 73 gives 65 . This means that 73 is the missing number in the series.
14. C. This is an arithmetic sequence in which each number is 12 greater than the previous number in the sequence. Adding 12 to 102 gives 114 , and adding 12 to 114 gives 126. This means that 114 is the missing number in the series.
15. A. In this arithmetic sequence, the constant that is being added is 5 : 31 plus 5 is 36,36 plus 5 is 41. The number that is wrong in the sequence is 25 . This number should be 26 since adding 21 $+5=26$, and $26+5=31$.
16. B. Consecutive terms in an arithmetic series are always the same distance apart. In this case, the difference between consecutive terms is 2 , and 8 is 2 above 6 and 2 below 10 . You can also find the halfway point between the two terms by taking the average of 6 and 10 , which is $(10+6) / 2$ $=8$.
17. D. Consecutive terms in an arithmetic series are always the same distance apart. In this case, the difference between consecutive terms is 6 , and $8+6=14$.
18. C. Consecutive terms in an arithmetic series are always the same distance apart. In this case, the difference between consecutive terms is 2 , and $15-2=13$.
19. D. Consecutive terms in an arithmetic series are always the same distance apart. In this case, the difference between consecutive terms is 4 , and $53+4=57$.
20. B. Consecutive terms in an arithmetic series are always the same distance apart. In this case, the difference between consecutive terms is -18 , so the next term should be $-20-18=-38$.
21. C. Consecutive terms in an arithmetic series are always the same distance apart. In this case, the difference between consecutive terms is 31 , so the next term should be $112+31=143$.
22. B. Consecutive terms in an arithmetic series are always the same distance apart. In this case, the difference between consecutive terms is -9 , so the next term should be 103-9=94.
23. A. Consecutive terms in an arithmetic series are always the same distance apart. In this case, the difference between consecutive terms is 13 , so the next term should be $43+13=56$.
24. B. Consecutive terms in an arithmetic series are always the same distance apart. In this case, the difference between consecutive terms is 17 , so the next term should be $45+17=62$.
25. C. Consecutive terms in an arithmetic series are always the same distance apart. In this case, the difference between consecutive terms is -9 , so the next term should be $53-9=44$.
26. C. Consecutive terms in an arithmetic series are always the same distance apart. In this case, the difference between consecutive terms is 15 , so the next term should be $12+15=27$.
27. A. Consecutive terms in an arithmetic series are always the same distance apart. In this case, the difference between consecutive terms is 3 , so the next term should be $-21+3=-18$.
28. C. Consecutive terms in an arithmetic series are always the same distance apart. In this case, the difference between consecutive terms is -56 , so the next term should be $-11-56=-67$.
29. D. Consecutive terms in an arithmetic series are always the same distance apart. In this case, the difference between consecutive terms is 14 , so the next term should be $39+14=53$.
30. B. Consecutive terms in an arithmetic series are always the same distance apart. In this case, the difference between consecutive terms is -3 , so the next term should be $-5-3=-8$.

## Geometric

31. B. For this sequence, each term is multiplied by 6 to obtain the next term. Therefore: $30 \times 6=$ 180.
32. C. For this sequence, each term is multiplied by 0.2 to obtain the next term. Therefore: $20 \times 0.2=$ 0.04 .
33. A. For this sequence, each term is multiplied by 7 to obtain the next term. Therefore: $56 \times 7=$ 392.
34. B. In this sequence, each term is divided by 10 to obtain the next term. Therefore: $0.1 \div 10=$ 0.01 .
35. A. Each term is multiplied by 20 to obtain the next term. Therefore: $9 \times 20=180$.
36. B. For this sequence, each term is multiplied by $-\frac{1}{2}$. Therefore: $\frac{1}{12} \times-\frac{1}{2}=-\frac{1}{24}$.
37. B. In this sequence, each term is multiplied by 10 to obtain the next term. Therefore: $0.022 \times 10=0.22$.
38. B. In this sequence, each term is multiplied by 11 to obtain the next term. Therefore: $11 \times 11=$ 121.
39. B. In this sequence, each term is divided by 12 to obtain the next term. Therefore: $120 \div 12=10$.
40. A. In this sequence, each term is multiplied by 3 to obtain the next term. Therefore: $13 \times 3=39$.
41. C. In this sequence, each term is divided by 2 to obtain the next term. Therefore: $312 \div 2=156$.
42. D. In this sequence, each term is multiplied by 3 to obtain the next term. Therefore: $36 \times 3=108$.
43. B. In this sequence, each term is multiplied by 1 . Therefore: $9 \times 1=9$.
44. B. In this sequence, each term is divided by 4 to obtain the next term. Therefore: $16 \div 4=4$.
45. A. In this sequence, each number is divided by 7 to obtain the next number. Therefore: $\frac{1}{7} \div 7=\frac{1}{49}$.
46. D. In this sequence, each number is multiplied by 5 to obtain the following number. Therefore: $25 \times 5=125$.
47. A. In this sequence, each number is divided by 2 to obtain the next number. Therefore: $7 \div 2=$ 3.5.
48. A. In this sequence, each number is multiplied by -3 to obtain the next number. Therefore; $9 \times-3=-27$
49. D. In this sequence, each number is multiplied by -5 to obtain the next number. Therefore: $-2 \times-5=10$
50. D. In this sequence, each number is multiplied by 2 to obtain the next number. Therefore: $280 \times 2=560$.
51. D. In this sequence, each number is divided by 2 to obtain the next number. Therefore: $3 \div 2=\frac{3}{2}$.
52. C. In this sequence, each number is multiplied by -1 to obtain the next number. Therefore: $-5,819 \times-1=5,819$.
53. C. In this sequence, each number is divided by 3 to obtain the next number. Therefore: $45 \div 3=$ 15.
54. D. In this sequence, each number is divided by 6 to obtain the next number. Therefore: $48 \div 6=$ 8.
55. D. In this series, each number is multiplied by -8 to obtain the next number. Therefore: $-64 \times-8=512$.
56. C. In this series, each term is multiplied by 5 to obtain the next number. Therefore: $50 \times 5=250$.
57. C. In this sequence, each number is multiplied by 2 to obtain the following term. Therefore:

$$
56 \times 2=112
$$

58. C. In this sequence, each term is multiplied by 20 to obtain the next term. Therefore: $16,000 \times 20=320,000$.
59. C. In this sequence, each term is multiplied by 6 to obtain the next term. Therefore: $6 \times 6=36$.
60. B. In this sequence, each term is divided by 9 to obtain the next term. Therefore: $9 \div 9=1$.

## Other

61. C. This is a sequence of decreasing multiplication: times 5 , then times 4 , then times 3 , and so on. The last step was to multiply 40 by 3 to get 120 . Multiplying 120 by 2 gives the correct answer of 240 .
62. B. This is a sequence of increasing addition: +1 , then +2 , then +3 , and so on. The last step was to add 4 to 6 to get 10 . Adding 5 to 10 gives 15 , the correct answer.
63. A. This is a sequence of subtracting a larger value between each term: $-3,-4,-5$, and so on. The last step was to subtract 5 from 13 to get 8 . Subtracting 6 from 8 gives 2 , the correct answer.
64. B. This is a sequence of decreasing division: dividing by 5 , then dividing by 4 , then dividing by 3 , and so on.
65. D. This is a sequence of increasing multiplication: times 2 , then times 3 , then times 4 and so on. The last step was to multiply 6 by 4 to get 24 . Multiplying 24 by 5 gives 120 , the correct answer.
66. B. This is a sequence of subtracting a smaller value each time: minus 7 , then minus 6 , then minus 5 , and so on. The last step was to subtract 5 from -3 , resulting in -8 . Subtraction 4 from -8 gives -12 , the correct answer.
67. A. This is a sequence of decreasing addition: plus 9 , then plus 8 , then plus 7 , and so on. The last step was to add 7 to 18 to get 25 . Adding 6 to 25 gives 31 , the correct answer.
68. C. This is a sequence of dividing by a larger amount between each term: divide by 1 , divide by 2 , divide by 3 , and so on. Forty-eight divided by 1 is 48 ; then 48 divided by 2 is 24 . Dividing 24 by 3 gives 8 as the correct answer. This is then divided by 4 to give 2 , the final term in the series.
69. D. This is an alternating sequence of increasing addition: plus 3 , then plus 4 , then plus 5 , and so on. The last step was to add 5 to 10 to get 15 . Adding 6 to 15 gives 21 . Then, adding 7 to 21 gives 28 , and adding 8 to 28 results in 36 .
70. D. This is a sequence of subtracting a larger amount between each term: minus 9 , then minus 8 , then minus 7 , and so on. The last step was to subtract 7 from 23 to get 16 . Subtracting 6 from 16 gives the correct answer of 10 .
71. B. Find the second term by squaring the first term: $0^{2}=0$. Then add 3 to the first term to get the third term. $0+3=3$. Now the pattern repeats. Square the third term to get the fourth term: $3^{2}=9$. Then add three to the third term to get 6 as the fifth term. Squaring 6 gives 36 as the sixth term. Repeating the pattern gives 9 as the next term in the sequence.
72. D. This is a pattern of alternating increasing by one, followed by the square of the number. For example, the first number is 5 , followed by the square of 5 , or 25 . The next term increases 5 by one, to get 6 . Then, 6 is squared to give 36 . Following the correct process gives 7, and then 49 as the next term in the sequence.
73. C. This sequence alternates between decreasing perfect squares, followed by the square root of that number. For example, 81 is the first term, and the square root of 81 is the second term, or 9. Decreasing from 81 , the next perfect square is 64 , which is the third term. Taking the square root gives the next term in the sequence, which is 8 . Following this pattern gives $49,7,36$ as the next three terms.
74. D. This pattern skips two letters in the alphabet between terms. Here, the first term is H. The next two letters in the alphabet are I and J, and these are jumped over to get to the second term, which is K. Skipping another two letters, L and M , gives N as the third term. Continuing this pattern gives Q as the next term in the sequence.
75. B. This is a pattern of two grouped letters, where the second letter comes immediately before the first letter in the alphabet. For example, in the first term, B is followed by A, because A comes directly before B. The second term is found by taking the next two letters in the alphabet and arranging them in the same way: DC. Following this pattern gives HG as the next term in this sequence.
76. C. This sequence shows decreasing letters in the alphabet, where a letter is skipped between each term. For example, the first term is Y. Decreasing from there and skipping X results in the second term, $W$. Following this pattern gives $S$ as the next term in the sequence.
77. D. This sequence shows Roman numerals, increasing by 4 each term. The first term is 1 , expressed as I in Roman numerals. Adding $1+4=5$; which is expressed as $V$ in Roman numerals. IX is 9 , so adding 4 gives the next term as 13 , or XIII.
78. B. Examine the third and fourth terms to determine the pattern. As C-III (or C-3) increases to D-IV (or D-4), this demonstrates a pattern of increasing letters in the alphabet, connected with a dash with increasing Roman numerals. Since the first term is A-I, the second term is found by moving one letter up in the alphabet, and one number up in the Roman numeral that follows the letter, so the second term is B-II.
79. B. This is a pattern of adding 4 and then subtracting 6 to the number, while moving one letter up in the alphabet each term. $30+4=34$. Then $34-6=28$. Adding 4 to 28 gives 32 as the number in the answer. As the letters go up by one each time, the letter attached to 32 will be N .
80. A. This is a pattern of decreasing integers, alternating between being expressed as a numerical digit and a Roman numeral. The first term is the Roman numeral for 7 , followed by 6 as a numerical digit. Then comes 5 as the Roman numeral $V$, so the next term in the sequence will be 4 as a numerical digit.
81. D. This is a pattern involving letters and numbers. Examining the letters reveals that 3 letters are skipped between each term. The numbers follow a pattern of adding 2 and then multiplying by 2. Continuing this pattern makes the next two terms Q36 and U38.
82. D. This is a pattern of both letters and numbers. Examining the pattern of the letters reveals that each term skips one additional letter in the alphabet. For example, there are no letters skipped between the first and second term, from B to C. Then, one letter, D, is skipped to get the next term which contains E. Two letters are skipped to move forward to $H$. Therefore, the letter in the correct answer will be L, as this skips the three letters I, J, and K. The numbers follow a similar pattern, of increasing addition: $+1,+2,+3$. This makes the next number: $29+4=33$.
83. C. This is a pattern of decreasing numbers and letters. Each term decreases by one integer and one letter in the alphabet. Following this pattern reveals $14 \times S$ as the next term in the sequence.
84. C. This is a pattern of alternating digits and Roman numerals. The Roman numerals increase by one every other term, and the digits alternate with increasing multiples of 4. The missing term is the Roman numeral III.
85. A. Each term in this series is made up of a letter in the alphabet connected to the next letter in the alphabet. Each additional term moves forward one letter. Therefore, the next term would begin with T and end with U .
86. D. This is a pattern of decreasing powers of 5 . The first term is $5^{3}$, the third term is $5^{1}$, and the last term is $5^{0}$. This means that the second term should be 25 .
87. B. This is a pattern of alternating operations: times two, plus seven. Working backwards reveals the missing term as 10 since $5 \times 2=10 ; 10+7=17$.
88. C. This is a pattern of alternating operations between adding 9 and dividing by 3 . This gives $0+$ $9=9 ; 9 \div 3=3 ; 3+9=12$.
89. C. This is a pattern of alternating roman numerals and numerical digits. The Roman numerals increase by one every other term, while the numerical digits increase by 2 . The last term given is a Roman numeral, meaning the first term of the correct answer must be a numerical digit, and $6+2=8$. Continuing the pattern gives $8, V$, and 10 as the next three terms.
90. A. This is a pattern of alternating dividing by 2 and dividing by 5 . The sequence is: $500 \div 2=$ $250 ; 250 \div 5=50 ; 50 \div 2=25 ; 25 \div 5=5$.
91. C. This is a pattern of alternating adding 6 and then adding 7 . As $19+6=25$, the next term will be found by adding 7 . This gives $25+7=32$.
92. D. The sequence follows the pattern: multiply by 2 , multiply by 4 , repeat. Therefore, the next term in the sequence is 1024.
93. B. The odd terms in the sequence increase by 1 , and the even terms are 10 more than the term before it. Therefore, the next term in the sequence is 15 .
94. D. Each even term in the sequence is the preceding term times $\frac{1}{3}$; each odd term is the preceding term times $\frac{1}{2}$. Therefore, the next term is $\frac{1}{108}$.
95. C. The sequence follows the pattern: divide by 3 , divide by 1 . Therefore, the next term is $\frac{10}{9}$.
96. A. Odd terms in the sequence decrease through division by 2 , and even terms in the sequence decrease through division by 10 . Letters increase by 3s. Therefore, M35 should come next.
97. C. Each term increases by four more than the previous interval. Therefore, we add 16 to 27, resulting in 43.
98. D. The sequence follows the pattern: multiply the previous term by 9 , then add 9 to the previous term. Therefore, the next term in the sequence should be $252 \times 9=2268$.
99. A. The sequence follows the pattern: divide by two, subtract two. Therefore, the missing term is 40. Since there are more given terms after the blank, you can also try to work backwards from the last term: starting at 17 , add 2 , then multiply by 2 . Adding 2 again will result in 40 , which you can then multiply by 2 to get 80 .
100. D. The sequence is every fifth letter. Therefore, the missing term is $K$.
101. A. The sequence follows the pattern: subtract 1000 , then subtract 100 , then 10 , then 1 . Therefore, the next term should be 0 .
102. C. For each letter component, the sequence skips 3 letters. For the 2 -digit number component, subtract five. Therefore, the following term should be WL30.
103. C. The sequence follows the pattern: subtract 2 , subtract 1000 , and repeat. Therefore, we should subtract 1000 from -1 , resulting in -1001 as the missing term.
104. B. The sequence follows the pattern: subtract 3, multiply by 7, repeat. Therefore, the missing term is -7 .

## Geometric Comparison

## Angles

1. D. First, determine the measure of each angle. $\angle A$ is 75 degrees (180-105), $\angle B$ is 80 degrees ( $90-10$ ), and $\angle C$ is 80 degrees ( $180-60-40$ ). Therefore, $\angle A<\angle B=\angle C$.
2. A. You begin by determining the measure of each angle. $\angle A$ is 55 degrees ( $90-35$ ), $\angle B$ is 60 degrees $(90-30)$, and $\angle C$ is 45 degrees $(90-45)$. Therefore, $B$ is the greatest, and $C$ is the smallest.
3. C. Both sets of angles are supplementary, so you can determine the sum of $\angle A$ and $\angle D$ by subtracting 50 and 30 from 180 , giving you a sum of 100 degrees. The same is true from $\angle B$ and $\angle C$, and subtracting 25 and 45 from 180 gives you 110 . Therefore, the sum of $\angle A$ and $\angle D$ is less.
4. C. In a right triangle, the sum of the two acute angles is equal to the right angle. Therefore, $\angle C=$ $\angle B+\angle A$. Furthermore, the right angle cannot be equal to or less than either of the acute angles, which eliminates the other three answers.
5. C. In a triangle, the angle opposite the largest side is the largest angle, and, similarly, the angle opposite the smallest side is the smallest angle. Therefore, $\angle C$ is the largest angle, and $\angle A$ is the smallest.
6. A. In a triangle, the side opposite the largest angle is the largest side. If two angles are equal, then the sides opposite those angles will also be equal. Therefore, $c$ is the largest side, and $a$ and $b$ are equal to each other.
7. A. In a triangle, the angle opposite the largest side is the largest angle, and, similarly, the angle opposite the smallest side is the smallest angle. Therefore, $\angle B$ is the largest angle, and $\angle C$ is the smallest.
8. C. Because $d$ must be less than 90 degrees, $e$ must be greater than 90 (as it is supplementary to $d$ ). Therefore, $e$ is greater than $a$, which is exactly 90 degrees.
9. D. Because $a$ and $b$ are the two acute angles of a right triangle, their sum is 90 degrees. $C$ is also 90 degrees, because it is an angle of a rectangle. Therefore, the sum of the three angles is 180 degrees.
10. D. When you have two parallel lines, corresponding angles are congruent, and $\angle A$ and $\angle E$ are corresponding angles.
11. B. You can determine $b$ by subtracting 60 from 180 , as $b$ and the angle next to it are supplementary angles. That means $b=120$. Angle $a$ is a vertical angle to the 60 -degree angle, so it is also 60 degrees, as vertical angles are congruent. Therefore, $a+a=120=b$.
12. C. The angles $a$ and $c$ are vertical angles, so they are equal to each other. It is possible that all four angles are equal to each other, but you cannot know that. The sum of $a$ and $c$ and the sum of $b$ and $d$ would only be equal to each other if all four angles were equal. Finally, the sum of $b$ and $c$ and the sum of $a$ and $d$ are equal to each other, so one sum is not greater than the other.
13. B. It helps in this kind of problem to determine the measure of each angle. Angle $a$ is complementary to 30 , as they form a right angle, so $a$ is $60(90-30)$. Angle $b$ is a right angle, so it is 90 . Angle $c$ is complementary to 50 , so it is $40(90-50)$. Angle $d$ is vertical to $a$, so it is also 60 . Therefore, the only answer which is true is that $c$ is less than $a$, and $a$ is less than $b$.
14. C. Angles $a$ and $b$ are complementary, as they form a right angle. Therefore, their sum is 90 degrees. Angle $e$ is supplementary to a right angle, so it is equal to 90 degrees (180-90). Therefore, the sum of $a$ and $b$ is equal to $e$.
15. C. The three angles of a triangle always add up to 180 . Therefore, the sum of three angles of one triangle is always equal to the sum of three angles of another triangle.
16. A. The four angles of a rectangle are each 90 degrees and, therefore, are equal to each other. Angles $f$ and $p$, as well as angles $q$ and $z$, form the right angles of a rectangle, so their sums are equal to each other.

## Polygons

17. A. The sum of the lengths of two radii of a circle is equal to the length of the diameter, and the length of a diameter is always greater than the length of a chord. Therefore, III is greater than I.
18. C. I has an area of $30\left(\frac{1}{2} \times 10 \times 6\right)$, II has an area of $32\left(\frac{1}{2} \times 8 \times 8\right)$, and III has an area of 24 $\left(\frac{1}{2} \times 6 \times 8\right)$.
19. B. The area of I is $48(12 \times 4)$. The area of II is $25 \pi\left(A=\pi r^{2}\right)$, or more than 75 . The area of III is $9 \pi$, or slightly more than 27 , as you need to divide the diameter by 2 to get the radius. Because the three areas are not particularly close, you can save some time by merely estimating the circle areas by multiplying by 3 rather than 3.14 for $\pi$.
20. D. This is a problem where you only need to determine which circle has the largest/smallest radius, as that is the only variable in determining each area. A circle of diameter 8 will have a radius of 4 , as the radius is half the length of the diameter. Therefore, the area of II will be the greatest, and I and III will be equal to each other.
21. B. The area of the triangle is $48\left(\frac{1}{2} \times 8 \times 12\right)$, the area of the parallelogram is $96(A=b h=$ $8 \times 12)$, and the area of the rectangle is also $96(A=12 \times 8)$. Therefore, II and III are equal, and both are greater than I.
22. A. The area of the triangle is 32 , as both its base and height are $8\left(\frac{1}{2} \times 8 \times 8\right)$. The area of the square is $64(8 \times 8)$. The area of the circle is $16 \pi\left(A=\pi r^{2}=\pi \times 4^{2}\right.$, remembering that the radius is half the length of the diameter). $16 \pi$ is equal to approximately 50 , so it is greater than 32 but less than 64.
23. D. The area of the parallelogram is $35(A=b h=7 \times 5)$. The area of the triangle is 18 , as both the base and height are $6\left(\frac{1}{2} \times 6 \times 6\right)$. The area of the rectangle is $36(9 \times 4)$. Therefore, III is greater than I, and I is greater than II.
24. A. The circumference of the circle is 31.4 ( $C=2 \pi r=2 \times 5 \times 3.14$ ). The perimeter of the triangle is $30(10+10+10)$. The perimeter of the rectangle is $32(2 l+2 w=2 \times 9+2 \times 7)$. Therefore, II is less than I , and I is less than III.
25. D. In a triangle, the sum of two sides is always greater than the third side, so II is less than I. Then the sum of all four sides is obviously greater than the sum of just two sides, so I is less than III.
26. B. In a square, all sides are equal length, so II and III are equal. Furthermore, the diagonal of a right triangle is always greater than the length of either leg, so I is greater than both II and III.
27. C. Both $\angle \mathrm{PON}$ and $\angle \mathrm{PMN}$ are right angles and equal 90 degrees. Therefore, the sum of the other two angles in each triangle is 90 degrees, as there are a total of 180 degrees in any triangle. This means that the sum of $\angle \mathrm{MNP}$ and $\angle \mathrm{MPN}$ is 90 , the sum of $\angle O N P$ and $\angle$ NPO is also 90 , and $\angle \mathrm{PON}$ itself is also 90 , since it is a right angle. Therefore, I, II, and III are all equal.
28. B. As the three angles of a triangle add up to 180 degrees, you can determine $\angle B$ by adding $\angle A$ ( 30 degrees) and $\angle \mathrm{C}$ ( 90 degrees) and subtracting from 180. That equals 60 degrees. Therefore, III is greater than II, and II is greater than I.
29. A. In a circle, all diameters of that circle are equal to each other, so I and III are equal. The circumference of a circle is always larger than its diameter, as the circumference is found by multiplying the diameter by $\pi(\approx 3.14)$. Therefore, both I and III are less than II.
30. A. As the number of sides increases, so does the sum of the angles inside the polygon. The sum of the angles of a triangle is 180 , and the sum of the angles of a square is $360(4 \times 90)$. The sum of the angles of a pentagon, with five sides, is 540 . Therefore, $\mathrm{II}<\mathrm{III}<\mathrm{I}$.
31. D. I is a 4 by 3 rectangle, so it has 12 blocks. III is a 6 by 2 rectangle, so it also has 12 blocks. II is a 5 by 2 rectangle, so it only has 10 blocks. Therefore, I and III are equal, and both are greater than II.
32. C. I and III both have 8 blocks, so their sum is 16 blocks. That is the same number of blocks as II.

## Non-Geometric Comparison

## Algebraic

1. A. Statement I is: $2+6=8$; statement II is: $2 \times 2^{2}+2=10$; statement III is: $2^{2}+4=8$. Therefore, I and III are equal, and both are less than II.
2. C. Statement I is: $2 \times 5-2=8$; statement II is: $2(5-1)=8$; statement III is: $5+2=7$. Therefore, I and II are equal, and both are greater than III.
3. C. Statement I is: $\frac{1+3}{2}=2$; statement II is: $4-2(1)=2$; statement III is: $1^{3}+1=2$. Therefore, all three expressions are equal to each other.
4. D. Statement I is: $0^{4}+4=4$; statement II is: $2 \times 0^{3}+0=0$; statement III is: $5-0=5$. Therefore, II < I $<$ III.
5. B. Simplifying statements II and III gives you $x+2 y$ and $2 x+2 y$, respectively. Therefore, I and II are equal. Since $x$ is positive, $2 x$ is always greater than $x$, so $2 x+2 y$ is greater than $x+2 y$.
6. A. Simplifying statements II and III gives you $2 x+y$ and $2 x-y$, respectively. Since all three expressions include $2 x$, you only need to compare the $y$-values to determine which is greater, and $y>-y>-2 y$ when $y$ is positive.
7. D. Simplifying statement I gives $3 y$ and simplifying statement II gives $3 y-3 x$. As all three expressions include $3 y$, you only need to compare the $x$-values to determine which is greater, and $-3 x<0<x$ ( 0 is the $x$-value in statement I).
8. A. Statement I is: $2 \times 4+3=11$; statement II is: $4^{2}=16$; statement III is: $3(4-2)=6$. Therefore III < I < II.
9. C. Statement I is: $\frac{2 \times 3}{3}=2$; statement II is: $2 \times 3-4=2$; statement III is: $5-3=2$. Therefore, all three expressions are equal to each other.
10. C. Statement I is: $4 \times 10=40$; statement II is: $\frac{10^{2}}{2}=50$; statement III is: $2(10+5)=30$. Therefore, II is greater than I, which is greater than III.
11. B. Statement I is: $3 \times 1^{3}=3$; statement II is: $4 \times 1=4$; statement III is: $2 \times 1^{2}+2=4$. Therefore, II and III are equal, and both are greater than I.

## Counting

12. C. (I) has 20 blocks, (II) has 24 blocks, and (III) has 22 blocks. Therefore, II > III > I.
13. D. (I) has 8 blocks, (II) has 7 blocks, and (III) has 10 blocks. Therefore, II $<$ I $<$ III.
14. D. (I) has 11 blocks, (II) has 10 blocks, and (III) has 9 blocks. Therefore, $\mathrm{I}=\mathrm{II}<$ III.
15. C. (I) has 1 circle and 3 stars for a total value of 8 , (II) has 2 circles and 1 star for a total value of 11 , and (III) has 1 circle and 6 stars for a total value of 11 . Therefore, II = III > I.
16. A. (I) has 4 circles and 4 stars for a total value of 24 , (II) has 2 circles for a value of 10 , and (III) has 2 circles and 4 stars for a total value of 14 . The sum of II and III is: $10+14=24$, so the sum of II and III is equal to I.
17. C. (I) has 2 large and 2 small houses for a total of 22 houses, (II) has 2 large and 2 small houses for a total of 22 houses, and (III) has 2 large and 5 small houses for a total of 25 houses. The sum of I and II is $22+22=44$, so I + II $>$ III.
18. B. (I) has 4 marks, (II) has 5 marks, and (III) has 6 marks. The sum of 4 and 5 is 9 , which is greater than 6.
19. D. (I) has 6 marks, (II) has 10 marks, and (III) has 3 marks. The sum of 6 and 3 is 9 , which is less than 10 .
20. D. (I) shows values of 4,3 , and 5 for a total value of 12 . (II) shows values of $1,4,3$, and 5 , for a total value of 13 . (III) shows values of 6 and 6 , for a total value of 12 . Thirteen is greater than 12 , so II > III = I is correct.
21. D. (I) shows values of 3,3 , and 3 for a total value of 9 . (II) shows values of 6 , and 2 , for a total value of 8 . (III) shows values of 4,6 , and 5 , for a total value of 15 . Fifteen is less than seventeen, which is the sum of 9 and 8 , therefore III $<I+$ II.

