PSAT/NMSQT®

Preliminary SAT/National Merit Scholarship Qualifying Test

Practice Test #1

ANSWER EXPLANATIONS

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Math

Module 1
(27 questions)

QUESTION 1

Choice C is correct. It's given that 3 teaspoons is equivalent to 1 tablespoon. Therefore, 44 tablespoons is equivalent to $(44 \text{ tablespoons})\left(\frac{3 \text{ teaspoons}}{1 \text{ tablespoon}}\right)$, or 132 teaspoons.

Choice A is incorrect. This is equivalent to approximately 15.66 tablespoons, not 44 tablespoons. *Choice B* is incorrect. This is equivalent to approximately 29.33 tablespoons, not 44 tablespoons. *Choice D* is incorrect. This is equivalent to approximately 58.66 tablespoons, not 44 tablespoons.

QUESTION 2

Choice D is correct. It's given that $f(x)=\frac{1}{6x}$. Substituting 3 for x in this equation yields $f(3)=\frac{1}{6(3)}$, or $f(3)=\frac{1}{18}$. Therefore, when $x=3$, the value of $f(x)$ is $\frac{1}{18}$.

Choice A is incorrect. This is the value of $f(x)$ when $x=0.5$. *Choice B* is incorrect. This is the value of $f(x)$ when $x=1$. *Choice C* is incorrect. This is the value of $f(x)$ when $x=1.5$.

QUESTION 3

Choice C is correct. It's given that $x=40$. Adding 6 to both sides of this equation yields $x+6=40+6$, or $x+6=46$. Therefore, the value of $x+6$ is 46.

Choice A is incorrect. This is the value of $x-6$, not $x+6$. *Choice B* is incorrect. This is the value of x, not $x+6$. *Choice D* is incorrect. This is the value of $x+24$, not $x+6$.

QUESTION 4

Choice A is correct. 23% of 100 can be calculated by multiplying $\frac{23}{100}$ by 100, which yields $\left(\frac{23}{100}\right)100$, or 23.

Choice B is incorrect. This is 46%, not 23%, of 100. *Choice C* is incorrect. This is 23% less than 100, not 23% of 100. *Choice D* is incorrect. This is 23% greater than 100, not 23% of 100.

QUESTION 5

Choice D is correct. The given expression shows addition of two like terms. Therefore, the given expression is equivalent to $(50+5)x^2$, or $55x^2$.

Choice A is incorrect. This expression is equivalent to $(50)(5)x^2$, not $(50+5)x^2$.

Choice B is incorrect. This expression is equivalent to $\left(\frac{50}{5}\right)x^2$, not $(50+5)x^2$.

Choice C is incorrect. This expression is equivalent to $(50-5)x^2$, not $(50+5)x^2$.

QUESTION 6

The correct answer is 370. It's given that the population density of Cedar County is 230 people per square mile and the county has a population of 85,100 people. Based on the population density, it follows that the area of Cedar County is $(85{,}100 \text{ people})\left(\frac{1 \text{ square mile}}{230 \text{ people}}\right)$, or 370 square miles.

QUESTION 7

The correct answer is -9. Since w is in the denominator of a fraction in the given equation, w can't be equal to 0. Since w isn't equal to 0, multiplying both sides of the given equation by w yields an equivalent equation, $-54 = 6w$. Dividing both sides of this equation by 6 yields $-9 = w$. Therefore, -9 is the solution to the given equation.

QUESTION 8

Choice B is correct. An equation defining a linear function can be written in the form $f(x) = mx + b$, where m and b are constants, m is the slope of the graph of $y = f(x)$ in the xy-plane, and $(0, b)$ is the y-intercept of the graph. It's given that for the function f, the graph of $y = f(x)$ in the xy-plane has a slope of 3. Therefore, $m = 3$. It's also given that this graph passes through the point $(0, -8)$. Therefore, the y-intercept of the graph is $(0, -8)$, and it follows that $b = -8$. Substituting 3 for m and -8 for b in the equation $f(x) = mx + b$ yields $f(x) = 3x - 8$. Thus, the equation that defines f is $f(x) = 3x - 8$.

Choice A is incorrect. For this function, the graph of $y = f(x)$ in the xy-plane passes through the point $(0, 0)$, not $(0, -8)$. *Choice C* is incorrect. For this function, the graph of $y = f(x)$ in the xy-plane passes through the point $(0, 5)$, not $(0, -8)$. *Choice D* is incorrect. For this function, the graph of $y = f(x)$ in the xy-plane passes through the point $(0, 11)$, not $(0, -8)$.

