QUESTION 42.

Choice D is the best answer. Sentence 4 is most logically placed after sentence 7 because sentence 7 implies that the words used in the survey were used synonymously, even though the words convey different levels of reaction. Sentence 4 supports this idea with further explanation.

Choices A, B, and C are incorrect because it would be illogical and confusing to place sentence 4 after sentence 2, 3, or 5.

QUESTION 43.

Choice C is the best answer. The pronoun "some" is used correctly as the subject of the independent clause. The comma after "some" is needed to set off the nonrestrictive clause ("influenced by the sensationalized news coverage afterward") that follows it.

Choice A is incorrect because without a comma, the resulting restrictive clause changes the meaning of the sentence. Choice B is incorrect because the pronoun "they" introduces an independent clause and provides another, unnecessary subject for the sentence. Choice D is incorrect because a comma is needed to set off the nonrestrictive clause.

QUESTION 44.

Choice A is the best answer. "Not unlike," which means the same as "like," most effectively signals the similarity between the two groups mentioned by the researchers.

Choices B, C, and D are incorrect because they all indicate difference instead of similarity.

Section 3: Math Test — No Calculator

QUESTION 1.

Choice C is correct. Maria spends x minutes running each day and y minutes biking each day. Therefore, $x + y$ represents the total number of minutes Maria spent running and biking each day. Because $x + y = 75$, it follows that 75 is the total number of minutes that Maria spent running and biking each day.

Choices A and B are incorrect. The problem states that Maria spends time in both activities each day, therefore x and y must be positive. If 75 represents the number of minutes Maria spent running each day, then Maria spent no minutes biking each day. Similarly, if 75 represents the number of minutes Maria spent biking each day, then Maria spent no minutes running each day. The number of minutes Maria spends running each day and biking each day may vary; however, the total number of minutes she spends each day on these activities is constant and equal to 75. Choice D is incorrect. The number of minutes Maria spent biking for each minute spent running cannot be determined from the information provided.

QUESTION 2.

Choice C is correct. Using the distributive property to multiply 3 and $(x + 5)$ gives $3x + 15 - 6$, which can be rewritten as $3x + 9$.

Choice A is incorrect and may result from rewriting the given expression as $3(x + 5 - 6)$. Choice B is incorrect and may result from incorrectly rewriting the expression as $(3x + 5) - 6$. Choice D is incorrect and may result from incorrectly rewriting the expression as $3(5x) - 6$.

Alternatively, evaluating the given expression and each answer choice for the same value of x, for example $x = 0$, will reveal which of the expressions is equivalent to the given expression.

QUESTION 3.

Choice B is correct. The first equation can be rewritten as $y - x = 3$ and the second as $\frac{x}{4} + y = 3$, which implies that $-x = \frac{x}{4}$, and so $x = 0$. The ordered pair (0, 3) satisfies the first equation and also the second, since $0 + 2(3) = 6$ is a true equality.

Alternatively, the first equation can be rewritten as $y = x + 3$. Substituting $x + 3$ for y in the second equation gives $\frac{x}{2} + 2(x + 3) = 6$. This can be rewritten using the distributive property as $\frac{x}{2} + 2x + 6 = 6$. It follows that $2x + \frac{x}{2}$ must be 0. Thus, $x = 0$. Substituting 0 for x in the equation $y = x + 3$ gives $y = 3$. Therefore, the ordered pair (0, 3) is the solution to the system of equations shown.

Choice A is incorrect; it satisfies the first equation but not the second. Choices C and D are incorrect because neither satisfies the first equation, $x = y - 3$.

QUESTION 4.

Choice D is correct. Applying the distributive property, the original expression is equivalent to $5 + 12i - 9i^2 + 6i$. Since $i = \sqrt{-1}$, it follows that $i^2 = -1$. Substituting -1 for i^2 into the expression and simplifying yields $5 + 12i + 9 + 6i$, which is equal to $14 + 18i$.

Choices A, B, and C are incorrect and may result from substituting 1 for i^2 or errors made when rewriting the given expression.

QUESTION 5.

Choice A is correct. Substituting -1 for x in the equation that defines f gives $f(-1) = \frac{(-1)^2 - 6(-1) + 3}{(-1) - 1}$. Simplifying the expressions in the numerator and denominator yields $\frac{1 + 6 + 3}{-2}$, which is equal to $\frac{10}{-2}$ or -5.

Choices B, C, and D are incorrect and may result from misapplying the order of operations when substituting -1 for x.

QUESTION 6.

Choice C is correct. The value of the camera equipment depreciates from its original purchase value at a constant rate for 12 years. So if x is the amount, in dollars, by which the value of the equipment depreciates each year, the value of the camera equipment, in dollars, t years after it is purchased would be $32{,}400 - xt$. Since the value of the camera equipment after 12 years is \$0, it follows that $32{,}400 - 12x = 0$. To solve for x, rewrite the equation as $32{,}400 = 12x$. Dividing both sides of the equation by 12 gives $x = 2{,}700$. It follows that the value of the camera equipment depreciates by \$2,700 each year. Therefore, the value of the equipment after 4 years, represented by the expression $32{,}400 - 2{,}700(4)$, is \$21,600.

