$\frac{6}{10} = \frac{18}{CE}$. Multiplying each side by *CE,* and then multiplying by $\frac{10}{6}$ yields *CE* = 30. Therefore, the length of $\overline{CE}$ is 30.

QUESTION 19

The correct answer is 1.5 or $\frac{3}{2}$. The total amount, in liters, of a saline solution can be expressed as the liters of each type of saline solution multiplied by the percent of the saline solution. This gives 3(0.10), *x*(0.25), and (*x* + 3)(0.15), where *x* is the amount, in liters, of a 25% saline solution and 10%, 15%, and 25% are represented as 0.10, 0.15, and 0.25, respectively. Thus, the equation 3(0.10) + 0.25*x* = 0.15(*x* + 3) must be true. Multiplying 3 by 0.10 and distributing 0.15 to (*x* + 3) yields 0.30 + 0.25*x* = 0.15*x* + 0.45. Subtracting 0.15*x* and 0.30 from each side of the equation gives 0.10*x* = 0.15. Dividing each side of the equation by 0.10 yields *x* = 1.5, or $x = \frac{3}{2}$.

QUESTION 20

The correct answer is $\frac{1}{6}$, .166, or .167. The circumference, *C*, of a circle is *C* = 2*πr*, where *r* is the radius of the circle. For the given circle with a radius of 1, the circumference is *C* = 2(*π*)(1), or *C* = 2*π*. To find what fraction of the circumference the length of arc *AB* is, divide the length of the arc by the circumference, which gives $\frac{\pi}{3} \div 2\pi$. This division can be represented by $\frac{\pi}{3} \cdot \frac{1}{2\pi} = \frac{1}{6}$. The fraction $\frac{1}{6}$ can also be rewritten as .166 or .167.

Section 4: Math Test - Calculator

QUESTION 1

Choice A is correct. The given expression $(2x^2 - 4) - (-3x^2 + 2x - 7)$ can be rewritten as $2x^2 - 4 + 3x^2 - 2x + 7$. Combining like terms yields $5x^2 - 2x + 3$.

Choices B, C, and D are incorrect because they are the result of errors when applying the distributive property.

QUESTION 2

Choice C is correct. The lines shown on the graph give the positions of Paul and Mark during the race. At the start of the race, 0 seconds have elapsed, so the *y*-intercept of the line that represents Mark's position during the race represents the number of yards Mark was from Paul's position (at 0 yards) at the start of the race. Because the *y*-intercept of the line that represents Mark's position is at the grid line that is halfway between 12 and 24, Mark had a head start of 18 yards.

Choices A, B, and D are incorrect. The y-intercept of the line that represents Mark's position shows that he was 18 yards from Paul's position at the start of the race, so he did not have a head start of 3, 12, or 24 yards.

QUESTION 3

Choice A is correct. The leftmost segment in choice A, which represents the first time period, shows that the snow accumulated at a certain rate; the middle segment, which represents the second time period, is horizontal, showing that the snow stopped accumulating; and the rightmost segment, which represents the third time period, is steeper than the first segment, indicating that the snow accumulated at a faster rate than it did during the first time period.

Choice B is incorrect. This graph shows snow accumulating faster during the first time period than during the third time period; however, the question says that the rate of snow accumulation in the third time period is higher than in the first time period. Choice C is incorrect. This graph shows snow accumulation increasing during the first time period, not accumulating during the second time period, and then decreasing during the third time period; however, the question says that no snow melted (accumulation did not decrease) during this time. Choice D is incorrect. This graph shows snow accumulating at a constant rate, not stopping for a period of time or accumulating at a faster rate during a third time period.

QUESTION 4

Choice D is correct. The equation $12d + 350 = 1{,}010$ can be used to determine d, the number of dollars charged per month. Subtracting 350 from both sides of this equation yields $12d = 660$, and then dividing both sides of the equation by 12 yields $d = 55$.

