Choices B, C, and D are incorrect because each provides a statement that does not logically connect to the examples that follow.

QUESTION 43.

Choice D is the best answer. It accurately states that the information in the proposed additional sentence is not related to formal portraits of cats, the main topic of the paragraph.

Choices A, B, and C are incorrect because each fails to recognize that the proposed sentence interrupts the logical development of the paragraph.

QUESTION 44.

Choice D is the best answer. The tone corresponds with that established in the passage, and the phrasing appropriately focuses on the cats' contribution to protecting artwork rather than on simply killing rodents.

Choices A, B, and C are incorrect because none makes explicit the link between the cats' hunting activities and the service to the museum.

Section 3: Math Test — No Calculator

QUESTION 1.

Choice C is correct. The painter's fee is given by $nK\ell h$, where n is the number of walls, K is a constant with units of dollars per square foot, ℓ is the length of each wall in feet, and h is the height of each wall in feet. Examining this equation shows that ℓ and h will be used to determine the area of each wall. The variable n is the number of walls, so n times the area of the walls will give the amount of area that will need to be painted. The only remaining variable is K, which represents the cost per square foot and is determined by the painter's time and the price of paint. Therefore, K is the only factor that will change if the customer asks for a more expensive brand of paint.

Choice A is incorrect because a more expensive brand of paint would not cause the height of each wall to change. Choice B is incorrect because a more expensive brand of paint would not cause the length of each wall to change. Choice D is incorrect because a more expensive brand of paint would not cause the number of walls to change.

QUESTION 2.

Choice D is correct. Dividing each side of the equation $3r = 18$ by 3 gives $r = 6$. Substituting 6 for r in the expression $6r + 3$ gives $6(6) + 3 = 39$.

Alternatively, the expression $6r + 3$ can be rewritten as $2(3r) + 3$. Substituting 18 for $3r$ in the expression $2(3r) + 3$ yields $2(18) + 3 = 36 + 3 = 39$.

Choice A is incorrect because 6 is the value of r; however, the question asks for the value of the expression $6r + 3$. Choices B and C are incorrect because if $6r + 3$ were equal to either of these values, then it would not be possible for $3r$ to be equal to 18, as stated in the question.

QUESTION 3.

Choice D is correct. By definition, $a^{\frac{m}{n}} = \sqrt[n]{a^m}$ for any positive integers m and n. It follows, therefore, that $a^{\frac{2}{3}} = \sqrt[3]{a^2}$.

Choice A is incorrect. By definition, $a^{\frac{1}{n}} = \sqrt[n]{a}$ for any positive integer n. Applying this definition as well as the power property of exponents to the expression $\sqrt{a^{\frac{1}{3}}}$ yields $\sqrt{a^{\frac{1}{3}}} = \left(a^{\frac{1}{3}}\right)^{\frac{1}{2}} = a^{\frac{1}{6}}$. Because $a^{\frac{1}{6}} \neq a^{\frac{2}{3}}$, $\sqrt{a^{\frac{1}{3}}}$ is not the correct answer. Choice B is incorrect. By definition, $a^{\frac{1}{n}} = \sqrt[n]{a}$ for any positive integer n. Applying this definition as well as the power property of exponents to the expression $\sqrt{a^3}$ yields $\sqrt{a^3} = (a^3)^{\frac{1}{2}} = a^{\frac{3}{2}}$. Because $a^{\frac{3}{2}} \neq a^{\frac{2}{3}}$, $\sqrt{a^3}$ is not the correct answer. Choice C is incorrect. By definition, $a^{\frac{1}{n}} = \sqrt[n]{a}$ for any positive integer n. Applying this definition as well as the power property of exponents to the expression $\sqrt[3]{a^{\frac{1}{2}}}$ yields $\sqrt[3]{a^{\frac{1}{2}}} = \left(a^{\frac{1}{2}}\right)^{\frac{1}{3}} = a^{\frac{1}{6}}$. Because $a^{\frac{1}{6}} \neq a^{\frac{2}{3}}$, $\sqrt[3]{a^{\frac{1}{2}}}$ is not the correct answer.

QUESTION 4.

Choice B is correct. To fit the scenario described, 30 must be twice as large as x. This can be written as $2x = 30$.

Choices A, C, and D are incorrect. These equations do not correctly relate the numbers and variables described in the stem. For example, the expression in choice C states that 30 is half as large as x, not twice as large as x.

QUESTION 5.