Choice A is incorrect. The value given in choice A is equivalent to \$2,700 × 4. This is the amount, in dollars, by which the value of the camera equipment depreciates 4 years after it is purchased, not the dollar value of the camera equipment 4 years after it is purchased. Choice B is incorrect. The value given in choice B is equal to \$2,700 × 6, which is the amount, in dollars, by which the value of the camera equipment depreciates 6 years after it is purchased, not the dollar value of the camera equipment 4 years after it is purchased. Choice D is incorrect. The value given in choice D is equal to \$32,400 – \$2,700. This is the dollar value of the camera equipment 1 year after it is purchased.

QUESTION 7.

Choice B is correct. Each of the options is a quadratic expression in vertex form. To rewrite the given expression in this form, the number 9 needs to be added to the first two terms, because $x^2 + 6x + 9$ is equivalent to $(x + 3)^2$. Rewriting the number 4 as $9 - 5$ in the given expression yields $x^2 + 6x + 9 - 5$, which is equivalent to $(x + 3)^2 - 5$.

Choice A is incorrect. Squaring the binomial and simplifying the expression in option A gives $x^2 + 6x + 9 + 5$. Combining like terms gives $x^2 + 6x + 14$, not $x^2 + 6x + 4$. Choice C is incorrect. Squaring the binomial and simplifying the expression in choice C gives $x^2 - 6x + 9 + 5$. Combining like terms gives $x^2 - 6x + 14$, not $x^2 + 6x + 4$. Choice D is incorrect. Squaring the binomial and simplifying, the expression in choice D gives $x^2 - 6x + 9 - 5$. Combining like terms gives $x^2 - 6x + 4$, not $x^2 + 6x + 4$.

QUESTION 8.

Choice C is correct. Ken earned \$8 per hour for the first 10 hours he worked, so he earned a total of \$80 for the first 10 hours he worked. For the rest of the week, Ken was paid at the rate of \$10 per hour. Let x be the number of hours he will work for the rest of the week. The total of Ken's earnings, in dollars, for the week will be $10x + 80$. He saves

90% of his earnings each week, so this week he will save $0.9(10x + 80)$ dollars. The inequality $0.9(10x + 80) \geq 270$ represents the condition that he will save at least $270 for the week. Factoring 10 out of the expression $10x + 80$ gives $10(x + 8)$. The product of 10 and 0.9 is 9, so the inequality can be rewritten as $9(x + 8) \geq 270$. Dividing both sides of this inequality by 9 yields $x + 8 \geq 30$, so $x \geq 22$. Therefore, the least number of hours Ken must work the rest of the week to save at least $270 for the week is 22.

Choices A and B are incorrect because Ken can save $270 by working fewer hours than 38 or 33 for the rest of the week. Choice D is incorrect. If Ken worked 16 hours for the rest of the week, his total earnings for the week will be $80 + $160 = $240, which is less than $270. Since he saves only 90% of his earnings each week, he would save even less than $240 for the week.

QUESTION 9.

Choice B is correct. Marisa will hire x junior directors and y senior directors. Since she needs to hire at least 10 staff members, $x + y \geq 10$. Each junior director will be paid $640 per week, and each senior director will be paid $880 per week. Marisa's budget for paying the new staff is no more than $9,700 per week; in terms of x and y, this condition is $640x + 880y \leq 9{,}700$. Since Marisa must hire at least 3 junior directors and at least 1 senior director, it follows that $x \geq 3$ and $y \geq 1$. All four of these conditions are represented correctly in choice B.

Choices A and C are incorrect. For example, the first condition, $640x + 880y \geq 9{,}700$, in each of these options implies that Marisa can pay the new staff members more than her budget of $9,700. Choice D is incorrect because Marisa needs to hire at least 10 staff members, not at most 10 staff members, as the inequality $x + y \leq 10$ implies.

QUESTION 10.

Choice B is correct. In general, a binomial of the form $x + f$, where f is a constant, is a factor of a polynomial when the remainder of dividing the polynomial by $x + f$ is 0. Let R be the remainder resulting from the division of the polynomial $P(x) = ax^3 + bx^2 + cx + d$ by $x + 1$. So the polynomial $P(x)$ can be rewritten as $P(x) = (x + 1)q(x) + R$, where $q(x)$ is a polynomial of second degree and R is a constant. Since -1 is a root of the equation $P(x) = 0$, it follows that $P(-1) = 0$.

Since $P(-1) = 0$ and $P(-1) = R$, it follows that $R = 0$. This means that $x + 1$ is a factor of $P(x)$.

Choices A, C, and D are incorrect because none of these choices can be a factor of the polynomial $P(x) = ax^3 + bx^2 + cx + d$. For example, if $x - 1$ were a factor (choice A), then $P(x) = (x - 1)h(x)$, for some polynomial function h. It follows that $P(1) = (1 - 1)h(1) = 0$, so 1 would be another root of the given equation, and thus the given equation would have at least 4 roots. However, a third-degree equation cannot have more than three roots. Therefore, $x - 1$ cannot be a factor of $P(x)$.

QUESTION 11.

Choice D is correct. For $x > 1$ and $y > 1$, $x^{\frac{1}{3}}$ and $y^{\frac{1}{2}}$ are equivalent to $\sqrt[3]{x}$ and $\sqrt{y}$, respectively. Also, x^{-2} and y^{-1} are equivalent to $\frac{1}{x^2}$ and $\frac{1}{y}$, respectively. Using these equivalences, the given expression can be rewritten as $\frac{y\sqrt{y}}{x^2\sqrt[3]{x}}$.

Choices A, B, and C are incorrect because these choices are not equivalent to the given expression for $x > 1$ and $y > 1$.