## Fractions, Decimals, Percent

22. D. When comparing fractions, it helps to find a common denominator and then convert into equivalent fractions. The common denominator of 2,5 , and 10 is 10 , so $\frac{1}{2}=\frac{5}{10}$ and $\frac{3}{5}=\frac{6}{10}$. Therefore, $\frac{1}{2}<\frac{3}{5}=\frac{6}{10}$.
23. D. The square root of 9 is exactly 3 , and $\frac{19}{6}=3 \frac{1}{6}$. Therefore, 3 is greater than 2.874 , but it is less than $3 \frac{1}{6}$.
24. B. When you are comparing fractions, square roots, and percents, one approach is to convert all of them into decimals. $108 \%$ equals $1.08, \frac{7}{5}$ equals 1.4 , and the square root of 1 is just 1 .
Comparing the three shows that 1 is the smallest, 1.08 is the next smallest, and 1.4 is the greatest.
25. B. $25 \%$ of $32=8, \frac{1}{2}$ of $24=12$, and $\frac{2}{3}$ of $18=12$. Therefore, $\mathrm{I}<\mathrm{II}=$ III must be the correct answer, as it is the only answer where II = III.
26. C. $8 \div 0.4=20,8 \div 4=2$, and $0.8 \div 0.4=2$.
27. D. $1.2 \div 4=0.3,1.2 \times 4=4.8$, and $1.2 \times 0.4=0.48$. Therefore, $\mathrm{I}<\mathrm{III}<\mathrm{II}$.
28. C. Converting fractions into decimals often makes comparing the numbers easier. Therefore, the first expression equals 2.78 , the second is 4.39 , and the third is 2.96 .
29. B. Write each shaded region as a fraction of the circle. I is $\frac{5}{6}$, II is $\frac{3}{6}$, and III is $\frac{3}{5}$. Therefore, I is the most-shaded circle, while II is the least-shaded.
30. A. Converting fractions into decimals often makes comparing the numbers easier. Therefore, the first expression equals 7.73 , the second is 7.94 , and the third is 7.26 .
31. D. Converting fractions into decimals often makes comparing the numbers easier. Therefore, the first expression equals 6.48 , the second is 8.65 , and the third is 8.26 .
32. D. Converting fractions into decimals often makes comparing the numbers easier. Therefore, the first expression equals 11.048, the second is 11.31 , and the third is 10.79 .
33. A. When comparing decimals, start with the greatest place values. In this problem, the ones places all have zeros and are equivalent. Then, the 1 in the tenths place of 0.1011 is larger than the 0 in both 0.011 and 0.00101 . Of the other two numbers, 0.011 has a larger number in the hundredths place than 0.00101 . Therefore, $0.00101<0.011<0.1011$.
Graphs
34. A. The values of both $A$ and $D$ are 10 , so they are equal.
35. A. The value of $C$ is 3 , and the value of $D$ is 7 . Their sum is 10 , which is the value of $A$.
36. $B$. The value of $A$ is 4 , and twice that is 8 , which is the value of $C$.
37. D. Tracy's values can be found by looking at the height of the darker line each day. Tracy watched 2 hours of television on Tuesday, which was the highest amount all week.
38. D. Dunable's class is the correct answer. The graph shows that, in May, Mrs. Taylor has 4 students with a birthday, while Mrs. Dunable has only 3 students with a birthday.
39. A. Eleven students in each class got a $B$ on the test, which is the highest number of any grade, so that is the correct answer.
40. C. Find each sum for each person by adding the hours spent on each day of the week. Mark spent a total of: $3+2+4+5+0=14$ hours doing homework. Jamal spent a total of: $4+2+3+5+$ $1=15$ hours doing homework. As $15>14$, Jamal's sum is higher.
41. C. She read more than 70 pages that week, while no other week had more than 60 pages.
42. A. The value of $A$ is 8 , and the value of $E$ is 6 , so their sum is 14 , which is the same value as $D$.
43. C. The value of $A$ is 50 , and the value of $B$ is 30 , so their sum is 80 . The value of $D$ is 40 , and twice that is 80 .
44. C. In game 1, Jamila had 15 points, and Darcy has 12. Jamila's next-highest game was 10 points in game 5, while Darcy's next-highest game was 11 points in game 2.
45. A. Mrs. Vo's class had more students participate on Monday, Thursday, and Friday.
46. D. B is greater than $A$ in weeks $1,2,3$, and 5 , but not in week 4 .
47. A. The values of $A$ are $7,5,3,6$, and 2 , for a sum of 23 . The values of $B$ over five weeks are $8,4,1$, 6 , and 2 , for a sum of 21 . Therefore, the sum of $A$ is greater than the sum of $B$.
48. B. A is half of the circle, so it is clearly the largest. Examining the center of the circle shows that C forms a right angle, while B's angle is clearly acute. Therefore, C is greater than B.

## Measurements

49. C. The difference of III and II is $2(9-7=2)$, and the difference of $I I$ and $I$ is also $2(7-5=2)$. Therefore, those differences are equal to each other.
50. A. One centimeter is equal to ten millimeters, so $2 \mathrm{~cm}=20 \mathrm{~mm}$. The sum of I and III is equal to 19 mm , so it is less than 2 cm .
51. C. One centimeter is equal to ten millimeters, so $5 \mathrm{~cm}=50 \mathrm{~mm}$. Therefore, it is greater than both 47 and 38 mm .
52. B. One liter (abbreviated as 1 L ) is equal to $1,000 \mathrm{ml}$. Therefore, it is greater than both 750 and 500 ml .
53. A. One centimeter is equal to ten millimeters, so $3 \mathrm{~cm}=30 \mathrm{~mm}$ and $6 \mathrm{~cm}=60 \mathrm{~mm}$. Therefore, 30 is less than 60 , and 60 is less 90 .
54. B. The perimeter of $I$ is 16 , of $I I$ is 17 , and of $I I I$ is 15 . Therefore, $I I I$ is less than $I$, and $I$ is less than II.
55. D. The perimeter of I is 19 , of II is 21 , and of III is 20 . Therefore, II is greater than III, and III is greater than I. A shortcut in determining a perimeter is to realize that triangles I and III have the same side lengths except that I has side of length 4 and III has a side of length 5 . This means that III will be larger than I by 1 .
56. A. The perimeter of $I$ is 6 , of II is 12 , and of III is 18 . Adding I and II together gives you 18 , which is equal to III.
57. A. The perimeter of I is 10 , of II is 24 , and of III is 12 . The difference of II and III (II - III) is 12 , which is greater than 10.
58. C. The area of I is 8 , of $I I$ is 15 , and of $I I I$ is 6 . The sum of I and III is 14 , which is less than II.
59. C. The area of $I$ is 30 , of $I I$ is 16 , and of $I I I$ is 15 . The difference of $I-I I$ is 14 , which is less than III.
60. A. The area of I is 12 , of II is 9 , and of III is 8 . Therefore, III is less than II, which is less than I.
61. B. The area of I is 24 , of $I I$ is 25 , and of $I I I$ is 24 . Therefore, $I$ and III are equal, and both are less than II.
62. D. A minute is 60 seconds, so 2 minutes are 120 seconds. Therefore, I and III are equal, and both are greater than II.
63. C. A nickel is worth five cents, and the sum of two and three pennies is also five cents.

## Order of Operations

64. A. Statement I can be solved as: $2^{-2}=\frac{1}{2^{2}}=\frac{1}{4}$; Statement II can be solved as: $(-2)^{2}=-2 \times-2=$ 4; Statement III can be solved as: $(-2)^{-2}=\frac{1}{(-2)^{2}}=\frac{1}{4}$.
65. C. When the negative is outside of parentheses, it is applied to the resulting number after applying the exponent. If it is inside parentheses, it is multiplied with the number. Statement I can be solved as: $-\left(3^{2}\right)=-(9)=-9$; Statement II can be solved as $(-3)^{2}=-3 \times-3=9$; Statement III can be solved as: $(-3)^{-2}=\frac{1}{(-3)^{2}}=\frac{1}{9}$.
66. C. When the negative is outside of parentheses, it is applied to the resulting number after applying the exponent. If it is inside parentheses, it is multiplied with the number.
Statement I can be solved as: $-\left(2^{3}+1\right)=-(8+1)=-9$; Statement II can be solved as: $(-2)^{3}+1=-8+1=-7$; Statement III can be solved as: $(-2+1)^{3}=(-1)^{3}=-1$.
67. A. Statement I can be solved as: $9 \times(10+3)=9 \times 13=117$; Statement II can be solved as: $(10 \times 9)+27=90+27=117$; Statement III can be solved as: $(3 \times 40)+9=120+9=$ 129.
68. D. Statement I can be solved as: $9 \times 10^{2}=900$; Statement II can be solved as: $(10 \times 10) \times 9^{2}=$ $100 \times 81=8100$; Statement III can be solved as: $0.090 \times 10^{3}=90$.
69. B. Statement I can be solved as: $32^{2}=32 \times 32=1024$; Statement II can be solved as: $2^{6}=$ $2 \times 2 \times 2 \times 2 \times 2 \times 2=64$; Statement III can be solved as: $4^{4}=4 \times 4 \times 4 \times 4=256$.
70. D. Statement I can be solved as: $16^{1}=16$. Statement II can be solved as: $2^{4}=2 \times 2 \times 2 \times 2=16$; Statement III can be solved as: $4^{2}=4 \times 4=16$
71. D. Statement I can be solved as: $2 \times 3^{2}=2 \times 9=18$; Statement II can be solved as: $2^{3} \times 2=$ $8 \times 2=16$; Statement III can be solved as: $3 \times 2^{2}=3 \times 4=12$.
72. D. Statement I can be solved as: $8.01 \times 10^{2}=801$; Statement II can be solved as: $8^{2}=$ 64; Statement III can be solved as: $0.801 \times 10^{1}=8.01$.
73. A. Statement I can be solved as: $6 \times(1+2)=6 \times 3=18$; Statement II can be solved as: $1+$ $(5 \times 1)+2=1+5+2=8$; Statement III can be solved as: $(1+5) \times(1+2)=6 \times 3=18$.
74. C. Statement I can be solved as: $-3 \times(5+2)-6=-3(7)-6=-21-6=-27$; Statement II can be solved as: $-(3 \times 5)+2-6=-15+2-6=-13-6=-19$; Statement III can be solved as: $(-3 \times 5)-(2-6)=-15-(-4)=-15+4=-11$.
75. B. Statement I can be solved as: $-(2+3)-6(4-1)=-5-6(3)=-5-18=-23$; Statement II can be solved as: $(-2+3)+6(-4-1)=1+6(-5)=1-30=-29$; Statement III can be solved as: $-(2-3)-6(4+1)=-(-1)-6(5)=1-30=-29$.
76. B. Statement I can be solved as: $-8+13=5$; Statement II can be solved as: $-(8+13)=-21$; Statement III can be solved as: $13-8=5$.
77. C. First complete the operations within parentheses, then distribute negative signs as needed. Statement I can be solved as: $-2 \times(3+11)=-2 \times 14=-28$; Statement II can be solved as: $(-2 \times 3)+11=-6+11=5$; Statement III can be solved as: $-(2 \times 3)+11=-6+11=5$.
78. C. First complete the operations within parentheses, then distribute negative signs as needed. Statement I can be solved as: $-(1+15)+3=-16+3=-13$; Statement II can be solved as: $(-1+15)+3=14+3=17$; Statement III can be solved as: $-1-15-3=-19$.
79. A. Statement I can be solved as: $1.043 \times 10^{6}=1,043,000$; Statement III can be solved as: $1,043 \times 10^{3}=1,043,000$.

## Slope

80. D. The $y$-intercept described in I is 0 , the $y$-intercept described in II is -3 , and the $y$-intercept described in III is 3 . Therefore, II $<$ I $<$ III.
81. A. The $y$-intercept described in I is -2 , the $y$-intercept described in II is 2 , and the $y$-intercept described in III is -1 . Therefore, $\mathrm{II}>\mathrm{III}>\mathrm{I}$.
82. B. The $y$-intercept described in I is -8, the $y$-intercept described in II is 8 , and the $y$-intercept described in III is 4 . Therefore, I is less than III.
83. B. The $y$-intercept described in I is 2 , the $y$-intercept described in II is -2 , and the $y$-intercept described in III is -1 . Therefore, I is greater than III.
84. B. The $y$-intercept described in I is 3 , the $y$-intercept described in II is 1 , and the $y$-intercept described in III is 1 . Therefore, II is equal to III.
85. B. The slope described in I is -1 , the $y$-intercept described in II is -5 , and the slope described in III is -1 . Therefore, I is equal to III.
86. C. The $y$-intercept described in I is -4 , the slope described in II is -2 , and the $y$-intercept described in III is -10 . Therefore, $\mathrm{I}>\mathrm{III}$.
87. C. The slope described in I is 6 , the $y$-intercept described in II is $\frac{1}{3}$, and the slope described in III is $-\frac{1}{2}$. Therefore, $\mathrm{I}>$ III.
88. B. The $y$-intercept described in I is -2 , the slope described in II is 0 , and the $y$-intercept described in III is -8 . Therefore, II $>\mathrm{I}$.
89. D. The $y$-intercept described in I is 0 , the $y$-intercept described in II is -4 , and the slope described in III is -3 . Therefore, III is greater than II.
90. A. The $y$-intercept described in I is 4 , the $y$-intercept described in II is -3 , and the slope described in III is $-\frac{1}{3}$. Therefore, $\mathrm{I}>\mathrm{II}$.
91. D. The slope described in I is 3 , the $y$-intercept described in II is -3 , and the $y$-intercept described in III is $\frac{2}{3}$. Therefore, II < III.
92. D. The $y$-intercept described in I is 0 , the slope described in II is 2 , and the slope described in III is 3. Therefore, $\mathrm{I}<\mathrm{II}<\mathrm{III}$.
93. C. The slope described in I is $\frac{1}{2}$, the slope described in II is the same as the slope in I because the lines are parallel, and the slope described in III will be negative because the lines are perpendicular, so the slope of III must be less than the slopes of I and II. Therefore, III < I = II.
94. D. The slope described in I is $-\frac{2}{3}$, the slope described in II is the same as the slope in I because the lines are parallel, and the slope described in III will be positive because the lines are perpendicular, so the slope of III must be greater than the slopes of I and II. Therefore, I = II < III.

## Number Manipulation (Reasoning)

## Fractions, Decimals

1. B. Before finding the percent, determine the difference: $40-34=6$. Then solve for $200 \%$ of 6 by multiplying the decimal form of the percent by the number: $2.0 \times 6=12$.
2. C. Simplify the problem: $4^{3}=64$, and $\frac{1}{3}$ of $27=9$. Now find what subtracted from 64 is 9 , or $64-$ $x=9$. Solving gives 55 as the answer.
3. C. Simplify the problem: One-fourth of 32 is 8 , and 4 less than that is 4 . Then determine what subtracted from 22 gives 4 , and the answer is 18.
4. C. Simplify the problem: $25 \%$ of 20 is 5 . Now determine what number divided by 5 is equal to 5 , or $\frac{x}{5}=5$. To solve, multiply 5 and 5 to get the correct answer of 25 .
5. B. Simplify the problem: one-third of 66 is 22 . Then determine what multiplies by 2 to get 22 , or $2 x=22$. Solving gives the correct answer of 11 .
6. B. Simplify the problem: one-fourth of 60 is 15 , and $10 \%$ of 30 is 3 . Then determine what subtracted from 15 gives 3 , or $15-x=3$. Solving gives the answer as 12 .
7. C. Simplify the problem: $3^{3}=27$, and $27 \times 2=54$. Seven less than 54 is 47 .
8. B. Simplify the problem: one-half of 70 is 35 , and $4^{2}$ is 16 . Then determine what added to 16 gives 35 , or $x+16=35$, and the answer is 19 .
9. D. Simplify the problem: $\frac{2}{3}$ of 24 is 16 . Then determine what number divided by 4 equals 16 , and the answer is 64 .
10. D. Simplify the problem: $25 \%$ of 20 is 5 , and $\frac{1}{2}$ of 10 is 5 . The product of 5 and 5 is 25 , and 5 more than that is 30 .
11. B. If a list of numbers is in order, the median is the number in the middle, so the median of 50,70 , and 120 is 70 . Two-fifths of 70 is $28: \frac{2}{5} \times 70=\frac{140}{5}=28$.
12. A. To determine the average of a group of numbers, take their sum and divide by how many numbers there are: $\frac{5+15+25+35}{4}=20$. Ten less than 20 is 10.
13. C. Simplify the problem: the square root of 36 is 6 , and the sum of 6 and 36 is 42 . Then, $\frac{1}{6}$ of 42 is 7.
14. B. Simplify by determining what $20 \%$ of 400 is: $\frac{x}{400}=\frac{20}{100}$. This gives 80 . Then $10 \%$ of 80 is 8 .
15. A. Simplify the problem: two-sevenths of 28 is 8 , and $\frac{1}{3}$ of 18 is 6 . Then determine what number subtracted from 8 equals 6 , and the answer is 2 .
16. D. Simplify the problem: $2^{2}=4$, and $40 \%$ of 20 is 8 . Then determine what number divided by 4 equals 8 , and the answer is 32 .
17. C. Simplify the problem: $3^{4}=81$, and the difference of 81 and 3 is 78 . Then solve for $\frac{1}{3}$ of 78 , which is 26 .
18. D. Simplify the problem: two-thirds of 33 is 22 . Then twice that is 44 . Determine how much to add to 12 to get 44 , and the answer is 32 .
19. B. Simplify the problem: $10 \%$ of 70 is 7 , and $\frac{1}{4}$ of 60 is 15 . The sum of 7 and 15 is 22 , and 10 less than 22 is 12 .
20. B. Simplify by multiplying 5,6 , and 10 to get 300 , and then multiply that by $\frac{1}{5}$. And $\frac{1}{5} \times 300=60$.

## Whole Numbers

21. D. Simplify the problem: the product of 8 and 11 is 88 , and 25 more than 38 is 63 . Then determine what subtracts from 88 to leave 63 , and the answer is 25 .
22. A. Simplify the problem: 10 less than 38 is 28 . Then determine what multiplies by 7 to leave 28 , and the answer is 4.
23. D. Simplify the problem: the sum of 25,31 , and 16 is 72 . Then determine what multiplies by 6 to equal 72 , and the answer is 12 .
24. B. Simplify the problem: the difference of 50 and 11 is 39 . Then determine what multiplies by 3 to equal 39 , and the answer is 13 .
25. C. The range of a set of numbers is the smallest number subtracted from the largest, so the range of $5,15,20$, and 95 is $90(95-5=90)$. Then determine what multiplies by 5 to equal 90 , and the answer is 18 .
26. B. Simplify the problem: the difference of 9 and 3 is 6 , and then the sum of 8 and 6 is 14 . Then determine what multiplies by 2 to equal 14 , and the answer is 7 .
27. B. When a list of numbers is in order, the median is the number in the middle, so the median of $17,28,31,46$, and 95 is 31 . Then 12 less than 31 is $19(31-12=19)$.
28. C. To determine the average of a group of numbers, take their sum and divide by how many numbers there are. In this case, that is $\frac{12+9+8+3}{4}=8$. Then determine what number subtracted from 24 would equal 8 , and the answer is 16.
29. A. Simplify the problem: the product of 6 and 8 is 48 . Then the difference of 57 and 48 is 9 (57$48=9$ ).
30. B. To determine the average of a group of numbers, you take their sum and divide by how many numbers there are. In this case, that is $\frac{6+7+3+5+7+6+8}{7}=6$. Then, 10 more than 6 is 16 .
31. B. Simplify the problem: the product of 8 and 2 is 16 , and the sum of 24 and 16 is 40 . Then determine what multiplies by 8 to equal 40 , and the answer is 5 .
32. D. Recognize that any number that ends in a 0 or 5 is divisible by 5 . Therefore, if a number divided by 5 has a remainder of 4 , it will always end in a number that is 4 more than 0 or 5 . This makes possible answers those that end in either a 4 or a 9 . This makes 109 the only reasonable answer given.
33. B. Recognize that any number that is divisible by 4 must be even. Therefore, if a number divided by 4 has a remainder of 1 , the number must be odd. Of the above numbers, only 53 is an odd number.
34. C. The range of a set of numbers is the largest minus the smallest. In this case, that equals 39 $(55-16=39)$. Then determine what number subtracted from 68 equals 39 , and the answer is 29.
35. C. When a list of numbers is in order, the median is the one in the middle, so the median of 8,26 , 54,75 , and 97 is 54 . Then determine what number added to 13 equals 54 , and the answer is 41 .
36. D. When a list of numbers is in order, the median is the one in the middle, so the median of 6,13 , 87,92 , and 108 is 87 . Then determine what number minus 20 equals 87 , and the answer is 107.
37. D. Simplify the problem: the product of 12 and 8 is 96 . Then, 21 less than 96 is $75(96-21=75)$, which is the final answer.
38. A. Simplify the problem: the product of 4 and 11 is 44 , and the sum of 10 and 44 is 54 . Then determine what multiplies by 9 to equal 54 , and the answer is 6 .
39. D. Simplify the problem: the difference of 25 and 11 is 14 . Then, the sum of 63 and 14 is 77 , which is the final answer.
40. C. Simplify the problem: the sum of 12 and 3 is 15 , and the difference of 60 and 15 is 45 . Then determine what adds to 12 to equal 45 , and the answer is 33 .

## Mathematics

## Concepts

## Algebraic

## Inequalities

1. A. We first add 7 from both sides giving $\frac{1}{y}<10$. We then multiply both sides by $y$ to obtain $1<$ $10 y$, and divide by 10 to obtain $\frac{1}{10}<y$, or $y>\frac{1}{10}$.
2. C. First add 28 to both sides: $\frac{3}{y}<27$. Then multiply both sides by $y: 3<27 y$. Finally, divide both sides by 27: $\frac{1}{9}<y$.
3. C. First, we can subtract $\frac{2}{3} y$ from both sides, resulting in $1>2 y-\frac{2}{3} y$. Combining $y$ terms gives $1>\frac{4}{3} y$. We then multiply both sides by the reciprocal of the coefficient to obtain $\frac{3}{4}>y$.

## Slope

4. B. To determine the slope ( $m$ ) from two points, use the formula $m=\frac{y_{1}-y_{2}}{x_{1}-x_{2}}$. Substituting in the values gives $\frac{5-4}{2-(-3)}$, resulting in an answer of $\frac{1}{5}$.
5. A. To determine the slope ( $m$ ) from two points, use the formula $m=\frac{y_{1}-y_{2}}{x_{1}-x_{2}}$. Substituting in the values gives $\frac{2-(-1)}{-3-(-2)}$, resulting in an answer of -3 .
6. D. To determine the slope $(m)$ from two points, use the formula $m=\frac{y_{1}-y_{2}}{x_{1}-x_{2}}$. Substituting in the values gives $\frac{4-(-2)}{1-(-1)}$, resulting in an answer of 3 .
7. A. To determine the slope $(m)$ from two points, use the formula $m=\frac{y_{1}-y_{2}}{x_{1}-x_{2}}$. Substituting in the values gives $\frac{3-(-1)}{-6-0}$, resulting in an answer of $-\frac{4}{6}$, which simplifies to $-\frac{2}{3}$.
8. D. To determine the value of an $x$ - or $y$-coordinate, create an equation using the slope formula: $m=\frac{y_{1}-y_{2}}{x_{1}-x_{2}}$. Substituting the values into the formula gives $\frac{1}{1}=\frac{7-6}{x-2}$. Since the slope is $\frac{1}{1}$, both the numerator and denominator must resolve to 1 . The numerator $7-6$ already equals one, and substituting 3 gives: $3-2=1$. Therefore, $x=3$.
9. D. To determine the value of an $x$ - or $y$-coordinate, create an equation using the slope formula: $m=\frac{y_{1}-y_{2}}{x_{1}-x_{2}}$. Substituting the values into the formula gives $\frac{2}{1}=\frac{6-4}{5-x}$. The numerator already equals 2 , and substituting 4 for $x$ gives 1 , for a slope of $\frac{2}{1}$.
10. B. When a line is written in slope-intercept form $(y=m x+b)$, the coefficient of $x$ is the slope of the line.
11. C. This line is written in standard form: $a x+b y=c$. Isolate $y$ so that the equation is in slopeintercept form by subtracting $3 x$ from both sides and then dividing by -4 . This results in $y=$ $\frac{3}{4} x-2$. The coefficient of $x$ is the slope of the line, so here the slope is $\frac{3}{4}$.
12. C. This line is written in standard form: $a x+b y=c$. Isolate $y$ so that the equation is in slopeintercept form by adding $2 x$ to both sides and then dividing by 5 . This results in $y=\frac{2}{5} x-3$. The coefficient of $x$ is the slope of the line, so here the slope is $\frac{2}{5}$.
13. D. This line is written in standard form: $a x+b y=c$. Isolate $y$ so that the equation is in slopeintercept form by subtracting $6 x$ from both sides and then dividing by -1 . This results in $y=$ $6 x-\frac{3}{5}$. The coefficient of $x$ is the slope of the line, so here the slope is 6 .
14. B. To determine the slope ( $m$ ), use the formula $m=\frac{y_{1}-y_{2}}{x_{1}-x_{2}}$, where $y_{1}$ is $4, y_{2}$ is $4, x_{1}$ is 1 , and $x_{2}$ is 5. Substituting in those values gives $\frac{4-4}{1-5}$, which equals 0 . A horizontal line will always have a slope of zero, as the $y$-coordinates will be equal.

## Geometry

## Angles

1. C. A circle is made up of $360^{\circ}$. If $\angle A O C$ is $45^{\circ}$, then that means $\angle A O C$ is $1 / 8$ of the circle. This means that $\operatorname{arc} A C$ is $1 / 8$ of the circumference, which would be 6 inches.
2. C. The angles along a straight line add up to $180^{\circ}$. Subtract to find $\angle x$ : $180-70-45=65$.
3. B. Angles making up a straight line always add up to $180^{\circ}$. Find $x$ by subtracting: $180-135=45$.
4. A. The central angles in a circle always add up to $360^{\circ}$. Therefore, one of the eight central angles can be found by dividing 360 by 8 . So, $360 \div 8=45$.
5. D. For all quadrilaterals, the interior angles add up to $360^{\circ}$.

## Area/Perimeter

6. D. If the area of the square is 49 , then you know that each of the sides is 7 cm . To find the new width, simply find $120 \%$ of 7 by doing $1.2 \times 7=8.4$. To find the area of the new rectangle do $8.4 \times 7=58.8$ square centimeters.
7. A. Be careful of the units. First, convert a18 ft and 15 ft to yards to get 6 ft and 5 ft , respectively. Next, multiply these together to get the area of the wall: $6 \times 5=30$ sq. yds. Next, divide the area by the 10 square yards per gallon to get the number of gallons needed: $\frac{30 \mathrm{sq} \mathrm{yds}}{10 \mathrm{sq} \mathrm{yds}}=3$ gallons.
8. C. Since we have an isosceles triangle, the third side could be either 3 or 6 . Using the triangle inequality theorem, we know that the sum of two sides of a triangle must be greater than the third side. Therefore, 3 would not work as the third side. Which means the third side must be 6 . To find the perimeter, add up all of the sides $3+6+6=15$.
9. C. First, convert the dimensions of the triangle from yards to feet to get that the base is 9 ft and the height is 12 feet. Next, find the area of the triangle $A=\frac{b h}{2}=\frac{9 \times 12}{2}=54$ square feet. Next, multiply the area by the cost per square foot: 54 sq. $\mathrm{ft} \times \frac{\$ 3}{\text { sq. ft }}=\$ 162$.
10. B. If the area of the triangle is twice the area of the square, then the area of the square is $72 \div 2=$ 36. If the area of the square is 36 , then that means each side is 6 . So the perimeter is $6+6+$ $6+6=24$.
11. D. First. find the length of each side by taking the square root of the area: $\sqrt{144}=12$. Then, increase the side length by $3(12+3=15)$ and square the new side length to find the new area: $15^{2}=225 \mathrm{~cm}^{2}$.
12. B. First, find the area that Jon needs to paint by multiplying the width by the height: $8 \times 15=$ 120 square feet. Then, divide this area by the number of square feet a can of paint can cover: $120 \div 24=5$ cans.
13. C. To find the side lengths of the squares, divide the perimeter by four: $\frac{28}{4}=7$. This makes the length of the rectangle 21 since: $7+7+7=21$. The height of the rectangle is 7 , and multiplying the two dimensions gives the area of the figure: $21 \times 7=147$.
14. B. The area of a rectangle is the height times the width. This means that dividing the area by the given height will result in the width: $84=w \times 12 ; w=\frac{84}{12}=7$ inches.
15. A. First, find the area of the rectangle: $10 \times 5=50$. Per the information in the question, this is also the value for the area of the triangle. The equation for area of a triangle is $A=\frac{b \times h}{2}$, where $b$ is the base and $h$ is the height. As this is an isosceles triangle, the base and height are equal in value (call this value $x$ ), so the equation can be rewritten as $A=\frac{x^{2}}{2}$. Plugging in the values to solve gives: $50=\frac{x^{2}}{2} ; x^{2}=100 ; x=10$.
16. D. First, using the equation for the area of a rectangle, $A=l w$, where $A$ is the area, $l$ is the length, and $w$ is the width of the rectangle, solve for the length of one side: $48=(3 L)(L) ; 48=$ $3 L^{2} ; L^{2}=16 ; L=4$. The perimeter is the sum of the value of the sides. Plugging in 4 for $L$ gives side lengths of 4 and 12 . Therefore, $4+12+4+12=32$.
17. A. Divide the area of the triangle by four to obtain the area of the square: $100 \div 4=25$. Take the square root to find the side length: $\sqrt{25}=5$. Multiply the side length by four to obtain the perimeter: $5 \times 4=20$.
18. D. Find the area of the quilt by multiplying the length by the width: $6 \times 8=48$. Then multiply the area by the cost per square foot: $48 \times 3.00=\$ 144$.