Choice A is incorrect. If d were equal to 25, the first 12 months would cost $350 + (12)(25) = 650$ dollars, not \$1,010. Choice B is incorrect. If d were equal to 35, the first 12 months would cost $350 + (12)(35) = 770$ dollars, not \$1,010. Choice C is incorrect. If d were equal to 45, the first 12 months would cost $350 + (12)(45) = 890$ dollars, not \$1,010.

QUESTION 5

Choice B is correct. Both sides of the given inequality can be divided by 3 to yield $2x - 3y > 4$.

Choices A, C, and D are incorrect because they are not equivalent to (do not have the same solution set as) the given inequality. For example, the ordered pair $(0, -1.5)$ is a solution to the given inequality, but it is not a solution to any of the inequalities in choices A, C, or D.

QUESTION 6

Choice C is correct. According to the table, 63% of survey respondents get most of their medical information from a doctor and 13% get most of their medical information from the Internet. Therefore, 76% of the 1,200 survey respondents get their information from either a doctor or the Internet, and 76% of 1,200 is 912.

Choices A, B, and D are incorrect. According to the table, 76% of survey respondents get their information from either a doctor or the Internet. Choice A is incorrect because 865 is about 72% (the percent of survey respondents who get most of their medical information from a doctor or from magazines/brochures), not 76%, of 1,200. Choice B is incorrect because 887 is about 74%, not 76%, of 1,200. Choice D is incorrect because 926 is about 77%, not 76%, of 1,200.

QUESTION 7

Choice D is correct. The members of the city council wanted to assess opinions of all city residents. To gather an unbiased sample, the council should have used a random sampling design to select subjects from all city residents. The given survey introduced a sampling bias because the 500 city residents surveyed were all dog owners. This sample is not representative of all city residents.

Choice A is incorrect because when the sampling method isn't random, there is no guarantee that the survey results will be reliable; hence, they cannot be generalized to the entire population. Choice B is incorrect because a larger sample size would not correct the sampling bias. Choice C is incorrect because a survey sample of non–dog owners would likely have a biased opinion, just as a sample of dog owners would likely have a biased opinion.

QUESTION 8

Choice D is correct. According to the table, 13 people chose vanilla ice cream. Of those people, 8 chose hot fudge as a topping. Therefore, of the people who chose vanilla ice cream, the fraction who chose hot fudge as a topping is $\frac{8}{13}$.

Choice A is incorrect because it represents the fraction of people at the party who chose hot fudge as a topping. Choice B is incorrect because it represents the fraction of people who chose vanilla ice cream with caramel as a topping. Choice C is incorrect because it represents the fraction of people at the party who chose vanilla ice cream.

QUESTION 9

Choice B is correct. The land area of the coastal city can be found by subtracting the area of the water from the total area of the coastal city; that is, 92.1 − 11.3 = 80.8 square miles. The population density is the population divided by the land area, or $\frac{621,000}{80.8} = 7,685$, which is closest to 7,690 people per square mile.

Choice A is incorrect and may be the result of dividing the population by the total area, instead of the land area. Choice C is incorrect and may be the result of dividing the population by the area of water. Choice D is incorrect and may be the result of making a computational error with the decimal place.

QUESTION 10

Choice B is correct. Let *x* represent the number of days the second voyage lasted. The number of days the first voyage lasted is then $x + 43$. Since the two voyages combined lasted a total of 1,003 days, the equation $x + (x + 43) = 1,003$ must hold. Combining like terms yields $2x + 43 = 1,003$, and solving for *x* gives $x = 480$.

Choice A is incorrect because 460 + (460 + 43) = 963, not 1,003 days. Choice C is incorrect because 520 + (520 + 43) = 1,083, not 1,003 days. Choice D is incorrect because 540 + (540 + 43) = 1,123, not 1,003 days.