For example, for $x = 2$ and $y = 2$, the value of the given expression is $2^{-\frac{5}{6}}$; the values of the choices, however, are $2^{-\frac{1}{3}}$, $2^{\frac{5}{6}}$, and 1, respectively.

QUESTION 12.

Choice B is correct. The graph of a quadratic function in the xy-plane is a parabola. The axis of symmetry of the parabola passes through the vertex of the parabola. Therefore, the vertex of the parabola and the midpoint of the segment between the two x-intercepts of the graph have the same x-coordinate. Since $f(-3) = f(-1) = 0$, the x-coordinate of the vertex is $\frac{(-3) + (-1)}{2} = -2$. Of the shown intervals, only the interval in choice B contains -2.

Choices A, C, and D are incorrect and may result from either calculation errors or misidentification of the graph's x-intercepts.

QUESTION 13.

Choice D is correct. The numerator of the given expression can be rewritten in terms of the denominator, $x - 3$, as follows: $x^2 - 2x - 5 = x^2 - 3x + x - 3 - 2$, which is equivalent to $x(x - 3) + (x - 3) - 2$. So the given expression is equivalent to $\frac{x(x-3) + (x-3) - 2}{x-3} = \frac{x(x-3)}{x-3} + \frac{x-3}{x-3} - \frac{2}{x-3}$. Since the given expression is defined for $x \neq 3$, the expression can be rewritten as $x + 1 - \frac{2}{x-3}$.

Long division can also be used as an alternate approach.

Choices A, B, and C are incorrect and may result from errors made when dividing the two polynomials or making use of structure.

QUESTION 14.

Choice A is correct. If x is the width, in inches, of the box, then the length of the box is $2.5x$ inches. It follows that the perimeter of the base is $2(2.5x + x)$, or $7x$ inches. The height of the box is given to be 60 inches. According to the restriction, the sum of the perimeter of the base and the height of the box should not exceed 130 inches. Algebraically, that is $7x + 60 \leq 130$, or $7x \leq 70$. Dividing both sides of the inequality by 7 gives $x \leq 10$. Since x represents the width of the box, x must also be a positive number. Therefore, the inequality $0 < x \leq 10$ represents all the allowable values of x that satisfy the given conditions.

Choices B, C, and D are incorrect and may result from calculation errors or misreading the given information.

QUESTION 15.

Choice D is correct. Factoring out the coefficient $\frac{1}{3}$, the given expression can be rewritten as $\frac{1}{3}(x^2 - 6)$. The expression $x^2 - 6$ can be approached as a difference of squares and rewritten as $(x - \sqrt{6})(x + \sqrt{6})$. Therefore, k must be $\sqrt{6}$.

Choice A is incorrect. If k were 2, then the expression given would be rewritten as $\frac{1}{3}(x - 2)(x + 2)$, which is equivalent to $\frac{1}{3}x^2 - \frac{4}{3}$, not $\frac{1}{3}x^2 - 2$. Choice B is incorrect. This may result from incorrectly factoring the expression and finding $(x - 6)(x + 6)$ as the factored form of the expression. Choice C is incorrect. This may result from incorrectly distributing the $\frac{1}{3}$ and rewriting the expression as $\frac{1}{3}(x^2 - 2)$.

QUESTION 16.

The correct answer is 8. The expression $2x + 8$ contains a factor of $x + 4$. It follows that the original equation can be rewritten as $2(x + 4) = 16$. Dividing both sides of the equation by 2 gives $x + 4 = 8$.

QUESTION 17.

The correct answer is 30. It is given that the measure of $\angle QPR$ is 60°. Angle MPR and $\angle QPR$ are collinear and therefore are supplementary angles. This means that the sum of the two angle measures is 180°, and so the measure of $\angle MPR$ is 120°. The sum of the angles in a triangle is 180°. Subtracting the measure of $\angle MPR$ from 180° yields the sum of the other angles in the triangle MPR. Since $180 - 120 = 60$, the sum of the measures of $\angle QMR$ and $\angle NRM$ is 60°. It is given that $MP = PR$, so it follows that triangle MPR is isosceles. Therefore $\angle QMR$ and $\angle NRM$ must be congruent. Since the sum of the measure of these two angles is 60°, it follows that the measure of each angle is 30°.

An alternate approach would be to use the exterior angle theorem, noting that the measure of $\angle QPR$ is equal to the sum of the measures of $\angle QMR$ and $\angle NRM$. Since both angles are equal, each of them has a measure of 30°.

QUESTION 18.

The correct answer is 4. There are π radians in a 180° angle. A 720° angle is 4 times greater than a 180° angle. Therefore, the number of radians in a 720° angle is 4π.

QUESTION 19.

The correct answer is 8. Since the line passes through the point (2, 0), its equation is of the form $y = m(x - 2)$. The coordinates of the point (1, 4) must also satisfy this equation. So $4 = m(1 - 2)$, or $m = -4$. Substituting -4 for m in the equation of the line gives $y = -4(x - 2)$, or equivalently $y = -4x + 8$. Therefore, $b = 8$.

Alternate approach: Given the coordinates of two points through which the line passes, the slope of the line is $\frac{4 - 0}{1 - 2} = -4$. So, the equation of the line is of the form $y = -4x + b$. Since (2, 0) satisfies this equation, $0 = -4(2) + b$ must be true. Solving this equation for b gives $b = 8$.

QUESTION 20.