Choice C is correct. Multiplying each side of $\dfrac{5}{x} = \dfrac{15}{x + 20}$ by $x(x + 20)$ gives $15x = 5(x + 20)$. Distributing the 5 over the values within the parentheses yields $15x = 5x + 100$, and then subtracting $5x$ from each side gives $10x = 100$. Finally, dividing both sides by 10 gives $x = 10$. Therefore, the value of $\dfrac{x}{5}$ is $\dfrac{10}{5} = 2$.

Choice A is incorrect because it is the value of x, not $\dfrac{x}{5}$. Choices B and D are incorrect and may be the result of errors in arithmetic operations on the given equation.

QUESTION 6.

Choice C is correct. Multiplying each side of the equation $2x - 3y = -14$ by 3 gives $6x - 9y = -42$. Multiplying each side of the equation $3x - 2y = -6$ by 2 gives $6x - 4y = -12$. Then, subtracting the sides of $6x - 4y = -12$ from the corresponding sides of $6x - 9y = -42$ gives $-5y = -30$. Dividing each side of the equation $-5y = -30$ by -5 gives $y = 6$. Finally, substituting 6 for y in $2x - 3y = -14$ gives $2x - 3(6) = -14$, or $x = 2$. Therefore, the value of $x - y$ is $2 - 6 = -4$.

Alternatively, adding the corresponding sides of $2x - 3y = -14$ and $3x - 2y = -6$ gives $5x - 5y = -20$, from which it follows that $x - y = -4$.

Choices A, B, and D are incorrect and may be the result of an arithmetic error when solving the system of equations.

QUESTION 7.

Choice C is correct. If $x - b$ is a factor of $f(x)$, then $f(b)$ must equal 0. Based on the table, $f(4) = 0$. Therefore, $x - 4$ must be a factor of $f(x)$.

Choice A is incorrect because $f(2) \neq 0$; choice B is incorrect because no information is given about the value of $f(3)$, so $x - 3$ may or may not be a factor of $f(x)$; and choice D is incorrect because $f(5) \neq 0$.

QUESTION 8.

Choice A is correct. The linear equation $y = kx + 4$ is in slope-intercept form, and so the slope of the line is k. Since the line contains the point (c, d), the coordinates of this point satisfy the equation $y = kx + 4$: $d = kc + 4$. Solving this equation for the slope, k, gives $k = \dfrac{d - 4}{c}$.

Choices B, C, and D are incorrect and may be the result of errors in substituting the coordinates of (c, d) in $y = kx + 4$ or of errors in solving for k in the resulting equation.

QUESTION 9.

Choice A is correct. If a system of two linear equations has no solution, then the lines represented by the equations in the coordinate plane are parallel. The equation $kx - 3y = 4$ can be rewritten as $y = \dfrac{k}{3}x - \dfrac{4}{3}$, where $\dfrac{k}{3}$ is the slope of the line, and the equation $4x - 5y = 7$ can be rewritten as $y = \dfrac{4}{5}x - \dfrac{7}{5}$, where $\dfrac{4}{5}$ is the slope of the line. If two lines are parallel, then the slopes of the line are equal. Therefore, $\dfrac{4}{5} = \dfrac{k}{3}$, or $k = \dfrac{12}{5}$. (Since the y-intercepts of the lines represented by the equations are $-\dfrac{4}{3}$ and $-\dfrac{7}{5}$, the lines are parallel, not identical.)

Choices B, C, and D are incorrect and may be the result of a computational error when rewriting the equations or solving the equation representing the equality of the slopes for k.

QUESTION 10.

Choice A is correct. Substituting 25 for y in the equation $y = (x - 11)^2$ gives $25 = (x - 11)^2$. It follows that $x - 11 = 5$ or $x - 11 = -5$, so the x-coordinates of the two points of intersection are $x = 16$ and $x = 6$, respectively. Since both points of intersection have a y-coordinate of 25, it follows that the two points are (16, 25) and (6, 25). Since these points lie on the horizontal line $y = 25$, the distance between these points is the positive difference of the x-coordinates: $16 - 6 = 10$.

Choices B, C, and D are incorrect and may be the result of an error in solving the quadratic equation that results when substituting 25 for y in the given quadratic equation.

QUESTION 11.

Choice B is correct. Since the angles marked $y°$ and $u°$ are vertical angles, $y = u$. Subtracting the sides of $y = u$ from the corresponding sides of $x + y = u + w$ gives $x = w$. Since the angles marked $w°$ and $z°$ are vertical angles, $w = z$. Therefore, $x = z$, and so I must be true.