## Circles

19. D. The diameter is twice the radius, so the diameter is 3 meters. There are 100 centimeters in a meter, so 3 meters is equivalent to 300 cm .
20. B. Circumference $=2 \pi r$, where $r$ represents the radius. Therefore, the circumference is $2 \pi(4.5)=9 \pi$.
21. B. $A=\pi r^{2}$, where $r$ represents the radius. Therefore, the difference of the areas can be represented as $\pi(7)^{2}-\pi(5)^{2}=49 \pi-25 \pi=24 \pi$.
22. C. $A=\pi r^{2}$, where $r$ represents the radius. Solve for the radius by isolating $r$ in the equation $121 \pi=\pi r^{2}$, resulting in $r=11$. The diameter is twice the radius, so the diameter is 22 feet.
23. C. If $W X$ is 12 , then the diameter of inscribed Circle $Q$ is also 12 , and the radius is 6 . Therefore, the area of Circle $Q$ is $A=6^{2} \times \pi=36 \pi$.
24. D. The circumference of a circle can be found using the equation: $C=\pi \times D$, where $D$ represents diameter. If the circumference is $25 \pi$, then $25 \pi=\pi \times D$. Solving for $D$ results in $D=25$.
25. C. $A=\pi r^{2}$. Therefore, the area of Circle $R$ is $25 \pi \mathrm{~cm}^{2}$. Circle $O$ has the same area. Therefore, their combined area is $50 \pi \mathrm{~cm}^{2}$.
26. B. The circumference of a circle can be found using the equation: $C=2 \pi r$. Plug in and solve: $C=$ $2 \pi \times 9=18 \pi$.
27. C. The circumference of a circle can be found using the equation: $C=2 \pi r$. Plug in the circumference and solve: $11 \pi=2 \pi(r)$, so $r=5.5 \mathrm{~cm}$.
28. D. If the radius of the circle is 3 in , then the side length of the square is 6 in . This means that $A_{\text {square }}=6 \times 6=36$. Next, find the area of the circle $A=(3)^{2} \pi=9 \pi$. To find the area of the shaded region, subtract the area of the circle from the area of the square: $A_{\text {shaded }}=36-9 \pi$.
29. D. Use the equation for the circumference of a circle to solve for the radius: $C=2 \pi r$; so $14 \pi=$ $2 \pi r$; which means that $r=7$. Find the area of the circle using this radius: $A=\pi r^{2}$; so $A=49 \pi$.
30. D. Use the equation for the area of a circle to solve for the radius: $A=\pi r^{2}$; so $144 \pi=\pi r^{2}$; reducing gives $r=12$. Use this radius to solve for the circumference: $C=2 \pi r$; so $C=$ $2 \times \pi \times 12=24 \pi$.
31. B. The circumference of a circle can be found using the formula $C=2 \pi r$. Set up the equation $9 \pi=2 \pi r$. Solve for $r$, which will get you $r=4.5$.
32. C. Set up the following equation and solve for $r: \pi r^{2}=49 \pi$ and you will get that $r=7$. Using the formula $C=2 \pi r$, plug in 7 for $r$ and you will get the $C=14 \pi$.
33. C . If $\mathrm{TQ}=10$, then the area of the square is 100 . TQ is also the diameter of the circle, so the radius of the circle will be 5 . Use this radius to find the area of the circle which will be $25 \pi$. To find the area of the shaded region, subtract the area of the circle from the area of the square: 100 $25 \pi$.

## Polygons

34. D. A trapezoid is a quadrilateral with only two parallel sides.
35. D. A decagon is any polygon containing 10 sides.
36. A. All of the angles are less than $90^{\circ}$ in an acute triangle.
37. B. The triangle inequality theorem states that the sum of any two sides of a triangle must be greater than the third side. Test of each of the answer choices to find which one does not violate the triangle inequality theorem.
38. D. The triangle inequality theorem states that any two sides must add up to a number greater than the third side.
39. B. A hexagon has 6 sides.
40. A. Isosceles triangles have two equal angles.
41. A. A trapezoid has two parallel sides.

## Surface Area/Volume

42. C. ExplanationThe volume of a cube is given by $a^{3}$, where a is the length of a side. Here this gives: $10 \times 10 \times 10=1000$.
43. D. Surface area of a rectangular prism is given by $2(w l+h l+h w)$, where $w, l$, and $h$, are the side lengths. Here this gives: $2(10 \times 8+2 \times 8+2 \times 10)=2(80+16+20)=2(116)=232$.
44. D. The volume of a rectangular prism is given by $l x w x h$, where $l$ is the length, $w$ is the width, and $h$ is the height. Here this gives: $15 \times 6 \times 10=900$.
45. D. Surface area of a rectangular prism is given by $2(w l+h l+h w)$, where $w$ is the width, $l$ is the length, and $h$ is the height of the prism. Here this gives $2(10 \times 4+4 \times 4+4 \times 10)=$ $2(40+16+40)=2(96)=192$.
46. C. The volume of a triangular prism is found by multiplying the area of one triangular face with the length of the prism. Area of a triangle is the base multiplied by the height: $\frac{3 \times 4}{2}=6$; and multiplying this by the length of the prism gives: $6 \times 10=60$.
47. A. Since a cube is made up of 6 faces, divide by 6 to find the area of one side: $\frac{294}{6}=49$. Then, take the square root: $\sqrt{49}=7$.
48. B. The volume of a cube is given by $V=a^{3}$, where $V$ is the volume and $a$ is the length of one side. Plug in 27 for the volume to get: $27=a^{3}$. Then the cube root gives the length of the side: $\sqrt[3]{27}=3$. The area of one face is therefore $3 \times 3=9$. As there are 6 faces, multiply by the area of one face by 6 to get the surface area: $9 \times 6=54$.
49. C. The volume of a right circular cylinder is given by $\pi r^{2} h$, where $r$ is the radius, and $h$ is the height. Here this gives: $\pi \times(6)^{2} \times 10=\pi \times 36 \times 10=360 \pi$.
50. A. The volume of a cylinder is given by: $V=\pi r^{2} h$, where $V$ is the volume, $r$ is the radius, and $h$ is the height. Solve using the known values for volume and height: $40 \pi=\pi r^{2} \times 10 ; r^{2}=4 ; r=2$.
51. D. The equation for the volume of a sphere is $V=\frac{4}{3} \pi r^{3}$, where $V$ is the volume, and $r$ is the radius. Therefore, the volume of the sphere is: $\frac{4}{3} \pi(2)^{3}=\frac{4}{3} \pi \times 8=\frac{32}{3} \pi$.

## Measurements

## Appropriate Units

1. C. Eliminate acres because this is a measure of land area and not mass. Eliminate milligrams because this is too small a unit to measure the mass of a book. Eliminate tons because this is an excessively large unit to measure the mass of a book.
2. C. If a single fish weighs 40 pounds and Calvin catches 300 fish per day, then in one day he catches 12,000 pounds of fish. 1 ton is equivalent to 2,000 pounds, which makes tons the most appropriate unit. Eliminate cubic meters since this is a measure of volume and not mass. Eliminate hectares since this is a measure of land area. Eliminate watts since this is a measure of electrical power.
3. B. Eliminate kiloliter because 1 kiloliter is 1000 liters, which is far too large. Eliminate microliter since one microliter is one millionth of a liter. Eliminate pounds because pounds are for mass, not volume. 1 gallon is approximately 3.8 liters.

## Numbers \& Operations

## Comparing Fractions

1. A. Each fraction has 3 parts taken out of the whole, so the fraction with the smallest denominator is the largest fraction. Therefore, $\frac{3}{4}$ is the correct answer.
2. A. Evaluate each fraction's relationship to $\frac{1}{2}$ to find out which is the largest fraction. The only given fraction that is larger than $\frac{1}{2}$ is $\frac{6}{10}$, making it the largest fraction.
3. D. Evaluate each fraction's relationship to $\frac{1}{2}$ to find out which is the smallest fraction. The only given fraction that is smaller than $\frac{1}{2}$ is $\frac{7}{15}$, making it the smallest fraction.
4. C. All of the given fractions are less than one. Therefore, the largest fraction will be the one closest to 1 . Converting the fractions to each have common denominator of 40 reveals which is the largest: $\frac{1}{4}=\frac{10}{40} ; \frac{1}{5}=\frac{8}{40} ; \frac{3}{10}=\frac{12}{40}$; and $\frac{5}{20}=\frac{10}{40}$. Of these, $\frac{12}{40}$ is the largest fraction, so $\frac{3}{10}$ is the correct answer.
5. B. Reduce each fraction and compare: $\frac{4}{20}=\frac{8}{40}=\frac{11}{55}=\frac{1}{5}$. The fraction $\frac{7}{30}$ does not reduce, and is not equal to $\frac{1}{5}$.

## Converting Fractions, Decimals, Percents

6. D. The 5 should go in the hundredths place, which is the second digit to the right of the decimal. A would be 305 , and C would be 300.5 . B is not a correct construction.
7. B. The 9 should go in the thousandths place, which is the third digit to the right of the decimal. A would be $4,008.09$. C would be $4,080.009$. D is not a correct construction.
8. C. To convert a fraction into a decimal, divide the numerator by the denominator. If you get a repeating decimal, as you do here, you put the bar over whatever numbers repeat. In this case, that is 45 . A is incorrect because the 5 also repeats and not just the 4 . $B$ is incorrect because it is not a repeating decimal.
9. A. To convert a percent into a decimal, you divide the number by 100 . Therefore, $31.7 \div 100=$ 0.317 . If the percent includes a decimal, one possible shortcut is to move the decimal two places to the left, which gives you the same answer.
10. D. To convert a decimal into a percent, you multiply the number by 100 . Therefore, $0.28 \times 100=$ 28. A is a common incorrect answer, as a student may divide by 100 instead of multiplying.

## Divisibility

11. A. To find out if a number is divisible by 3 , find the sum of the digits in the number; if the sum is divisible by 3 , then the original number is also divisible by 3 . So: $9+6+7+4+1=27$. Since 27 is divisible evenly by 3 , the original number $(96,741)$ is also divisible by 3 . Since 3 goes evenly into the number, the remainder is zero.
12. A. For a number to be divisible by 2 , it must be an even number. Squaring a number means multiplying it times itself. The sign rules with multiplication show that: even $\times$ even $=$ even; odd $\times$ odd $=$ odd. Therefore, if $x$ starts out as an even number, squaring it will result in another even number which will be divisible by 2 . The sign of the number does not affect its divisibility, so the answers about positive and negative are incorrect.
13. B. Distinct means "different from each other," so we are looking for the number that has only 4 different divisors. List out the numbers that divide evenly into each answer to find the correct one. Twelve has 6 divisors ( $1,2,3,4,6,12$ ); fourteen has 4 divisors ( $1,2,7,14$ ); eighteen has 6 divisors ( $1,2,3,6,9,18$ ); and twenty has 6 divisors ( $1,2,4,5,10,20$ ). The only one listed with only 4 different divisors is 14 , which makes it the correct answer.
14. C. List out the all the different numbers that are divisors of 36 . These are: $1,2,3,4,6,9,12,18$, and 36 ; this is a list of 9 numbers.
15. C. A number is divisible by 9 if the sum of its digits is divisible by 9 . Therefore $111,111,111$ is divisible by 9 because $1+1+1+1+1+1+1+1+1=9$ which is divisible by 9 .

## Exponents

16. C. Since there are four $y$ variables being multiplied together, that is equivalent to $y^{4}$, and there are two $z$ variables being multiplied, so that is equivalent to $z^{2}$.
17. D. Two $a$ variables being multiplied together is equivalent to $a^{2}$, and three $c$ variables being multiplied together is $c^{3}$. As there is only one $b$ variable, it does not need an exponent.
18. B. When you raise an exponent to another exponent, you multiply the exponents. $x^{5}$ is a common incorrect answer because students think you add the exponents as you would if you were multiplying two expressions with exponents. $x^{9}$ is incorrect because you do not take the exponent of the exponent but rather multiply the two exponents.

## Factors

19. C. Factor 54 to only prime numbers to find the answer. $54=2 \times 3 \times 3 \times 3=2 \times 3^{3}$.
20. C. The largest integer to come out of 45 and 81 is 9 , and neither variable is common to either term.
21. C. The GCF of 21 and 7 is 7 . The variable $x$ is not common to both terms, so it will not be in the answer. Both terms have $y^{3}$ in common, so this makes the GCF equal to $7 y^{3}$.

## Multiples

22. C. The LCM of 2 and 13 is 26 . The LCM is given by the greatest exponent of any variable present, which here is $a^{3}$ and $b^{3}$. This gives $26 a^{3} b^{3}$ as the LCM of these two terms.
23. B. First, find the prime factors of each number. The prime factors of $8=2 \times 2 \times 2=2^{3}$; the prime factors of $12=2 \times 2 \times 3=2^{2} 3$. The LCM is found by taking the largest exponent of each prime number present. Here this gives: $2^{3} 3=24$.
24. D. When finding a common multiple between variables, simply choose the highest exponent. The highest exponent of $x$ is 5 , the highest exponent of $y$ is 3 , and the highest exponent of $z$ is 6 .

## Scientific Notation

25. C. Begin by multiplying the first factors: $7 \times 3=21$. Then add the exponents for the factors where 10 is the base: $10^{2} \times 10^{4}=10^{6}$. That gives an answer of $21 \times 10^{6}$, but it is not in proper form. To get the final answer, move the decimal in the first term (from 21.0 to 2.1 ) and then add 1 to the exponent (because the decimal was moved one place to the left). This results in a final answer of $2.1 \times 10^{7}$.
26. B. Begin by multiplying the first factors: $8 \times 5=40$. Then add the exponents for the factors where 10 is the base: $10^{3} \times 10^{-2}=10^{1}$. That gives an answer of $40 \times 10^{1}$, but it is not in scientific notation. To get the final answer, move the decimal in the first term (from 40 to 4.0 , or 4 ) and then add 1 to the exponent (because the decimal was moved one place to the left). This results in a final answer of $4 \times 10^{2}$.
27. B. Convert both parts of the expression into standard form: $2 \times 10^{3}=2,000$ and $4 \times 10^{2}=400$. Sum to get 2,400 , and then convert into scientific notation to get $2.4 \times 10^{3}$.
28. D. Convert both parts of the expression into standard form: $6 \times 10^{3}=6,000$ and $9 \times 10^{4}=$ 90,000 . Sum to get 96,000 , and then convert into scientific notation to get $9.6 \times 10^{4}$.
29. B. Convert both parts of the expression into standard form: $5 \times 10^{4}=50,000$ and $3 \times 10^{3}=$ 3,000 . Subtract to get 47,000 , and then convert into scientific notation to get $4.7 \times 10^{4}$.
30. C. $10^{2}$ is equal to 100 , as the exponent shows how many zeroes there are when the base is 10 . Therefore, $3.742 \times 100=374.2$. A would be the correct answer if you were multiplying by $10^{-2}$. D would be the correct answer if you were multiplying by $10^{3}$.
31. D. The exponent when the base is 10 shows how many zeroes the number has, so $10^{4}$ is 10,000 . Therefore, $.035 \times 10,000=350$. A would be the correct answer if you were multiplying by $10^{-4}$ (or dividing by $10^{4}$ ). C would be the correct answer if you were multiplying by $10^{3}$.
32. C. The exponent when the base is 10 shows how many zeroes the number has, so $10^{3}$ is 1,000 . Therefore, $70.4 \times 1,000=70,400$. B and D are incorrect because the problem is multiplying by 70.4 , not 7.4 or 74 . A would be correct if you were multiplying by $10^{2}$.
33. A. When a base of 10 has a negative exponent, it is a decimal less than 1 . For example, $10^{-1}=0.1$, and $10^{-2}=0.01$. Because $10^{-3}=0.001,500 \times 0.001=0.5$. B and C would be the correct answers if you were multiplying by $10^{-2}$ and $10^{-1}$, respectively.
34. B. The exponent when the base is 10 shows how many zeroes the number has, so $10^{2}=100$. Therefore, $20 \times 100=2,000$.
35. D. Simplifying the expression gives a number of 98,630 . The number in the ten-thousands place is 9.
36. D. $\left(2 \times 10^{4}\right)=20,000,\left(5 \times 10^{3}\right)=5,000,\left(9 \times 10^{2}\right)=900$, and $\left(9 \times 10^{1}\right)=90$. Add them together, and you get the answer of 25,990 .
37. C. $\left(7 \times 10^{4}\right)=70,000,\left(5 \times 10^{3}\right)=5,000,\left(2 \times 10^{2}\right)=200$, and $\left(6 \times 10^{1}\right)=60$. Add them together, and you get the answer of 75,260 . Because many students expect this expression to go in order from largest term to smallest, some may assume that ( $5 \times 10^{3}$ ) gives the first number and $\left(7 \times 10^{4}\right)$ gives the second, which would give them an incorrect answer. The same is true for the last two terms, as $\left(2 \times 10^{2}\right)$ gives the number in the hundreds place, while $\left(6 \times 10^{1}\right)$ gives the number in the tens place.
38. B. A is incorrect, as that would be 139 . C is incorrect, as that would be 1,390 . D is incorrect, as that would be 10,390.

## Problem-Solving Exercise

## Algebraic Concepts

## Algebra Word Problems

1. B. It is useful to think of Mikaiah and Portia's age as $x$, so Jalen's age would be $x+2$. Half of 64 is 32 , so the algebra expression would be $x+x+(x+2)=32$. Therefore, $x=10$. As Jalen's age is $x+2$, then Jalen's age is 12 .
2. D. In algebra word problems, it is often best to start off with the smallest unknown and make that equivalent to $x$. In this case, the smallest unknown is the number of bears. Since the number of snakes is four times that, it is equivalent to $4 x$. There are twice as many frogs as snakes, so it is equivalent to $2 \times 4 x$, or $8 x$. The algebra expression becomes $3+x+4 x+8 x=68$, which means $x=5$. The number of frogs is $8 x$, or 40 .
3. C. Because the sum of of the two pieces will equal the length of the wood before it was cut ( 8 feet), you can create an algebraic expression. The smaller piece will be equivalent to $x$, and the larger piece will be $4 x$, since it is four times as long. The expression then will be $x+4 x=8$, or $5 x=8$. By dividing each side by 5 , you get $x=\frac{8}{5}$, or $1 \frac{3}{5}$.
4. C. It is useful to make the smallest side equivalent to $x$, so the larger side is $2 x$. As the opposite sides of a parallelogram are congruent, you can write an equation to determine the sum: $x+$ $x+2 x+2 x=42$. Combining like terms gives you $6 x=42$, so $x=7$. The larger side is $2 x$, so the answer is $2(7)=14$.
5. D. You can make $x$ be equivalent to the number of miles on Monday, so the number of miles on Tuesday is $3 x$. The algebraic expression then becomes $x+3 x=36$, so $x=9$. Therefore, the number of miles the bird flew on Tuesday is equal to 3(9), or 27.
6. B. When you have a ratio in a word problem, you can convert it easily into an algebraic expression: 2:3:5 becomes $2 x, 3 x$, and $5 x$. The algebraic expression then is $2 x+3 x+5 x=200$, so $x=20$. As you are looking for the shortest number of miles flown, you substitute 20 for x in the expression $2 x$, or 2 (20), which gives you an answer of 40 .
7. C. To solve this problem, it helps to create an algebraic expression for the amount of money Julie has. If you are comfortable using decimals, you can leave it as 1.50 , but many students will want to convert that into cents, or 150 cents. Make $x$ be the number of quarters, so $x+1$ is the number of dimes. A quarter is worth 25 cents, so its part of the expression is 25 x . A dime is worth 10 cents, so its part of the expression is $10(x+1)$, or $10 x+10$. The algebraic expression then is $25 x+(10 x+10)=150$. Solving, you get $x=4$. As the number of dimes is $x+1$, then the number of dimes is 5 . [Note: if you left the problem in decimals, your algebraic expression would be $.25 x+(.10 x+.10)=1.50$. That would still give you the same answer.]
8. D. Because difference means subtraction, $x+16$ and $3 x+16$ are not correct. $x-16$ is incorrect because it is a "three times a number" rather than just a number.
9. C. Because you are multiplying two times the sum, you put the sum in parentheses before you multiply it by $2.2(x-8)=15$ is incorrect because that is the difference of a number and 8 , not the sum.
10. D. The difference of two terms means that you will subtract those terms, and three times a number is equivalent to $3 x$. Similarly, two times a number is $2 x .3 x+2 x=20$ is incorrect because that would be a sum, not a difference.
11. C. Since you are taking three times a sum, you put the sum in parentheses, so $3(x+4)$ is one side of the equation. $3 x+4$ is incorrect as that would be the sum of three times a number and 4 . Then " 7 less than the number" is equivalent to $x-7$, which goes on the other side of the equation. $7-x$ is incorrect because that would be $x$ less than 7 .
12. B. $5 x+6$ is correct because that represents the sum of five times a number and 6 . The description for $5(x+6)$ would be "five times the sum of a number and 6 ." When you are writing an expression of difference, you go in the same order, so the difference of 8 and a number means the 8 comes first, or $8-x$.
13. D. In algebra word problems, it helps to start with the smallest amount and make that $x$. Because Maya read fewer than Sofia or Sebastian, her number of books is represented by $x$. That makes the number of books Sofia read $x+6$, and the number of books Sebastian read $2 x$ (because he read twice as many as Maya). The algebraic equation is $x+(x+6)+2 x=26$. Solving, that gives you $x=5$. As Sofia's books is equivalent to $x+6$, that means she read 11 books.
14. C. Because Tarun read fewer books than Naomi, make his number of books be represented by $x$. Then Naomi's books is $x+4$. The total number of books will be three times as many as Tarun's, or $3 x$. The algebraic equation then is $4+x+(x+4)=3 x$. That simplifies to $2 x+8=3 x$, for an answer of $x=8$. As Naomi's books is equivalent to $x+4$, that means she read $8+4$ books, or 12 books.
15. C. To solve the problem, you substitute 100 for $d$ and 40 for $r$. That gives you the equation $100=$ $40 \times t$. Solving for $t$, you get 2.5 hours, or2 hours 30 minutes.

## Proportions

16. D. Set up a proportion: $\frac{1 \text { inch }}{3 \text { miles }}=\frac{4.5 \text { inches }}{x \text { miles }}$. To solve, cross-multiply, resulting in $x=13.5$.
17. A. Set up a proportion: $\frac{1 \text { foot }}{100 \text { million miles }}=\frac{x \text { feet }}{430 \text { million miles }}$, or $\frac{1}{100}=\frac{x}{430}$. To solve, cross-multiply, giving $100 x=430$. The answer is $x=4.3$ feet, or approximately 4 feet.
18. A. Create a proportion: $\frac{\frac{2}{5} \text { car }}{1 \text { hour }}=\frac{x \text { cars }}{20 \text { hours }}$. Cross-multiplying gives you $x=8$.
19. D. Create a proportion: $\frac{1 \text { gallon }}{8 \text { pints }}=\frac{4 \text { gallons }}{x \text { pints }}$. Cross-multiplying gives you $x=32$.
20. B. Create a proportion: $\frac{1 \text { quart }}{32 \text { ounces }}=\frac{x \text { quarts }}{112 \text { ounces }}$. Cross-multiplying gives $32 x=112$, and dividing both sides by 32 results in 3.5 .
21. C. Set up a proportion: $\frac{5 \text { ducks }}{2 \text { geese }}=\frac{x \text { ducks }}{10 \text { geese }}$. Cross-multiplying gives you $2 x=50$, so $x=25$.
22. D. Set up a proportion: $\frac{4 \text { blue }}{11 \text { total }}=\frac{20 \text { blue }}{x \text { total }}$. The total of 11 comes from adding 4,5 , and 2 . Crossmultiplying gives you $4 x=220$, so $x=55$.
23. C. Set up a proportion: $\frac{10 \text { ninth graders }}{31 \text { total }}=\frac{270 \text { ninth graders }}{x \text { total }}$. The total of 31 comes from adding 10, 9, 7 , and 5. Cross-multiplying gives you $10 x=8370$, so $x=837$.
24. C. When there are two similar triangles, create a proportion to find the length of a missing side. In this case, that is $\frac{3}{5}=\frac{5}{x}$. Cross-multiply to get $3 x=25$. Divide each side by 3 to get $x$ by itself, giving a final answer of $8 . \overline{3}$.
25. C. When there are two similar shapes, create a proportion to find the length of a missing side. In this case, the proportion is $\frac{4}{10}=\frac{9}{x}$. Cross-multiply to give you $4 x=90$, and then divide each side by 4 to get $x$ by itself. That gives the final answer of 22.5 .

## Solving Algebraic Equations

26. C. Simplifying $\frac{3}{4} \times 10$ results in $\frac{30}{4}=2 x$. Dividing both sides by 2 results in $x=\frac{30}{8}$, or $3 \frac{3}{4}$.
27. B. Find a common denominator and then sum the equivalent fractions. This results in: $\frac{2}{6}+\frac{15}{6}+$ $\frac{5}{6}=\frac{22}{6}$. Once you have $5 x=\frac{22}{6}$, divide both sides by 5 to get $x$ by itself. This results in $\frac{22}{30^{\prime}}$, which simplifies to $\frac{11}{15}$.
28. A. Divide 9 by -0.3 and the equation becomes $-30=\frac{x}{1.2}$. Then multiply each side by 1.2 to get $x$ by itself.
29. B. To isolate the term with the variable, add 6 to both sides, which gives $-2 y=1.8$. Then divide both sides by -2 to get $y$ by itself. That gives the final answer of -0.9 .
30. D. To isolate the term with the variable, subtract 4 from both sides. This gives $-0.6 n=-11.4$. Then divide both sides by -0.6 to get $n$ by itself. That gives the final answer of 19 .
31. A. Divide -2.4 by 1.2 to get $-2=\frac{x}{5}$, then multiply each side by 5 to get $x$ by itself.
32. B. Adding $2 x$ to both sides gives $5 x+5=-10$. Then subtract both sides by 5 , which gives $5 x=$ -15 . Dividing both sides by 5 results in the final answer: $x=-3$.
33. D. Begin by adding $\frac{1}{2} y$ to both sides. This gives $\frac{2}{3}=\frac{4}{2} y-\frac{7}{3}$. Next, add $\frac{7}{3}$ to each side. Now the equation is $\frac{9}{3}=\frac{4}{2} y$, or $3=2 y$. Divide both sides by 2 to get the variable by itself, giving you a final answer of $\frac{3}{2}=y$.
34. A. Adding $1.2 a$ to both sides gives $-3.5=0.4 a+1.7$. Next, subtract 1.7 from each side of the equation, resulting in $-5.2=0.4 a$. Finally, divide both sides by 0.4 to isolate $a$. This gives a final answer of $-13=a$.
35. D. Cross-multiply as you would with a proportion. This gives $0.5 k=4.5$. Divide both sides by 0.5 to get the final answer $k=9$.
36. C. Combining like terms on each side of the equation results in $-6=-3 x$. Divide both sides by -3 to isolate the variable. That gives the final answer: $2=x$.
37. C. Combine like terms to achieve: $-4+2 x=-8$. Then add 4 to each side to get the term with the variable by itself: $2 x=-4$. Dividing by 2 reveals the final answer, $x=-2$.
38. B. Cross-multiply to get $0.8 y=-0.96$. Then divide both sides by 0.8 to get $y=1.2$.
39. D. Combine the variables on the left side of the equation: $\frac{1}{2} p-\frac{1}{3} p=\frac{1}{6} p$. This gives a simpler equation: $\frac{1}{6} p-4=2$. Then adding 4 to each side gives the equation $\frac{1}{6} p=6$. Divide both sides of the equation by $\frac{1}{6}$ to isolate the variable. Dividing by a fraction is like multiplying by its reciprocal, so $6 \div \frac{1}{6}=6 \times \frac{6}{1}=36$.
40. A. Subtracting a negative is the same as adding, so $3 k-(-2 k)-7 k=3 k+2 k-7 k=-2 k$. Now there is a simpler equation: $-2 k=4.8$. Dividing both sides by -2 gets the variable by itself and gives the final answer: $k=-2.4$.