The correct answer is 6632. Applying the distributive property to the expression yields $7532 + 100y^2 + 100y^2 - 1100$. Then adding together $7532 + 100y^2$ and $100y^2 - 1100$ and collecting like terms results in $200y^2 + 6432$. This is written in the form $ay^2 + b$, where $a = 200$ and $b = 6432$. Therefore $a + b = 200 + 6432 = 6632$.

Section 4: Math Test - Calculator

QUESTION 1.

Choice B is correct. There are 2 dogs that are fed only dry food and a total of 25 dogs. Therefore, the fraction of dogs fed only dry food is $\frac{2}{25}$.

Choice A is incorrect. This fraction is the number of dogs fed only dry food divided by the total number of pets instead of the total number of dogs. Choice C is incorrect because it is the fraction of all pets fed only dry food. Choice D is incorrect. This fraction is the number of dogs fed only dry food divided by the total number of pets fed only dry food.

QUESTION 2.

Choice A is correct. Applying the distributive property, the given expression can be rewritten as $x^2 - 3 + 3x^2 - 5$. Combining like terms yields $4x^2 - 8$.

Choice B is incorrect and is the result of disregarding the negative sign in front of the first 3 before combining like terms. Choice C is incorrect and is the result of not multiplying $-3x^2$ by -1 before combining like terms. Choice D is incorrect and is the result of disregarding the negative sign in front of the first 3 and not multiplying $-3x^2$ by -1 before combining like terms.

QUESTION 3.

Choice C is correct. Multiplying each side of 1 meter = 100 cm by 6 gives 6 meters = 600 cm. Each package requires 3 centimeters of tape. The number of packages that can be secured with 600 cm of tape is $\frac{600}{3}$, or 200 packages.

Choices A, B, and D are incorrect and may be the result of incorrect interpretations of the given information or of computation errors.

QUESTION 4.

Choice D is correct. The survey was given to a group of people who liked the book, and therefore, the survey results can be applied only to the population of people who liked the book. Choice D is the most appropriate inference from the survey results because it describes a conclusion about people who liked the book, and the results of the survey indicate that most people who like the book disliked the movie.

Choices A, B, and C are incorrect because none of these inferences can be drawn from the survey results. Choices A and B need not be true. The people surveyed all liked the book on which the movie was based, which is not true of all people who go see movies or all people who read books. Thus, the people surveyed are not representative of all people who go see movies or all people who read books. Therefore, the results of this survey cannot appropriately be extended to at least 95% of people who go see movies or to at least 95% of people who read books. Choice C need not be true because the sample includes only people who liked the book, and so the results do not extend to people who dislike the book.

QUESTION 5.

Choice C is correct. Substituting (1, 1) into the inequality gives $5(1) - 3(1) < 4$, or $2 < 4$, which is a true statement. Substituting (2, 5) into the inequality gives $5(2) - 3(5) < 4$, or $-5 < 4$, which is a true statement. Substituting (3, 2) into the inequality gives $5(3) - 3(2) < 4$, or $9 < 4$, which is not a true statement. Therefore, (1, 1) and (2, 5) are the only ordered pairs that satisfy the given inequality.

Choice A is incorrect because the ordered pair (2, 5) also satisfies the inequality. Choice B is incorrect because the ordered pair (1, 1) also satisfies the inequality. Choice D is incorrect because the ordered pair (3, 2) does not satisfy the inequality.

QUESTION 6.

Choice C is correct. Since $x = -3$ is a solution to the equation, substituting -3 for x gives $(-3a + 3)^2 = 36$. Taking the square root of each side of this equation gives the two equations $-3a + 3 = 6$ and $-3a + 3 = -6$. Solving each of these for a yields $a = -1$ and $a = 3$. Therefore, -1 is a possible value of a.

Choice A is incorrect and may be the result of ignoring the squared expression and solving $-3a + 3 = 36$ for a. Choice B is incorrect and may be the result of dividing 36 by 2 instead of taking the square root of 36 when solving for a. Choice D is incorrect and may be the result of taking the sum of the value of x, -3, and the constant, 3.

QUESTION 7.

Choice A is correct. The slope of the line of best fit is negative, meaning as the distance of planetoids from the Sun increases, the density of the planetoids decreases. Therefore, planetoids that are more distant from the Sun tend to have lesser densities.

Choice B is incorrect because as the distance of planetoids from the sun increases, the density of the planetoids decreases. Choice C is incorrect. For example, according to the line of best fit, a planetoid that is 0.8 AU from the Sun has a density of 5 g/cm^3, but a planetoid that is twice as far from the Sun with a distance of 1.6 AU has a density of 4.25 g/cm^3. However, the density of 4.25 g/cm^3 is not half the density of 5 g/cm^3. Choice D is incorrect because there is a relationship between the distance from a planetoid to the Sun and density, as shown by the line of best fit.

QUESTION 8.

Choice C is correct. According to the line of best fit, a planetoid with a distance from the Sun of 1.2 AU has a density between 4.5 g/cm^3 and 4.75 g/cm^3. The only choice in this range is 4.6.

Choices A, B, and D are incorrect and may result from misreading the information in the scatterplot.

QUESTION 9.

Choice A is correct. To isolate the terms that contain ax and b, 6 can be added to both sides of the equation, which gives $9ax + 9b = 27$. Then, both sides of this equation can be divided by 9, which gives $ax + b = 3$.

Choices B, C, and D are incorrect and may result from computation errors.

QUESTION 10.