QUESTION 9

Choice A is correct. The perimeter of a triangle is the sum of the lengths of its three sides. The triangle shown has side lengths x, y, and z. It's given that the triangle has a perimeter of 22 units. Therefore, $x+y+z=22$. If $x=9$ units and $y=7$ units, the value of z, in units, can be found by substituting 9 for x and 7 for y in the equation $x+y+z=22$, which yields $9+7+z=22$, or $16+z=22$. Subtracting 16 from both sides of this equation yields $z=6$. Therefore, if $x=9$ units and $y=7$ units, the value of z, in units, is 6.

Choice B is incorrect. This is the value of y, in units, not the value of z, in units. *Choice C* is incorrect. This is the value of x, in units, not the value of z, in units. *Choice D* is incorrect. This is the value of $x+y$, in units, not the value of z, in units.

QUESTION 10

Choice A is correct. The value of $h(-2)$ can be found by substituting -2 for x in the equation defining h. Substituting -2 for x in $h(x)=3x-7$ yields $h(-2)=3(-2)-7$, or $h(-2)=-13$. Therefore, the value of $h(-2)$ is -13.

Choice B is incorrect. This is the value of $h(-1)$, not $h(-2)$. *Choice C* is incorrect and may result from conceptual or calculation errors. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 11

Choice C is correct. The tangent of an acute angle in a right triangle is defined as the ratio of the length of the side opposite the angle to the length of the shorter side adjacent to the angle. In the triangle shown, the length of the side opposite the angle with measure $x°$ is 26 units and the length of the side adjacent to the angle with measure $x°$ is 7 units. Therefore, the value of $\tan x°$ is $\frac{26}{7}$.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice B* is incorrect and may result from conceptual or calculation errors. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 12

Choice C is correct. It's given that the scatterplot shows the relationship between two variables, x and y, and a line of best fit is shown. For the line of best fit shown, for each increase in the value of x by 1, the corresponding value of y increases by a constant rate. It follows that the relationship between the variables x and y has a positive linear trend. A line in the *xy*-plane that passes through the points (a, b) and (c, d) has a slope of $\frac{d-b}{c-a}$. The line of best fit shown passes approximately through the points $(0, 0.25)$ and $(4, 2)$. It follows that the slope of this line is approximately $\frac{2-0.25}{4-0}$, which is equivalent to 0.4375. Therefore, of the given choices, 0.44 is closest to the slope of the line of best fit shown.

Choice A is incorrect. This is the slope of a line of best fit for a relationship between x and y that has a negative, rather than a positive, linear trend. *Choice B*

is incorrect. This is the slope of a line of best fit for a relationship between x and y that has a negative, rather than a positive, linear trend. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 13

The correct answer is 9. It's given that the *y*-intercept of the graph of $12x+2y=18$ in the *xy*-plane is $(0, y)$. Substituting 0 for x in the equation $12x+2y=18$ yields $12(0)+2y=18$, or $2y=18$. Dividing both sides of this equation by 2 yields $y=9$. Therefore, the value of y is 9.

QUESTION 14

The correct answer is 241. For a certain animal, it's given that a model predicts the animal weighed 241 pounds when it was born and gained 3 pounds per day in its first year of life. It's also given that this model is defined by an equation in the form $f(x)=a+bx$, where $f(x)$ is the predicted weight, in pounds, of the animal x days after it was born, and a and b are constants. It follows that a represents the predicted weight, in pounds, of the animal when it was born and b represents the predicted rate of weight gain, in pounds per day, in its first year of life. Thus, the value of a is 241.

QUESTION 15

Choice A is correct. It's given that the graph shows the height above ground, in meters, of a ball x seconds after the ball was launched upward from a platform. In the graph shown, the *x*-axis represents time, in seconds, and the *y*-axis represents the height of the ball above ground, in meters. It follows that for the marked point $(1.0, 4.8)$, 1.00 represents the time, in seconds, after the ball was launched upward from a platform and 4.80 represents the height of the ball above ground, in meters. Therefore, the best interpretation of the marked point $(1.0, 4.8)$ is 1.00 second after being launched, the ball's height above ground is 4.80 meters.