## Variable Exponents

41. B. $2^{x}$ means that 2 will be multiplied by itself a certain number of times to produce 16 . Since $2^{4}=$ $16, x=4$.
42. A. $19^{x}$ means that 19 will be multiplied by itself a certain number of times to produce 361 . Since $19^{2}=361, x=2$.
43. B. 8,000 can be written as $8 \times 1,000$, or $2^{3} \times 10^{3}$. Therefore, $x=3$.
44. C. 2,500 can be written as $25 \times 100$, or $5^{2} \times 10^{2}$. Therefore, $x=2$.
45. A. A negative exponent creates a reciprocal. As $4^{3}=64$, then $4^{-3}=\frac{1}{64}$.
46. A. A negative exponent creates a reciprocal. As $7^{2}=49$, then $7^{-2}=\frac{1}{49}$.
47. B. When an exponent is raised to another exponent, multiply the exponents. This means $\left(3^{4}\right)^{x}=$ $3^{4 x}$. Since any base to the power of 0 equals 1 , this means that $3^{4 x}=3^{0}$, so $x=0$.
48. A. The prime factorization of 175 is $7^{1} \times 5^{2}$. Therefore, $x=1$, and $y=2$, and $1-2=-1$.
49. D. The prime factorization of 216 is $2^{3} \times 3^{3}$. Therefore, $x=3$, and $y=3$, and $3 \times 3=9$.
50. A. The prime factorization of 1,400 is $2^{3} \times 5^{2} \times 7^{1}$. Therefore, $x=3$, and $y=2$ and $z=1$.

## Data \& Probability

## Averages

1. C. To determine an average, take the sum of the data and divide by how many pieces of data there are. To get an average of 84 on 5 tests, multiply 84 and 5 to get the total sum Alicia needs, which is 420 . Then find the sum of what she already has, and $80+90+70+92=332$. Subtracting 420 by 332 shows what she needs on her fifth test, which is an 88.
2. D. Dominic's three throws were approximately $50 \mathrm{~m}, 45 \mathrm{~m}$, and 55 m . To obtain the average, find the sum and then divide by the number of throws: $150 \div 3=50$.
3. D. The range is the difference between the highest and lowest value, so $20-2=18$.
4. A. The mode is the number that appears most frequently. There were three answers of 1 mile, so this number was the most frequent.
5. C. Determine the median by writing the numbers in order and then determining which number(s) is in the middle. This set contains 9 values, so the median will be the fifth value, which is 3 .
6. C. Determine the median by writing the numbers in order and then finding which number(s) is in the middle. This set contains 5 values, so the median will be the third value, which is 95 .
7. B. To determine the mean, add the data and then divide by how many pieces of data there are. In this problem, the sum is 445 , and dividing that by 5 gives a mean of 89 .
8. C. Determine the median by writing the numbers in order and then finding which number(s) is in the middle. This set contains 12 values, so the median will be the average of the sixth and seventh values, which are 1 and 2. Their average is 1.5 .
9. D. To determine the mean, take the sum of the values in the set and divide by the number of values in the set. The sum of the data is 20 , and there are 12 values in the set. Therefore, $20 \div$ $12=1 . \overline{6}$.
10. C. The range of the original scores is 32 , as it is the difference of the highest and lowest values ( $99-67$ ). For other scores to not alter the range, they must not be smaller than 67 nor greater than 99. The only pair of scores that satisfies that condition is 67 and 96.
11. B. If a new number is introduced that is less than the smallest existing value in the set, then the mean will decrease.
12. A. Because the range is the difference of the lowest and highest values in a set of data, adding a number that is lower than all the others will increase the range, as the difference between the lowest and highest values will now be larger.
13. D. The median could decrease, or it is possible that that the new median will be the same as the previous one. This would be true if there were two or more pieces of data that were the same value in the middle of the data set.
14. A. To get an average of 7.5 cm in 4 throws, multiply 7.5 and 4 to get the total Ronaldo needs, which is 30 cm . Then add what he already has, which is 26 cm . Subtracting 30 by 26 shows what he needs in his next throw, which is 4 cm or less.
15. B. To determine the mean, add up the data and divide by the amount of data in the set. In this case, adding Jason's five tests gives a sum of 43 . There are 5 tests, and dividing 43 by 5 results in 8.6.

## Graphs

16. C. $2100 \times .51=1071$.
17. B. The data show a trend over time which is best shown with a line graph.
18. B. A histogram is a bar-like graph with small ranges of grouped data. The height of the bar gives the number of times a value appears that falls within that range. In this problem, for example, there were 12 daily temperature values between 31 and 40 , inclusive.
19. C. First, subtract the percent of people who chose shark from the percent of people who chose penguin: $55-9=46$. Find $46 \%$ of the total: $0.46 \times 300=138$. This shows 138 more people chose penguins as their favorite animal.
20. A. Line graphs are best for showing data over time.
21. D. The lowest data point on the $y$-axis occurs at January, meaning that this is the month with the lowest temperature.
22. D. The highest data point on the y-axis occurs at August, meaning that this is the month with the highest temperature.
23. B. The greatest difference in temperature between consecutive months occurs between March and April.
24. C. The two columns on the far right reflect grades above $80 \%$. Adding the number of students from those columns results in $21+6=27$ students.
25. B. We add the number of students from the four relevant columns representing 21-30\%, 31-40\%, $41-50 \%$, and $51-60 \% .2+4+4+6=16$.
26. C. Take the sum of the 4 columns reflecting grades below $41 \%(4+2+1+1=8$ students $)$ and divide by the total number of students (80). This is: $8 \div 80=0.1$. Multiplying by 100 gives 10\%.
27. B. The circle graph shows that $14 \%$ of the students did not study for the test. Multiplying this percent as a decimal by the total number of students gives the answer: $50 \times 0.14=7$.
28. B. Add the percent of students who studied $30-60$ minutes and the percent who studied for over an hour. Convert this percent into a decimal and multiply by the total: $50 \times(0.46+0.04)=25$.
29. B. As 36 students make up $40 \%$ of the class, set up a proportion to solve for the total: $\frac{40}{100}=$ $\frac{36}{x}$; reducing gives: $\frac{4}{10}=\frac{36}{x} ; x=90$.
30. A. The question states that 36 students have one sibling, and this wedge makes up $40 \%$ of the class. Set up a proportion to solve for how many students make up $10 \%$ of the class: $\frac{36}{40}=\frac{x}{10}$; $x=$ 9.

## Probability

31. B. Simple probability is "correct" possibilities over total possibilities. In this case, there are 4 blue marbles, so that is the number of "correct" possibilities. There are 14 marbles altogether, so that is the number of total possibilities. That gives a ratio of $\frac{4}{14}$, or $\frac{2}{7}$.
32. A. Simple probability is "correct" possibilities over total possibilities. In this case, there are 2 black cars, so that is the number of "correct" possibilities. There are 9 cars altogether, so that is the number of total possibilities. That gives a ratio of $\frac{2}{9}$.
33. A. In compound probability, determine the probability of two independent events both occurring by multiplying the probability of each event. In this case, the probability of Tara choosing a purple marble is 2 out of 10 , or $\frac{1}{5}$. Multiplying $\frac{1}{5}$ by $\frac{1}{5}$ gives a final answer of $\frac{1}{25}$.
34. B. In compound probability, determine the probability of two independent events both occurring by multiplying the probability of each event. In this case, the probability of Jonathan choosing a cat card is 6 out of 20 , or $\frac{3}{10}$, and the probability of choosing a bird card is also 6 out of 20 , or $\frac{3}{10}$. Multiplying $\frac{3}{10}$ by $\frac{3}{10}$ gives a final answer of $\frac{9}{100}$.
35. A. In compound probability, determine the probability of multiple independent events all occurring by multiplying the probability of each event. The probability of a coin landing on heads is always $\frac{1}{2}$. The probability of a coin landing on heads three times in a row is $\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}=$ $\frac{1}{8}$.
36. A. In compound probability, determine the probability of two dependent events both occurring by multiplying the probability of each event. The probability of Katie selecting a cherry candy first is 3 out of 9 , or $\frac{1}{3}$. Since Katie keeps the first candy, the probability of her selecting a strawberry candy next is 4 out of 8 , or $\frac{1}{2}$. Multiplying $\frac{1}{3}$ by $\frac{1}{2}$ results in $\frac{1}{6}$.
37. D. Simple probability is "correct" possibilities over total possibilities. In this case, there are 32 boys who prefer soccer, so that is the number of "correct" possibilities. There are 48 students who prefer soccer altogether, so that is the number of total possibilities. That gives a ratio of $\frac{32}{48^{\prime}}$, or $\frac{2}{3}$.
38. D. Simple probability is "correct" possibilities over total possibilities. In this case, there are 13 cousins who are girls ( 20 minus the 7 who are boys), so that is the number of "correct" possibilities. There are 20 cousins altogether, so that is the number of total possibilities. That gives a ratio of $\frac{13}{20}$.
39. B. Simple probability is "correct" possibilities over total possibilities. In this case, there are 4 pairs of black shoes, so that is the number of "correct" possibilities. There are 11 pairs altogether, so that is the number of total possibilities. That gives a ratio of $\frac{4}{11}$.
40. A. Simple probability is "correct" possibilities over total possibilities. In this case, there are 5 cashews, so that is the number of "correct" possibilities. There are 30 nuts and candies altogether, so that is the number of total possibilities. That gives a ratio of $\frac{5}{30^{\prime}}$ or $\frac{1}{6}$.
41. C. Simple probability is "correct" possibilities over total possibilities. In this case, there are 9 bracelets, so that is the number of "correct" possibilities. There are 20 items in the bag, so that is the number of total possibilities. That gives a ratio of $\frac{9}{20}$.
42. A. In compound probability, determine the probability of two independent events both occurring by multiplying the probability of each event. The probability of Ellen selecting a white shirt is 2 out of 6 , or $\frac{1}{3}$. The probability of her choosing a pair of dress pants is 2 out of 7 , or $\frac{2}{7}$. Multiplying $\frac{1}{3}$ by $\frac{2}{7}$ results in $\frac{2}{21}$.
43. A. In compound probability, determine the probability of two independent events both occurring by multiplying the probability of each event. The probability of Von selecting the number 3 is 1 out of 6 (since there are 6 numbers in that bag), or $\frac{1}{6}$. The probability of him choosing a 10 is also 1 out of 6 , or $\frac{1}{6}$. Multiplying $\frac{1}{6}$ by $\frac{1}{6}$ results in $\frac{1}{36}$.
44. D. In compound probability, determine the probability of two independent events both occurring by multiplying the probability of each event. The probability of Jin selecting a blue marble with his first choice is 4 out of 7 , or $\frac{4}{7}$. The probability of him choosing a red marble with his second choice is 2 out of 6 , or $\frac{1}{3}$. This is because there is one less marble in the jar after he chooses a blue marble. Multiplying $\frac{4}{7}$ by $\frac{1}{3}$ results in $\frac{4}{21}$.
45. A. In compound probability, determine the probability of two independent events both occurring by multiplying the probability of each event. The probability of Yuna selecting a decimal problem with her first choice is 2 out of 6 , or $\frac{1}{3}$. The probability of her also choosing a decimal problem with her second choice is 1 out of 5 , or $\frac{1}{5}$, as now there is one less decimal problem in the bag. Multiplying $\frac{1}{5}$ by $\frac{1}{3}$ results in $\frac{1}{15}$.

## Venn Diagrams

46. C. In a Venn diagram, the intersection of the two circles represents what is true of both circles.
47. D. In a Venn diagram, the intersection of the three circles, which is where the "B" is, represents what is true of all three circles. In this case, that indicates students who have lived in all three states.
48. A. Add together the number of students who enjoy each category. This is $16+14=30$. Subtract the number of students in the survey to reveal how many students enjoy both. So, 30-24=6.
49. C. There are 40 total students in the survey. To find the number who enjoy comedy movies, scary movies, or both, subtract the 9 who enjoy neither from the total. This gives $40-9=31$. From these 31 students, subtract the 9 students who enjoy only scary movies to give those who enjoy comedies: 31-9 = 22 .
50. C. Subtract the 12 people who like neither category from the 80 total people in the survey to reveal that there are 68 people who enjoy watching television or listening to music, or both. According to the diagram, 18 people only enjoy watching television, so subtract that number from 68 to find out how many people enjoy listening to music: 68-18=50.
51. B. If 4 teachers drink only tea, then 3 teachers drink both coffee and tea, for a total of 7 teachers who drink tea. Create a Venn diagram :
52. D. Create a Venn diagram:


Inside the circles, $\mathrm{a}+\mathrm{b}+\mathrm{c}=76$. If 45 adults watch television news, then subtracting 45 from 76 gives 31 in section $b$, representing the number of people who get their news only from the internet. Since 73 adults get their news from the internet, subtracting 31 gives 42 adults who get their news from both sources.
53. C. Create a Venn diagram:


The intersection of all three circles represents 2 students who play all three instruments. The intersection of piano and guitar only (a) equals 10 minus 2 , or 8 students. Similarly, the intersection of piano and trumpet only (b) equals 8 minus 2 , or 6 students. To determine the number of students who only play the piano (c), subtract 2,8 , and 6 from the 28 who play piano. This gives 12 students who only play the piano.
54. D. Create a Venn diagram:


The intersection of all three circles represents 10 students who play all three instruments. Then the intersection of trumpet and guitar only (a) equals 20 minus 10 , or 10 students.
Similarly, the intersection of piano and trumpet only (b) equals 30 minus 10 , or 20 students. To determine the number of students who only play the trumpet, subtract 10, 10, and 20 from the 120 who play trumpet. This gives 80 students who only play the trumpet.
55. B. Create a Venn diagram:


Then it helps to work from the inside out. The intersection of all three circles represents 20 students who play all three instruments. Then the intersection of piano and guitar only (a) equals 50 minus 20 , or 30 students. Similarly, the intersection of piano and trumpet only (b) equals 40 minus 20 , or 20 students. The intersection of guitar and trumpet only (c) equals 30 minus 20 , or 10 students. Then determine how many students play only one of the instruments. For example, the number of students who only play guitar (e) is $30(90-30-$ $20-10$ ). The number of students who play only piano (f) is 70 , and 20 students only play the trumpet ( d ). Take the sum of the data $(a+b+c+d+e+f+20)$ and subtract from 250 students to find the number of music students who do not play one of those instruments, which gives 50 students.

## Measurements

## Speed

1. C. We convert 60 minutes to 1 hour. Distance is the time travelled multiplied by the pace. Therefore: $D=1 \times 10$.
2. A. We convert the time driven to hours and plug into the distance formula: $D=\frac{1}{2} \times 40=20$ miles.
3. C. We use the distance formula: $D=2.5 \times 400=1,000$ miles.
4. B. We manipulate the distance formula to obtain speed: $S=\frac{D}{t}=\frac{24}{2}=12$ miles per hour.
5. C. We manipulate the distance formula to obtain time: $t=\frac{D}{s}=\frac{30}{6}=5$ hours.
6. C. We manipulate the distance formula to obtain speed: $S=\frac{D}{t}=\frac{.5}{.1}=5$ miles per hour.
7. A. We first calculate Tara's travel time by manipulating the distance equation: $t=\frac{D}{s}=\frac{20}{60}=\frac{1}{3}=$ 20 minutes. Then, we do the same for Reid: $t=\frac{D}{s}=\frac{15}{45}=\frac{1}{3}=20$ minutes. Given that their travel times are the same, the difference between them is 0 minutes.
8. D. We calculate time by manipulating the distance equation: $t=\frac{D}{s}=\frac{3.2}{4}=.8=48$ minutes. Since she began walking at $4: 30 \mathrm{pm}$, she will arrive at $5: 18 \mathrm{pm}$.
9. D. We convert 30 minutes to .5 hours. Distance is the time travelled multiplied by the pace. Therefore: $D=15 \times .5$.
10. D. We manipulate the distance formula to obtain the equation for her speed: $S=\frac{D}{t}=\frac{40}{.75}$.

## Units

11. A. A quart is a quarter of a gallon. Therefore, 4 quarts fit in a gallon.
12. B. There are 8 pints in every gallon.
13. A. There are 120 minutes in two hours. Therefore, we can solve: $\frac{20}{120}=\frac{1}{6}$.
14. A. Two nickels make up 10 cents. Therefore, we can solve: $\frac{10}{100}=\frac{1}{10}$.
15. B. There are 180 minutes in three hours. Therefore, we can solve: $\frac{45}{180}=\frac{1}{4}$.
16. B. We can solve: $\frac{30}{100}=\frac{3}{10}$.
17. B. Each pound has 16 ounces. Therefore, $\frac{46}{16}=2 \mathrm{lb} .14 \mathrm{oz}$.
18. D. There are 36 inches in one yard. Therefore $36 \times 52=1,872$ inches.
19. D. There are 16 oz . per pound. Therefore: $10 \times 16+11=171 \mathrm{oz}$.
20. C. There are 1000 meters in a kilometer. Therefore: $1.424 \times 1,000=1,424$ meters.
21. A. There are 8 pints in a gallon. Therefore: $3.25 \times 8=26$ pints.
22. C. There are 5280 feet in a mile. Therefore: $5 \times 5,280=26,400$ feet. We then divide this number by the number of minutes in an hour: $\frac{26,400}{60}=440$ feet per minute.
23. A. There are 1000 millimeters in a meter. Therefore: $\frac{913}{1000}=0.913$ meters.
24. A. There are 12 inches in a foot. Therefore: $\frac{90}{12}=7.5$ feet.
25. B. There are 24 hours in a day. Therefore: $\frac{4}{24}=\frac{1}{6}$ of a day.

## Numbers \& Operations

## Arithmetic

1. C. When you add and subtract integers, you want to go from left to right. $14+(-4)$ is the same as $14-4$, which is 10 . Then subtracting a negative is the same as adding a positive, so $10-(-6)$ is the same as $10+6$, for an answer of 16 .
2. D. When you divide a negative by a negative, the answer is positive. Some students will choose $\frac{1}{15}$ because they divide 12 by 180 instead of the other way around.
3. C. Order of operations says that you should do what is in parentheses first, so you multiply -4 and -2 . When you multiply two negative numbers, the answer is positive, so $(-4) \times(-2)=8$. Then $152 \div 8=19$. Some students will choose 76 because they will divide 152 by -4 before multiplying -4 and -2 .
4. B. When you add and subtract, you want to go from left to right, taking each operation one step at a time, so you begin with $(-12)+8$. Adding a negative number and a positive number, you subtract the two numbers and keep the sign of the larger number, so $(-12)+8=-4$. Then, for $(-4)-(-3)$, you need to remember that subtracting a negative is like adding a positive. This leads to $(-4)+3=-1$. Finally, with $(-1)-20$, remember that subtracting a positive number is the same as adding a negative, so you change to $(-1)+(-20)$, which equals -21 .
5. C. When you have a combination of adding, subtracting, and multiplying operations, you begin the multiplying operation. Therefore, your first operation is $-2 \times 4$, which equals -8 (remember that a positive times a negative equals a negative). At this point, it may help you to rewrite what is left: $(-3)+(-8)-1$. Then you go from left to right. When you add two negative numbers, you add the digits and keep the answer as negative, so $(-3)+(-8)=-11$. Then $(-11)-1$ is the same as $(-11)+(-1)$, which is -12 .
6. C. When you have a combination of subtracting, multiplying, and dividing operations, you begin with the multiplying and dividing operations, going from left to right. In this problem, that means you begin with $24 \div(-3)$, which is -8 (remember that a positive multiplied or divided by a negative is a negative). Similarly, $(-2) \times 3=-6$. That leaves you with the subtraction operation: $(-8)-(-6)$. When you subtract a negative, it is the same as adding a positive: $(-8)+6$. That gives you a final answer of -2 . This is because when you add a positive and negative number, you subtract the digits and keep the sign of the larger number.
7. C. When you divide two negative numbers, the answer will be positive.
8. D. When you divide, divide the divisor into the first digit(s) it can go into. In this case, 25 can go into 95 , and it does so 3 times with 20 left over. Then you bring down the 7 , so you are now dividing 25 into 207, which is 8 times with 7 left over. There is no other number to bring down, so you are finished, and 7 is your remainder.
9. B. When you divide, divide the divisor into the first digit(s) it can into. In this case, 8 can go into 63 , and it does so 7 times with 7 left over. Then you bring down the 5 , so you are now dividing 8 into 75 , which is 9 times with 3 left over. Then you bring down the 1 , so you are now dividing 8 into 31 , which is 3 times with 7 left over. There is no other number to bring down, so you are finished, and 7 is your remainder.
10. D. When you divide, divide the divisor into the first digit(s) it can go into. In this case, 6 can go into 6 , and it does so 1 time with 0 left over. Then you bring down the 5 , so you are now dividing 6 into 05 , which is 0 times with 5 left over. Then you bring down the 9 , so you are now dividing 6 into 59 , which is 9 times with 5 left over. There is no other number to bring down, so you are finished, and 5 is your remainder.
11. C. When you divide, divide the divisor into the first digit(s) it can go into. In this case, 45 goes into 82 , and it does 1 time with 37 left over. Then you bring down the 3 , so you are now dividing 45 into 373 , which is 8 times with 13 left over. There is no other number to bring down, so you are finished, and 13 is your remainder.
12. C. There are many ways to multiply multi-digit numbers. One way is to split the problem into two parts: $254 \times 5$ and $254 \times 20$. This is because $(254 \times 5)+(254 \times 20)=(254 \times 25)$. When you multiply 254 and 5 , you get 1,270 . To multiply 254 and 20 , it is easier to multiply 254 and 2 , then add a 0 on the end. That gives you 5,080. Adding 5,080 and 1,270 gives you the final answer of 6,350 .
13. B. When you multiply by $10,100,1000$, or any number that starts with 1 followed by a lot of zeroes, the easy shortcut is simply to add however many zeroes are in that number to the number that you're multiplying. In this case then, you would add two zeroes (because you are multiplying by 100) to the number 3,083 . That gives you an answer of 308,300 . As easy as these kinds of problems can be, you still want to be careful that you do not make a silly mistake, as often the test will include answers that look similar to the correct one.
14. C. When you multiply with a number that has a number followed by one or more zeroes, a shortcut is to multiply that first number and leave the zeroes off. In this problem, you would multiply $53 \times 2$, which is 106 . Then because there were three zeroes after the 2 (in 2,000 ), you add three zeroes to your final answer, which gives you 106,000.
15. D. Line up the numbers according to place value and find the sum. Here, $1,021+101,210+$ $10,002+202,021=314,254$. When a problem looks particularly easy, such as this, be careful that you write it down properly before you start adding. It is particularly common for students to leave off a zero, which is what leads to the three incorrect answers.

## Operations with Fractions and Decimals

16. B. To add fractions, you first find a common denominator, which in this case is 6 . Then you convert to equivalent fractions: $\frac{2}{3}=\frac{4}{6}$. Therefore, $\frac{4}{6}+\frac{1}{6}=\frac{5}{6}$. The fraction $\frac{3}{9}$ is not correct because you need to have a common denominator before adding fractions.
17. A. To subtract fractions, you first find the common denominator, which in this case is 8 . Then convert to equivalent fractions: $\frac{1}{2}=\frac{4}{8}$. Then you subtract the fractions, and $\frac{7}{8}-\frac{4}{8}=\frac{3}{8} \cdot \frac{6}{16}$ is incorrect because it is not simplified to its lowest form. $\frac{6}{6}$ is incorrect because you subtracted before you found a common denominator and converted to equivalent fractions. $\frac{11}{8}$ is incorrect because you added instead of subtracting.
18. D. When you have a complex fraction, it can help to rewrite it as a regular division problem. In this case, that is $\frac{2}{3} \div \frac{3}{4}$. Now, you can change to a multiplying problem by taking the reciprocal of the fraction on the right. Therefore, $\frac{2}{3} \times \frac{4}{3}=\frac{8}{9} \cdot \frac{1}{2}$ and $\frac{6}{12}$ are both incorrect because the student multiplied the fractions before taking the reciprocal of the fraction on the right.
19. A. When you have a complex fraction, it can help to rewrite it as a regular division problem. In this case, that is $\frac{3}{4} \div \frac{9}{8}$. Then you can change to a multiplying problem by taking the reciprocal of the fraction on the right. Therefore, $\frac{3}{4} \times \frac{8}{9}=\frac{24}{36}$. You then simplify to lowest form by dividing both numerator and denominator by 12 . Therefore, $\frac{24}{36}=\frac{2}{3} \cdot \frac{24}{36}$ is incorrect because it is not simplified. $\frac{27}{32}$ is incorrect because the student multiplied before taking the reciprocal of the fraction on the right.
20. B. To divide fractions, you first change to a multiplying problem by taking the reciprocal of the number on the right. The reciprocal of a whole number is a fraction with a 1 in the numerator and the whole number in the denominator, so the reciprocal of 2 is $\frac{1}{2}$. Therefore, $\frac{5}{8} \div 2$ is equivalent to $\frac{5}{8} \times \frac{1}{2}$, which equals $\frac{5}{16}$.
21. A. To add decimals, you must line up the numbers properly. The easiest way is to line up the decimals, and this ensures that the place values are in their proper place, so that you are adding the numbers in the ones place, the numbers in the tenths place, and so on. Also, when a decimal addition problem involves a lot of the same numbers (here, 1's and 2's), be careful that you have accurately written down the numbers, as it is easy to make a mistake.
22. A. To subtract decimals, you need to line up the numbers properly. The easiest way to do this to line up the decimals, which ensures that the place values are in their proper place. Since you will need to borrow, it also helps to add a zero at the end of the first number, so 4.5 becomes 4.50. That helps ensure that you will subtract properly. 2.17 and 2.27 are common mistakes when students do not make the top number 4.50. 6.87 is incorrect because it adds instead of subtracts.
23. A. One simple way to multiply decimals is to first multiply the numbers without decimals, so $7 \times 4=28$. Then you determine how many digits in the problem were to the right of the decimal. In this problem, there were four numbers to the right of the decimal: the $0,7,0$, and 4 . Then you make sure there are the same amount of numbers to the right of the decimal in your answer. None of the incorrect answers have four numbers to the right of the decimal.
24. D. To divide by a decimal, it helps to start the problem by moving the decimal in both dividend and divisor, so that the divisor ( 0.2 in this case) does not have a decimal. In this problem, that means you move the decimal one place to the right: 8 turns into 80 , and 0.2 turns into 2 . Then dividing 80 by 2 (or $\frac{80}{2}$ ) is a simple operation that gives you the correct answer of 40 .
25. A. To divide mixed numbers, it helps to begin by converting them into improper fractions. For each fraction, you multiply the denominator by the whole number and then add the numerator to obtain a new numerator. That gives you $\frac{240}{25} \div \frac{26}{5}$. You now change to a multiplying problem by taking the reciprocal of the fraction on the right: $\frac{240}{25} \times \frac{5}{26}$. It helps to cancel by dividing 5 and 25 by 5 . This gives you a more manageable $\frac{240}{5} \times \frac{1}{26}$. This can be reduced further to $\frac{120}{5} \times \frac{1}{13}$, and then to $\frac{24}{1} \times \frac{1}{13}$. Multiply to get $\frac{24}{13}$. Then you convert to a mixed number by dividing 24 by 13 . This gives you a final answer of $1 \frac{11}{13}$.
26. B. To divide by a decimal, it helps to start the problem by moving the decimal in both dividend and divisor, so that the divisor ( 1.6 in this case) does not have a decimal. In this problem, that means you move the decimal one place to the right: 5.0 becomes 50 , and 1.6 becomes 16 . Then dividing 50 by 16 equals 3.125 . A common mistake is that students switch what they are dividing by, so they calculate $1.6 \div 5$, which gives the incorrect answer of 0.32 .
27. C. When you subtract a negative number, it is the same as adding a positive number. Therefore, $8.1-(-1.5)$ is the same as $8.1+1.5$. That becomes a simpler problem. Some students will get confused by the negative number and just subtract to get the incorrect answer of 6.6.
28. C. When you multiply integers, a negative number times a negative number gets a positive answer, so you know that you will be choosing between 0.51 and 5.1. To determine which answer is correct, multiply 17 by 3 . That gives you 51 . Then count how many numbers are to the right of the decimal in the original problem. That would be two: the 7 and the 3. Therefore, you should have two numbers to the right of the decimal in your answer, which is 0.51 .5 .1 is incorrect, as it only has one number to the right of the decimal.
29. A. When you divide integers, if one number is positive and the other number is negative, you will get a negative answer. In this problem, you should realize there is only one negative answer, so that must be the correct one. You do not even need to do any dividing.
30. D. When you add decimals, a good start is to line up the numbers. The easiest way to do that is to line up the decimals, which will cause the place values to be in their proper place (the tenths above the tenths, the hundredths above the hundredths, and so on). In this problem, you want to change 4 into 4.0 , so that it is easier to line up the decimals properly. The incorrect answers all reflect situations where the numbers were not lined up correctly.