Choice D is correct. There are 60 minutes in one hour, so an 8-hour workday has $(60)(8) = 480$ minutes. To calculate 15% of 480, multiply 0.15 by 480: $(0.15)(480) = 72$. Therefore, Lani spent 72 minutes of her workday in meetings.

Choice A is incorrect because 1.2 is 15% of 8, which gives the time Lani spent of her workday in meetings in hours, not minutes. Choices B and C are incorrect and may be the result of computation errors.

QUESTION 11.

Choice A is correct. The total number of copies of the game the company will ship is 75, so one equation in the system is $s + c = 75$, which can be written as $75 - s = c$. Because each standard edition of the game has a volume of 20 cubic inches and s represents the number of standard edition games, the expression $20s$ represents the volume of the shipment that comes from standard edition copies of the game. Similarly, the expression $30c$ represents the volume of the shipment that comes from collector's edition copies of the games. Because these volumes combined are 1,870 cubic inches, the equation $20s + 30c = 1{,}870$ represents this situation. Therefore, the correct answer is choice A.

Choice B is incorrect. This equation gives the volume of each standard edition game as 30 cubic inches and the volume of each collector's edition game as 20 cubic inches. Choice C is incorrect. This is the result of finding the average volume of the two types of games, using that average volume (25) for both types of games, and assuming that there are 75 more standard editions of the game than there are collector's editions of the game. Choice D is incorrect. This is the result of assuming that the volume of each standard edition game is 30 cubic inches, that the volume of each collector's edition game is 20 cubic inches, and that there are 75 more standard editions than there are collector's editions.

QUESTION 12.

Choice B is correct. Let x be the price, in dollars, of the jacket before sales tax. The price of the jacket after the 6% sales tax is added was \$53. This can be expressed by the equation $x + 0.06x = 53$, or $1.06x = 53$. Dividing each side of this equation by 1.06 gives $x = 50$. Therefore, the price of the jacket before sales tax was \$50.

Choices A, C, and D are incorrect and may be the result of computation errors.

QUESTION 13.

Choice B is correct. Theresa's speed was increasing from 0 to 5 minutes and from 20 to 25 minutes, which is a total of 10 minutes. Theresa's speed was decreasing from 10 minutes to 20 minutes and from 25 to 30 minutes, which is a total of 15 minutes. Therefore, Theresa's speed was NOT increasing for a longer period of time than it was decreasing.

Choice A is incorrect. Theresa ran at a constant speed for the 5-minute period from 5 to 10 minutes. Choice C is incorrect. Theresa's speed decreased at a constant rate during the last 5 minutes. Choice D is incorrect. Theresa's speed reached its maximum at 25 minutes, which is within the last 10 minutes.

QUESTION 14.

Choice D is correct. The figure is a quadrilateral, so the sum of the measures of its interior angles is 360°. The value of x can be found by using the equation $45 + 3x = 360$. Subtracting 45 from both sides of the equation results in $3x = 315$, and dividing both sides of the resulting equation by 3 yields $x = 105$. Therefore, the value of x in the figure is 105.

Choice A is incorrect. If the value of x were 45, the sum of the measures of the angles in the figure would be $45 + 3(45)$, or 180°, but the sum of the measures of the angles in a quadrilateral is 360°. Choice B is incorrect. If the value of x were 90, the sum of the measures of the angles in the figure would be $45 + 3(90)$, or 315°, but the sum of the measures of the angles in a quadrilateral is 360°. Choice C is incorrect. If the value of x were 100, the sum of the measures of the angles in the figure would be $45 + 3(100)$, or 345°, but the sum of the measures of the angles in a quadrilateral is 360°.

QUESTION 15.

Choice B is correct. A column of 50 stacked one-cent coins is about $3\frac{7}{8}$ inches tall, which is slightly less than 4 inches tall. Therefore a column of stacked one-cent coins that is 4 inches tall would contain slightly more than 50 one-cent coins. It can then be reasoned that because 8 inches is twice 4 inches, a column of stacked one-cent coins that is 8 inches tall would contain slightly more than twice as many coins; that is, slightly more than 100 one-cent coins. An alternate approach is to set up a proportion comparing the column height to the number of one-cent coins, or $\frac{3\frac{7}{8}\text{ inches}}{50\text{ coins}} = \frac{8\text{ inches}}{x\text{ coins}}$, where x is the number of coins in an 8-inch-tall column. Multiplying each side of the proportion by $50x$ gives $3\frac{7}{8}x = 400$. Solving for x gives $x = \frac{400 \times 8}{31}$, which is approximately 103. Therefore, of the given choices, 100 is closest to the number of one-cent coins it would take to build an 8-inch-tall column.

Choice A is incorrect. A column of 75 stacked one-cent coins would be slightly less than 6 inches tall. Choice C is incorrect. A column of 200 stacked one-cent coins would be more than 15 inches tall. Choice D is incorrect. A column of 390 stacked one-cent coins would be over 30 inches tall.

QUESTION 16.

Choice D is correct. If $\frac{b}{2} = 10$, then multiplying each side of this equation by 2 gives $b = 20$. Substituting 20 for b in the equation $a - b = 12$ gives $a - 20 = 12$. Adding 20 to each side of this equation gives $a = 32$. Since $a = 32$ and $b = 20$, it follows that the value of $a + b$ is $32 + 20$, or 52.