QUESTION 11

Choice B is correct. Adding the equations side-by-side eliminates *y*, as shown below.

$$\begin{array}{l} 7x+3y=8 \\ \underline{6x-3y=5} \\ 13x+\ 0=13 \end{array}$$

Solving the obtained equation for *x* gives $x = 1$. Substituting 1 for *x* in the first equation gives $7(1) + 3y = 8$. Subtracting 7 from both sides of the equation yields $3y = 1$, so $y = \frac{1}{3}$. Therefore, the value of $x - y$ is $1 - \frac{1}{3}$, or $\frac{2}{3}$.

Choice C is incorrect because $1+\frac{1}{3}=\frac{4}{3}$ is the value of $x + y$, not $x - y$. Choices A and D are incorrect and may be the result of some computational errors.

QUESTION 12

Choice D is correct. The average growth rate of the sunflower over a certain time period is the increase in height of the sunflower over the period divided by the time. Symbolically, this rate is $\frac{h(b)-h(a)}{b-a}$, where *a* and *b* are the first and the last day of the time period, respectively. Since the time period for each option is the same (21 days), the total growth over the period can be used to evaluate in which time period the sunflower grew the least. According to the graph, the sunflower grew the least over the period from day 63 to day 84. Therefore, the sunflower's average growth rate was the least from day 63 to day 84.

Alternate approach: The average growth rate of the sunflower over a certain time period is the slope of the line segment that joins the point on the graph at the beginning of the time period with the point on the graph at the end of the time period. Based on the graph, of the four time periods, the slope of the line segment is least between the sunflower's height on day 63 and its height on day 84.

Choices A, B, and C are incorrect. On the graph, the line segment from day 63 to 84 is less steep than each of the three other line segments representing other periods. Therefore, the average growth rate of the sunflower is the least from day 63 to 84.

QUESTION 13

Choice A is correct. Based on the definition and contextual interpretation of the function *h*, when the value of *t* increases by 1, the height of the sunflower increases by *a* centimeters. Therefore, *a* represents the predicted amount, in centimeters, by which the sunflower grows each day during the period the function models.

Choice B is incorrect. In the given model, the beginning of the period corresponds to $t = 0$, and since $h(0) = b$, the predicted height, in centimeters, of the sunflower at the beginning of the period is represented by *b*, not by *a*. Choice C is incorrect. If the period of time modeled by the function is *c* days long, then the predicted height, in centimeters, of the sunflower at the end of the period is represented by $ac + b$, not by *a*. Choice D is incorrect. If the period of time modeled by the function is *c* days long, the predicted total increase in the height of the sunflower, in centimeters, during that period is represented by the difference $h(c) - h(0) = (ac + b) - (a \cdot 0 + b)$, which is equivalent to *ac*, not *a*.

QUESTION 14

Choice B is correct. According to the table, the height of the sunflower is 36.36 cm on day 14 and 131.00 cm on day 35. Since the height of the sunflower between day 14 and day 35 changes at a nearly constant rate, the height of the sunflower increases by approximately

$\frac{131.00-36.36}{35-14} \approx 4.5$ cm per day. Therefore, the equation that models the height of the sunflower *t* days after it begins to grow is of the form *h* = 4.5*t* + *b*. Any ordered pair (*t*, *h*) from the table between day 14 and day 35 can be used to estimate the value of *b*. For example, substituting the ordered pair (14, 36.36) for (*t*, *h*) into the equation *h* = 4.5*t* + *b* gives 36.36 = 4.5(14) + *b*. Solving this for *b* yields *b* = −26.64. Therefore, of the given choices, the equation *h* = 4.5*t* − 27 best models the height *h*, in centimeters, of the sunflower *t* days after it begins to grow.

Choices A, C, and D are incorrect because the growth rates of the sunflower from day 14 to day 35 in these choices are significantly higher or lower than the true growth rate of the sunflower as shown in the graph or the table. These choices may result from considering time periods different from the period indicated in the question or from calculation errors.