## Percent Word Problems

31. D. A $15 \%$ increase means that the number of visitors in 2021 would be $115 \%$ of the number of visitors in 2020 . Therefore do $1.15 \times 3200=3680$.
32. C. If the golf clubs are on sale for $40 \%$, that means the sale price will be $60 \%$ of the original price. Do: $0.6 \times 320=192$.
33. B. If there are $50 \%$ more oranges than there are apples, and there are 20 apples, we can find the number of oranges by doing $1.5 \times 20=30$. Now that we know there are 30 oranges, we can use this to find the number of peaches. If there are $10 \%$ fewer peaches than oranges, this means that peaches are equal to $90 \%$ of the oranges. To find the number of peaches do $0.9 \times 30=27$.
34. C. First, find how much interest Marguerite has to pay in one year. To do this, find $10 \%$ of $\$ 15,000$ by doing $0.10 \times 15000=1500$. Since she has to pay $\$ 1,500$ per year in interest, find how much she interest she has to pay for two years by doing $1500 \times 2=3000$. To find how much she paid the bank in total after two years, do $15,000+3,000=18,000$.
35. A. If $x$ is $50 \%$ greater than $z$, then we can say that $x=1.5 z$. If $y$ is $20 \%$ greater than $z$, then we can say that $y=1.2 z$. Next, we find the percent difference between $x$ and $y$ by doing $\frac{1.5 \mathrm{z}-1.2 \mathrm{z}}{1.2 \mathrm{z}} \times 100=25 \%$.
36. D. Since we do not know the original price, let's call it $p$. We know that $\$ 30$ is $60 \%$ of $p$. Using this, we can write the equation $30=0.6 p$. Solving for $p$ we get that the original price is $\$ 50.00$.
37. D. Let the original price be $p$. If he gets a $20 \%$ discount, that means Calvin pays $80 \%$ of the original price, or $0.8 p$. He then gets an additional $30 \%$ discount on this price, so he pays $70 \%$ of $0.8 p$ or ( 0.7 )(0.8)p. Multiplying everything out, we get that Calvin paid $0.56 p$ or $56 \%$ of the original price, $p$.
38. B. First, find how many parrot fish there are in the aquarium by doing $680-510=170$ parrot fish. Next, determine 170 is what percent of 680 by doing $\frac{170}{680} \times 100=25 \%$.
39. A. Timothy paid $\$ 120$ for the boxed set. He paid sales tax on this amount. To find how much tax he paid, simply find $8 \%$ of 120 by doing $\frac{8}{100} \times 120=9.60$.
40. D. If Mrs. Williams paid $\$ 720$ in interest after one year, to find her annual interest rate simply determine $\$ 720$ is what percent of $\$ 9,000$. Determine this by doing $\frac{720}{9000} \times 100=8 \%$.

## Percents

41. C. First, convert the fraction into a decimal. This is $2 \frac{1}{4}=2.25$. Then, divide by 100 to find the percent. This is the same as moving the decimal twice to the left, so the correct answer is 0.0225 .
42. C. When given the part and whole values, place the part over the whole to find the percent. This gives $\frac{10}{50}=\frac{20}{100}=20 \%$.
43. A. To find the decimal value of a percent, move the decimal two places to the left. This gives 0.0042 .
44. A. First, $75 \%$ of 20 is: $0.75 \times 20=15$. So the question becomes, " 15 is what percent of 60 ?" Given the part and the whole, make a fraction and multiply by 100 to find the percent. Here this is: $\frac{15}{60}=\frac{1}{4}=0.25=25 \%$.
45. B. Use estimation since the answer choices are far apart in value. The fraction $\frac{44}{110}$ can be estimated to $\frac{40}{100}$ which is closest to $40 \%$, the correct answer.
46. A. To turn a percent into a decimal, move the decimal place two places to the left. This gives 0.025 as the correct answer.
47. C. Find the fraction of shaded boxes to total boxes and then divide to find the percent: $\frac{3}{15}=\frac{1}{5}=$ 20\%.
48. D. To find the decimal form of a percent, move the decimal twice to the left. This gives 0.0012 .
49. C. Move the decimal place twice to the left to find the decimal version of the percent, and then multiply: $1.3 \times 60=78$.
50. A. The value of $10 \frac{1}{2} \%=10.5 \%$. Move the decimal twice to the left to get the decimal version of the percent: 0.105 .

## Roots

51. B. To solve this question, first identify a perfect square that comes before 42 and a perfect square that comes after 42. This would be 36 and 49. $\sqrt{36}=6$ and $\sqrt{49}=7$. Therefore, the $\sqrt{42}$ is between 6 and 7 .
52. B. $\sqrt{169-144}=\sqrt{25}=5$.
53. A. $\sqrt{9 \sqrt{4}}=\sqrt{9 \times 2}=\sqrt{9} \times \sqrt{2}=3 \times \sqrt{2}=3 \sqrt{2}$.
54. C. To solve this question, first identify a perfect square that comes before 159 and a perfect square that comes after 159 . This would be 144 and 169. $\sqrt{144}=12$ and $\sqrt{169}=13$. Therefore, the $\sqrt{159}$ is between 12 and 13 .
55. A. $\frac{\sqrt{18}}{3}=\frac{\sqrt{9 \times 2}}{3}=\frac{3 \sqrt{2}}{3}=\sqrt{2}$.
56. B. $\sqrt{121}=11$. Rewrite the equation as $11+x=34$. Solving the equation, we get that $x=23$.
57. D. If $x=\sqrt{81}$, then $x= \pm 9$. We will be squaring $x$, so it does not matter whether you use 9 or -9 . Substituting this value of $x$ into the equation: $2 x^{2}-21=2(9)^{2}-21=2(81)-21=162-$ $21=141$.
58. B. $\sqrt{4 a b^{2}} \cdot \sqrt{a}=\sqrt{4 a^{2} b^{2}}=\sqrt{4} \cdot \sqrt{a^{2}} \cdot \sqrt{b^{2}}=2 a b$.
59. A. $\sqrt[3]{27}-\sqrt[3]{8}=3-2=1$.
60. A. $\sqrt[3]{125 x^{3}}-\sqrt[3]{8 x^{3}}=\left(\sqrt[3]{125} \cdot \sqrt[3]{x^{3}}\right)-\left(\sqrt[3]{8} \cdot \sqrt[3]{x^{3}}\right)=5 x-2 x=3 x$.

## Rounding

61. C. You begin by adding to get an answer of 3.806. To round to the nearest hundredth, you look at the thousandths place. Since that is 5 or higher, you add one to the hundredths place, making it 1 . Everything to its right turns to a zero, giving an answer of 3.810, or 3.81. 3.805 is incorrect as it is not rounded. 3.8 is rounded to the nearest tenth, not hundredth.
62. D. When you subtract, you get 0.892 , which rounds to 0.9 . To save time when doing these problems, you want to eliminate as many answers quickly as you can. For example, 10.23 is approximately 10 and 6.875 is approximately 7 . The difference of those is 3 , which is not close to 0.9 . Similarly, 8.054 is approximately 8 and 4.146 is approximately 4 . The difference of those is 4 , which is also not close to 0.9 . You will need to solve $4.351-3.527$. When you do, you get an answer of 0.824 . That rounds to 0.8 , so it is also incorrect.
63. B. You begin by multiplying to get an answer of 1.248 . To round to the nearest tenth, you look to its right, at the hundredths place. Since that is 4 or lower, you leave the tenths place the same. Everything to its right turns to zero, which gives you 1.2.
64. C. One way to solve this problem is to round each number to the nearest one in your head and then multiply. As 8.2 rounds to 8 and 4.8 rounds to 5 , its product is approximately 40 . As for the incorrect answers, 9.7 can be rounded to 10 and 5.3 can be rounded to 5 . The product of those two numbers is 50 , which is too high. Similarly, 7.9 rounds to 8 and 5.8 to 6 , so its product is approximately 48 , also too high. On the opposite side, 6.9 rounds to 7 and 5.1 to 5 , so its product is approximately 35 , which is too low.
65. C. You begin by multiplying to get an answer of 5.996. To round to the nearest hundredth, you look to its right, at the thousandths place. Since that is 5 or higher, you add one to the hundredths place. Because $9+1=10$, you need to carry both to the tenths and ones place, which gives you 6.00 , or 6 . If it helps, you can think of it as $5.99+0.01=6.00 .5 .996$ is incorrect because it is not rounded. Some students will choose 5.5, as they added instead of multiplying.
66. B. You begin by dividing to get an answer of 0.05 . To round to the nearest tenth, you look to its right, at the hundredths place. Since that is 5 or higher, you add one to the tenths place. Everything to its right turns to zero, which gives you 0.1. Some students will chose 20 because they divided 0.12 by 0.006 .
67. D. You begin by dividing to get an answer of 165 . To round to the nearest hundred, you look to its right, at the tens place. Since that is 5 or higher, you add one to the hundreds place. Everything to its right turns to zero, which gives you 200.165 is incorrect because it has not been rounded. 170 is incorrect because it is rounded to the nearest ten instead of the nearest hundred.
68. C. One way to solve this problem is to round each dividend to the nearest hundred and each divisor to the nearest ten. For example, in the correct answer, 587 is approximately 600 and 19 is approximately 20 , and $600 \div 20$ is 30 . Since 821 is approximately 800 and 22 is approximately 20 , its quotient is approximately 40 . If you solved that one first, you can immediately know that $985 \div 22$ is even larger, as 985 is larger than 821 .
69. A. One way to solve this problem is to round each number to the nearest hundred. Because 308 rounds to 300 and 95 rounds to 100 , the difference is approximately 200 . Some students will choose either $793-515$ or $887-605$ because those differences seem to be 200 , since $7-5=$ 2 and $8-6=2$. The first of those is incorrect, however, because 793 is approximately 800 , so $793-515$ is approximately 300 . Similarly, 887 is approximately 900 , so $887-605$ is also approximately 300.
70. A. You begin by adding to get an answer of 1.2349. To round to the nearest hundredth, you look to its right, at the thousandths place (which has a 4). Since that is 4 or lower, you leave the hundredths place the same. Everything to its right turns to zero, which gives you 1.23.1.235 is incorrect as it is rounded to the thousandths place. 1.24 is incorrect as it rounded up when the hundredths place should have been left the same.

## Vocabulary

71. C. A cylinder has two congruent circular bases, the common shape for most cans. A cone has a circular base, but it tapers to a point, which is not what a can looks like. Neither a cube nor a pyramid has a circular base.
72. B. An equilateral triangle has three congruent sides.
73. A. A heptagon is a polygon with seven sides.
74. C. A rational number is a number that can be expressed as a quotient of two integers. A repeating decimal is a rational number, as $7 . \overline{3}$ is equivalent to $\frac{22}{3}$. However, the square root of a nonperfect square number, like $\sqrt{6}$, results in an irrational number.
75. A. A chord is a line segment whose end points both lie on a circle. A diameter is the name for a a specific chord which passes through the center of the circle.
76. D. A trapezoid is a four-side figure with one pair of parallel sides. A square is also a four-sided figure, but all of its sides are congruent. A kite is a four-sided figure which also has consecutive sides that are congruent, but it has no parallel sides.
77. D. A parallelogram has two pairs of parallel sides, whereas a trapezoid only has one pair of parallel sides.
78. A. A parallelogram always has two pairs of parallel sides. That is also true of a rhombus, so statement II is false. A trapezoid has one pair of parallel sides, so statement I is false.
79. C. Counting (or natural) numbers are all of the positive numbers, but 0 is neither positive nor negative, so it is not a counting number. It is, however, both an integer and whole number.
80. C. A shape has symmetry if a central dividing line can be drawn on it and then both sides are the same. Although pentagons, quadrilaterals, and triangles can sometimes be symmetrical, they can also be asymmetrical depending on how they are drawn. A square, however, is always symmetrical.

## Word Problems

81. B. Use $x$ to represent the number of pens. This makes $x+5$ the number of pencils. Adding the two together gives the total number of items purchased: $x+x+5=47$. Solve to find that $x$ is 21. This is the number of pens, and the question asks for the number of pencils. Add 5 to $x$ to find that the answer is 26 .
82. D. To find how much he paid, on average, each month, divide the total cost by twelve: $530.40 \div$ $12=44.20$.
83. B. To find the average MONTHLY budget, divide the annual budget by 12 , as there are 12 months in a year. So, $39,600 \div 12=3,300$.
84. A. There are 5 doublings that occur between Monday at 9 a and Wednesday at 9 p. Start with 70 and multiply by two 5 times: $70 \times 2 \times 2 \times 2 \times 2 \times 2=2,240$.
85. A. Find the total number of cookies: $7 \times 8=56$; then find the number of cookies eaten: $9 \times 5=$ 45. Subtract the number eaten from the total to find the number of cookies left: $56-45=11$.
86. B. There are 11 people to begin, and 5 people get off and twice that (10) get on the bus. This is: $11-5+10=16$. Then, half of the those get off, leaving 8 people. Finally, add one for the single person who gets on at the second stop: $8+1=9$.
87. D. To find the number of days that it will take Buckley to save up $\$ 30$ if she saves $\$ 0.70$ per day, divide: $30 \div 0.70=42.857$. After 42 days she will still not have enough money, so we need to round the number up to 43 .
88. B. First, convert the feet to yards by dividing by three: 9 feet $\div 3=3$ yards, and 12 feet $\div 3=4$ yards. There are 4 walls, so she needs 4 pieces of fabric, each measuring 3 by 4 yards. So, $3 \times 4 \times 4=48$ square yards are needed. The fabric is $\$ 20$ per square yard, so multiply to get the answer: $20 \times 48=\$ 960$.
89. D. Since her parents contribute $\$ 2$ for every $\$ 1$ she makes, multiply to find the amount her parents contribute: $37 \times 2=74$. This is in addition to the amount she earned, so add to find the total amount she raised for the trip: $37+74=111$.
90. D. Henry purchases 2 books on 5 days, and 1 book on 2 days each week which means he buys 12 total comic books in one week: $(2 \times 5)+(1 \times 2)=12$. This means that in two weeks, he purchases 24 comic books. Multiply this by the value of one comic book to find the answer: $24 \times 6=144$.
91. C. To find the number of envelopes she needs to seal and mail, divide: $\$ 78 \div 0.65=120$.
92. A. First, divide to find the cost of one orange: $3.27 \div 3=1.09$. Then, multiply by that value by 4 to find that 4 oranges cost $\$ 4.36$. Subtract this amount from the total to find the cost of 3 bananas: $7.39-4.36=3.03$. Since the question asks for the cost of a single banana, remember to divide by 3 to get the final answer: $3.03 \div 3=1.01$.
93. C. Count forward by three days on the calendar and each time triple the value: Jan $13=\$ 20$; Jan $16=\$ 40$; Jan $19=\$ 80$; Jan $22=\$ 160$.
94. C. First, subtract the amount of money he already has saved from the total he needs: $115-10=$ 105. Then, divide to find the number of weeks he needs to work: $105 \div 30=3.5$. This means that he will have enough after 3 and a half weeks. But, since he only gets paid for full weeks worked, he needs to complete the last week and work for a total of 4 weeks.
95. D. Find the number of necklaces Erin sold: $(2 \times 5)+4=14$. Add this to the number that Erin sold to find the total number of necklaces sold. This is: $14+5=19$. Finally, multiply by the cost per necklace to find the total earned: $19 \times 12=228$.


## Practice Test 1

## Verbal Skills

1. B. Broom, mop, and soap are all tools used to clean. "Chores" is a more general word that can include sweeping, mopping, and cleaning. Therefore, chores is the word that does not belong.
2. B. Elegance means showing "grace" or refinement of movement and style.
3. A. "Spacious" means having a lot of room. This is the opposite of the word "cramped," which means to be very limited in space.
4. B. There are two true statements about apples: they grow on trees and they are sweet. There could be other fruit that grows on a tree that is not sweet, such as lemons. Therefore, the third statement is false.
5. B. Surpass is to exceed or be greater than, which is closest in meaning to "excel' which is to do well.
6. B. Eyes, lips, and nose are all found on the face. Fingers are on the hand, so it does not belong with the others.
7. A. It is required that someone has to be at least 35 years old to have been president.

Therefore, anyone who has been the president was at least 35 years old when they became president. This makes the third statement true.
8. B. Depressed, joyful, and worried are types of different emotions. "Emotion" is the category itself, so it does not belong.
9. C. The relationship is that of item to where it is found. A rose is found in a garden, and a tree is found in a forest.
10. D. The word "serious" means important. This is the opposite of the word "silly," which means unimportant.
11. C. There are two categories of socks given in the first two sentences: those made of wool, and those that are very warm. This means that there could be socks that are made of wool, socks that are very warm, and socks that are both made of wool and are very warm. This means there could be wool socks that are not very warm. The third statement is uncertain.
12. D. Engineer, fisherman, and sailor are types of jobs. "Ship" is an object, not a job, so it does not belong.
13. A. Tim is taller than Jessica and shorter than Abraham. We can order the people according to height with this information. From shortest to tallest: Jessica, Tim, Abraham. Therefore, the third statement is true.
14. C. "Filthy" means dirty. This is the opposite of the word "pristine," which means absolutely clean.
15. D. This is a relationship of water feature to type of water. Waves are found in oceans, and rapids are found in rivers.
16. B. Dairy, meat, and produce are types of groceries. "Groceries" is the general category, so it does not belong.
17. C. Daisy, tulip, and fern are all nouns and types of plants. "Growth" is a verb that means getting bigger or better, so it doesn't belong.
18. B. "Reduce" means to decrease in number. This is the opposite of the word "increase."
19. A. Lively means being "active" and full of life.
20. C. This is a relationship of categories. A stove is a type of appliance, and a hammer is a type of tool.
21. A. If something is essential, it is "necessary," or required to be done or present.
22. B. To desire is to wish or want, or to have "longing."
23. A. This is a relationship of action to outcome. Sanitizing something makes it safer, and teaching someone makes them more educated.
24. C. To erode means to gradually destroy or wear away, or "crumble."
25. C. Book, movie, and show are all nouns that people use for entertainment. "Read" is a verb, so it does not belong.
26. A. Absence is the lack of something being present; it does not exist in this location.
27. C. "Eliminate" means to completely get rid of. This is the opposite of the word "include," which means to keep as part of a set.
28. A. This is a relationship of opposites. Impartial is the opposite of biased, and failure is the opposite of achievement.
29. A. An introduction is at the start, or the "beginning" of a story.
30. C. To perform a task calmly means to perform it without strong emotion, or "peacefully."
31. A. "Cryptic" means hard to understand or see. This is the opposite of the word "clear," which means easy to understand or see.
32. D. To extract is to remove from a source, such as to "uproot" a tree.
33. D. To suspect is to have the impression of something without proof, or to "speculate."
34. D. "Esteemed" means to be admired. This is the opposite of the word "unknown," which means to not be known.
35. D. This is a relationship of antonyms, or opposites. Day is the opposite of night, and summer is the opposite of winter.
36. A. Dinner, feast, and meal all describe a specific time or event during which people eat together. While all of these things may be part of or happen during a celebration, not all celebrations have dinners, feasts, or meals. Therefore, celebration is the word that doesn't belong.
37. A. This is a relationship of a smaller part of a larger whole. There are many cities in a state, and there are many regions in a country.
38. B. Sharks are fish and only some fish need to live in salt water. This means that there are some fish, including sharks, that can live in fresh water. The third statement is false.
39. A. Earthquake, tornado, and tsunami are all specific types of destructive events. "Destruction" is what happens as a result of any of these types of storms, so it doesn't belong.
40. D. Decorations, food, and music are all things that can be found at a party. "Party" is the general category, so it does not belong.
41. C. Climax means the upmost point, or the "height" of the action.
42. A. Lions are carnivores, which are animals that only eat meat. This means that lions only eat mean. The third statement is true.
43. B. Lizard, snake, and turtle are all specific types of animals. "Reptile" is a category of animal, so it does not fit.
44. B. This is a relationship of opposites. Apathy is the opposite of enthusiasm, and melancholy is the opposite of joy.
45. B. Melissa isn't allowed to watch movies with a rating of PG-13 or higher, and most horror movies have a rating of PG-13 or higher, which means that there are some of those movies that have a rating that allows her to watch them. The third statement is false.
46. A. "Impede" means to get in the way of something happening. This is the opposite of the word "allow," which means to let something happen.
47. A. To be ornate is to be very showy and decorated, or "flamboyant."
48. C. Roger loves to read books, and he can check them out at the library. It might make sense that he would love to hang out at the library, but we can't be certain that it is true. He might not like the temperature or the lighting or something else about the library. Therefore, the third statement is uncertain.
49. A. To scorch is to "burn" with heat.
50. B. The fact that herbs are often added to pasta means that they are not always added to pasta. There are also other herbs than sage that could be added to pasta. Therefore, the third statement is false.
51. A. Muffin, croissant, and strudel are all specific types of pastries. "Pastry" is the category itself, so it does not belong.
52. B. Discord is disagreement or "conflict" between people.
53. B. Adjective, noun, and verb are parts of speech. "Definition" explains a word's meaning in detail, so it does not belong.
54. C. Both the blue and red fish can swim faster than the green fish. However, there is no information that tells whether the blue or red fish is fastest. The third statement is uncertain.
55. D. Cardigan, jacket, and sweater are all layers worn on top of the primary clothing for the purpose of staying warm when it is cold. A $t$-shirt is not warn for additional warmth, and does not belong.
56. D. "Obscure" means rare and hard to find. This is the opposite of the word "ubiquitous," which means common and found everywhere.
57. C. This is a relationship of synonyms. A group is a category, and a neighborhood is a community.
58. C. Dressing, lettuce, and tomatoes are all ingredients that can be found in salad. "Salad" is the more general term, so it does not belong.
59. D. Dream, hope, and imagine all describe the state of thinking about what you would like to happen. Succeed is to achieve those things, so this is the word that does not belong.
60. C. The relationship is one of synonyms. A rabid animal is wild, and a calm animal is tame.

## Quantitative Reasoning

61. D. This is an alternating pattern of adding 7 and multiplying by -1 . The last step was to add 7 to -12 to get -5 . Multiplying -5 by -1 gives 5 as the correct answer.
62. B. (I) has 18 blocks, (II) has 16 blocks, and (III) has 16 blocks. Therefore, $\mathrm{I}>\mathrm{II}=\mathrm{III}$.
63. A. Simplify the problem: one-half of 100 is 50 . Then " 8 less than" 50 is the same as subtracting, and $50-8=42$.
64. C. This is an arithmetic sequence in which each number is 11 less than the previous number in the sequence. Subtracting 11 from 35 gives 24 as the correct answer.
65. D. An acute angle is always less than 90 degrees, so it is less than a right angle, which is always 90 . Similarly, an obtuse angle is always greater than 90 degrees, so a right angle is always less than an obtuse angle.
66. D. The value of $A$ is 8 , and the value of $B$ is 7 , and their sum is 15 . The value of $C$ is 9 , and the value of $D$ is 6 , and their sum is also 15 .
67. D. A yard is equal to three feet, so two yards (I) are equal to six feet (II).
68. D. Each number is the preceding number multiplied by 3 . Therefore, the following number is 59.4.
69. C. When comparing fractions, one approach is to find a common denominator and convert into equivalent fractions. When the fractions all have the same numerator, however, there is a shortcut: the fraction with the smallest denominator will be the largest fraction.
Therefore, $\frac{3}{4}>\frac{3}{7}>\frac{3}{11}$.
70. A. Simplify the problem: the difference of 18 and 5 is 13 , and 5 more than 13 is 18 . Then determine what subtracts from 22 to leave 18 , and the answer is 4 .
71. D. Each number is the preceding number multiplied by 2 . Therefore, the missing number is 14.
72. A. This is an arithmetic sequence in which each number is 3 less than the previous number in the sequence. Subtracting 3 from 6 gives 3 as the correct answer.
73. B. Because the circle is divided into four equal quadrants, that means $\mathrm{A}, \mathrm{B}, \mathrm{C}$, and D are all equal. Therefore, the sum of any two quadrants will be equal to the sum of any two other quadrants.
74. A. When comparing decimals, start with the greatest place values. In this problem, statement II is greatest because it has a 7 is in the tenths place, and statements I and III have a 0 in the tenths place. Statements I and III are equal because they both have a 7 in the hundredths place and no other value after.
75. B. When comparing decimals, start with the greatest place values. In this problem, the whole numbers are not the same, as the 2 in 2.013 means that it is larger than the other numbers, which just have a 1 in the ones place. Comparing 1.013 and 1.103 , the latter number is larger because it has a 1 in the tenths place while 1.013 has a 0 in that place. Therefore, $1.013<1.103<2.013$.
76. B. Simplify the problem: one-half of 100 is 50 . Then determine what multiplies by 5 to get 50 , or $5 x=50$. Solving gives the correct answer of 10 .
77. C. Simplifying all three expressions gives $x-y(-y+x$ is equivalent). Therefore, all three statements are equal.
78. A. Statement I simplifies to $x+2 y$, and statement II simplifies to $2 x+y$. When both $x$ and $y$ are positive, $2 x$ will always be greater than $x$, and similarly $2 y$ will be greater than $y$. Therefore, $x+y$ is less than $x+2 y$ and also less than $2 x+y$, making statement III less than both statements I and II.
79. C. One quarter is twenty-five cents, so four quarters (II) are worth one dollar (III).
80. C. Simplify the problem: one-third of 60 is 20 , and $10 \%$ of 50 is 5 . Then determine what subtracted from 20 gives 5 , or $20-x=5$. Solving gives the answer as 15 .
81. B. The area of a square with side 2 is $4(2 \times 2)$, the area of a right triangle with legs of 3 and 2 is $3\left(\frac{1}{2} \times 3 \times 2\right)$, and the circumference of a circle with 2 is $2 \pi$, as the formula for circumference is $\pi$ times the diameter. Because $\pi$ is approximately $3.14,2 \pi$ is approximately 6.28.
82. D. You can determine $a$ by subtracting from 110 , as $a$ and 110 are supplementary angles. Therefore, $a=70$. On the other hand, $b=110$, as those two angles are vertical angles, and vertical angles are congruent. Therefore, $b$ is greater than $a$.
83. D. Simplify the problem: $3^{2}=9$, and $9 \times 5=45$. Ten more than 45 is 55 .
84. B. Statement I can be solved as: $-3(12)=-36$; Statement II can be solved as: $3(-12)=-$ 36; Statement III can be solved as: $-3(12)=-36$.
85. A. Simplify the problem: one-third of 90 is 30 , and $5^{2}$ is 25 . Then determine what added to 25 gives 30 , or $x+25=30$, and the answer is 5 .
86. B. The positive exponent on the 10 reveals how many times the decimal should be moved to the right. Therefore, $0.234 \times 10^{5}=23,400$ and $23.4 \times 10^{3}=23,400$.
87. D. Simplify the problem: the sum of 8 and 7 is 15 , and twice that is 30 . Then 12 less than 30 is 18. Finally, determine what subtracts from 62 to leave 18 , and the answer is 44 .
88. D. Three nickels (I) are worth fifteen cents, and two dimes (II) are worth twenty. Their sum is thirty-five cents, which is more than one quarter (III).
89. D. Distribute statement II to get $4 x-2 y$, and statement III to get $4 x+2 y$. All three expressions have $4 x$ and some amount of $y$. When $y$ is positive, $2 y$ will always be greater than $-y$. Therefore, $4 x+2 y$ is greater than $4 x-y$, which makes statement III greater than II. Similarly, $-y$ will always be greater than $-2 y$. Therefore, $4 x-y$ is greater than $4 x-2 y$, which means statement I is greater than II.
90. A. The slope described in I is $\frac{1}{2}$, the slope described in II is $-\frac{1}{2}$, and the slope described in III is 2. Therefore, I > II.
91. D. This is an alternating sequence of subtracting 4 and multiplying by 2 . Thirteen minus 4 results in 9 . Multiplying 9 by 2 gives the correct answer of 18 .
92. A. Because both $c$ and $d$ form an angle of a rectangle, they are both right angles and are therefore equal to each other.
93. B. The slope described in I is -1 , the slope described in II is 2 , and the slope described in III is -1 . Therefore, I is equal to III.
94. B. This is an arithmetic sequence in which each number is 6 less than the previous number in the sequence. Subtracting 6 from 92 gives 86 as the correct answer.
95. A. Statement I can be solved as: $1.09 \times 10^{2}=109$; Statement II can be solved as: $109 \times 10^{1}=1090$; Statement II can be solved as: $0.0109 \times 10^{3}=10.9$.
96. B. Jonathan outscored Teddy in games 1,2 , and 5 . Jonathan and Teddy had the same number of points in one game, not two, and Teddy outscored Jonathan in game 4, so those answers are incorrect.
97. A. A foot (II) is 12 inches, so it is greater than the sum of 4 and 6 inches.
98. C. Distribute statement III to get $2 x+2 y$ and evaluate. When both $x$ and $y$ are positive, $2 x$ will always be greater than $x$. Therefore, $2 x+2 y$ is greater than $x+2 y$, which makes statement III greater than statement I. Similarly, $2 y$ will always be greater than $-y$. Therefore, $x+2 y$ is greater than $x-y$, which makes statement I greater than statement II.
99. B. The slope described in I is -3 , the slope described in II is 2 , and the slope described in III is 3. Therefore, $I$ is less than III.
100. C. This is an arithmetic sequence in which each number is 9 less than the previous number in the sequence. Subtracting 9 from 60 gives 51 as the correct answer.
101. A. When comparing fractions, one approach is to find a common denominator and convert into equivalent fractions. When the fractions all have the same numerator, however, there is a shortcut: the fraction with the smallest denominator will be the largest fraction. Therefore, $\frac{1}{5}>\frac{1}{6}>\frac{1}{8}$.
102. D. $\angle B$ equals 60 degrees, as you can subtract 30 from 90 to determine its measure. Similarly, you can subtract 80 and 40 from 180 to determine $\angle C$, which is also 60 degrees.
103. B. This is an alternating sequence of adding 9 and diving by 3 . The last step was to add 9 to 6 to get 15 . Dividing 15 by 3 gives the correct answer of 5 .
104. C. Simplify the problem: the sum of 15,12 , and 8 is 35 . Then determine what subtracts from 56 to leave 35 , and the answer is 21 .
105. A. (I) has 8 blocks, (II) has 9 blocks, and (III) has 8 blocks. Therefore, $\mathrm{I}=\mathrm{III}<\mathrm{II}$.
106. B. Each number is the preceding number multiplied by $\frac{1}{4}$. Therefore, the following number is $\frac{55}{32}$.
107. A. Angle $a$ in triangle I must be less than 90 degrees since it is the acute angle of a right triangle. Angle $b$ in triangle II is an obtuse angle, so it must be greater than 90 degrees. The sum of the three angles of a triangle is always 180 degrees. Therefore, III is greater than II, and II is greater than I.
108. C. Simplify the problem: the sum of 20 and 30 is 50 , and twice that is 100 . Then determine what adds to 86 to get 100 . To do so, subtract 86 from 100, which gives a final answer of 14.
109. B. Simplify the problem: the product of 12 and 4 is 48 , and 4 more than 48 is 52 . Then determine what subtracts from 77 to leave 52 , and the answer is 25 .
110. A. (I) shows values of 3,6 , and 4 for a total value of 13 . (II) shows values of $5,2,3$, and 4 , for a total value of 14 . (III) shows values of $5,4,1$, and 6 , for a total value of 16 . Sixteen is greater than 14 , which is greater than 13.
111. C. This is an alternating sequence of adding 2 and multiplying by -2 . The last step was to multiply -2 times -8 to get 16 . Adding 2 to 16 gives the correct answer of 18.
112. B. Each number is the preceding number times $\frac{1}{2}$. Therefore, the missing number is 42 .

