QUESTION 43.

Choice D is the best answer because it creates a complete and coherent sentence.

Choices A, B, and C are incorrect because each inserts an unnecessary relative pronoun or conjunction, resulting in a sentence without a main verb.

QUESTION 44.

Choice D is the best answer because it provides a possessive pronoun that is consistent with the sentence's plural subject "students," thus creating a grammatically sound sentence.

Choices A, B, and C are incorrect because each proposes a possessive pronoun that is inconsistent with the plural noun "students," the established subject of the sentence.

Section 3: Math Test — No Calculator

QUESTION 1.

Choice D is correct. Since $k = 3$, one can substitute 3 for k in the equation $\frac{x-1}{3} = k$, which gives $\frac{x-1}{3} = 3$. Multiplying both sides of $\frac{x-1}{3} = 3$ by 3 gives $x - 1 = 9$ and then adding 1 to both sides of $x - 1 = 9$ gives $x = 10$.

Choices A, B, and C are incorrect because the result of subtracting 1 from the value and dividing by 3 is not the given value of k, which is 3.

QUESTION 2.

Choice A is correct. To calculate $(7 + 3i) + (-8 + 9i)$, add the real parts of each complex number, $7 + (-8) = -1$, and then add the imaginary parts, $3i + 9i = 12i$. The result is $-1 + 12i$.

Choices B, C, and D are incorrect and likely result from common errors that arise when adding complex numbers. For example, choice B is the result of adding $3i$ and $-9i$, and choice C is the result of adding 7 and 8.

QUESTION 3.

Choice C is correct. The total number of messages sent by Armand is the 5 hours he spent texting multiplied by his rate of texting: m texts/hour $\times$ 5 hours $= 5m$ texts. Similarly, the total number of messages sent by Tyrone is the 4 hours he spent texting multiplied by his rate of texting: p texts/hour $\times$ 4 hours $= 4p$ texts. The total number of messages sent by Armand and Tyrone is the sum of the total number of messages sent by Armand and the total number of messages sent by Tyrone: $5m + 4p$.

Choice A is incorrect and arises from adding the coefficients and multiplying the variables of $5m$ and $4p$. Choice B is incorrect and is the result of multiplying $5m$ and $4p$. The total number of messages sent by Armand and Tyrone should be the sum of $5m$ and $4p$, not the product of these terms. Choice D is incorrect because it multiplies Armand's number of hours spent texting by Tyrone's rate of texting, and vice versa. This mix-up results in an expression that does not equal the total number of messages sent by Armand and Tyrone.

QUESTION 4.

Choice B is correct. The value 108 in the equation is the value of P in $P = 108 - 23\,d$ when $d = 0$. When $d = 0$, Kathy has worked 0 days that week. In other words, 108 is the number of phones left before Kathy has started work for the week. Therefore, the meaning of the value 108 in the equation is that Kathy starts each week with 108 phones to fix because she has worked 0 days and has 108 phones left to fix.

Choice A is incorrect because Kathy will complete the repairs when $P = 0$. Since $P = 108 - 23d$, this will occur when $0 = 108 - 23d$ or when $d = \frac{108}{23}$, not when $d = 108$. Therefore, the value 108 in the equation does not represent the number of days it will take Kathy to complete the repairs. Choices C and D are incorrect because the number 23 in $P = 108 - 23P = 108$ indicates that the number of phones left will decrease by 23 for each increase in the value of d by 1; in other words, that Kathy is repairing phones at a rate of 23 per day, not 108 per hour (choice C) or 108 per day (choice D).

QUESTION 5.

Choice C is correct. Only like terms, with the same variables and exponents, can be combined to determine the answer as shown here:

$$\begin{aligned}&(x^2y - 3y^2 + 5xy^2) - (-x^2y + 3xy^2 - 3y^2)\\&= (x^2y - (-x^2y)) + (-3y^2 - (-3y^2)) + (5xy^2 - 3xy^2)\\&= 2x^2y + 0 + 2xy^2\\&= 2x^2y + 2xy^2\end{aligned}$$

Choices A, B, and D are incorrect and are the result of common calculation errors or of incorrectly combining like and unlike terms.