The equation in II need not be true. For example, if $x = w = z = t = 70$ and $y = u = 40$, then all three pairs of vertical angles in the figure have equal measure and the given condition $x + y = u + w$ holds. But it is not true in this case that y is equal to w. Therefore, II need not be true.

Since the top three angles in the figure form a straight angle, it follows that $x + y + z = 180$. Similarly, $w + u + t = 180$, and so $x + y + z = w + u + t$. Subtracting the sides of the given equation $x + y = u + w$ from the corresponding sides of $x + y + z = w + u + t$ gives $z = t$. Therefore, III must be true. Since only I and III must be true, the correct answer is choice B.

Choices A, C, and D are incorrect because each of these choices includes II, which need not be true.

QUESTION 12.

Choice A is correct. The parabola with equation $y = a(x - 2)(x + 4)$ crosses the x-axis at the points (−4, 0) and (2, 0). The x-coordinate of the vertex of the parabola is halfway between the x-coordinates of (−4, 0) and (2, 0). Thus, the x-coordinate of the vertex is $\frac{-4 + 2}{2} = -1$. This is the value of c. To find the y-coordinate of the vertex, substitute −1 for x in $y = a(x - 2)(x + 4)$:
$y = a(x - 2)(x + 4) = a(-1 - 2)(-1 + 4) = a(-3)(3) = -9a$.

Therefore, the value of d is $-9a$.

Choice B is incorrect because the value of the constant term in the equation is not the *y*-coordinate of the vertex, unless there were no linear terms in the quadratic. Choice C is incorrect and may be the result of a sign error in finding the *x*-coordinate of the vertex. Choice D is incorrect because the negative of the coefficient of the linear term in the quadratic is not the *y*-coordinate of the vertex.

QUESTION 13.

Choice B is correct. Since $24x^2 + 25x - 47$ divided by $ax - 2$ is equal to $-8x - 3$ with remainder -53, it is true that $(-8x - 3)(ax - 2) - 53 = 24x^2 + 25x - 47$. (This can be seen by multiplying each side of the given equation by $ax - 2$). This can be rewritten as $-8ax^2 + 16x - 3ax = 24x^2 + 25x - 47$. Since the coefficients of the x^2-term have to be equal on both sides of the equation, $-8a = 24$, or $a = -3$.

Choices A, C, and D are incorrect and may be the result of either a conceptual misunderstanding or a computational error when trying to solve for the value of *a*.

QUESTION 14.

Choice A is correct. Dividing each side of the given equation by 3 gives the equivalent equation $x^2 + 4x + 2 = 0$. Then using the quadratic formula, $\dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$, with $a = 1$, $b = 4$, and $c = 2$, gives the solutions $x = -2 \pm \sqrt{2}$.

Choices B, C, and D are incorrect and may be the result of errors when applying the quadratic formula.

QUESTION 15.

Choice D is correct. If *C* is graphed against *F*, the slope of the graph is equal to $\dfrac{5}{9}$ degrees Celsius/degrees Fahrenheit, which means that for an increase of 1 degree Fahrenheit, the increase is $\dfrac{5}{9}$ of 1 degree Celsius. Thus, statement I is true. This is the equivalent to saying that an increase of 1 degree Celsius is equal to an increase of $\dfrac{9}{5}$ degrees Fahrenheit. Since $\dfrac{9}{5} = 1.8$, statement II is true. On the other hand, statement III is not true, since a temperature increase of $\dfrac{9}{5}$ degrees Fahrenheit, not $\dfrac{5}{9}$ degree Fahrenheit, is equal to a temperature increase of 1 degree Celsius.

Choices A, B, and C are incorrect because each of these choices omits a true statement or includes a false statement.

QUESTION 16.

The correct answer is either 1 or 2. The given equation can be rewritten as $x^5 - 5x^3 + 4x = 0$. Since the polynomial expression on the left has no constant term, it has x as a factor: $x(x^4 - 5x^2 + 4) = 0$. The expression in parentheses is a quadratic equation in x^2 that can be factored, giving $x(x^2 - 1)(x^2 - 4) = 0$. This further factors as $x(x - 1)(x + 1)(x - 2)(x + 2) = 0$. The solutions for x are $x = 0$, $x = 1$, $x = -1$, $x = 2$, and $x = -2$. Since it is given that $x > 0$, the possible values of x are $x = 1$ and $x = 2$. Either 1 or 2 may be gridded as the correct answer.