QUESTION 15

Choice D is correct. According to the table, the value of *y* increases by $\frac{14}{4} = \frac{7}{2}$ every time the value of *x* increases by 1. It follows that the simplest equation relating *y* to *x* is linear and of the form $y = \frac{7}{2}x + b$ for some constant *b*. Furthermore, the ordered pair $\left(1, \frac{11}{4}\right)$ from the table must satisfy this equation. Substituting 1 for *x* and $\frac{11}{4}$ for *y* in the equation $y = \frac{7}{2}x + b$ gives $\frac{11}{4} = \frac{7}{2}(1) + b$. Solving this equation for *b* gives $b = -\frac{3}{4}$. Therefore, the equation in choice D correctly relates *y* to *x*.

Choices A and B are incorrect. The relationship between *x* and *y* cannot be exponential because the differences, not the ratios, of *y*-values are the same every time the *x*-values change by the same amount. Choice C is incorrect because the ordered pair $\left(2, \frac{25}{4}\right)$ is not a solution to the equation $y = \frac{3}{4}x + 2$. Substituting 2 for *x* and $\frac{25}{4}$ for *y* in this equation gives $\frac{25}{4} = \frac{3}{2} + 2$, which is false.

QUESTION 16

Choice B is correct. In right triangle *ABC*, the measure of angle *B* must be 58° because the sum of the measure of angle *A*, which is 32°, and the measure of angle *B* is 90°. Angle *D* in the right triangle *DEF* has measure 58°. Hence, triangles *ABC* and *DEF* are similar. Since *BC* is the side opposite to the angle with measure 32° and *AB* is the hypotenuse in right triangle *ABC*, the ratio $\frac{BC}{AB}$ is equal to $\frac{DF}{DE}$.

Alternate approach: The trigonometric ratios can be used to answer this question. In right triangle *ABC*, the ratio $\frac{BC}{AB} = \sin(32°)$. The angle *E* in triangle *DEF* has measure 32° because $\text{m}(\angle D) + \text{m}(\angle E) = 90°$. In triangle *DEF*, the ratio $\frac{DF}{DE} = \sin(32°)$. Therefore, $\frac{DF}{DE} = \frac{BC}{AB}$.

Choice A is incorrect because $\frac{DE}{DF}$ is the inverse of the ratio $\frac{BC}{AB}$. Choice C is incorrect because $\frac{DF}{EF} = \frac{BC}{AC}$, not $\frac{BC}{AB}$. Choice D is incorrect because $\frac{EF}{DE} = \frac{AC}{AB}$, not $\frac{BC}{AB}$.

QUESTION 17

Choice B is correct. Isolating the term that contains the riser height, *h*, in the formula 2*h* + *d* = 25 gives 2*h* = 25 − *d*. Dividing both sides of this equation by 2 yields $h = \frac{25 - d}{2}$, or

$h = \frac{1}{2}(25 - d)$.

Choices A, C, and D are incorrect and may result from incorrect transformations of the riser-tread formula 2*h* + *d* = 25 when expressing *h* in terms of *d*.

QUESTION 18

Choice C is correct. Since the tread depth, *d*, must be at least 9 inches, and the riser height, *h*, must be at least 5 inches, it follows that *d* ≥ 9 and *h* ≥ 5, respectively. Solving for *d* in the riser-tread formula 2*h* + *d* = 25 gives *d* = 25 − 2*h*. Thus the first inequality, *d* ≥ 9, is equivalent to 25 − 2*h* ≥ 9. This inequality can be solved for *h* as follows:

$$-2h \geq 9 - 25$$

$$2h \leq 25 - 9$$

$$2h \leq 16$$

$$h \leq 8$$

Therefore, the inequality $5 \leq h \leq 8$, derived from combining the inequalities $h \geq 5$ and $h \leq 8$, represents the set of all possible values for the riser height that meets the code requirement.