QUESTION 6.

Choice A is correct. In the equation $h = 3a + 28.6$, if a, the age of the boy, increases by 1, then h becomes $h = 3(a + 1) + 28.6 = 3a + 3 + 28.6 = (3a + 28.6) + 3$. Therefore, the model estimates that the boy's height increases by 3 inches each year.

Alternatively: The height, h, is a linear function of the age, a, of the boy. The coefficient 3 can be interpreted as the rate of change of the function; in this case, the rate of change can be described as a change of 3 inches in height for every additional year in age.

Choices B, C, and D are incorrect and are likely to result from common errors in calculating the value of h or in calculating the difference between the values of h for different values of a.

QUESTION 7.

Choice B is correct. Since the right-hand side of the equation is P times the expression $\dfrac{\left(\dfrac{r}{1{,}200}\right)\left(1+\dfrac{r}{1{,}200}\right)^N}{\left(1+\dfrac{r}{1{,}200}\right)^N-1}$, multiplying both sides of the equation by the reciprocal of this expression results in $\dfrac{\left(1+\dfrac{r}{1{,}200}\right)^N-1}{\left(\dfrac{r}{1{,}200}\right)\left(1+\dfrac{r}{1{,}200}\right)^N}m = P$.

Choices A, C, and D are incorrect and are likely the result of conceptual or computation errors while trying to solve for P.

QUESTION 8.

Choice C is correct. Since $\frac{a}{b} = 2$, it follows that $\frac{b}{a} = \frac{1}{2}$. Multiplying both sides of the equation by 4 gives $4\left(\frac{b}{a}\right) = \frac{4b}{a} = 2$.

Choice A is incorrect because if $\frac{4b}{a} = 0$, then $\frac{a}{b}$ would be undefined. Choice B is incorrect because if $\frac{4b}{a} = 1$, then $\frac{a}{b} = 4$. Choice D is incorrect because if $\frac{4b}{a} = 4$, then $\frac{a}{b} = 1$.

QUESTION 9.

Choice B is correct. Adding x and 19 to both sides of $2y - x = -19$ gives $x = 2y + 19$. Then, substituting $2y + 19$ for x in $3x + 4y = -23$ gives $3(2y + 19) + 4y = -23$. This last equation is equivalent to $10y + 57 = -23$. Solving $10y + 57 = -23$ gives $y = -8$. Finally, substituting -8 for y in $2y - x = -19$ gives $2(-8) - x = -19$, or $x = 3$. Therefore, the solution (x, y) to the given system of equations is $(3, -8)$.

Choices A, C, and D are incorrect because when the given values of x and y are substituted in $2y - x = -19$, the value of the left side of the equation does not equal -19.

QUESTION 10.

Choice A is correct. Since g is an even function, $g(-4) = g(4) = 8$.

Alternatively: First find the value of a, and then find $g(-4)$. Since $g(4) = 8$, substituting 4 for x and 8 for $g(x)$ gives $8 = a(4)^2 + 24 = 16a + 24$. Solving this last equation gives $a = -1$. Thus $g(x) = -x^2 + 24$, from which it follows that $g(-4) = -(-4)^2 + 24$; $g(-4) = -16 + 24$; and $g(-4) = 8$.

Choices B, C, and D are incorrect because g is a function and there can only be one value of $g(-4)$.

QUESTION 11.

Choice D is correct. To determine the price per pound of beef when it was equal to the price per pound of chicken, determine the value of x (the number of weeks after July 1) when the two prices were equal. The prices were equal when $b = c$; that is, when $2.35 + 0.25x = 1.75 + 0.40x$. This last equation is equivalent to $0.60 = 0.15x$, and so $x = \frac{0.60}{0.15} = 4$. Then to determine b, the price per pound of beef, substitute 4 for x in $b = 2.35 + 0.25x$, which gives $b = 2.35 + 0.25(4) = 3.35$ dollars per pound.

Choice A is incorrect. It results from using the value 1, not 4, for x in $b = 2.35 + 0.25x$. Choice B is incorrect. It results from using the value 2, not 4, for x in $b = 2.35 + 0.25x$. Choice C is incorrect. It results from using the value 3, not 4, for x in $c = 1.75 + 0.40x$.