QUESTION 17.

The correct answer is 2. First, clear the fractions from the given equation by multiplying each side of the equation by 36 (the least common multiple of 4, 9, and 12). The equation becomes $28x - 16x = 9 + 15$. Combining like terms on each side of the equation yields $12x = 24$. Finally, dividing both sides of the equation by 12 yields $x = 2$.

Alternatively, since $\frac{7}{9}x - \frac{4}{9}x = \frac{3}{9}x = \frac{1}{3}x$ and $\frac{1}{4} + \frac{5}{12} = \frac{3}{12} + \frac{5}{12} = \frac{8}{12} = \frac{2}{3}$, the given equation simplifies to $\frac{1}{3}x = \frac{2}{3}$. Multiplying each side of $\frac{1}{3}x = \frac{2}{3}$ by 3 yields $x = 2$.

QUESTION 18.

The correct answer is 105. Since $180 - z = 2y$ and $y = 75$, it follows that $180 - z = 150$, and so $z = 30$. Thus, each of the base angles of the isosceles triangle on the right has measure $\frac{180° - 30°}{2} = 75°$. Therefore, the measure of the angle marked $x°$ is $180° - 75° = 105°$, and so the value of x is 105.

QUESTION 19.

The correct answer is 370. A system of equations can be used where h represents the number of calories in a hamburger and f represents the number of calories in an order of fries. The equation $2h + 3f = 1700$ represents the fact that 2 hamburgers and 3 orders of fries contain a total of 1700 calories, and the equation $h = f + 50$ represents the fact that one hamburger contains 50 more calories than an order of fries. Substituting $f + 50$ for h in $2h + 3f = 1700$ gives $2(f + 50) + 3f = 1700$. This equation can be solved as follows:

$$2f + 100 + 3f = 1700$$
$$5f + 100 = 1700$$
$$5f = 1600$$
$$f = 320$$

The number of calories in an order of fries is 320, so the number of calories in a hamburger is 50 more than 320, or 370.

QUESTION 20.

The correct answer is $\frac{3}{5}$ or .6. Triangle ABC is a right triangle with its right angle at B. Thus, $\overline{AC}$ is the hypotenuse of right triangle ABC, and $\overline{AB}$ and $\overline{BC}$ are the legs of right triangle ABC. By the Pythagorean theorem, $AB = \sqrt{20^2 - 16^2} = \sqrt{400 - 256} = \sqrt{144} = 12$. Since triangle DEF is similar to triangle ABC, with vertex F corresponding to vertex C, the measure of angle F equals the measure of angle C. Thus, $\sin F = \sin C$. From the side lengths of triangle ABC, $\sin C = \dfrac{\text{opposite side}}{\text{hypotenuse}} = \dfrac{AB}{AC} = \dfrac{12}{20} = \dfrac{3}{5}$. Therefore, $\sin F = \dfrac{3}{5}$. Either $\frac{3}{5}$ or its decimal equivalent, .6, may be gridded as the correct answer.

Section 4: Math Test – Calculator

QUESTION 1.

Choice C is correct. Marilyn's distance from her campsite remained the same during the time she ate lunch. This is represented by a horizontal segment in the graph. The only horizontal segment in the graph starts at a time of about 1:10 P.M. and ends at about 1:40 P.M. Therefore, Marilyn finished her lunch and continued her hike at about 1:40 P.M.

Choices A, B, and D are incorrect and may be the result of a misinterpretation of the graph. For example, choice B is the time Marilyn started her lunch, and choice D is the time Marilyn was at the maximum distance from her campsite.

QUESTION 2.

Choice B is correct. Of the 25 people who entered the contest, there are 8 females under age 40 and 2 males age 40 or older. Therefore, the probability that the contest winner will be either a female under age 40 or a male age 40 or older is $\dfrac{8}{25} + \dfrac{2}{25} = \dfrac{10}{25}$.

Choice A is incorrect and may be the result of dividing 8 by 2, instead of adding 8 to 2, to find the probability. Choice C is incorrect; it is the probability that the contest winner will be either a female under age 40 or a female age 40 or older. Choice D is incorrect and may be the result of multiplying 8 and 2, instead of adding 8 and 2, to find the probability.

QUESTION 3.

Choice C is correct. Based on the graph, sales increased in the first 3 years since 1997, which is until year 2000, and then generally decreased thereafter.

Choices A, B, and D are incorrect; each of these choices contains inaccuracies in describing the general trend of music album sales from 1997 to 2000.