## Reading Comprehension

113. A. The purpose of the passage is to provide an overview about what hurricanes are and why they happen, making this a fitting title. Though Hurricane Katrina is mentioned in the final paragraph, it's just a supporting detail and not the main idea. The other two options have no relevance in the text.
114. A. The passage aims to give a general overview of hurricanes by describing what they are, why they happen, and how they're named. Though option A does not state the word "hurricanes," a hurricane is a specifically destructive natrual phenomenon, and the other options are either too specific or too broad to cover the central topic of the passage..
115. C. This is stated in the third paragraph of the passage, when the author is describing the conditions hurricanes need in order to form. The other options all have direct evidence in the text contradicting them-hurricanes occur over warm water, are tracked by scientists, and have the potential to hit land, eliminating A, B, and D respectively.
116. A. This is stated at the end of the second paragraph of the passage. Though the reader can tell the answer by textual evidence, they can also eliminate B, C, and D due to their underplaying of the danger hurricanes can pose to those who live in coastal environments. Throughout the passage, the author repeatedly emphasizes the danger of hurricanes-if hurricane winds were slow, the least dangerous part of the storm, or quick to stop, then hurricanes would be significantly less dangerous, undercutting the author's point.
117. B. The author gives an example of a list of tropical storms names in the final paragraph of the passage, also explaining why they're named in the manner they are. The other options have no textual evidence and similarly directly contradict the stated reasoning behind the naming conventions for storms.
118. D. Since the dangers of hurricanes are discussed at length, readers can infer that people who live in those areas may need to take extra precautions and be aware of the risks. Similarly, by describing the potential responses a population might have to a hurricane (sheltering in place or evacuating their homes), the author suggests that being aware of the danger the storms can pose leads one to better safety if a hurricane hits.
119. C. Because of the scientific content and informative tone of the passage, it would likely be found in a science magazine. The content and tone of the other options do not matchwhile newspapers are informative, they lack the scientific focus of the passage.
120. C. Answers B and D contain false information, so they can be eliminated as incorrect answers pretty quickly. Readers may consider A, but there's nothing in the passage that blames the victims of hurricanes for living near the coast or suggests that coastal populations should move inland, meaning that A is incorrect. C makes the most sense and conveys the author's purpose in informing the reader about hurricanes.
121. B. The word "catastrophic" is used to describe a type of event that has major negative effects on a community for years after the fact; based on this, we can discern that "catastrophic" means "disastrous." Though the word "tropical" can also be used to describe the type of storm, in the context of the sentence it does not make sense.
122. B. The paragraph suggests that hurricanes can cause extensive damage to coastal areas, saying that their strong winds "have the power to knock down trees, powerlines, and buildings..." This suggests that the damage they cause is extensive or "immense."
123. D. The passage gives a general description of the Philippine tarsier, including what it looks like, some of its unique traits, what it eats, and why it is in danger.
124. C. While the other titles are somewhat related to the topics discussed in the passage, C is the title that gives the best summary of what the passage is about, which is a specific tiny type of primate. The other options are too broad to convey the focus of the passage on the Philippine tarsier.
125. A. Near the beginning of the second paragraph, the author states that Philippine tarsiers are nocturnal, sleeping during the day and living their lives at night. $B$ and $C$ have no textual evidence and $D$ directly contradicts information from the passage.
126. D. According to the first paragraph, the tarsier is named after their large tarsal bones in their ankles, which allow them to jump far distances. Though the Philipine Tarsier has large eyes, their name does not come from this fact.
127. C. In the third paragraph, the author states that the tarsiers are decreasing in population in the wild. The other options either do not have evidence in the text or directly contradict supporting details from the passage.
128. B. Based on the passage's focus on the features of a specific animal, it would make most sense in a nature journal. It would not make sense for this passage to be in a diary, a sports magazine, or school newsletter, which each focus on topics other than animal life and wellness.
129. B. The third paragraph discusses how Philippine tarsier populations are struggling largely because of humans destroying their habitat, hunting them, and kidnapping them. The reader can infer that this means that the author believes that humans have had a negative impact on tarsiers and their environment. The other options have no evidence in the text.
130. A. This can be inferred from the information in the second paragraph that talks about their advanced way of communicating distinct emotions through sound. The other options do not make sense in the context of the passage; the author provides no reference to the amount of time Tarsiers sleep, the pickiness of their diet, or their childcare habits.
131. D. The passage states that the Philippine tarsier is a small primate that weighs less than half a pound-by this, the reader can infer that "diminutive" means tiny. The reader can also pick up by definition-since jumping three meters is impressive based on the tarsier's diminutive size, the reader can infer that "diminutive" means some variety of extremely small.
132. C. The passage states that the tarsiers have a unique way of conversing with each other, utilizing distinct noises for different emotions. The best synonym for "conversing" here is "communicating." Arguing and disagreeing are too aggressive, and though "converse" is similar to "reverse," "reversing" and "conversing" are not the same thing.
133. D. The passage aims to provide a general overview of the Sentinelese people who inhabit North Sentinel Island. In the introductory paragraph, the author refers to the Sentinelese people as isolated on their island in the Indian Ocean, meaning that this topic specifically refers to North Sentinal Island. The other options are too vague or factually incorrect to contain the general topic of the passage.
134. D. This is the most fitting title of the four options; most of the passage concerns the Sentinelese people's desires to be left alone, and how those desires have been expressed in the past and in our current understanding of them. The other options are too vague or contradictory to the text.
135. C. This is stated in the second paragraph, which discusses the customs of the Sentinelese people. We know based on the passage that the Sentinelese have their own language and hunt for their food, proving A and B wrong. We also know that, historically, the Senitnelese people have had negative interactions with outsiders-if $D$ was to be correct, we would've heard more about some positive interactions that may or may not have occurred and how that tradition has changed over time.
136. D. This is stated in the first paragraph when the author is introducing North Sentinel Island; by describing North Sentinel Island as one of the few places where outsiders are still completely banned, the author tells us that this is one of the few remaining places where people are truly isolated from the outside world.
137. A. This is stated in the first paragraph, when the author says that the Sentinelese people defend their island against intruders with violence if necessary, and that previous interactions between them and the outside world have ended poorly for both sides.
138. C. By saying that the "Sentinelese people have demonstrated their desire to be left alone" and "their wishes are finally being respected," the author indicates that they believe that the Sentinelese people's wishes should be respected. Combined with their repeated assertion that the Sentinelese are fine on their own, it can be inferred that the author is for them retaining their isolation.
139. B. The author describes that, according to the little data that we do have, the Sentinelese people live in lean-tos surrounding a central firepit. This, alongside the rest of the sparse data, suggests that anthropologists have an idea of some ways in which the Sentinelese people live-after all, how else would they have that information for it to appear in this passage?
140. A. In the first paragraph, it is stated that North Sentinel is one of the only islands where the inhabitants live in isolation and that previous interactions with outsiders have ended poorly-form this, the reader can determine that the Sentinelese people want to protect their island from outsiders. The other options make no sense given the information presented in the passage.
141. C. In the first paragraph, the author describes North Sentinel Island as one of the only places where the people live in isolation. This suggests that when the author describes them as "secluded," that means they are isolated. The other options, which suggest a sense of broadness to their community, make no sense in the context of the passage.
142. C. In the third paragraph, the author states the Sentinelese people's aversion to outsiders makes contact difficult; through the context of the passage and surrounding sentences, the reader can infer that "aversion" means "dislike;" because of the Sentinelese people's dislike of outsiders, contact is difficult.
143. D. While all of these are mentioned in the story, it is important to distinguish minor details from the main idea. The main idea, which is the story's main point, will be the correct answer. As the Lara's excitement at opening her first business, D is the best answer choice. $A$ is too broad, $B$ is inaccurate because her business is not just any summer job, and $C$ is incorrect because the story does not get into the challenges of running a business.
144. C. The story tells us that caring for Mrs. Grayson's mini-pinscher and the Bronsons' lab was previous experience that Lara had caring for other people's pets. A is not correct as we do not know if they are Pet Heaven customers. The passage does not tell the reader whether or not Mrs. Grayson and the Bronsons still utilize Lara's services, meaning that both A and D are incorrect. B also has no evidence in the story.
145. B. In context, the story contrasts Lara's working for someone else to being an entrepreneur; this suggests that to be an entrepreneur is nearly to be the opposite of someone else's employee; this suggests that she is a business person. Though Lara does specialize in animals as a veterinarian does, in context that is not what entrepreneur means. C and D also do not make sense in the context of the passage.
146. A. Based on the author's enthusiastic tone, the reader can infer that they believe that it is an impressive and unique thing for a young person to open up their own business. Though the author describes some challenges Lara faces opening her business, the passage generally is incredibly positive concerning the desire and benefits of doing so.
147. C. As Lara did not want to be a "boring" waitress, cashier or counselor, it can be inferred that she believes these are not interesting jobs, at least for her. There is no textual evidence for A, B or D. Additionally, though summer jobs might be hard to find, the passage does not mention or suggest that difficulty anywhere, meaning $A$ is incorrect.
148. A. The story tells us that Lara had to turn clients away after she posted flyers because there was so much interest, meaning that answer choice A is correct. B and C contradict the story details. There is no textual evidence to support $D$.
149. D. Lara opened her own business, something described as atypical for students her age, meaning that she made a creative decision which involved a lot of hard work. A contradicts Lara's personality as she appears in the story, and there is no evidence to suggest Lara is timid or selvish, meaning B and C are also incorrect.
150. A. The flyers attracted a lot of attention from customers, so it must have been appealing to them. Though engaging can be used to describe getting into a fight or getting married, neither case makes any sense here. There is also no evidence to suggest that the flyers were particularly expensive.
151. C. Because Lara is able to create a bright and engaging flyer that attracts customers, the reader can infer that she is good at graphic design. The other options have no evidence in the text.
152. B. The story is about a girl's first business venture, so it's fitting that the title includes her name and the name of her business. There is no mention of Lara rescuing animals, and she is happy with her summer work, so A and C contradict the passage. D is inappropriate because the narrative is not a guide on how to start a business.

## Vocabulary

153. D. Preserve means to "retain," "keep," or "uphold."
154. A. Pleasant means "likable," "nice," or "enjoyable."
155. C. Torrential means a very heavy or relentless amount of rain.
156. A. Creative means "imaginative," "inventive," or "artistic."
157. A. Exuberant means "cheerful," "spirited," or "exciting."
158. D. To be unwelcome is to be uninvited or unwanted.
159. C. Grievous means "appalling," "dreadful," or "grave."
160. C. Expert means "experienced," "trained," or "skilled."
161. C. A hypothesis is an explanation or idea.
162. C. A situation that is fraught is filled with anxiety and tension.
163. A. Tension means "pressure," "stress," or "anxiety."
164. C. If something is approximate, it is an imprecise, rough guess.
165. C. A temperate climate is one that is mild and pleasant.
166. D. Stealthy means "sneaky," "catlike," or "surreptitious."
167. A. Shameful means "humiliating," "heinous," or "disgraceful."
168. B. If something is excruciating, it is very painful.
169. C. To disclose means to reveal, divulge, or share.
170. D. If something is inevitable, it is unavoidable.
171. D. To address a crowd of people means to speak to them.
172. A. Dismiss means "ignore," "reject," or "disregard."
173. D. If something is acceptable, it is adequate, sufficient, or suitable.
174. B. Perfect means "pristine," "impeccable," or "flawless."

## Mathematics

175. B. The sum of the exterior angles of any polygon, including a rectangle, is always $360^{\circ}$.
176. B. If the combined are of the circles is $50 \pi$ yards and both of the circles are congruent, then each circle has an area of $25 \pi$ yards. This means that the radius of each circle is 5 yards, so the length of AB would be twice that, or 10 yards.
177. A. The area of a triangle is given by $A=\frac{1}{2} b h$, where $A$ is the area, $b$ is the base, and $h$ is the height. In a right triangle, the two legs are the base and the height. Therefore, the area of this triangle is $\frac{1}{2}(7)(24)=84$.
178. B. If the circumference is $16 \pi$ feet, then the radius must be 8 feet. If the radius is 8 feet, then the area must be $64 \pi \mathrm{sq} . \mathrm{ft}$.
179. B. Since $a, b$, and $c$ are prime numbers, we can simply multiply the three together to find the LCM.
180. D. When you multiply monomials, you add the exponents of the same base. You must also remember that if a variable does not have a written exponent, then its exponent is 1 . Therefore $a^{2} \times a \times a^{2}=a^{5}$, and $b \times b \times b^{3}=b^{5}$.
181. C. Begin by multiplying the first factors: $2 \times 9=18$. Then add the exponents for the factors where 10 is the base: $10^{-2} \times 10^{-3}=10^{-5}$. That gives an answer of $18 \times 10^{-5}$, but it is not in proper form. To get the final answer, move the decimal in the first term (from 18 to 1.8) and then add 1 to the exponent (because the decimal was moved one place to the left). This results in a final answer of $1.8 \times 10^{-4}$.
182. D. Find the side length by taking the cube root of the volume: $\sqrt[3]{216}=6$. Then, use $A=6 a^{2}$ to solve for the surface area, where $a$ is the side length of the cube: $A=6 a^{2}=6 \times 6^{2}=216$ in ${ }^{2}$.
183. A. When you divide monomials, you subtract the exponents of the same base. $m^{7} n^{3}$ is incorrect because it adds the exponents for $m \cdot m^{7} n^{11}$ is incorrect as it adds the exponents for both bases.
184. D. All the sides of a square have the same length, and the area of a square is given by $A=l w$. If the length and width are the same, we can write the equation $144=x^{2}$ which will give us that the side length of the square is 12 in . Perimeter is the sum of all the sides. So $12 \times 4=$ 48.
185. B. Integers are positive and negative whole numbers including zero. The even numbers are the ones that are divisible by 2 . Since the question uses the word "inclusive," the numbers 1 and 20 are included in the list of numbers. This leaves $2,4,6,8,10,12,14,16,18$, and 20 as the numbers that are divisible by 2 , for a total of 10 numbers.
186. C. Find the prime factors of each number: $12=2 \times 2 \times 3$ and $18=2 \times 3 \times 3$. Take the common prime factors and multiply them to find the GCF: $2 \times 3$.
187. C. Find the prime factors for each number. Five is prime. Nine factors to $3 \times 3=3^{2}$. Fifteen factors to $3 \times 5$. Take the highest frequency of each prime number and multiply: the LCM is $3^{2} \times 5=45$.
188. A. Find the length of the third side from subtracting the two known sides from the perimeter: $24-8-10=6$. Then, find the area of the triangle by multiplying the base times the height and diving by two: $\frac{6 \times 8}{2}=\frac{48}{2}=24 \mathrm{~cm}^{2}$.
189. A. The 8 should go in the thousandths place, which is the third digit after the decimal point. B is incorrect, as the last number is in the hundredths place, making it eighteen hundredths, not eighteen thousandths. C is incorrect, as that is eighteen hundred. D is incorrect, as that is eighteen thousand, not eighteen thousandths.
190. B. Since a cube is made of 6 faces, divide the surface area by 6 to find the area of one face: $96 \div 6=16$. Then, take the square root to solve for one side length: $\sqrt{16}=4$.
191. B. To convert a fraction into a decimal, divide the numerator by the denominator. If you get a repeating decimal, as you do here, you put the bar over whatever numbers repeat. In this case, that is the number 3 . Because $\frac{1}{12}$ is a repeating decimal, A and C are incorrect answers. D is incorrect because that is equal to $\frac{5}{6}$, not $\frac{1}{12}$.
192. B. Evaluate each fraction's relationship to $\frac{1}{2}$ to find out which is the smallest fraction. All of the given fractions are larger than $\frac{1}{2}$ except $\frac{5}{10}$, which is equal to $\frac{1}{2}$ making it the smallest fraction.
193. B. Factor 27 completely to prime numbers: $27=3 \times 3 \times 3=3^{3}$.
194. C. Reduce each fraction and compare: $\frac{18}{24}=\frac{21}{28}=\frac{30}{40}=\frac{3}{4}$. The fraction $\frac{24}{36}$ reduces to $\frac{2}{3}$, which is different from the rest.
195. C. First, we subtract 9 from both sides, which gives $\frac{5}{6} x>-2$. We then multiply by the reciprocal of the coefficient, resulting in $x>-\frac{12}{5}$.
196. D. By multiplying our original equation by 7 , we obtain: $7 x>-35$.
197. C. Two lines that are perpendicular have slopes that are opposite reciprocals of each other. To determine the slope of the given line, convert into slope-intercept form $(y=m x+b)$ by subtracting $2 x$ from both sides and then dividing by 3 . That gives the equation $y=-\frac{2}{3} x+$ 2 , which has a slope of $-\frac{2}{3}$ (the coefficient of $x$ ). The opposite reciprocal of that is $\frac{3}{2}$.
198. A. Because the model will fit on a dinner table, it will be at most a few feet long. Eliminate micrometers because this is a microscopic unit of length. Eliminate kilometers and miles because these are units of distance, not length, and are far too large.
199. A. Begin by dividing the first elements: $4 \div 8=0.5$. Then subtract the exponents for the factors where 10 is the base: $10^{3} \div 10^{1}=10^{2}$. That gives an answer of $0.5 \times 10^{2}$, but it is not in proper form. To get the final answer, move the decimal in the first term (from 0.5 to 5.0 , or 5 ) and then subtract 1 from the exponent (because the decimal was moved one place to the right). This results in a final answer of $5 \times 10^{1}$.
200. B. Eliminate square feet because this is a measure of area, and eliminate cubic feet because this is a measure of volume. Eliminate millimeters because this unit of length is too small.
201. B. The internal angles of all triangles have a sum of $180^{\circ}$.
202. A. To determine the slope $(m)$, use $m=\frac{y_{1}-y_{2}}{x_{1}-x_{2}}$, where $y_{1}$ is $18, y_{2}$ is $10, x_{1}$ is 1 , and $x_{2}$ is 6 . Substituting in those values gives you $\frac{18-10}{1-6}$, which equals $-\frac{8}{5}$.

## Problem Solving

203. C. There are 16 cups in every gallon.
204. C. In age problems, it is often easier to have the younger person's age be equivalent to $x$. If Krystal's age is $x$, then her teacher's age is $3 x$. Since difference is subtraction, the algebra expression is $3 x-x=20$. Therefore, $x=10$. Since her teacher's age is $3 x$, she is 30 years old.
205. D. Set up a proportion: $\frac{1 \text { inch }}{250 \text { miles }}=\frac{10 \text { inches }}{x \text { miles }}$. To solve, cross-multiply, resulting in $x=2,500$.
206. B. You begin by adding to get an answer of 124.31 (do not forget to turn 13 into 13.0 and then line up the decimal places). To round to the nearest tens place, you look to its right, at the ones place. Since that is 4 or lower, you leave the tens place as it is. Everything to its right turns to zero, giving you 120.124 .3 is incorrect because it is rounded to the nearest tenths place, not the nearest tens place. 124.31 is incorrect because it is not rounded.
207. B. $\sqrt{\frac{9}{64}}=\frac{\sqrt{9}}{\sqrt{64}}=\frac{3}{8}$
208. B. Congruent segments are segments of the same length, which is true of only $m$ and $p$ in this diagram.
209. B. Find the total hours that she worked: $3+3+4+5=15$. Multiply this by the amount she earns per hour: $15 \times 15=225$.
210. D. We can solve the distance equation for speed to get: $S=\frac{D}{T}$. Rewriting our time in hours, we get: $S=\frac{10}{.25}=40$. Therefore, Franny must go 40 miles per hour to arrive on time
211. C. When you subtract a negative, it is like adding a positive, so $(-5)-(-2)$ is the same as $(-5)+2$. That equals -3 . Then $-3+3=0$. Many students will get -4 because they think that $(-5)-(-2)=-7$.
212. D. To add fractions, you first find a common denominator, which in this case is 8 . Then you convert to equivalent fractions: $\frac{3}{4}=\frac{6}{8}$. Then you add the fractions, so $\frac{6}{8}+\frac{3}{8}$. Because $\frac{9}{8}$ is an improper fraction, you have to convert it into a mixed number, and $\frac{9}{8}=1 \frac{1}{8} \cdot \frac{6}{12}$ is incorrect because you need to find a common denominator before adding. Both $\frac{9}{8}$ and $\frac{36}{32}$ are incorrect because they are improper fractions.
213. C. To determine a median, write the numbers in order and then determine which number(s) is in the middle. In this case, when the 11 numbers in the set are written in order, the number in the middle is 87 , so that is the median.
214. C. Subtract the 5 who have other ways of getting to work from the 80 total surveyed to find out how many workers have driven, taken the bus, or both: $80-5=75$. Then, add the number of workers who answered for each category: $58+30=88$. Subtract to find the number of workers who have done both: $88-75=13$.
215. A. In a Venn diagram, the intersection of the two circles represents what is true of both circles. The region that does not intersect with a second circle, which is true of where the " B " is, means that it represents only what is in that circle.
216. A. You begin by adding to get an answer of 8.74. To round to the nearest tenth, you look at the hundredths place. Since that is 4 or lower, you leave the tenths place as it is. Everything to its right turns to zero. 8.74 is incorrect because it is not rounded. 8.8 is rounded up, which is incorrect because the hundredths place is 4 or lower. Some students will incorrectly choose 13.6 because they multiplied instead of adding. A sum is an addition problem.
217. B. Find $100 \%$ of 20 and then add it to 20 to find the answer. The value of $100 \%$ of 20 is 20 , and adding that to 20 gives 40 .
218. B. Each pound has 16 ounces. Therefore, $2 \mathrm{lb} .2 \mathrm{oz} .=2 \times 16+2=34 \mathrm{oz}$.
219. A. Simple probability is "correct" possibilities over total possibilities. In this case, there are 23 girls who prefer basketball, so that is the number of "correct" possibilities. There are 89 students altogether, so that is the number of total possibilities. The probability is $\frac{23}{89}$.
220. A. Let $A$ represent the number of houses in Town $A$, and let $B$ represent the number of houses in Town B. Write the equation $A=(1.25) B$. Using the information in the problem, let $A=$ 70 and rewrite the equation as $70=1.25 B$. Solving for $B$, we get that the number of houses built in Town B in 2010 is 56.
221. D. Simplify the left side of the equation by multiplying: $-\frac{2}{5} \times 6=-\frac{2}{5} \times \frac{6}{1}=-\frac{12}{5}$. Now divide both sides of the equation by $-\frac{1}{4}$ to get $q$ by itself. This gives $\frac{48}{5}$ which converts to the mixed number $9 \frac{3}{5}$.
222. D. To make a decimal into a percent, move the decimal point two places to the right. This gives $130 \%$.
223. C. Soccer has the greatest number of watchers among Latin American audiences; the grey bar reflecting Latin America is tallest for soccer.
224. A. We calculate distance: $D=1.5 \times 15=22.5$ miles.
225. C. To answer this problem, you can do the addition problem in the numerator: $1.2+3+$ $0.7+2.3=7.2$. Then you divide that sum by 9 , and $7.2 \div 9=0.8$. A common mistake would be for a student to confuse 3 with 0.3 . Then the sum would be $1.2+0.3+0.7+$ $2.3=4.5$, which would give an incorrect answer of 0.5 .
226. B. To find the difference between the average costs of Ford and Toyota cars, subtract the average cost of a Toyota from the average cost of a Ford: $\$ 50,000-\$ 40,000=\$ 10,000$.
227. D. $\sqrt{2} \times \sqrt{4} \times \sqrt{8}=\sqrt{2 \times 4 \times 8}=\sqrt{64}=8$.
228. A. One way to solve this problem is to create an algebraic expression for the amount of money Martin has. You can make $x$ be the number of dimes, so $x+1$ is the number of nickels. As a dime is worth 10 cents, its part of the expression is $10 x$. A nickel is worth 5 cents, so its part of the expression is $5(x+1)$, or $5 x+5$. The entire expression then is $10 x+(5 x+5)=50$. Solving for $x$, you get $x=3$. Since $x$ is the number of dimes, that is your answer.
229. C. Simple probability is "correct" possibilities over total possibilities. In this case, there are 14 players for soccer, so that is the number of "correct" possibilities. There are 28 players altogether, so that is the number of total possibilities. That gives a ratio of $\frac{14}{28}$, or $\frac{1}{2}$.
230. D. Solving $\frac{1}{2}-\frac{7}{8}$, gives $-\frac{3}{8}$. Once you have $-\frac{3}{8}=-\frac{1}{8} x$, divide both sides by $-\frac{1}{8}$ to get $x$ by itself. To divide by a fraction, you multiply by its reciprocal, so $-\frac{3}{8} \div-\frac{1}{8}$ is the same as $-\frac{3}{8} \times-\frac{8}{1}$. This gives $\frac{24}{8}$, or 3 .
231. B. When an exponent is raised to another exponent, multiply the exponents, so $\left(2^{x}\right)^{2}$ is the same as $2^{2 x}$. Since $2^{4}=16$, rewrite the equation to be $2^{2 x}=2^{4}$. As the bases are the same, set the exponents equal to each other: $2 x=4$, or $x=2$.
232. A. When you add two negative numbers, you add the numbers and keep the negative sign. Some students will mistakenly subtract the numbers to get either $-1,688$ or 1,688 .
233. C. To get a mean of 2 runs in 5 games, multiply 2 and 5 to get the total Frankie needs, which is 10 . Then add what he already has: $3+2+2+0=7$ runs. Subtracting 10 by 7 shows what he needs in his next game, which is 3 runs.
234. B. When there are two similar triangles, create a proportion to find the length of a missing side. In this case, that is $\frac{x}{16}=\frac{10}{18}$. Cross-multiply to get $18 x=160$. Divide each side by 18 to get $x$ by itself, giving you a final answer of $8 . \overline{8}$.
235. B. A rational number is a number that can be expressed as a quotient of two integers (as long as the divisor is not 0 ). Neither $\sqrt{61}$ nor $\sqrt{80}$ are equivalent to a quotient of integers, so those are irrational numbers, and $\pi$ is also irrational. Because $\sqrt{49}$ is equivalent to 7 , however, it is a rational number.
236. C. $5^{x}$ means that 5 will be multiplied by itself a certain number of times to produce 625 . Since $5^{4}=625, x=4$.
237. C. If Darrelle received $20 \%$ off, this means that he paid $80 \%$ of the original price. Let $p$ represent the original price and set up the following equation: $0.8 p=20$. Solve this equation to find $p$ by doing $\frac{80}{100} p=20 \rightarrow p=20\left(\frac{100}{80}\right)$. Solving this equation, you will get that $p=25$. So, the original price of the jeans was $\$ 25$.
238. A. First, divide to find the cost of one hamburger: $12.90 \div 3=4.30$. Then, multiply this number by 2 to find the cost of the 2 hamburgers in the order: $4.30 \times 2=8.60$. Finally, subtract this amount from the total amount to find the cost of one order of fries: $10.00-$ $8.60=1.40$.