Choice A is incorrect because the riser height, h, cannot be less than 5 inches. Choices B and D are incorrect because the riser height, h, cannot be greater than 8. For example, if $h = 10$, then according to the riser-tread formula $2h + d = 25$, it follows that $d = 5$ inches. However, d must be at least 9 inches according to the building codes, so h cannot be 10.

QUESTION 19

Choice C is correct. Let h be the riser height, in inches, and n be the number of the steps in the stairway. According to the architect's design, the total rise of the stairway is 9 feet, or $9 \times 12 = 108$ inches. Hence, $nh = 108$, and solving for n gives $n = \frac{108}{h}$. It is given that $7 < h < 8$. It follows that $\frac{108}{8} < \frac{108}{h} < \frac{108}{7}$, or equivalently, $\frac{108}{8} < n < \frac{108}{7}$. Since $\frac{108}{8} < 14$ and $\frac{108}{7} > 15$ and n is an integer, it follows that $14 \leq n \leq 15$. Since n can be an odd number, n can only be 15; therefore, $h = \frac{108}{15} = 7.2$ inches. Substituting 7.2 for h in the riser-tread formula $2h + d = 25$ gives $14.4 + d = 25$. Solving for d gives $d = 10.6$ inches.

Choice A is incorrect because 7.2 inches is the riser height, not the tread depth of the stairs. Choice B is incorrect and may be the result of calculation errors. Choice D is incorrect because 15 is the number of steps, not the tread depth of the stairs.

QUESTION 20

Choice C is correct. Since the product of $x - 6$ and $x + 0.7$ equals 0, by the zero product property either $x - 6 = 0$ or $x + 0.7 = 0$. Therefore, the solutions to the equation are 6 and −0.7. The sum of 6 and −0.7 is 5.3.

Choice A is incorrect and is the result of subtracting 6 from −0.7 instead of adding. Choice B is incorrect and may be the result of erroneously calculating the sum of −6 and 0.7 instead of 6 and −0.7. Choice D is incorrect and is the sum of 6 and 0.7, not 6 and −0.7.

QUESTION 21

Choice D is correct. The sample of 150 largemouth bass was selected at random from all the largemouth bass in the pond, and since 30% of them weighed more than 2 pounds, it can be concluded that approximately 30% of all largemouth bass in the pond weigh more than 2 pounds.

Choices A, B, and C are incorrect. Since the sample contained 150 largemouth bass, of which 30% weighed more than 2 pounds, the largest population to which this result can be generalized is the population of the largemouth bass in the pond.

QUESTION 22

Choice B is correct. The median of a list of numbers is the middle value when the numbers are listed in order from least to greatest. For the electoral votes shown in the table, their frequency should also be taken into account. Since there are 21 states represented in the table, the middle number will be the eleventh number in the ordered list. Counting the frequencies from the top of the table (4 + 4 + 1 + 1 + 3 = 13) shows that the median number of electoral votes for the 21 states is 15.

Choice A is incorrect. If the electoral votes are ordered from least to greatest taking into account the frequency, 13 will be in the tenth position, not the middle. Choice C is incorrect because 17 is in the fourteenth position, not in the middle, of the ordered list. D is incorrect because 20 is in the fifteenth position, not in the middle, of the ordered list.

QUESTION 23

Choice C is correct. Since the graph shows the height of the ball above the ground after it was dropped, the number of times the ball was at a height of 2 feet is equal to the number of times the graph crosses the horizontal grid line that corresponds to a height of 2 feet. The graph crosses this grid line three times.

Choices A, B, and D are incorrect. According to the graph, the ball was at a height of 2 feet three times, not one, two, or four times.

QUESTION 24

Choice D is correct. To find the percent increase of the customer’s water bill, the absolute increase of the bill, in dollars, is divided by the original amount of the bill, and the result is multiplied by 100%, as follows: $\frac{79.86-75.74}{75.74} \approx 0.054$; $0.054 \times 100\% = 5.4\%$.

