QUESTION 43

Choice A is the best answer because the conjunctive adverb “then” correctly shows that given previously stated information, the conclusion that can be drawn is that the transition between the Golden and Silver Ages of comic books was more successful than others.

Choices B, C, and D are incorrect because they do not indicate the correct relationship between the information presented earlier and conclusions that can be drawn from the information. “However,” “nevertheless,” and “yet” are ordinarily used to indicate that in spite of some action, a different or unexpected result occurs.

QUESTION 44

Choice C is the best answer because the singular pronoun “that” agrees in number with its singular antecedent “transition.”

Choices A and B are incorrect because the plural pronouns “those” and “these” do not agree with the singular antecedent “transition.” Additionally, choice B is incorrect because “these” implies that whatever is being referred to is at hand, not in the past. Choice D is incorrect because a pronoun is needed to complete the comparison of transitions between comic book ages.

Section 3: Math Test - No Calculator

QUESTION 1

Choice B is correct. The total amount T, in dollars, Salim will pay for n tickets is given by $T = 15n + 12$, which consists of both a per-ticket charge and a one-time service fee. Since n represents the number of tickets that Salim purchases, it follows that $15n$ represents the price, in dollars, of n tickets. Therefore, 15 must represent the per-ticket charge. At the same time, no matter how many tickets Salim purchases, he will be charged the $12 fee only once. Therefore, 12 must represent the amount of the service fee, in dollars.

Choice A is incorrect. Since n represents the total number of tickets that Salim purchases, it follows that $15n$ represents the price, in dollars, of n tickets, excluding the service fee. Therefore, 15, not 12, must represent the price of 1 ticket. Choice C is incorrect. If Salim purchases only 1 ticket, the total amount, in dollars, Salim will pay can be found by substituting $n = 1$ into the equation for T. If $n = 1$, $T = 15(1) + 12 = 27$. Therefore, the total amount Salim will pay for one ticket is $27, not $12. Choice D is incorrect. The total amount, in dollars, Salim will

pay for n tickets is given by $15n + 12$. The value 12 represents only a portion of this total amount. Therefore, the value 12 does not represent the total amount, in dollars, for any number of tickets.

QUESTION 2

Choice B is correct. Since Fertilizer A contains 60% filler materials by weight, it follows that x pounds of Fertilizer A consists of $0.6x$ pounds of filler materials. Similarly, y pounds of Fertilizer B consists of $0.4y$ pounds of filler materials. When x pounds of Fertilizer A and y pounds of Fertilizer B are combined, the result is 240 pounds of filler materials. Therefore, the total amount, in pounds, of filler materials in a mixture of x pounds of Fertilizer A and y pounds of Fertilizer B can be expressed as $0.6x + 0.4y = 240$.

Choice A is incorrect. This choice transposes the percentages of filler materials for Fertilizer A and Fertilizer B. Fertilizer A consists of $0.6x$ pounds of filler materials and Fertilizer B consists of $0.4y$ pounds of filler materials. Therefore, $0.6x + 0.4y$ is equal to 240, not $0.4x + 0.6y$. Choice C is incorrect. This choice incorrectly represents how to take the percentage of a value mathematically. Fertilizer A consists of $0.6x$ pounds of filler materials, not $60x$ pounds of filler materials, and Fertilizer B consists of $0.4y$ pounds of filler materials, not $40y$ pounds of filler materials. Choice D is incorrect. This choice transposes the percentages of filler materials for Fertilizer A and Fertilizer B and incorrectly represents how to take the percentage of a value mathematically.

QUESTION 3

Choice C is correct. For a complex number written in the form $a + bi$, a is called the real part of the complex number and b is called the imaginary part. The sum of two complex numbers, $a + bi$ and $c + di$, is found by adding real parts and imaginary parts, respectively; that is, $(a + bi) + (c + di) = (a + c) + (b + d)i$. Therefore, the sum of $2 + 3i$ and $4 + 8i$ is $(2 + 4) + (3 + 8)i = 6 + 11i$.

Choice A is incorrect and is the result of disregarding i and adding all parts of the two complex numbers together, $2 + 3 + 4 + 8 = 17$. Choice B is incorrect and is the result of adding all parts of the two complex numbers together and multiplying the sum by i. Choice D is incorrect and is the result of multiplying the real parts and imaginary parts of the two complex numbers, $(2)(4) = 8$ and $(3)(8) = 24$, instead of adding those parts together.