QUESTION 12.

Choice D is correct. Determine the equation of the line to find the relationship between the x- and y-coordinates of points on the line. All lines through the origin are of the form $y = mx$, so the equation is $y = \frac{1}{7}x$. A point lies on the line if and only if its y-coordinate is $\frac{1}{7}$ of its x-coordinate. Of the given choices, only choice D, (14, 2), satisfies this condition: $2 = \frac{1}{7}(14)$.

Choice A is incorrect because the line determined by the origin (0, 0) and (0, 7) is the vertical line with equation $x = 0$; that is, the y-axis. The slope of the y-axis is undefined, not $\frac{1}{7}$. Therefore, the point (0, 7) does not lie on the line that passes the origin and has slope $\frac{1}{7}$. Choices B and C are incorrect because neither of the ordered pairs has a y-coordinate that is $\frac{1}{7}$ the value of the x-coordinate.

QUESTION 13.

Choice B is correct. To rewrite $\dfrac{1}{\dfrac{1}{x+2} + \dfrac{1}{x+3}}$, multiply by $\dfrac{(x+2)(x+3)}{(x+2)(x+3)}$.

This results in the expression $\dfrac{(x+2)(x+3)}{(x+3)+(x+2)}$, which is equivalent to the expression in choice B.

Choices A, C, and D are incorrect and could be the result of common algebraic errors that arise while manipulating a complex fraction.

QUESTION 14.

Choice A is correct. One approach is to express $\frac{8^x}{2^y}$ so that the numerator and denominator are expressed with the same base. Since 2 and 8 are both powers of 2, substituting 2^3 for 8 in the numerator of $\frac{8^x}{2^y}$ gives $\frac{(2^3)^x}{2^y}$, which can be rewritten as $\frac{2^{3x}}{2^y}$. Since the numerator and denominator of $\frac{2^{3x}}{2^y}$ have a common base, this expression can be rewritten as 2^{3x-y}. It is given that $3x - y = 12$, so one can substitute 12 for the exponent, $3x - y$, giving that the expression $\frac{8^x}{2^y}$ is equal to 2^{12}.

Choices B and C are incorrect because they are not equal to 2^{12}. Choice D is incorrect because the value of $\frac{8^x}{2^y}$ can be determined.

QUESTION 15.

Choice D is correct. One can find the possible values of a and b in $(ax + 2)(bx + 7)$ by using the given equation $a + b = 8$ and finding another equation that relates the variables a and b. Since $(ax + 2)(bx + 7) = 15x^2 + cx + 14$, one can expand the left side of the equation to obtain $abx^2 + 7ax + 2bx + 14 = 15x^2 + cx + 14$. Since ab is the coefficient of x^2 on the left side of the equation and 15 is the coefficient of x^2 on the right side of the equation, it must be true that $ab = 15$. Since $a + b = 8$, it follows that $b = 8 - a$. Thus, $ab = 15$ can be rewritten as $a(8 - a) = 15$, which in turn can be rewritten as $a^2 - 8a + 15 = 0$. Factoring gives $(a - 3)(a - 5) = 0$. Thus, either $a = 3$ and $b = 5$, or $a = 5$ and $b = 3$. If $a = 3$ and $b = 5$, then $(ax + 2)(bx + 7) = (3x + 2)(5x + 7) = 15x^2 + 31x + 14$. Thus, one of the possible values of c is 31. If $a = 5$ and $b = 3$, then $(ax + 2)(bx + 7) = (5x + 2)(3x + 7) = 15x^2 + 41x + 14$. Thus, another possible value for c is 41. Therefore, the two possible values for c are 31 and 41.

Choice A is incorrect; the numbers 3 and 5 are possible values for a and b, but not possible values for c. Choice B is incorrect; if $a = 5$ and $b = 3$, then 6 and 35 are the coefficients of x when the expression $(5x + 2)(3x + 7)$ is expanded as $15x^2 + 35x + 6x + 14$. However, when the coefficients of x are 6 and 35, the value of c is 41 and not 6 and 35. Choice C is incorrect; if $a = 3$ and $b = 5$, then 10 and 21 are the coefficients of x when the expression $(3x + 2)(5x + 7)$ is expanded as $15x^2 + 21x + 10x + 14$. However, when the coefficients of x are 10 and 21, the value of c is 31 and not 10 and 21.