Choice A is incorrect. This choice is the difference $79.86 - 75.74$ rounded to the nearest tenth, which is the (absolute) increase of the bill’s amount, not its percent increase. Choice B is incorrect and may be the result of some calculation errors. Choice C is incorrect and is the result of dividing the difference between the two bill amounts by the new bill amount instead of the original bill amount.

QUESTION 25

Choice B is correct. A linear function has a constant rate of change, and any two rows of the shown table can be used to calculate this rate. From the first row to the second, the value of x is increased by 2 and the value of $f(x)$ is increased by $6 = 4 - (-2)$. So the values of $f(x)$ increase by 3 for every increase by 1 in the value of x. Since $f(2) = 4$, it follows that $f(2 + 1) = 4 + 3 = 7$. Therefore, $f(3) = 7$.

Choice A is incorrect. This is the third x-value in the table, not $f(3)$. Choices C and D are incorrect and may result from errors when calculating the function's rate of change.

QUESTION 26

Choice C is correct. Since Gear A has 20 teeth and Gear B has 60 teeth, the gear ratio for Gears A and B is 20:60. Thus the ratio of the number of revolutions per minute (rpm) for the two gears is 60:20, or 3:1. That is, when Gear A turns at 3 rpm, Gear B turns at 1 rpm. Similarly, since Gear B has 60 teeth and Gear C has 10 teeth, the gear ratio for Gears B and C is 60:10, and the ratio of the rpms for the two gears is 10:60. That is, when Gear B turns at 1 rpm, Gear C turns at 6 rpm. Therefore, if Gear A turns at 100 rpm, then Gear B turns at $\frac{100}{3}$ rpm, and Gear C turns at $\frac{100}{3} \times 6 = 200$ rpm.

Alternate approach: Gear A and Gear C can be considered as directly connected since their "contact" speeds are the same. Gear A has twice as many teeth as Gear C, and since the ratios of the number of teeth are equal to the reverse of the ratios of rotation speeds, in rpm, Gear C would be rotated at a rate that is twice the rate of Gear A. Therefore, Gear C will be rotated at a rate of 200 rpm since Gear A is rotated at 100 rpm.

Choice A is incorrect and may result from using the gear ratio instead of the ratio of the rpm when calculating the rotational speed of Gear C. Choice B is incorrect and may result from comparing the rpm of the gears using addition instead of multiplication. Choice D is incorrect and may be the result of multiplying the 100 rpm for Gear A by the number of teeth in Gear C.

QUESTION 27

Choice A is correct. One way to find the radius of the circle is to put the given equation in standard form, $(x - h)^2 + (y - k)^2 = r^2$, where (h, k) is the center of the circle and the radius of the circle is r. To do this, divide the original equation, $2x^2 - 6x + 2y^2 + 2y = 45$, by 2 to make the leading coefficients of x^2 and y^2 each equal to 1: $x^2 - 3x + y^2 + y = 22.5$. Then complete the square to put the equation in standard form. To do so, first rewrite $x^2 - 3x + y^2 + y = 22.5$ as $(x^2 - 3x + 2.25) - 2.25 + (y^2 + y + 0.25) - 0.25 = 22.5$. Second, add 2.25 and 0.25 to both sides of the equation: $(x^2 - 3x + 2.25) + (y^2 + y + 0.25) = 25$. Since $x^2 - 3x + 2.25 = (x - 1.5)^2$, $y^2 - x + 0.25 = (y$

$-\ 0.5)^2$, and $25 = 5^2$, it follows that $(x - 1.5)^2 + (y - 0.5)^2 = 5^2$. Therefore, the radius of the circle is 5.

Choices B, C, and D are incorrect and may be the result of errors in manipulating the equation or of a misconception about the standard form of the equation of a circle in the *xy*-plane.