QUESTION 4

Choice A is correct. The right side of the equation can be multiplied using the distributive property: $(px + t)(px - t) = p^2x^2 - ptx + ptx - t^2$. Combining like terms gives $p^2x^2 - t^2$. Substituting this expression for the right side of the equation gives $4x^2 - 9 = p^2x^2 - t^2$, where p and t are

constants. This equation is true for all values of x only when $4 = p^2$ and $9 = t^2$. If $4 = p^2$, then $p = 2$ or $p = -2$. Therefore, of the given answer choices, only 2 could be the value of p.

Choices B, C, and D are incorrect. For the equation to be true for all values of x, the coefficients of x^2 on both sides of the equation must be equal; that is, $4 = p^2$. Therefore, the value of p cannot be 3, 4, or 9.

QUESTION 5

Choice D is correct. In the xy-plane, the graph of the equation $y = mx + b$, where m and b are constants, is a line with slope m and y-intercept $(0, b)$. Therefore, the graph of $y = 2x - 5$ in the xy-plane is a line with slope 2 and a y-intercept $(0, -5)$. Having a slope of 2 means that for each increase in x by 1, the value of y increases by 2. Only the graph in choice D has a slope of 2 and crosses the y-axis at $(0, -5)$. Therefore, the graph shown in choice D must be the correct answer.

Choices A, B, and C are incorrect. The graph of $y = 2x - 5$ in the xy-plane is a line with slope 2 and a y-intercept at $(0, -5)$. The graph in choice A crosses the y-axis at the point $(0, 2.5)$, not $(0, -5)$, and it has a slope of $\frac{1}{2}$, not 2. The graph in choice B crosses the y-axis at $(0, -5)$; however, the slope of this line is -2, not 2. The graph in choice C has a slope of 2; however, the graph crosses the y-axis at $(0, 5)$, not $(0, -5)$.

QUESTION 6

Choice A is correct. Substituting the given value of $y = 18$ into the equation $x = \frac{2}{3}y$ yields $x = \left(\frac{2}{3}\right)(18)$, or $x = 12$. The value of the expression $2x - 3$ when $x = 12$ is $2(12) - 3 = 21$.

Choice B is incorrect. If $2x - 3 = 15$, then adding 3 to both sides of the equation and then dividing both sides of the equation by 2 yields $x = 9$. Substituting 9 for x and 18 for y into the equation $x = \frac{2}{3}y$ yields $9 = \frac{2}{3}18 = 12$, which is false. Therefore, the value of $2x - 3$ cannot be 15. Choices C and D are also incorrect. As with choice B, assuming the value of $2x - 3$ is 12 or 10 will lead to a false statement.

QUESTION 7

Choice C is correct. By properties of multiplication, the formula $n = 7\ell h$ can be rewritten as $n = (7h)\ell$. To solve for ℓ in terms of *n* and *h*, divide both sides of the equation by the factor 7*h*. Solving this equation for ℓ gives $\ell = \frac{n}{7h}$.

Choices A, B, and D are incorrect and may result from algebraic errors when rewriting the given equation.

QUESTION 8

Choice B is correct. This question can be answered by making a connection between the table and the algebraic equation. Each row of the table gives a value of *x* and its corresponding values in both *w*(*x*) and *t*(*x*). For instance, the first row gives *x* = 1 and the corresponding values *w*(1) = −1 and *t*(1) = −3. The row in the table where *x* = 2 is the only row that has the property *x* = *w*(*x*) + *t*(*x*): 2 = 3 + (−1). Therefore, choice B is the correct answer.

Choice A is incorrect because when *x* = 1, the equation *w*(*x*) + *t*(*x*) = *x* is not true. According to the table, *w*(1) = −1 and *t*(1) = −3. Substituting the values of each term when *x* = 1 gives −1 + (−3) = 1, an equation that is not true. Choice C is incorrect because when *x* = 3, the equation *w*(*x*) + *t*(*x*) = *x* is not true. According to the table, *w*(3) = 4 and *t*(3) = 1. Substituting the values of each term when *x* = 3 gives 4 + 1 = 3, an equation that is not true. Choice D is incorrect because when *x* = 4, the equation *w*(*x*) + *t*(*x*) = *x* is not true. According to the table, *w*(4) = 3 and *t*(4) = 3. Substituting the values of each term when *x* = 4 gives 3 + 3 = 4, an equation that is not true.