Choice A is incorrect. If the value of $a + b$ were less than the value of $a - b$, it would follow that b is negative. But if $\frac{b}{2} = 10$, then b must be positive. This contradiction shows that the value of $a + b$ cannot be 2. Choice B is incorrect. If the value of $a + b$ were equal to the value of $a - b$, then it would follow that $b = 0$. However, b cannot equal zero because it is given that $\frac{b}{2} = 10$. Choice C is incorrect. This is the value of a, but the question asks for the value of $a + b$.

QUESTION 17.

Choice A is correct. The y-intercept of the graph of $y = 19.99 + 1.50x$ in the xy-plane is the point on the graph with an x-coordinate equal to 0. In the model represented by the equation, the x-coordinate represents the number of miles a rental truck is driven during a one-day rental, and so the y-intercept represents the charge, in dollars, for the rental when the truck is driven 0 miles; that is, the y-intercept represents the cost, in dollars, of the flat fee. Since the y-intercept of the graph of $y = 19.99 + 1.50x$ is (0, 19.99), the y-intercept represents a flat fee of \$19.99 in terms of the model.

Choice B is incorrect. The slope of the graph of $y = 19.99 + 1.50x$ in the xy-plane, not the y-intercept, represents a driving charge per mile of \$1.50 in terms of the model. Choice C is incorrect. Since the coefficient of x in the equation is 1.50, the charge per mile for driving the rental truck is \$1.50, not \$19.99. Choice D is incorrect. The sum of 19.99 and 1.50, which is 21.49, represents the cost, in dollars, for renting the truck for one day and driving the truck 1 mile; however, the total daily charges for renting the truck does not need to be \$21.49.

QUESTION 18.

Choice B is correct. The charity with the greatest percent of total expenses spent on programs is represented by the highest point on the scatterplot; this is the point that has a vertical coordinate slightly less than halfway between 90 and 95 and a horizontal coordinate slightly less than halfway between 3,000 and 4,000. Thus, the charity represented by this point has a total income of about \$3,400 million and spends about 92% of its total expenses on programs. The percent predicted by the line of best fit is the vertical coordinate of the point on the line of best fit with horizontal coordinate \$3,400 million; this vertical coordinate is very slightly more than 85. Thus, the line of best fit predicts that the charity with the greatest percent of total expenses spent on programs will spend slightly more than 85% on programs. Therefore, the difference between the actual percent (92%) and the prediction (slightly more than 85%) is slightly less than 7%.

Choice A is incorrect. There is no charity represented in the scatterplot for which the difference between the actual percent of total expenses spent on programs and the percent predicted by the line of best fit is as much as 10%. Choices C and D are incorrect. These choices may result from misidentifying in the scatterplot the point that represents the charity with the greatest percent of total expenses spent on programs.

QUESTION 19.

Choice A is correct. Current's formula is $A = \frac{4 + w}{30}$. Multiplying each side of the equation by 30 gives $30A = 4 + w$. Subtracting 4 from each side of $30A = 4 + w$ gives $w = 30A - 4$.

Choices B, C, and D are incorrect and may result from errors in choosing and applying operations to isolate w as one side of the equation in Current's formula.

QUESTION 20.

Choice C is correct. If Mosteller's and Current's formulas give the same estimate for A, then the right-hand sides of these two equations are equal; that is, $\frac{\sqrt{hw}}{60} = \frac{4 + w}{30}$. Multiplying each side of this equation by 60 to isolate the expression $\sqrt{hw}$ gives $\sqrt{hw} = 60\left(\frac{4 + w}{30}\right)$ or $\sqrt{hw} = 2(4 + w)$. Therefore, if Mosteller's and Current's formulas give the same estimate for A, then $\sqrt{hw}$ is equivalent to $2(4 + w)$.

An alternate approach is to multiply the numerator and denominator of Current's formula by 2, which gives $\frac{2(4 + w)}{60}$. Since it is given that Mosteller's and Current's formulas give the same estimate for A, $\frac{2(4 + w)}{60} = \frac{\sqrt{hw}}{60}$. Therefore, $\sqrt{hw} = 2(4 + w)$.

Choices A, B, and D are incorrect and may result from errors in the algebraic manipulation of the equations.

QUESTION 21.

Option C is correct. The predicted increase in total fat, in grams, for every increase of 1 gram in total protein is represented by the slope of the line of best fit. Any two points on the line can be used to calculate the slope of the line as the change in total fat over the change in total protein. For instance, it can be estimated that the points (20, 34) and (30, 48) are on the line of best fit, and the slope of the line that passes through them is $\frac{48 - 34}{30 - 20} = \frac{14}{10}$, or 1.4. Of the choices given, 1.5 is the closest to the slope of the line of best fit.

Choices A, B, and D are incorrect and may be the result of incorrectly finding ordered pairs that lie on the line of best fit or of incorrectly calculating the slope.

QUESTION 22.

Choice B is correct. The median of a set of numbers is the middle value of the set values when ordered from least to greatest. If the percents in the table are ordered from least to greatest, the middle value is 27.9%. The difference between 27.9% and 26.95% is 0.95%.

Choice A is incorrect and may be the result of calculation errors or not finding the median of the data in the table correctly. Choice C is incorrect and may be the result of finding the mean instead of the median. Choice D is incorrect and may be the result of using the middle value of the unordered list.

QUESTION 23.

Choice C is correct. The total volume of the cylindrical can is found by multiplying the area of the base of the can, 75 cm^2, by the height of the can, 10 cm, which yields 750 cm^3. If the syrup needed to fill the can has a volume of 110 cm^3, then the remaining volume for the pieces of fruit is $750 - 110 = 640$ cm^3.