QUESTION 28

Choice A is correct. The coordinates of the points at a distance *d* units from the point with coordinate *a* on the number line are the solutions to the equation $|x - a| = d$. Therefore, the coordinates of the points at a distance of 3 units from the point with coordinate −4 on the number line are the solutions to the equation $|x - (-4)| = 3$, which is equivalent to $|x + 4| = 3$.

Choice B is incorrect. The solutions of $|x - 4| = 3$ are the coordinates of the points on the number line at a distance of 3 units from the point with coordinate 4. Choice C is incorrect. The solutions of $|x + 3| = 4$ are the coordinates of the points on the number line at a distance of 4 units from the point with coordinate −3. Choice D is incorrect. The solutions of $|x - 3| = 4$ are the coordinates of the points on the number line at a distance of 4 units from the point with coordinate 3.

QUESTION 29

Choice B is correct. The average speed of the model car is found by dividing the total distance traveled by the car by the total time the car traveled. In the first *t* seconds after the car starts, the time changes from 0 to *t* seconds. So the total distance the car traveled is the distance it traveled at *t* seconds minus the distance it traveled at 0 seconds. At 0 seconds, the car has traveled $16(0)\sqrt{0}$ inches, which is equal to 0 inches. According to the equation given, after *t* seconds, the car has traveled $16t\sqrt{t}$ inches. In other words, after the car starts, it travels a total of $16t\sqrt{t}$ inches in *t* seconds. Dividing this total distance traveled by the total time shows the car's average speed: $\frac{16t\sqrt{t}}{t} = 16\sqrt{t}$ inches per second.

Choices A, C, and D are incorrect and may result from misconceptions about how average speed is calculated.

QUESTION 30

Choice D is correct. The data in the scatterplot roughly fall in the shape of a downward-opening parabola; therefore, the coefficient for the x^2 term must be negative. Based on the location of the data points, the y-intercept of the parabola should be somewhere between 740 and 760. Therefore, of the equations given, the best model is $y = -1.674x^2 + 19.76x + 745.73$.

Choices A and C are incorrect. The positive coefficient of the x^2 term means that these these equations each define upward-opening parabolas, whereas a parabola that fits the data in the scatterplot must open downward. Choice B is incorrect because it defines a parabola with a y-intercept that has a negative y-coordinate, whereas a parabola that fits the data in the scatterplot must have a y-intercept with a positive y-coordinate.

QUESTION 31

The correct answer is 10. Let n be the number of friends originally in the group. Since the cost of the trip was \$800, the share, in dollars, for each friend was originally $\frac{800}{n}$. When two friends decided not to go on the trip, the number of friends who split the \$800 cost became $n - 2$, and each friend's cost became $\frac{800}{n-2}$. Since this share represented a \$20 increase over the original share, the equation $\frac{800}{n} + 20 = \frac{800}{n-2}$ must be true. Multiplying each side of $\frac{800}{n} + 20 = \frac{800}{n-2}$ by $n(n - 2)$ to clear all the denominators gives

$$800(n - 2) + 20n(n - 2) = 800n$$

This is a quadratic equation and can be rewritten in the standard form by expanding, simplifying, and then collecting like terms on one side, as shown below:

$$800n - 1600 + 20n^2 - 40n = 800n$$

$$40n - 80 + n^2 - 2n = 40n$$

$$n^2 - 2n - 80 = 0$$

After factoring, this becomes $(n + 8)(n - 10) = 0$.

The solutions of this equation are −8 and 10. Since a negative solution makes no sense for the number of people in a group, the number of friends originally in the group was 10.

QUESTION 32

The correct answer is 31. The equation can be solved using the steps shown below.

$2(5x - 20) - 15 - 8x = 7$

$2(5x) - 2(20) - 15 - 8x = 7$ (Apply the distributive property.)

$10x - 40 - 15 - 8x = 7$ (Multiply.)

$2x - 55 = 7$ (Combine like terms.)