Choice B is incorrect and may result from conceptual errors. *Choice C* is incorrect and may result from conceptual errors. *Choice D* is incorrect and may result from conceptual errors.

QUESTION 16

Choice A is correct. It's given that based on a random sample from a population, the estimated mean value for a certain variable for the population is 20.5, with an associated margin of error of 1. This means that it is plausible that the actual mean value of the variable for the population is between $20.5-1$ and $20.5+1$. Therefore, the most appropriate conclusion is that it is plausible that the actual mean value of the variable for the population is between 19.5 and 21.5.

Choice B is incorrect. The estimated mean value and associated margin of error describe only plausible values, not all the possible values, for the actual mean value of the variable, so this is not an appropriate conclusion. *Choice C* is

incorrect. The estimated mean value and associated margin of error describe only plausible values for the actual mean value of the variable, not all the possible values of the variable, so this is not an appropriate conclusion. *Choice D* is incorrect. Since 20.5 is the estimated mean value of the variable based on a random sample, the actual mean value of the variable may not be exactly 20.5. Therefore, this is not an appropriate conclusion.

QUESTION 17

Choice B is correct. It's given that the equation $7m = 5(n + p)$ relates the positive numbers m, n, and p. Dividing both sides of the given equation by 5 yields $\frac{7m}{5} = n + p$. Subtracting p from both sides of this equation yields $\frac{7m}{5} - p = n$, or $n = \frac{7m}{5} - p$. It follows that the equation $n = \frac{7m}{5} - p$ correctly gives n in terms of m and p.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect and may result from conceptual or calculation errors. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 18

Choice A is correct. It's given that a rectangle has a length that is 15 times its width. It's also given that the function $y = (15w)(w)$ represents this situation, where y is the area, in square feet, of the rectangle and $y > 0$. The area of a rectangle can be calculated by multiplying the rectangle's length by its width. Since the rectangle has a length that is 15 times its width, it follows that w represents the width of the rectangle, in feet, and $15w$ represents the length of the rectangle, in feet. Therefore, the best interpretation of $15w$ in this context is that it's the length of the rectangle, in feet.

Choice B is incorrect. This is the best interpretation of y, not $15w$, in the given function. *Choice C* is incorrect and may result from conceptual errors. *Choice D* is incorrect. This is the best interpretation of w, not $15w$, in the given function.

QUESTION 19

Choice B is correct. Adding the first equation to the second equation in the given system yields $(x + 2y) + (x - 2y) = 6 + 4$, or $(x + x) + (2y - 2y) = 10$. Combining like terms in this equation yields $2x = 10$. Dividing both sides of this equation by 2 yields $x = 5$. Thus, the value of x is 5.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect and may result from conceptual or calculation errors. *Choice D* is incorrect. This is the value of $2x$, not x.

QUESTION 20

The correct answer is 19. The minimum value of a data set is the least value in the data set. The frequency refers to the number of times a value occurs. The given table shows that for this data set, the value 19 occurs 7 times, the value 21 occurs 1 time, the value 23 occurs 7 times, and the value 25 occurs 4 times. Therefore, of the values 19, 21, 23, and 25 given in the data set, the minimum value of the data set is 19.

QUESTION 21

The correct answer is -2. It's given that a number x is at most 17 less than 5 times the value of y, or $x \leq 5y - 17$. Substituting 3 for y in this inequality yields $x \leq 5(3) - 17$, or $x \leq -2$. Thus, if the value of y is 3, the greatest possible value of x is -2.

QUESTION 22

Choice C is correct. The left-hand side of the given equation can be factored as $(5x + 3)(x - 8)$. Therefore, the given equation, $5x^2 - 37x - 24 = 0$, can be written as $(5x + 3)(x - 8) = 0$. Applying the zero product property to this equation yields $5x + 3 = 0$ and $x - 8 = 0$. Subtracting 3 from both sides of the equation $5x + 3 = 0$ yields $5x = -3$. Dividing both sides of this equation by 5 yields $x = -\frac{3}{5}$. Adding 8 to both sides of the equation $x - 8 = 0$ yields $x = 8$. Therefore, the two solutions to the given equation, $5x^2 - 37x - 24 = 0$, are $-\frac{3}{5}$ and 8. It follows that 8 is the positive solution to the given equation.