## Language Skills


239. A. The ending "-er" on the end of the comparison word means "more." Therefore, both are never used together. Here we have "more longer," so the word "more" should be removed. The sentence should read: Summer days are longer than winter days.
240. B. Answer choice (B) contains an error in capitalization. The "Brooklyn Bridge" is the proper noun name referring to a specific bridge, and so should be capitalized. The sentence should read: She walked all the way across the Brooklyn Bridge.
241. B. There should only be one negative word in the same sentence. There are two in this sentence: "never" and "no." The sentence should read: Maria never eats dairy.
242. B. A complete sentence must have a subject and a verb and contain a complete idea. The verb "made" is lacking a subject and therefore creates a sentence fragment. The sentence could read: I made everyone a delicious feast.
243. D. There is no error in punctuation, capitalization, or usage.
244. C. When a sentence contains a subject performing more than one action, each verb should be in the same form. The "-ing" form of the word "play" is incorrect. The sentence should read: They watched movies, listened to music, and played games.
245. C. Pronouns must agree in number with the noun that they are referencing. Here, the sentence has the singular person "Seth," which requires the singular pronoun "him." The sentence should read: Seth was grateful to have his dog returned to him.
246. A. A complete sentence must have a subject and a verb and contain a complete idea. While this sentence has a subject, it is missing a verb to make a complete thought. The sentence should read: The movie comes out today.
247. B. The ending "-est" on the end of the comparison word means "most." Therefore, both are never used together. Here we have "most highest," so the word "most" should be removed. The sentence should read: The mountain was the highest in the land.
248. C. Answer choice (C) contains an error in capitalization. The word "bridge" is a common noun, and should not be capitalized. It would be capitalized if referring to a specific bridge, such as "the London Bridge." The sentence should read: It was the longest bridge in the United States.
249. A. Abbreviations should have periods after each letter and not just the last one. The sentence should read: The U.S. is a very large country.
250. B. The contraction "shouldn't" is a combination of the two words "should" and "not." Contractions have apostrophes replacing the letters that have been dropped. The sentence should read: He really shouldn't have lied to his mom.
251. B. Answer choice (B) contains an error in capitalization. The "North Pole" refers to a specific place and is a proper noun that should be capitalized. The sentence should read: They endeavored to reach the North Pole.
252. B. A complete sentence must have a subject and a verb and contain a complete idea. This is a sentence fragment that is missing both a subject and a verb. The sentence could read: She was never able to cook a real meal.
253. B. Answer choice (B) contains an error in capitalization. Names of specific places (like the Eiffel Tower) are proper nouns and are capitalized in their entirety. The sentence should read: Fleur was so excited to see the Eiffel Tower.
254. A. Verbs must be in their proper form for a given tense, which can be determined by the context of the sentence. The phrase "he expressed disappointment" sets the action in the past tense, so the rest of the sentence should be set in the same tense. The sentence should read: He expressed disappointment upon finding out his brother lied.
255. B. The number of the subject and verb must match. The subject in this sentence is "mentor and close friend," which is singular, and the singular form of the verb is "requests." The sentence should read: My mentor and close friend requests that he be invited.
256. A. Commas are used to separate items in a list. There should be a comma before the "and," separating the last two items on this list. The sentence should read: It was me, Paul, and Laurie.
257. C. Julia's markers leaked all over his bag. Traditionally, the name Julia is female and requires the singular female pronoun "her." The sentence should read: Julia's markers leaked all over her bag.
258. B. A colon should be used to introduce a list. The sentence should read: Jordan always said he only needed two things to be happy: friends and family.
259. A. Verbs must be in their proper form for a given tense, which can be determined by the context of the sentence. The phrase "after the scandal broke out" sets the action of the sentence in the past. Therefore, the verb should be in the past tense form. The sentence should read: The hospital had to fire the doctor after the scandal broke out.
260. C. The number of the subject and verb must match. The subject in this sentence is a compound subject of "Katherine and her mother," which is plural, and the plural form of the verb is "shop." The sentence should read: Katherine and her mother shop early in the morning.
261. C. Answer choice (C) contains an error in capitalization. Names of specific places (like Mount Rushmore) are proper nouns and are capitalized in their entirety. The sentence should read: The only sight Mark hadn't seen on the trip was Mount Rushmore.
262. A. When a sentence contains a subject performing more than one action, each verb should be in the same form. The "-ing" form of the word "decorate" is incorrect. The sentence should read: He baked, iced, and decorated the cake.
263. B. Answer choice (B) contains an error in capitalization. The word "dad" should not be capitalized because here it is being used as a common noun, not a proper noun. The sentence should read: Ali asked his dad for a bigger allowance.
264. C. Verbs must be in their proper form for a given tense, which can be determined by the context of the sentence. The sentence indicates that "Lucy forgot. . . yesterday" which places the sentence in the past tense. The past tense of the verb is "needed." The sentence should read: Lucy forgot that she needed to buy groceries yesterday.
265. B. The ending "-er" on the end of the comparison word means "more." Therefore, both are never used together. Here we have "more happier," so the word "more" should be removed. The sentence should read:
266. D. There are no mistakes in punctuation, capitalization, or usage.
267. C. Answer choice (C) contains an error in punctuation. To show that the debt belongs to her, the third person singular possessive pronoun "hers" should be used in the sentence. This is one of the possessive pronouns showing possession that does not have an apostrophe. The sentence should read: The debt was hers alone.
268. A. The word "intelligent" is being used as an adjective describing a person, and should not have the adverb ending "-ly." The sentence should read: She is both kind and intelligent.
269. B. The word "mountains" is being used as a common noun and should not be capitalized. The sentence should read: The mountains are so beautiful in the winter.
270. A. Answer choice (A) contains an error in capitalization. The names of all planets are proper nouns and should be capitalized. The sentence should read: The farthest planet from Earth is Neptune.
271. C. A comma comes before a conjunction, not after. Here, the comma should come before the word "but." The sentence should read: She was tired, but she kept going.
272. A. Answer choice (A) contains an error in capitalization. The word "mystery" is an adjective describing the common noun "novels" and should not be capitalized. The sentence should read: Amanda's favorite genre of books is mystery novels.
273. C. There should only be one negative word in the same sentence. There are two in this sentence: "wasn't" and "no." The sentence should read: There wasn't any gas in the tank.
274. B. Answer choice (B) contains an error in punctuation. This is the favorite restaurant of the actress, so the word should be singular possessive with an apostrophe. The sentence should read: Her favorite actress's restaurant was incredibly expensive.
275. D. There is no error in punctuation, capitalization, or usage.
276. B. The ending "-est" on the end of the comparison word means "most." Therefore, both are never used together. Here we have "most fastest," so the word "most" should be removed. The sentence should read: She was the fastest runner on the team.
277. D. There are no mistakes in punctuation, capitalization, or usage.
278. D. There is no error in punctuation, capitalization, or usage.
279. C. The word "exercise" is misspelled.

280. B. The word "curiosity" is misspelled.
281. D. There is no spelling error.
282. B. The word "existence" is misspelled.
283. C. The word "definitely" is misspelled.
284. A. The word "friend" is misspelled.
285. B. The word "forest" is misspelled.
286. C. The word "disappointed" is misspelled.
287. B. The word "foreign" is misspelled.
288. B. The word "lightning" is misspelled.
289. A. This version of the sentences expresses the idea most clearly.
290. B. This is the best word choice to join the thoughts together: "I usually ride my bike to my friend's house; however, my bike is broken." However suggests a contrast between the two clauses of the sentence.
291. B. This is the best word choice to join the thoughts together: "Cats are playful animals; for example, they love to chase feather toys." For example is best because the second clause provides supporting evidence of the first clause.
292. C. This sentence is not directly related to the topic, "Please Shovel the Snow," and does not provide support for it.
293. D. This version of the sentences expresses the idea most clearly.
294. B. This sentence best supports the topic "Bird Migration." The other choices, while related to birds, are not about bird migration.
295. B. This sentence best supports the topic "Home Remodeling." The other choices, while related to homes, are not about home remodeling.
296. B. This is the best word choice to complete this sentence: "Tanya, who was nervous for her ballet tryouts, anxiously paced the room."
297. A. This version of the sentences expresses the idea most clearly.
298. B. This is the best word choice to complete this sentence: "The blizzard snowed us in; sadly, we were unable to make it to the show."


## Practice Test 2

## Verbal Skills

1. B. Complex means something difficult to understand, or "complicated."
2. C. Classical, jazz, and pop are types of music. "Music" is the general category, so it does not belong.
3. B. "Tedious" means too slow or dull. This is the opposite of the word "expedited," which means made to happen more quickly.
4. C. We are told that roller coasters are too scary for young children, but only most (not all) amusement parks have roller coasters. Therefore, some amusement parks (those with roller coasters), but not all, will be too scary for young children, The third statement is uncertain.
5. C. This is a relationship of ingredient to product. Mashed strawberries make jam, and mashed tomatoes make ketchup.
6. D. Duke, prince, and queen are all specific members of a royal family. Royalty is the general category, so it does not belong with the other words.
7. C. Agitate is to work someone up, to make them troubled or nervous, or to "bother" them.
8. A. "Dispute" means to argue against. This is the opposite of the word "affirm," which means to state as a fact.
9. B. Skiing is both expensive and fun, but this does not make all expensive sports fun. The third statement is false.
10. B. This is a relationship of small version to large version. A town is a smaller version of a city, and a creek is a smaller version of a river.
11. C. If something is irrelevant, it is not related to the issue, or is "unimportant."
12. C. A tie, cuff, and collar are all single clothing items that are worn wrapped around a part of the body. A suit is a full garment worn on the whole body, so "suit" does not fit.
13. B. If something is infinite, it never ends, or is "limitless."
14. B. The relationship is that of animal to its name as a baby. A baby dog is called a puppy, and a baby cat is called a kitten.
15. D. Contain, grip, and hold all mean to restrain something. "Yield" means to give way to pressure, and is the word that does not fit.
16. B. To quarrel is to bicker or "fight."
17. B. "Complicate" means to make more difficult. This is the opposite of the word "simplify," which means to make easier.
18. C. According to the statements, writers can be clever, and therefore good at making jokes. But this is just some writers. Others might not be clever, and we do not know what this means for their ability to make jokes. So, the third statement is uncertain.
19. D. Bowl, cup, and plate are all specific types of dishes used to drink or eat. A table is what you place those items on. Therefore, "table" does not belong.
20. A. Patient is the human quality of tolerance, or being kind.
21. A. This is a relationship of location to things that place holds. A library holds books, and an aquarium holds fish.
22. D. "Complex" means difficult. This is the opposite of the word "simple," which means easy.
23. C. We know that the gray mouse and brown mouse both have tails that are longer than the white mouse's tail. However, we do not know the relationship between the tail lengths of the gray and brown mouse. Therefore, the third statement is uncertain.
24. C. This is a relationship of solution to problem. An error is corrected, and an illness is cured.
25. B. Prevention is the act of keeping something bad from happening, or "deterrence."
26. A. Original, special, and unique all describe something that is unlike anything else. "Average" describes something that is like everything else, or normal, so it does not belong.
27. D. "Frigid" means very cold. This is the opposite of the word "warm."
28. C. Caroline's favorite color is red, which is the color of rubies. Therefore, she could love rubies, but not necessarily so. The third statement is uncertain.
29. C. This is a relationship of opposites. Extinguish is the opposite of ignite, and disgrace is the opposite of honor.
30. B. A magician, witch, and wizard are all individuals who can cast a spell. Spell is what they cast, so it does not fit with the others.
31. A. A scowl is an expression of displeasure, much like a frown.
32. C. "Conquer" means to win control over someone. This is the opposite of the word "liberate," which means to free someone.
33. D. Orderly means that things are arranged in order, or are "tidy."
34. C. Flowers, leaves, and roots are all parts of a plant. "Plants" is a more general category, so it does not belong.
35. B. There are two things that can be true for lawyers: they can be good at arguing, and they can make large salaries. This does not mean that a general person who is not a lawyer will make a large salary if they are good at arguing. Therefore, the third statement is false.
36. C. This is a relationship of synonyms. To inform is to explain, and to idle is to wait.
37. C. To be durable is to not wear out and to be "lasting."
38. D. Hail, rain, and snow are types of weather. "Weather" is the general category, so it does not belong.
39. B. If Bonnie is smarter than Katherine who is smarter than Elena, then Bonnie is the smartest girl out of the three. Therefore, Elena is not smarter than Bonnie. The third statement is false.
40. A. This is a relationship of an action to its more extreme version. To mumble is to speak quietly and to shout is to speak loudly. To stumble is to fall a little, and to collapse is to fall down entirely.
41. D. "Rehearsed" means practiced beforehand. This is the opposite of the word "spontaneous," which means to happen without planning.
42. B. There are categories of people in this problem: the ones who believe black cats are bad luck, and those who have black cats as pets. This does not mean that all pets would be considered bad luck. The third statement is false.
43. C. Dream, fantasy, and vision describe what someone wants or hopes will happen in the future. Strategy describes a more concrete plan with a series of steps to take to complete a goal. Therefore, "strategy" doesn't belong with the other words.
44. D. To reduce means to make smaller, or to "shrink."
45. D. This is a relationship of synonyms. Jog is the same as sprint, and disagree is the same as fight.
46. B. Ballet, hip hop, and salsa are all kinds of dances. Dance is the category itself, so it doesn't belong.
47. C. A spectacle is a visually impressive display, or an elaborate "extravaganza."
48. D. "Bequeath" means to give something away. This is the opposite of the word "steal," which means to take something that does not belong to you.
49. B. Kitchen, bathroom, and living room are all rooms in a house. A house is the centerpiece of all the other words, so it does not belong.
50. A. Allege means to affirm or "declare" that something is true.
51. A. All paella contains meat, so if Brenda does not eat meat, she will not eat paella. The third statement is true.
52. A. Hamburger, salad, and steak are items eaten at dinner. "Dinner is the category itself, so it does not belong.
53. D. An achievement is a successful accomplishment, or a "triumph."
54. D. This is a relationship of synonyms. Instantaneous means immediate, and distraught means upset.
55. C. To "create" means to make something. This is the opposite of the word "destroy," which means to break something down.
56. A. Penguins are a type of bird that cannot fly. This means that there are some birds that cannot fly. This means that the third statement is true.
57. A. Draw, paint, and sketch all describe making a picture on a two-dimensional surface. "Build" means to make a three-dimensional object, so it does not belong.
58. A. To bewilder is to confuse, or to "confound."
59. A. Running, skiing, and swimming are types of sports. While one could enter a competition for any of these sports, a competition is not a type of sport, so it does not belong.
60. C. Engine, headlights, and windshield are specific parts that are found in or on a car. The word vehicle means car, so it is the general category and does not belong.

## Quantitative Reasoning

61. D. Complete the operation in parentheses first. Statement I can be solved as: $2 \times-(4+7)=$ $2 \times-11=-22$; Statement II can be solved as: $(2 \times-4)+7=-8+7=-1$; Statement III can be solved as: $(2 \times-7)+4=-14+4=-10$.
62. D. (I) has 15 blocks, (II) has 15 blocks, and (III) has 19 blocks. Therefore, $\mathrm{I}=\mathrm{II}<\mathrm{III}$.
63. B. Each number is the preceding number multiplied by -1 . Therefore, the missing number is -1000 .
64. B. Statement I is: $(-1)^{2}=1$; statement II is: $-1 \times 2=-2$; statement III is: $-1-1=-2$. Therefore, II and III are equal.
65. A. Each number is the preceding number multiplied by -3 . Therefore, the following number is -24.3.
66. D. When a list of numbers is in order, the median is the number in the middle, so the median of $6,10,15,17$, and 28 is 15 . Then determine what subtracts from 60 to leave 15 , and the answer is 45 .
67. B. To determine the average of a group of numbers, take their sum and divide by how many numbers there are: $\frac{10+20+30+40}{4}=25$. Eight less than 25 is 17 .
68. D. In a triangle the angle opposite the largest side is the largest angle. Therefore, $C$, which is opposite the side of length 5, is the largest angle. Similarly, $A$ is the angle opposite the smallest side, so it is the smallest angle.
69. C. Complete the operation in parentheses first. Statement I can be solved as $2+(21)=23$; Statement II can be solved as (9) $\times 3=27$; Statement III can be solved as $3 \times(9)=27$.
70. D. The area of the rectangle is $40(8 \times 5)$, the perimeter of the square is $36(4 \times 9)$, and the perimeter of the equilateral triangle is also $36(12+12+12)$.
71. A. Figure I is a rectangle, so its area is $35(7 \times 5)$. Figure II is a triangle, so its area is 40 $\left(\frac{1}{2} \times 8 \times 10\right)$. Figure III is a square, so its area is $49(7 \times 7)$. Therefore, I is less than II, and II is less than III.
72. A. Each number is the preceding number multiplied by 10 . Therefore, the missing number is 110.
73. C. Complete the operation in parentheses first. Statement I can be solved as: $-5 \times(7)=-35$; Statement II can be solved as: $(-20)+3=-17$; Statement III can be solved as: $(-15)+$ $4=-11$.
74. B. The value of $D$ is 4 , and the value of $E$ is 2 , so their sum is 6 . That is less than the value of $B$, which is 7 .
75. D. Simplify the problem: $25 \%$ of 40 is 10 , and $\frac{1}{2}$ of 14 is 7 . The product of 10 and 7 is 70 , and 7 more than that is 77 .
76. C. If a list of numbers is in order, the median is the number in the middle, so the median of 10 , 30 , and 80 is 30 . Two-thirds of 30 is $20: \frac{2}{3} \times 30=\frac{60}{3}=20$.
77. D. Statement I is: $1^{5}=1$; statement II is: $5 \times 1=5$; statement III is: $5+1=6$. Therefore, $I$ is less than II, and II is less than III.
78. C. (I) has 8 blocks, (II) has 9 blocks, and (III) has 10 blocks. Therefore, I < II < III.
79. B. Statement I is: $2 \times 3=6$; statement II is: $3^{2}=9$; statement III is: $2^{3}=8$. Therefore, $I$ is less than III, and III is less than II.
80. C. A regular polygon is one where all the sides are the same length. A pentagon has 5 sides, so its perimeter is $30(5 \times 6)$. A hexagon has 6 sides, so its perimeter is also $30(6 \times 5)$. An octagon has 8 sides, so its perimeter is $32(8 \times 4)$.
81. B. A nickel (II) is worth five cents, and a penny (III) is worth one cent. The sum of those is less than a dime (I), which is ten cents.
82. A. This is an alternating sequence of subtracting 3 then subtracting 7. The last step was to subtract 3 from -7 to get -10 . Subtracting 7 from -10 gives the correct answer of -17 .
83. A. Statement I is: $\frac{12}{4}=3$; statement II is: $3 \times 4=12$; statement III is: $5-4+3=4$. Therefore, III is greater than I.
84. B. In this arithmetic sequence, the constant that is being subtracted is $3: 22$ minus 3 is 19,19 minus 3 is 16 . If that continued, then 16 minus 3 would be 13 , and 13 minus 3 would be 10 . Therefore, the number should be 13 instead of 12 .
85. D. The slope described in I is $-\frac{2}{3}$, the slope described in II is 2 , and the slope described in III is 3. Therefore, I < II $<$ III.
86. A. $200 \%$ of $4=8, \frac{1}{3}$ of $24=8$, and $50 \%$ of $18=9$. Therefore, $\mathrm{I}=\mathrm{II}<\mathrm{III}$ is the correct answer, as I is equal to II and both are less than III.
87. C. A is equal to half of the circle. Therefore, the sum of the other three variables must equal the other half of the circle. Therefore, the sum of $\mathrm{B}, \mathrm{C}$, and D is equal to A .
88. C. $\frac{3}{4}$ of $36=27,300 \%$ of $9=27$, and $10 \%$ of $270=27$. Therefore, I, II, and III are equal to each other.
89. C. Simplify the problem: difference means subtraction, and $100-65=35$. Then 10 less than 35 is 25 .
90. D. Simplify the problem: $\frac{2}{3}$ of 12 is 8 . Then determine what number divided by 8 equals 8 , and the answer is 64.
91. A. When two lines form vertical angles (the angles across from each other), those angles are congruent. In this figure, $\angle C$ and $\angle B$ are vertical angles, as are $\angle A$ and $\angle D$.
92. B. When a list of numbers is in order, the median is the number in the middle, so the median of $15,25,40,50$, and 60 is 40 . Then determine what multiplies by 5 to give 40 , and the answer is 8 .
93. A. Two yards (III) is equal to six feet. Because ten inches is less than a foot, the sum of I and II is less than six feet (III).
94. B. (I) has 6 marks, (II) has 7 marks, and (III) has 7 marks. Therefore, (II) and (III) are equal, and they are both greater than (I).
95. B. Each number is the preceding number multiplied by -7 . Therefore, the missing term is -7 .
96. D. Simplify the problem: the difference of 14 and 9 is 5 , and the sum of 12,20 , and 19 is 51 . Then determine what adds to 5 to equal 51 , and the answer is 46 .
97. C. A mile is 5,280 feet, so it is greater than 5,000 feet but less than 6,000 feet.
98. A. To determine the average of a group of numbers, find their sum and divide by how many numbers there are. In this case, that is $\frac{8+5+10+13}{4}=9$. Then determine what adds to 6 to equal 9 , and the answer is 3 .
99. C. The slope described in I is -4 , the slope described in II is 0 , and the slope described in III is 4. Therefore, III > II > I.
100. D. When comparing decimals, start with the greatest place values. In this problem, the numbers are equivalent until you reach the thousandths place. 5.14041 is the smallest because it has a 0 in the thousandths place while the other two numbers have a 1 . Next, 5.1414 is larger than 5.141 because the former has a 4 in the ten-thousandths place, while 5.141 has a value of 0 in the ten-thousandths place. Therefore, $5.1414>5.141>5.14041$.
101. D. Write each shaded region as a fraction of the circle. I is $\frac{1}{7}$, II is $\frac{1}{5}$, and III is $\frac{1}{6}$. Therefore, I is the least-shaded circle, while II is the most-shaded.
102. A. This is an alternating sequence of adding 11 and multiplying by 2 . The last step was multiplying 33 by 2 to get 66 . Adding 11 to 66 gives the correct answer of 77 .
103. C. This is an alternating sequence of adding 4 and then adding 5 . The last step was adding 4 to 2 to get 6 . Adding 5 to 6 reveals 11 as the correct answer.
104. B. Angles $h$ and $y$ are supplementary angles, so their sum is 180 . The three angles of a triangle add up to 180 , so the sum of $f, g$, and $h$ also equals 180 .
105. B. This is an arithmetic sequence in which each number is $\frac{1}{2}$ less than the previous number in the sequence. Subtracting $\frac{1}{2}$ from $2 \frac{1}{2}$ gives 2 as the correct answer.
106. B. An hour is sixty minutes, and $40+15=55$. Therefore, an hour is greater than the sum of 15 and 40 minutes.
107. A. This is an arithmetic sequence in which each number is $\frac{1}{4}$ greater than the previous number in the sequence. Adding $\frac{1}{4}$ to $1 \frac{1}{4}$ gives $1 \frac{1}{2}$ as the correct answer.
108. A. In this arithmetic sequence, the constant that is being added is $4: 15$ plus 4 is 19,27 plus 4 is 31 . The number 22 throws off the sequence, but if 4 is added to 19 , the result is 23 , and if 4 is added to 23 , the results is 27 . Therefore, 23 is the correct number in the sequence to replace 22.
109. B. To determine the average of a group of numbers, find their sum and divide by how many numbers there are. In this case, that is $\frac{26+20+14}{3}=20$. Then determine what you would subtract from 28 to leave you with 20 , and the answer is 8 .
110. C. The slope described in I is -2 , the slope described in II is -2 , and the slope described in III is $-\frac{1}{2}$. Therefore, $\mathrm{I}<\mathrm{III}$.
111. A. This is an alternating sequence of multiplying by -3 and then multiplying by 2 . Three was multiplied by 2 to get 6 , which will be multiplied by -3 to give the correct answer of -18 . This number is then multiplied by 2 to get -36 which completes the pattern.
112. C. The value of $A$ is 4 , and the value of $B$ is 7 . Their sum is 11 , which is greater than 10 , the value of $D$.

## Reading Comprehension

113. B. While all of these are mentioned in the story, it is important to distinguish minor details from the main idea. The main idea, which is the story's main point, will be the correct answer. Only B, which concerns the immense popularity of tulips in Holland in the 1500s, covers the main idea of the passage. $A$ is too broad and $C$ and $D$ are too specific.
114. D. Holland and all of Western Europe were intrigued by foreign and exotic goods, including tulips. Tulips were prized for their beauty in both Europe and the Ottoman Empire. Only D is incorrect, as they were not coveted for being disease ridden.
115. A. Both Clusius and the Sultan are examples of the public's interest in nature and exotic cultures. $B$ is incorrect because there is no argument being made about the quality of tulips. The Ottoman and Dutch cultures are not being contrasted, and the 2 men are not being cited as examples of experts in trending topics.
116. C. The passage tells us that the botanists had discovered a way to make the tulips grow faster and that this method was costly. This suggests that the botonists desired to make the process of tulip production easier and more efficient, even if ended up costing more. The other answer choices are not mentioned in the passage.
117. D. The word "exotic" is used in the passage to describe things that are unusual to the Dutch; because the flowers were unusual, people liked them. The other words do not capture the same sentiment and imply a negative connotation to the word exotic; if the word was negative, the reactions of the Dutch would've been far more tempered.
118. D. Though Clusius may have been a member of the upper class with an advanced degree, it cannot be assumed that all members of the upper class were university educated. Dutch business people certainly did have greater resources (money), leisure time, and desperately wanted to flaunt their social status, as suggested in the passage. The final sentence in the third paragraph suggests that though growing tulips comes with all these costs, the business people had the resources and desire to still cultivate them.
119. B. Flaunt is a physical, showy display. To describe is to show something, but it doesn't have the same flashy connotation as flaunt. Hide suggests the opposite of what the context suggests. Increase does not make sense in context.
120. C. The last paragraph suggests that many people were buying tulips not out of love or desire for a garden, but because they felt it would be profitable. Option A contradicts the passages, and $B$ and $D$ are not mentioned in the passage.
121. D. The university garden where Clusius planted the tulips is cited as being where the Dutch first became widely aware of tulips. Option A contradicts the passage, but B and C are not mentioned.
122. A. Since the passage explores the widespread interest and great lengths that people went to in order to acquire tulips, A most suitably conveys the main idea. B and C cite specific details of the passage, not main ideas, and $D$ is not mentioned in the passage.
123. C. Choose the title that reflects the main idea of the passage. The text is about the Leaning Tower of Pisa, not many famous bell towers, the Tower of London, or travel destinations in Italy.
124. C. The passage may mention other details, but the passage is about the history and construction of the Learning Tower of Pisa. The architect who designed it, the statistics about how many tourists visit per year, and directions on how to get there are not addressed in the passage and are not the main idea of the text.
125. B. At the end of the second paragraph, the passage states that the tower has "a functioning bell tower with seven bells." This makes choice B correct, and the other answer choices incorrect as they use the wrong number of bells.
126. C. The passage makes the point that the original construction of the tower took a long time, stating that "it took workers around two hundred years to finish building the tower." Construction began, not ended, in 1173 . The tower was not designed to lean, and it is not known if or when the tower will collapse.
127. A. The first paragraph states that the Leaning Tower of Pisa is located in Pisa, Italy. There is no mention of the designer, or what the word "pisa" means.
128. B. The author has a very positive tone about the tower, and about the efforts over the years that have been taken to keep the tower standing. Therefore, the author would agree that the tower's maintenance has been worth the effort. The author never alludes to a safety issue or that the tower should be destroyed, or that it is impossible to stabilize the tower. There is no mention of other old towers, or that they often lean. In fact, that seems to be a rare occurrence and why we are reading about this special tower.
129. C. The passage is most suited for a history book as it tells about a historical tower and the events in its past. A diary would contain personal information, a hospital brochure would inform about medical issues, and a sports magazine would be about sports.
130. D. It can be inferred from the passage that the tower was well-constructed or it would not have been able to remain standing despite the leaning and all the adjustments to it over the years. There is no evidence that only European tourists visit the tower, or that tourists have lost interest in the recent years. The author presents the tower and restoration efforts in a positive light, so we would not make the inference that the effort was wasted.
131. B. The passage states that the foundation was laid too thin to support the mammoth, or very large, tower. This means that mammoth most nearly means gigantic.
132. C. The passage states that the bells were temporarily removed to relieve, or lessen, the weight at the top of the tower.
133. B. While all of these are mentioned in the story, it is important to distinguish minor details from the main idea. The main idea, which is the story's main point, will be the correct answer. Because Claire's dread of the long trail hike is assuaged by her connection with Anne and a good first day, it is appropriate to say that the story is about her surprise of her actual experience not meeting with what she anticipated would happen. A is too broad. C and D are too specific.
134. D. Claire is dreading her upcoming trail hike and that is the cause of the feeling of the pit in her stomach. Her backpack, although heavy, is not the cause of her dread. There is not mention of her dinner and she has lost her excitement and now instead feels anxious.
135. C. Claire feels anxious about her upcoming hike, so anxious anticipation most clearly matches the idea expressed with dread. she is not excited or indifferent. She may be skeptical, but that idea is expressed with the use of doubt and would be redundant.
136. A. The story tells us that the other hikers "seemed to know one another and most seemed very enthusiastic about their upcoming journey." This would suggest they are confident and excited. There is no evidence for B or D. And though they may be more experienced hikers than Claire, the story does not specifically mention or suggest this.
137. B. Claire's fears are confirmed by the challenge of carrying the heavy weight, her exhaustion and nearly falling.
138. D. The combination of the heavy weight, her tiredness and the slippery rock on which she loses her footing cause Clarie to nearly fall.
139. B. The story tells us that both Claire and Anne have a "love of sushi and snowboarding," making them things that they both enjoy., though probably not the only things (C). There is no evidence for A or D.
140. D. The story tells us that, "Exhausted but feeling at peace under the stars, Claire slept better than she had in a long time." Therefore, her physical exertion and sleeping outdoors lead to her having a very restful sleep and feeling at peace. Hiking is not easy. Claire does make a friend, which leads her to have a more enjoyable time. And as an inexperienced hiker, Claire still managed to successfully face the hike's challenges.
141. A. Claire feels out of place amongst the other hikers, but she will not allow herself to appear a "wimp". Her doubts and fears do not make her adventurous. Her willingness to meet her commitment do not make her spoiled. There is no specific evidence to particularly suggest she is either intelligent or ambitious.
142. B. Claire's expectations about her hike are not met and she is left pleasantly surprised at the end of her first day. Her week does not seem to be going badly (A). Nature Tale is too broad. And there is not strong enough evidence to suggest that Claire and Anne have become best friends.
143. C. The author's purpose in the passage is to give an overview of silk and persuade the reader that is better than other fabrics. For this reason, C is the best title of these choices.
144. D. This passage is about silk, a unique type of fabric. Although silkworms are mentioned in the passage, they are not the focus. Additionally, sewing is never discussed in the passage. Therefore, the only logical response is D.
145. C. The last paragraph begins by stating that "silk farming began in China thousands of years ago." This makes choice $C$ the correct answer. The other answers are not supported by the information in the text.
146. A. This is stated in the third paragraph when the author is pointing out the benefits of wearing silk clothing. The passage states that silk is "great at absorbing heat in cold weather and moisture in warm weather." The other options conflict with or are not supported by information in the passage.
147. B. The second paragraph states that the fibers that make silk are from "cocoons woven by silkworms when they begin their transformations." This makes choice B correct. Silk moths produce all, not the majority, of the silk in the world, and only silk moths, not all insects, can make silk. This also makes choice D incorrect.
148. C. The author makes this point about all the positives of silk in many places throughout the text. The author does not make the point that silk is too expensive to consider purchasing, or that it is not good for clothing. The author states that silk is rather difficult to manufacture, making choice D incorrect as well.
149. A. The passage discusses the challenges to producing silk, and states that it is expensive to purchase and valuable. This means that it is hard to make but that it can be a profitable endeavour.
150. C. This can be inferred mainly from the third paragraph, which talks about how silk is the strongest of all natural fabrics. From this, the reader can infer that silk is stonger than cotton, another natural fabric.
151. B. In the first paragraph, silk is described as having luxurious, or elegant, softness.
152. C. Silk is said to have a number of characteristics that make it versitile, so here this means multipurpose.