QUESTION 9

Choice C is correct. The two numerical expressions in the given equation can be simplified as $\sqrt{9} = 3$ and $\sqrt{64} = 8$, so the equation can be rewritten as $\sqrt{x}$ + 3 = 8, or $\sqrt{x}$ = 5. Squaring both sides of the equation gives *x* = 25.

Choice A is incorrect and may result from a misconception about how to square both sides of $\sqrt{x}$ = 5 to determine the value of *x*. Choice B is incorrect. The value of $\sqrt{x}$, not *x*, is 5. Choice D is incorrect and represents a misconception about the properties of radicals. While it is true that 55 + 9 = 64, it is not true that $\sqrt{55} + \sqrt{9} = \sqrt{64}$.

QUESTION 10

Choice D is correct. Jaime's goal is to average at least 280 miles per week for 4 weeks. If *T* is the total number of miles Jamie will bicycle for 4 weeks, then his goal can be represented symbolically by the inequality: $\frac{T}{4} \geq 280$, or equivalently *T* ≥ 4(280). The total number of miles

Jamie will bicycle during this time is the sum of the distances he has completed and has yet to complete. Thus $T = 240 + 310 + 320 + x$. Substituting this expression into the inequality $T \geq 4(280)$ gives $240 + 310 + 320 + x \geq 4(280)$. Therefore, choice D is the correct answer.

Choices A, B, and C are incorrect because they do not correctly capture the relationships between the total number of miles Jaime will ride his bicycle ($240 + 310 + 320 + x$) and the minimum number of miles he is attempting to bicycle for the four weeks ($280 + 280 + 280 + 280$).

QUESTION 11

Choice B is correct. Since the shown parabola opens upward, the coefficient of x^2 in the equation $y = ax^2 + c$ must be positive. Given that a is positive, $-a$ is negative, and therefore the graph of the equation $y = -a(x - b)^2 + c$ will be a parabola that opens downward. The vertex of this parabola is (b, c), because the maximum value of y, c, is reached when $x = b$. Therefore, the answer must be choice B.

Choices A and C are incorrect. The coefficient of x^2 in the equation $y = -a(x - b)^2 + c$ is negative. Therefore, the parabola with this equation opens downward, not upward. Choice D is incorrect because the vertex of this parabola is (b, c), not $(-b, c)$, because the maximum value of y, c, is reached when $x = b$.

QUESTION 12

Choice D is correct. Dividing $4x^2 + 6x$ by $4x + 2$ gives:

$$
\begin{array}{r}
x + 1 \\
4x + 2 \overline{)\,4x^2 + 6x} \\
-(4x + 2x) \\
\hline
4x \\
-(4x + 2) \\
\hline
-2
\end{array}
$$

Therefore, the expression $\frac{4x^2 + 6x}{4x + 2}$ is equivalent to $x + 1 - \frac{2}{4x + 2}$.

Alternate approach: The numerator of the given expression, $4x^2 + 6x$, can be rewritten in terms of the denominator, $4x + 2$, as follows: $4x^2 + 2x + 4x + 2 - 2$, or $x(4x + 2) + (4x + 2) - 2$. So the given expression can be rewritten as

$$\frac{x(4x+2)+(4x+2)-2}{4x+2} = x+1-\frac{2}{4x+2}.$$

Choices A and B are incorrect and may result from incorrectly factoring the numerator and denominator of the expression $\frac{4x^2 + 6x}{4x + 2}$ and then incorrectly identifying common factors in the two factored expressions. Choice C is incorrect and may result from a variety of mistakes made when performing long division.

QUESTION 13

Choice A is correct. The number of solutions to any quadratic equation in the form $ax^2 + bx + c = 0$, where a, b, and c are constants, can be found by evaluating the expression $b^2 - 4ac$, which is called the discriminant. If the value of $b^2 - 4ac$ is a positive number, then there will be exactly two real solutions to the equation. If the value of $b^2 - 4ac$ is zero, then there will be exactly one real solution to the equation. Finally, if the value of $b^2 - 4ac$ is negative, then there will be no real solutions to the equation.