Choice A is incorrect because if the fruit had a volume of 7.5 cm^3, there would be $750 - 7.5 = 742.5$ cm^3 of syrup needed to fill the can to the top. Choice B is incorrect because if the fruit had a volume of 185 cm^3, there would be $750 - 185 = 565$ cm^3 of syrup needed to fill the can to the top. Choice D is incorrect because it is the total volume of the can, not just of the pieces of fruit.

QUESTION 24.

Choice A is correct. The variable t represents the seconds after the object is launched. Since $h(0) = 72$, this, means that the height, in feet, at 0 seconds, or the initial height, is 72 feet.

Choices B, C, and D are incorrect and may be the result of misinterpreting the function in context.

QUESTION 25.

Choice B is correct. The relationship between x food calories and k kilojoules can be modeled as a proportional relationship. Let (x_1, k_1) and (x_2, k_2) represent the values in the first two rows in the table: (4.0, 16.7) and (9.0, 37.7). The rate of change, or $\frac{(k_2 - k_1)}{(x_2 - x_1)}$, is $\frac{21}{5} = 4.2$; therefore, the equation that best represents the relationship between x and k is $k = 4.2x$.

Choice A is incorrect and may be the result of calculating the rate of change using $\frac{(x_2 - x_1)}{(k_2 - k_1)}$. Choice C is incorrect and may be the result of confusing the independent and dependent variables. Choice D is incorrect and may be the result of an error when setting up the equation.

QUESTION 26.

Choice B is correct. It is given that there are 4.0 food calories per gram of protein, 9.0 food calories per gram of fat, and 4.0 food calories per gram of carbohydrate. If 180 food calories in a granola bar came from p grams of protein, f grams of fat, and c grams of carbohydrate, then the situation can be represented by the equation $180 = 4p + 9f + 4c$. The equation can then be rewritten in terms of f by subtracting $4p$ and $4c$ from both sides of the equation and then dividing both sides of the equation by 9. The result is the equation $f = 20 - \frac{4}{9}(p + c)$.

Choices A, C, and D are incorrect and may be the result of not representing the situation with the correct equation or incorrectly rewriting the equation in terms of f.

QUESTION 27.

Choice A is correct. Because the world's population has grown at an average rate of 1.9% per year since 1945, it follows that the world's population has been growing by a constant factor of 1.019 since 1945. If the world's population in 1975 was about 4 billion, in 1976 the world's population would have been about 4(1.019); in 1977 the world's population would have been about 4(1.019)(1.019), or $4(1.019)^2$; and so forth. Therefore, the world's population, $P(t)$, t years since 1975 could be represented by the function $P(t) = 4(1.019)^t$.

Choice B is incorrect because it represents a 90% increase in population each year. Choices C and D are incorrect because they are linear models, which represent situations that have a constant growth.

QUESTION 28.

Choice C is correct. The line shown has a slope of $\frac{6 - 0}{3 - 0} = 2$ and a y-intercept of (0, 0); therefore, the equation of the line is $y = 2x$. This means that for each point on the line, the value of the y-coordinate is twice the value of the x-coordinate. Therefore, for the point (s, t), the ratio of t to s is 2 to 1.

Choice A is incorrect and would be the ratio of t to s if the slope of the line were $\frac{1}{3}$. Choice B is incorrect and would be the ratio of t to s if the slope of the line were $\frac{1}{2}$. Choice D is incorrect and would be the ratio of t to s if the slope of the line were 3.

QUESTION 29.

Choice D is correct. The circle with equation $(x + 3)^2 + (y - 1)^2 = 25$ has center (–3, 1) and radius 5. For a point to be inside of the circle, the distance from that point to the center must be less than the radius, 5. The distance between (3, 2) and (–3, 1) is $\sqrt{(-3 - 3)^2 + (1 - 2)^2} = \sqrt{(-6)^2 + (-1)^2} = \sqrt{37}$, which is greater than 5. Therefore, (3, 2) does NOT lie in the interior of the circle.

Choice A is incorrect. The distance between (–7, 3) and (–3, 1) is $\sqrt{(-7+3)^2+(3-1)^2} = \sqrt{(-4)^2+(2)^2} = \sqrt{20}$, which is less than 5, and therefore (–7, 3) lies in the interior of the circle. Choice B is incorrect because it is the center of the circle. Choice C is incorrect because the distance between (0, 0) and (–3, 1) is $\sqrt{(0+3)^2+(0-1)^2} = \sqrt{(3)^2+(1)^2} = \sqrt{8}$, which is less than 5, and therefore (0, 0) lies in the interior of the circle.

QUESTION 30.

Choice B is correct. The percent increase from 2012 to 2013 was $\frac{5{,}880 - 5{,}600}{5{,}600} = 0.05$, or 5%. Since the percent increase from 2012 to 2013 was estimated to be double the percent increase from 2013 to 2014, the percent increase from 2013 to 2014 was expected to be 2.5%. Therefore, the number of subscriptions sold in 2014 is expected to be the number of subscriptions sold in 2013 multiplied by (1 + 0.025), or 5,880(1.025) = 6,027.

Choices A and C are incorrect and may be the result of a conceptual or calculation error. Choice D is incorrect and is the result of interpreting the percent increase from 2013 to 2014 as double the percent increase from 2012 to 2013.

QUESTION 31.