## Vocabulary

153. C. If something is optimum, it is the ideal result.
154. C. Frequently means "often," "continually," or "regularly."
155. C. If someone is downtrodden, they are destitute or oppressed.
156. D.
157. A. If something is fortuitous, it is fortunate or advantageous.
158. C. Unpleasant means "disagreeable," "undesirable," or "horrible."
159. C. To compare means to study, analyze, or contrast.
160. A. Compete means to challenge, spar, or battle.
161. A. To verify something means to confirm or authenticate it.
162. B. Arduous means "exhausting," "burdensome," or "challenging."
163. C. Complicate means to convolute, obscure, or muddle.
164. D. To supply someone with food means to provide them with it.
165. B. Dreaded means "frightful," "ghastly," or "feared."
166. A. To be conflicted means to be ambivalent about something.
167. A. To be bold means to be adventurous or daring.
168. C. Compliant means "willing," "submissive," or "obedient."
169. C. If something is delayed, it is running behind or late.
170. D. Dastardly means someone who is fearful or spineless.
171. A. Diabolical means "cruel," "vicious," or "fiendish."
172. B. Heinous means "awful," "terrible," or "atrocious."
173. B. Rational means "reasonable," "sensible," or "logical."
174. B. Meek means "docile," "passive," or "compliant."

## Mathematics

175. C. If all of the treats are used, and all 5 cats get the same number of treats, the correct answer will be a number that is evenly divisible by 5 . Numbers that end with 0 or 5 are evenly divisible by 5 . Twenty ends in a zero, and is the correct answer.
176. C. The surface area of a cube is given by $6 a^{2}$, where $a$ is the length of one side. Here this gives: $6 \times(8)^{2}=6 \times 64=384$.
177. B. Begin by dividing the first elements: $9 \div 3=3$. Then subtract the exponents for the factors where 10 is the base: $10^{-5} \div 10^{2}=10^{-7}$, because $(-5)-2=-7$. That results in a final answer of $3 \times 10^{-7}$.
178. D. If a square has an area of 4 , then each side length is 2 . Perimeter is the sum of all side lengths, which would be $2+2+2+2=8$.
179. B. The LCM of 3 and 9 is 9 . The LCM is given by the greatest exponent of any variable present. This gives $9 x^{5}$ as the LCM of these two terms.
180. D. If the circumference is $15 \pi \mathrm{~mm}$, then the diameter must be 15 mm .
181. C. Find the prime factors for each number given: $14=2 \times 7 ; 42=2 \times 3 \times 7$; and $28=$ $2 \times 2 \times 7$. The common factors for all three numbers are 2 and 7 . Multiply these to find the GCF: $2 \times 7=14$.
182. D. We are looking for a unit of area. Eliminate kilograms because this is a unit of weight. Eliminate square feet and square inches because even though these are measures of area, they are too small to measure the area of a large park.
183. C. The area of a rectangle is $A=l w$. First, find the length of the rectangle by doing $60 \div 4=$ 15. Next, find the perimeter by adding up all of the sides $15+15+4+4=38$.
184. D. To convert a fraction into a decimal, divide the numerator by the denominator. C is incorrect because $\frac{7}{8}$ is not a repeating decimal. A and $B$ are incorrect as they are not equivalent to $\frac{7}{8}$.
185. C. Solve for the radius using the formula for area of a circle: $144 \pi=\pi r^{2}$. This results in $r=$ 12. Then plug in the radius to the circumference equation: $C=2 \pi r=2(12) \pi=24 \pi$.
186. D. Convert both parts of the expression into standard form: $9 \times 10^{5}=900,000$ and $6 \times 10^{4}=60,000$. Subtract to get 840,000 , and then convert that into scientific notation to get $8.4 \times 10^{5}$.
187. A. To convert a decimal into a fraction, the number to the left of the decimal simply becomes a whole number. The number to the right of the decimal is converted to a fraction by expressing it as a phrase (twenty-five hundredths), writing it as a fraction $\left(\frac{25}{100}\right)$ and then simplifying it to its lowest form. C and D are incorrect because they are not simplified to their lowest form. B is incorrect because $\frac{2}{5}$ is equivalent to 0.4 , not 0.25 .
188. A. Since we are measuring the amount of water, a liquid, we are looking for units of volume. Eliminate grams because this is a unit of mass. Eliminate milliliters because even though it is a unit of volume, it is far too small. Quarts and gallons are both units of volume; however, quarts are smaller than gallons. Therefore, gallons is the best option.
189. C. Find the length of one side of each square by taking the square root of the area: $\sqrt{36}=6$. This makes the rectangle 18 mm long $(6+6+6=18)$ and 6 mm tall. The perimeter is then $18+6+18+6=48$.
190. C. First, find the greatest common factor of 12 and 4 which is 4 . Then select the lowestexponent version of each of the common variables. These are $a^{2}$ and $b^{2}$. This means the GCF of the two terms is $4 a^{2} b^{2}$.
191. B. We subtract 20 and $4 x$ from both sides, resulting in: $-8 x \leq-24$.Then, we divide by -8 and flip the inequality to obtain: $x \geq 3$.
192. C. Since this is a regular hexagon, all of the angles will have the same measure. To find the measure of each angle do $\frac{180(6-2)}{6}=120$.
193. A. We first subtract $6 y$ from both sides, resulting in: $-11>12 y$. We then divide by 12 to obtain $y<\frac{-11}{12}$.
194. C. Obtuse triangles have one angle which measures greater than $90^{\circ}$.
195. D. The equation $x=8$ describes a vertical line. The slope of a vertical line is undefined.
196. D. Each fraction has 2 parts taken out of the whole, so the fraction with the largest denominator is the smallest fraction. Therefore, $\frac{2}{6}$ is the correct answer.
197. C. First, find the lowest number that 4,5 , and 10 can multiply to: the LCM of these numbers is 20. Then, the LCM is given by the greatest exponent of any variable present, which here are $x^{3}, y^{2}$, and $z^{2}$. This makes the LCM of these terms $20 x^{3} y^{2} z^{2}$.
198. B. Convert each fraction to have the common denominator of 10,000 and compare. $\frac{1}{10}=$ $\frac{1,000}{10,000} ; \frac{9}{100}=\frac{900}{10,000} ; \frac{98}{1,000}=\frac{980}{10,000}$. The smallest numerator that results is 900 , showing that $\frac{9}{100}$ is the smallest fraction given.
199. D. Surface area of a rectangular prism is given by $2(w l+h l+h w)$, where $w$ is the width, $l$ is the length, and $h$ is the height of the prism. Here this gives: $2(5 \times 8+4 \times 8+4 \times 5)=$ $2(40+32+20)=2(92)=184$.
200. B. When you multiply monomials, you add the exponents of the same base. If you need an expression of $a^{3}$, then you want to look for the exponents connected to the $a$ variable that add up to 3 . That would be answers B and C, so you can eliminate answers A and D. Then you look between answers $B$ and $C$ to see which of those will be the equivalent of $b^{5}$, and that is $b^{3} \times b^{2}$. C is incorrect because $b^{5} \times b=b^{6}$.
201. B. When you divide monomials, you subtract the exponents of the same base. You must also remember that a variable that does not have a written exponent has an exponent of 1 . If you need an expression of $m^{4}$, then you need exponents connected with the $m$ variable that subtract to 4 . That is true of answers $\frac{m^{5} n^{8}}{m n^{2}}$ and $\frac{m^{6} n}{m^{2} n^{5}}$. Then you look for the $n$ variables where the exponents will subtract to 6 . That is true of $\frac{m^{5} n^{8}}{m n^{2}}$ but not of $\frac{m^{6} n}{m^{2} n^{5}}$. Therefore, $\frac{m^{5} n^{8}}{m n^{2}}$ is the correct answer.
202. C. Two lines that are parallel have the same slope, so to answer this problem simply determine the slope of the given line. The given line is in slope-intercept form $(y=m x+$ $b)$, so the slope is the value of the coefficient of $x$. Here the that value is $-\frac{3}{4}$.

## Problem Solving

203. D. You begin by subtracting to get an answer of 5.268. To round to the nearest tenth, you look to its right, at the hundredths place. Since that is 5 or higher, you add one to the tenths place. Everything to its right turns to zero, giving you 5.3. 5.2 is incorrect because you did not round up. 5.268 is incorrect because it is not rounded at all. 5.27 is incorrect because it is rounded to the nearest hundredth instead of the nearest tenth.
204. B. When you have a ratio in a word problem, you can simply convert that into algebraic expressions. In this case, the number of dogs is $3 x$, while the number of cats is $2 x$. Since the "total" will be an adding problem, you can make an algebraic expression $3 x+2 x=$ 40 , so $\mathrm{x}=8$. As the number of cats is equivalent to $2 x$, that means there are 16 cats.
205. C. Set up a proportion: $\frac{18 \text { problems }}{1 \text { hour }}=\frac{30 \text { problems }}{x \text { hours }}$. To solve, cross multiply, resulting in $18 x=$ 30. Dividing by 18 results in $x=\frac{5}{3}$, which equals $1 \frac{2}{3}$.
206. A. You begin by subtracting to get an answer of 0.73 . To round to the nearest tenth, you look to its right, at the hundredths place. Since that is 4 or lower, you leave the tenths place as it is. Everything to its right turns to zero, giving you 0.7. 0.73 is incorrect because you did not round. The other two incorrect answers reflect improper borrowing. If you obtained one of those answers, it might help to write 5 as 5.00 when you subtract, and then you will remember to borrow from the 5 .
207. D. First, simplify each individual term: $\sqrt{18}=\sqrt{9 \times 2}=3 \sqrt{2}$ and $\sqrt{8}=\sqrt{4 \times 2}=2 \sqrt{2}$. Once simplified, add the two together $3 \sqrt{2}+2 \sqrt{2}=5 \sqrt{2}$.
208. C. An octagon is a polygon with eight sides.
209. C. When you add and subtract, you want to go from left to right, so you begin with $132+$ $(-28)$. That equals 104. Then when you subtract a negative number, it is the same as adding a positive, so $104-(-12)$ is the same as $104+12$. That gives you an answer of 116.
210. B. A kilometer is defined as 1000 meters. Therefore, .15 of a kilometer is 150 meters.
211. A. To subtract fractions, you first find the common denominator, which is 12 in this case. Then convert to equivalent fractions: $\frac{3}{4}=\frac{9}{12}$. Then you subtract the fractions, so $\frac{11}{12}-\frac{9}{12}=$ $\frac{2}{12}$. Then you simplify to lowest form, and $\frac{2}{12}=\frac{1}{6}$. Both $\frac{2}{12}$ and $\frac{8}{48}$ are incorrect because they are not simplified. $\frac{8}{8}$ is incorrect because you need to find the common denominator and convert to equivalent fractions before you simplify.
212. C. To obtain the range, subtract the smallest value from the largest value. In this case, the shortest throw was approximately 37 m and the largest was 55 m . Subtracting the two results in 18 m .
213. B. Line charts are best for displaying data over time; therefore, gas mileage over time is best displayed on a line chart.
214. D. To find the percent decrease we use the formula: $\frac{\text { new-old }}{\text { old }} \times 100$. Plug in the new and old values of the car into the formula $\frac{1200-3000}{3000} \times 100=60 \%$.
215. D. Find the total number of boxes sold: $3+8+9=20$. Multiply this number by the cost per box to find the total amount earned: $20 \times 3.25=65$.
216. A. We manipulate the distance formula to obtain speed: $S=\frac{D}{t}=\frac{30}{.75}=40$ miles per hour.
217. D. The decimal version of $25 \frac{1}{2} \%=25.2 \%$. To find the value without the percent sign, you must divide that decimal by 100, moving the decimal twice to the left. Therefore, the answer CANNOT be 25.2.
218. C. The prime factorization of 24 is $2^{3} \times 3^{1}$, so $x=3$ and $y=1$. Therefore, $x+y=4$.
219. A. When you add integers, you want to go from left to right, so you begin with $15+(-3)$. That answer is 12 . When you add a positive and negative integer, you subtract the numbers and keep the sign of the larger one. Then you do the second operation: $12+(-18)$. This is a similar step, but in this case the answer is negative because 18 is a bigger number. Some students will choose 36 because they simply add all the numbers together and do not pay attention to the negative signs.
220. C. There are 100 centimeters per meter. Therefore, 4,320 centimeters is equivalent to 43.2 meters.
221. C. We calculate time by manipulating the distance equation: $t=\frac{D}{s}=\frac{3}{12}=\frac{1}{4}=15$ minutes.
222. C. In a Venn diagram, the intersection of the two circles represents what is true of both circles. In this diagram, there are 2 students who play flute and piano, plus an additional 3 students who play all three instruments, meaning they can also play flute and piano, for a total of 5 students.
223. C. Adding $1 x$ to both sides gives $4=6 x-8$. Then add 8 to both sides, which gives $12=6 x$. Dividing both sides by 6 gives the final answer $x=2$.
224. D. To find the decimal version of the percent, move the decimal two places to the left. This gives 5.5 , which is also equal to $\frac{11}{2}$ and $\frac{165}{30}$.
225. C. To subtract decimals, you need to line up the numbers properly. In this case, it helps to write 7 as 7.000 . That will both line up the numbers (because you can line up the decimals) and then assist in borrowing. 7.994 is a common mistake as students will borrow from the 0 's but then forget to borrow from the 7.
226. C. Find the sum of the number of games with fewer than 5 goals. The Wildcats scored 4 goals in 3 games, 3 goals in 2 games, 2 goals in 4 games, and 1 goal in 6 games. This gives: $3+$ $2+4+6=15$.
227. B. $\sqrt{x^{6}}=\sqrt{x^{4} \cdot x^{2}}=x^{2} \sqrt{x^{2}}=x^{3}$.
228. C. Since we do not know the total number of pants in the store, let's call it $T$. If $20 \%$ of the pants are khakis, and $60 \%$ are jeans, that means $20 \%$ of the pants have to be slacks. Since there are 40 pairs of slacks we can say that $40=0.2 T$. We can solve this equation for $T$, and we get that the total number of pants in the store is 200 . Since $60 \%$ of the pants are jeans, we can find $60 \%$ of 200 to find the total number of jeans. $0.6 \times 200=120$
229. D. Create two average expressions and set them equal to each other. The average of 8,9 , and $x$ can be expressed as $\frac{8+9+x}{3}$, and the average of 7 and $x$ can be expressed as $\frac{7+x}{2}$. Setting them equal to each other and then cross-multiplying gives $3(7+x)=2(8+9+x)$. Distributing gives $21+3 x=34+2 x$, and solving for $x$ results in 13 .
230. C. Simple probability is "correct" possibilities over total possibilities. In this case, there are 15 seventh graders who spend more time on the internet, so that is the number of "correct" possibilities. There are 37 students who spend more time on the internet altogether, so that is the number of total possibilities. The probability is $\frac{15}{37}$.
231. B. Set up a proportion: $\frac{5 \text { girls }}{3 \text { boys }}=\frac{15 \text { girls }}{x \text { boys }}$. Cross-multiplying gives you $5 x=45$, so $x=9$.
232. D. A scalene right triangle is a triangle with a right, or $90^{\circ}$, angle and no congruent sides, which fits this diagram. An isosceles right triangle would have two congruent sides. A parallelogram and a rhombus are both quadrilaterals, not triangles.
233. C. Create a Venn diagram: Subtracting 50 from 120 gives 70 : the number of adults who get their news from the television, the internet, or both. This is the sum of $a, b, a n d$. Subtracting the number of adults who watch television news (section $b+$ section $c$ ), leaves the value for section a, or the 30 adults who only use the internet.

234. D. First, add the amounts of the purchases together to find the total amount spent: $45+12+$ $37=94$. Then, subtract from the amount she started with to find out how much money she has left after the purchases: $108-94=14$.
235. B. Simple probability is "correct" possibilities over total possibilities. In this case, there are 4 green marbles, so that is the number of "correct" possibilities. After Jasmine selects a marble and keeps it, there are 20 marbles left, so that is the number of total possibilities. That gives a ratio of $\frac{4}{20}$, or $\frac{1}{5}$.
236. B. Solving the right hand of the equation for $12 \times 0.25 \times 3$ gives you $-4 x=9$, and then you divide both sides by -4 to get $x$ by itself. This results in the final answer of -2.25 .
237. B. $2^{x}$ means that 2 will be multiplied by itself a certain number of times to produce 128 . Since $2^{7}=128, x=7$.
238. D. When you have a ratio in a word problem, you can convert it into an algebraic expression: 10:4:3 becomes $10 x, 4 x$, and $3 x$. The algebraic expression then is $10 x+4 x+3 x=51$, so $x=3$. As you are looking for the number of pennies, you substitute 3 for $x$ in the expression 10x, or $10(3)$, which gives you an answer of 30 .

## Language Skills


239. A. The number of the subject and verb must match. The subject in this sentence is "all" which is plural, and the plural form of the verb is "have." The sentence should read: All of her books have sad endings.
240. C. Answer choice (C) contains an error in capitalization. The word "German" refers to a nationality or country, and is a proper noun that should always be capitalized. The sentence should read: Her favorite dog breed is the German shepherd.
241. A. Answer choice (A) contains an error in capitalization. The word "concert" is a common noun, and should not be capitalized. The sentence should read: The concert would take place at the Hollywood Bowl.
242. B. The word "impressive" is describing the action "dance," meaning it is an adverb, and should end with an "-ly." The sentence should read: They dance impressively.
243. B. It should always be clear to what a pronoun is referring. The use of the word "it" is nonspecific at this point in the sentence, and does not clearly refer to an earlier noun. An informative noun is needed at this point in the sentence. The sentence could better read: I love baking both cookies and brownies, but during the holidays, I prefer to bake pies more.
244. A. Answer choice (A) contains an error in punctuation. There should be no apostrophe after the word "show" which would demonstrate possession. This sentence requires the plural word with no possession and should read: A variety of shows played at the local theater.
245. C. Verbs must be in their proper form for a given tense, which can be determined by the context of the sentence. The phrase "when he realized" is in the past tense, so the rest of the sentence must also remain in this tense. The past tense form of the verb is "jumped." The sentence should read: When he realized he was going to be late, Terry jumped out of bed.
246. B. The ending "-er" on the end of the comparison word means "more." Therefore, both are never used together. Here we have "more blonder," so the word "more" should be removed. The sentence should read: Kelsey is blonder than Samiya.
247. A. Verbs must be in their proper form for a given tense, which can be determined by the context of the sentence. The phrase "if you are" is in present tense, so the rest of the sentence must also remain in this tense. The sentence should read: If you are a billionaire, then I am Mickey Mouse!
248. A. The word "universe" is being used as a common noun and should not be capitalized. The sentence should read: The universe contains billions of stars.
249. B. There should only be one negative word in the same sentence. There are two in this sentence: "won't" and "never." The correct phrase is "won't ever." The sentence should read: She won't ever leave her house.
250. A. When a sentence contains a subject performing more than one action, each verb should be in the same form. The verb "left" matches with the verb "drove," so the sentence should read: She left the party and drove home.
251. C. The ending "-est" on the end of the comparison word means "most." Therefore, both are never used together. Here we have "most boldest," so the word "most" should be removed. The sentence should read: She was the boldest artist of her generation.
252. B. Answer choice (B) contains an error in capitalization. The word "British" should be capitalized, as nationalities and languages are proper nouns. The sentence should read: The British are known for their love of tea.
253. D. There are no mistakes in punctuation, capitalization, or usage.
254. A. Verbs must be in their proper form for a given tense, which can be determined by the context of the sentence. The phrase "if you receive" refers to a conditional future, so the rest of the sentence must also remain in future tense. The sentence should read: If you receive a perfect score on the exam, it will lead to many opportunities.
255. C. A complete sentence must have a subject and a verb and contain a complete idea. While this sentence has a subject, it is missing a verb to make a complete thought. The sentence should read: The winter is freezing.
256. A. When a sentence contains a subject performing more than one action, each verb should be in the same form and tense. Here, the verb tense changes with the incorrect use of the word "did." The sentence should read: This summer, we're going to relax, have fun, and do new things.
257. C. When a sentence gives the exact words spoken by another person, those words should be surrounded by quotation marks. The sentence should read: "Isn't it time to leave?" asked Cheryl.
258. D. There is no error in punctuation, capitalization, or usage.
259. C. The phrase "orange tree" is made up of an adjective and a common noun, and should not be capitalized. The sentence should read: She hoped to plant an orange tree in the back yard.
260. D. There is no error in punctuation, capitalization, or usage.
261. B. Verbs must be in their proper form for a given tense, which can be determined by the context of the sentence. The verb "change" is placed after "expected to" in this sentence, and should be in the present tense. The sentence should read: The weather is expected to change after noon.
262. B. Pronouns must agree in number with the noun that they are referencing. Here, the sentence has the singular noun "cow," which requires the singular pronoun "it." The sentence should read: The cow spends its days eating grass.
263. C. A complete sentence must have a subject and a verb and contain a complete idea. While this sentence has a subject, it is missing a verb to make a complete thought. The sentence should read: Every day is the same.
264. C. Answer choice ( $C$ ) contains an error in punctuation. If/then statements are separated by a comma. The sentence should read: If Maria wins, then she gets the money.
265. A. There should only be one negative word in the same sentence. There are two in this sentence: "barely" and "never." One can be removed to correct the sentence: John never runs late.
266. A. The contraction "wasn't" is a combination of the two words "was" and "not." Contractions have apostrophes replacing the letters that have been dropped. The sentence should read: It wasn't time for us to go yet.
267. A. The number of the subject and verb must match. The subject in this sentence is "mathematics," which is singular, and the singular form of the verb is "is." The sentence should read: Mathematics, a challenging subject, is fundamental to learning physics.
268. B. Answer choice (B) contains an error in punctuation. The arm belongs to Mirabel's brother, so "brothers" should have an apostrophe showing possession. The sentence should read: Mirabel's brother's arm was broken when he fell from the tree.
269. C. A complete sentence must have a subject and a verb and contain a complete idea. The verb "forgot" is lacking a subject and therefore creates a sentence fragment. The sentence could read: I forgot to say hello.
270. C. Answer choice (C) contains an error in capitalization. The word "Japanese" refers to a nationality or country, and is a proper noun that should be capitalized. The sentence should read: Rikio studied Japanese in college.
271. C. The phrase "forgetting to set her alarm clock" is a dependent clause, and should be separated from the rest of the sentence with a comma, not a semicolon. A semicolon separates two independent clauses. The sentence should read: Forgetting to set her alarm clock, the star athlete was late for her big game.
272. B. Seasons are not capitalized unless the year is also given, such as "the Summer of 2013." The sentence should read: She always went to Canada during the summer.
273. A. Pronouns must agree in number with the noun that they are referencing. Here, the sentence has the singular person "Jade," which requires the singular pronoun "his/her." The sentence could read: Jade's birthday was her favorite day of the year.
274. D. There is no error in punctuation, capitalization, or usage.
275. C. Answer choice (C) contains an error in punctuation. The contraction "that's" is a combination of the two words "that" and "is." Contractions have apostrophes replacing the letters that have been dropped. The sentence should read: "That's great!" shouted Michael.
276. D. There are no mistakes in punctuation, capitalization, or usage.
277. A. Answer choice (A) contains an error in capitalization. Proper nouns, names of specific locations and people, are capitalized in their entirety. The sentence should read: The United States has only fifty states.
278. B. Answer choice (B) contains an error in punctuation. The dependent clause "who had a loud bark" is extra information in the main sentence, and should be surrounded by commas. The sentence should read: His dog, who had a loud bark, was annoying the neighbors.
279. C. The word "medicine" is misspelled.
280. D. There is no spelling error.
281. B. The word "parallel" is misspelled.
282. A. The word "occurrence" is misspelled.
283. A. The words "too" and "to" are commonly confused. The word "to" implies direction, where "too" means also. Here, we want the word at the end of the sentence to mean "also." The sentence should read: The public had access to that information too.
284. C. The word "publicly" is misspelled.
285. B. The word "surprise" is misspelled.
286. C. The word "tongue" is misspelled.
287. D. There is no spelling error.
288. A. The word "appetite" is misspelled.
289. B. This sentence would best fit at the end of the paragraph because it is the last step of the process for making a peanut butter and jelly sandwich.
290. C. This word choice is the clearest connective for this sentence: "The stairs in the old house were falling apart; therefore, they are unsafe to walk on." Therefore suggests a cause-andeffect relationship between the two clauses.
291. A. This word choice is the clearest connective for this sentence: "Samson was a very smart cat; additionally, he loved to sleep on his owner's lap." Additionally helps the second clause provide new information about Samson that is not necessarily related to the first clause.
292. B. This sentence best supports the topic "Eating Healthy."
293. D. This sentence is not related to the topic of the paragraph (basketball) and does not belong.
294. D. Each of these topics is too broad or complex for a one-paragraph theme.
295. B. The other topics are too broad or complex for a one-paragraph theme.
296. C. This is the best word choice to complete this sentence: "Bruce cheered excitedly when his teammate scored the winning goal."
297. C. This sentence concludes the paragraph and fits best after sentence 3 .
298. C. Although this sentence is related to driving, it does not support the topic "The History of the Automobile," and does not belong.