QUESTION 16.

The correct answer is 2. To solve for t, factor the left side of $t^2 - 4 = 0$, giving $(t - 2)(t + 2) = 0$. Therefore, either $t - 2 = 0$ or $t + 2 = 0$. If $t - 2 = 0$, then $t = 2$, and if $t + 2 = 0$, then $t = -2$. Since it is given that $t > 0$, the value of t must be 2.

Another way to solve for t is to add 4 to both sides of $t^2 - 4 = 0$, giving $t^2 = 4$. Then, taking the square root of the left and the right side of the equation gives $t = \pm\sqrt{4} = \pm 2$. Since it is given that $t > 0$, the value of t must be 2.

QUESTION 17.

The correct answer is 1600. It is given that $\angle AEB$ and $\angle CDB$ have the same measure. Since $\angle ABE$ and $\angle CBD$ are vertical angles, they have the same measure. Therefore, triangle EAB is similar to triangle DCB because the triangles have two pairs of congruent corresponding angles (angle-angle criterion for similarity of triangles). Since the triangles are similar, the corresponding sides are in the same proportion; thus $\frac{CD}{x} = \frac{BD}{EB}$. Substituting the given values of 800 for CD, 700 for BD, and 1400 for EB in $\frac{CD}{x} = \frac{BD}{EB}$ gives $\frac{800}{x} = \frac{700}{1400}$. Therefore, $x = \frac{(800)(1400)}{700} = 1600$.

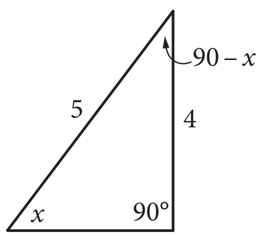
QUESTION 18.

The correct answer is 7. Subtracting the left and right sides of $x + y = -9$ from the corresponding sides of $x + 2y = -25$ gives $(x + 2y) - (x + y) = -25 - (-9)$, which is equivalent to $y = -16$. Substituting -16 for y in $x + y = -9$ gives $x + (-16) = -9$, which is equivalent to $x = -9 - (-16) = 7$.

QUESTION 19.

The correct answer is $\frac{4}{5}$ or 0.8. By the complementary angle relationship for sine and cosine, $\sin(x°) = \cos(90° - x°)$. Therefore, $\cos(90° - x°) = \frac{4}{5}$. Either the fraction $\frac{4}{5}$ or its decimal equivalent, 0.8, may be gridded as the correct answer.

Alternatively, one can construct a right triangle that has an angle of measure $x°$ such that $\sin(x°) = \frac{4}{5}$, as shown in the figure below, where $\sin(x°)$ is equal to the ratio of the opposite side to the hypotenuse, or $\frac{4}{5}$.



Since two of the angles of the triangle are of measure $x°$ and 90°, the third angle must have the measure $180° - 90° - x° = 90° - x°$. From the figure, $\cos(90° - x°)$, which is equal to the ratio of the adjacent side to the hypotenuse, is also $\frac{4}{5}$.

QUESTION 20.

The correct answer is 100. Since $a = 5\sqrt{2}$, one can substitute $5\sqrt{2}$ for a in $2a = \sqrt{2x}$, giving $10\sqrt{2} = \sqrt{2x}$. Squaring each side of $10\sqrt{2} = \sqrt{2x}$ gives $(10\sqrt{2})^2 = (\sqrt{2x})^2$, which simplifies to $(10)^2(\sqrt{2})^2 = (\sqrt{2x})^2$, or $200 = 2x$. This gives $x = 100$. Checking $x = 100$ in the original equation gives $2(5\sqrt{2}) = \sqrt{(2)(100)}$, which is true since $2(5\sqrt{2}) = 10\sqrt{2}$ and $\sqrt{(2)(100)} = (\sqrt{2})(\sqrt{100}) = 10\sqrt{2}$.