The correct answer is 195. Since the mass of gold was worth \$62,400 and each ounce of gold was worth \$20, the mass of the gold was $\frac{62{,}400}{20} = 3120$ ounces. Since 1 pound = 16 ounces, 3120 ounces is equivalent to $\frac{3120}{16} = 195$ pounds.

QUESTION 32.

The correct answer is $\frac{2}{5}$. The slope of the line can be found by selecting any two points (x_1, y_1) and (x_2, y_2) on the line and then dividing the difference of the y-coordinates $(y_2 - y_1)$ by the difference of the x-coordinates $(x_2 - x_1)$. Using the points $\left(-6, -\frac{27}{5}\right)$ and $\left(9, \frac{3}{5}\right)$, the slope is $\frac{\frac{3}{5} - \left(-\frac{27}{5}\right)}{9 - (-6)} = \frac{\frac{30}{5}}{15}$. This can be rewritten as $\frac{6}{15}$, which reduces to $\frac{2}{5}$. Any of the following equivalent expressions can be gridded as the correct answer: 2/5, .4, .40, .400, 4/10, 8/20.

QUESTION 33.

The correct answer is 30. Let x represent the number of correct answers from the player and y represent the number of incorrect answers from the player. Since the player answered 40 questions in total, the equation $x + y = 40$ represents this situation. Also, since the score is found by subtracting the number of incorrect answers from twice the number of correct answers and the player received a score of 50, the equation $2x - y = 50$ represents this situation. Adding the system of two equations together yields $(x + y) + (2x - y) = 40 + 50$. This can be rewritten as $3x = 90$. Finally, solving for x by dividing both sides of the equation by 3 yields $x = 30$.

QUESTION 34.

The correct answer is $\frac{5}{18}$. There are 360° in a circle, and it is shown that the central angle of the shaded region is 100°. Therefore, the area of the shaded region can be represented as a fraction of the area of the entire circle, $\frac{100}{360}$, which can be reduced to $\frac{5}{18}$. Either 5/18, .277, or .288 can be gridded as the correct answer.

QUESTION 35.

The correct answer is 0 or 3. For an ordered pair to satisfy a system of equations, both the x- and y-values of the ordered pair must satisfy each equation in the system. Both expressions on the right-hand side of the given equations are equal to y, therefore it follows that both expressions on the right-hand side of the equations are equal to each other: $x^2 - 4x + 4 = 4 - x$. This equation can be rewritten as $x^2 - 3x = 0$, and then through factoring, the equation becomes $x(x - 3) = 0$. Because the product of the two factors is equal to 0, it can be concluded that either $x = 0$ or $x - 3 = 0$, or rather, $x = 0$ or $x = 3$.

QUESTION 36.

The correct answer is 6. Since $\tan B = \frac{3}{4}$, ΔABC and ΔDBE are both 3-4-5 triangles. This means that they are both similar to the right triangle with sides of lengths 3, 4, and 5. Since $BC = 15$, which is 3 times as long as the hypotenuse of the 3-4-5 triangle, the similarity ratio of ΔABC to the 3-4-5 triangle is 3:1. Therefore, the length of $\overline{AC}$ (the side opposite to B) is $3 \times 3 = 9$, and the length of $\overline{AB}$ (the side adjacent to angle B) is $4 \times 3 = 12$. It is also given that $DA = 4$. Since $AB = DA + DB$ and $AB = 12$, it follows that $DB = 8$, which means that the similarity ratio of ΔDBE to the 3-4-5 triangle is 2:1 ($\overline{DB}$ is the side adjacent to angle B). Therefore, the length of $\overline{DE}$, which is the side opposite to angle B, is $3 \times 2 = 6$.

QUESTION 37.

The correct answer is 2.4. The mean score of the 20 contestants on Day 1 is found by dividing the sum of the total scores of the contestants by the number of contestants. It is given that each contestant received 1 point for each correct answer. The table shows that on Day 1, 2 contestants each answered 5 questions correctly, so those 2 contestants scored 10 points in total ($2 \times 5 = 10$). Similarly, the table shows 3 contestants each answered 4 questions correctly, so those 3 contestants scored 12 points in total ($3 \times 4 = 12$). Continuing these calculations reveals that the 4 contestants who answered 3 questions correctly scored 12 points in total ($4 \times 3 = 12$);

the 6 contestants who answered 2 questions correctly scored 12 points in total ($6 \times 2 = 12$); the 2 contestants who answered 1 question correctly scored 2 points in total ($2 \times 1 = 2$); and the 3 contestants who answered 0 questions correctly scored 0 points in total ($3 \times 0 = 0$). Adding up the total of points scored by these 20 contestants gives $10 + 12 + 12 + 12 + 2 + 0 = 48$. Therefore, the mean score of the contestants is $\frac{48}{20} = 2.4$. Either 12/5, 2.4, or 2.40 can be gridded as the correct answer.

QUESTION 38.

The correct answer is $\frac{5}{7}$. It is given that no contestant received the same score on two different days, so each of the contestants who received a score of 5 is represented in the "5 out of 5" column of the table exactly once. Therefore, the probability of selecting a contestant who received a score of 5 on Day 2 or Day 3, given that the contestant received a score of 5 on one of the three days, is found by dividing the total number of contestants who received a score of 5 on Day 2 or Day 3 ($2 + 3 = 5$) by the total number of contestants who received a score of 5, which is given in the table as 7. So the probability is $\frac{5}{7}$. Either 5/7 or .714 can be gridded as the correct answer.