$2x = 62$ (Add 55 to both sides of the equation.)

$x = 31$ (Divide both sides of the equation by 2.)

QUESTION 33

The possible correct answers are 97, 98, 99, 100, and 101. The volume of a cylinder can be found by using the formula $V = \pi r^2 h$, where r is the radius of the circular base and h is the height of the cylinder. The smallest possible volume, in cubic inches, of a graduated cylinder produced by the laboratory supply company can be found by substituting 2 for r and 7.75 for h, giving $V = \pi(2^2)(7.75)$. This gives a volume of approximately 97.39 cubic inches, which rounds to 97 cubic inches. The largest possible volume, in cubic inches, can be found by substituting 2 for r and 8 for h, giving $V = \pi(2^2)(8)$. This gives a volume of approximately 100.53 cubic inches, which rounds to 101 cubic inches. Therefore, the possible volumes are all the integers greater than or equal to 97 and less than or equal to 101, which are 97, 98, 99, 100, and 101. Any of these numbers may be gridded as the correct answer.

QUESTION 34

The correct answer is 5. The intersection points of the graphs of $y = 3x^2 - 14x$ and $y = x$ can be found by solving the system consisting of these two equations. To solve the system, substitute x for y in the first equation. This gives $x = 3x^2 - 14x$. Subtracting x from both sides of the equation gives $0 = 3x^2 - 15x$. Factoring $3x$ out of each term on the left-hand side of the equation gives $0 = 3x(x - 5)$. Therefore, the possible values for x are 0 and 5. Since $y = x$, the two intersection points are (0, 0) and (5, 5). Therefore, $a = 5$.

QUESTION 35

The correct answer is 1.25 or $\frac{5}{4}$. The y-coordinate of the x-intercept is 0, so 0 can be substituted for y, giving $\frac{4}{5}x + \frac{1}{3}(0) = 1$. This simplifies to $\frac{4}{5}x = 1$. Multiplying both sides of $\frac{4}{5}x$

= 1 by 5 gives $4x = 5$. Dividing both sides of $4x = 5$ by 4 gives $x = \frac{5}{4}$, which is equivalent to 1.25. Either 5/4 or 1.25 may be gridded as the correct answer.

QUESTION 36

The correct answer is 2.6 or $\frac{13}{5}$. Since the mean of a set of numbers can be found by adding the numbers together and dividing by how many numbers there are in the set, the mean mass, in kilograms, of the rocks Andrew collected is $\frac{2.4+2.5+3.6+3.1+2.5+2.7}{6} = \frac{16.8}{6} = 2.8$. Since the mean mass of the rocks Maria collected is 0.1 kilogram greater than the mean mass of rocks Andrew collected, the mean mass of the rocks Maria collected is 2.8 + 0.1 = 2.9 kilograms. The value of x can be found by using the algorithm for finding the mean: $\frac{x+3.1+2.7+2.9+3.3+2.8}{6} = 2.9$. Solving this equation gives $x = 2.6$, which is equivalent to $\frac{13}{5}$. Either 2.6 or 13/5 may be gridded as the correct answer.

QUESTION 37

The correct answer is 30. The situation can be represented by the equation $x(2^4) = 480$, where the 2 represents the fact that the amount of money in the account doubled each year and the 4 represents the fact that there are 4 years between January 1, 2001, and January 1, 2005. Simplifying $x(2^4) = 480$ gives $16x = 480$. Therefore, $x = 30$.

QUESTION 38

The correct answer is 8. The 6 students represent (100 − 15 − 45 − 25)% = 15% of those invited to join the committee. If x people were invited to join the committee, then $0.15x = 6$. Thus, there were $\frac{6}{0.15}$ = 40 people invited to join the committee. It follows that there were 0.45(40) = 18 teachers and 0.25(40) = 10 school and district administrators invited to join the committee. Therefore, there were 8 more teachers than school and district administrators invited to join the committee.