The given equation $2x^2 - 4x = t$ is a quadratic equation in one variable, where t is a constant. Subtracting t from both sides of the equation gives $2x^2 - 4x - t = 0$. In this form, $a = 2$, $b = -4$, and $c = -t$. The values of t for which the equation has no real solutions are the same values of t for which the discriminant of this equation is a negative value. The discriminant is equal to $(-4)^2 - 4(2)(-t)$; therefore, $(-4)^2 - 4(2)(-t) < 0$. Simplifying the left side of the inequality gives $16 + 8t < 0$. Subtracting 16 from both sides of the inequality and then dividing both sides by 8 gives $t < -2$. Of the values given in the options, -3 is the only value that is less than -2. Therefore, choice A must be the correct answer.

Choices B, C, and D are incorrect and may result from a misconception about how to use the discriminant to determine the number of solutions of a quadratic equation in one variable.

QUESTION 14

Choice A is correct. The number of containers in a shipment must have a weight less than 300 pounds. The total weight, in pounds, of detergent and fabric softener that the supplier delivers can be expressed as the weight of each container multiplied by the number of each type of container, which is $7.35d$ for detergent and $6.2s$ for fabric softener. Since this total cannot exceed 300 pounds, it follows that $7.35d + 6.2s \leq 300$. Also, since the laundry service wants to buy at least twice as many containers of detergent as containers of fabric softener, the number of containers of detergent should be greater than or equal to two times the number of containers of fabric softener. This can be expressed by the inequality $d \geq 2s$.

Choice B is incorrect because it misrepresents the relationship between the numbers of each container that the laundry service wants to buy. Choice C is incorrect because the first inequality of the system incorrectly doubles the weight per container of detergent. The weight

of each container of detergent is 7.35, not 14.7 pounds. Choice D is incorrect because it doubles the weight per container of detergent and transposes the relationship between the numbers of containers.

QUESTION 15

Choice D is correct. The expression can be rewritten as $\left(a+\frac{b}{2}\right)\left(a+\frac{b}{2}\right)$. Using the distributive property, the expression yields $\left(a+\frac{b}{2}\right)\left(a+\frac{b}{2}\right)=a^2+\frac{ab}{2}+\frac{ab}{2}+\frac{b^2}{4}$. Combining like terms gives $a^2+ab+\frac{b^2}{4}$.

Choices A, B, and C are incorrect and may result from errors using the distributive property on the given expression or combining like terms.

QUESTION 16

The correct answers are 1, 2, 4, 8, or 16. Number 16 can be written in exponential form $a^{\frac{b}{4}}$, where *a* and *b* are positive integers as follows: 2^4, 4^2, 16^1, $\left(16^2\right)^{\frac{1}{2}}$, $\left(16^4\right)^{\frac{1}{4}}$. Hence, if $a^{\frac{b}{4}}=16$, where *a* and *b* are positive integers, then $\frac{b}{4}$ can be 4, 2, 1, $\frac{1}{2}$, or $\frac{1}{4}$. So the value of *b* can be 16, 8, 4, 2, or 1. Any of these values may be gridded as the correct answer.

QUESTION 17

The correct answer is $\frac{15}{4}$ or 3.75. Multiplying both sides of the equation $\frac{2}{3}t=\frac{5}{2}$ by $\frac{3}{2}$ results in $t=\frac{15}{4}$, or t = 3.75.

QUESTION 18

The correct answer is 30. In the figure given, since $\overline{BD}$ is parallel to $\overline{AE}$ and both segments are intersected by $\overline{CE}$, then angle *BDC* and angle *AEC* are corresponding angles and therefore congruent. Angle *BCD* and angle *ACE* are also congruent because they are the same angle. Triangle *BCD* and triangle *ACE* are similar because if two angles of one triangle are congruent to two angles of another triangle, the triangles are similar. Since triangle *BCD* and triangle *ACE* are similar, their corresponding sides are proportional. So in triangle *BCD* and triangle *ACE*, $\overline{BD}$ corresponds to $\overline{AE}$ and $\overline{CD}$ corresponds to $\overline{CE}$. Therefore, $\frac{BD}{CD}=\frac{AE}{CE}$. Since triangle *BCD* is a right triangle, the Pythagorean theorem can be used to give the value of *CD*: $6^2 + 8^2 = CD^2$. Taking the square root of each side gives *CD* = 10. Substituting the values in the proportion $\frac{BD}{CD}=\frac{AE}{CE}$ yields

$\frac{6}{10} = \frac{18}{CE}$. 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 $C = 2\pi r$, where *r* is the radius of the circle. For the given circle with a radius of 1, the circumference is $C = 2(\pi)(1)$, or $C = 2\pi$. 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