Choice A is incorrect and may result from conceptual or calculation errors.
Choice B is incorrect and may result from conceptual or calculation errors.
Choice D is incorrect and may result from conceptual or calculation errors.

QUESTION 23

Choice B is correct. In the figure shown, the angle measuring $y°$ is congruent to its vertical angle formed by lines s and m, so the measure of the vertical angle is also $y°$. The vertical angle forms a same-side interior angle pair with the angle measuring $x°$. It's given that lines r and s are parallel. Therefore, same-side interior angles in the figure are supplementary, which means the sum of the measure of the vertical angle and the measure of the angle measuring $x°$ is 180°, or $x + y = 180$. Subtracting x from both sides of this equation yields $y = 180 - x$. Substituting $180 - x$ for y in the inequality $y < 65$ yields $180 - x < 65$. Adding x to both sides of this inequality yields $180 < 65 + x$. Subtracting 65 from both sides of this inequality yields $115 < x$, or $x > 115$. Thus, if $y < 65$, it must be true that $x > 115$.

Choice A is incorrect and may result from conceptual or calculation errors.
Choice C is incorrect. $x + y$ must be equal to, not less than, 180. *Choice D* is incorrect. $x + y$ must be equal to, not greater than, 180.

QUESTION 24

Choice B is correct. It's given that the graph of $y=g(x)$ is produced by translating the graph of $y=f(x)$ 3 units down and 4 units to the right in the *xy*-plane. Therefore, function g can be defined by an equation in the form $g(x)=f(x-4)-3$. Function f is defined by the equation $f(x)=\frac{a-19}{x}+5$, where a is a constant. Substituting $x-4$ for x in the equation $f(x)=\frac{a-19}{x}+5$ yields $f(x-4)=\frac{a-19}{x-4}+5$. Substituting $\frac{a-19}{x-4}+5$ for $f(x-4)$ in the equation $g(x)=f(x-4)-3$ yields $g(x)=\frac{a-19}{x-4}+5-3$, or $g(x)=\frac{a-19}{x-4}+2$. Therefore, the equation that defines function g is $g(x)=\frac{a-19}{x-4}+2$.

Choice A is incorrect. This equation defines a function whose graph is produced by translating the graph of $y=f(x)$ 3 units down and 4 units to the left, not 3 units down and 4 units to the right. *Choice C* is incorrect. This equation defines a function whose graph is produced by translating the graph of $y=f(x)$ 4 units to the left, not 3 units down and 4 units to the right. *Choice D* is incorrect. This equation defines a function whose graph is produced by translating the graph of $y=f(x)$ 4 units to the right, not 3 units down and 4 units to the right.

QUESTION 25

Choice D is correct. An equation representing the height above ground *h*, in meters, of a softball t seconds after it is launched by a machine from ground level can be written in the form $h=-a(t-b)^2+c$, where *a*, *b*, and *c* are positive constants. In this equation, *b* represents the time, in seconds, at which the softball reaches its maximum height of c meters above the ground. It's given that this softball reaches a maximum height of 51.84 meters above the ground at 1.8 seconds; therefore, $b=1.8$ and $c=51.84$. Substituting 1.8 for *b* and 51.84 for *c* in the equation $h=-a(t-b)^2+c$ yields $h=-a(t-1.8)^2+51.84$. It's also given that this softball hits the ground at 3.6 seconds; therefore, $h=0$ when $t=3.6$. Substituting 0 for *h* and 3.6 for *t* in the equation $h=-a(t-1.8)^2+51.84$ yields $0=-a(3.6-1.8)^2+51.84$, which is equivalent to $0=-a(1.8)^2+51.84$, or $0=-3.24a+51.84$. Adding $3.24a$ to both sides of this equation yields $3.24a=51.84$. Dividing both sides of this equation by 3.24 yields $a=16$. Substituting 16 for *a* in the equation $h=-a(t-1.8)^2+51.84$ yields $h=-16(t-1.8)^2+51.84$. Therefore, $h=-16(t-1.8)^2+51.84$ represents the height above ground *h*, in meters, of this softball t seconds after it is launched.

Choice A is incorrect. This equation represents a situation where the maximum height is 3.6 meters above the ground at 0 seconds, not 51.84 meters above the ground at 1.8 seconds. *Choice B* is incorrect. This equation represents a situation where the maximum height is 51.84 meters above the ground at 0 seconds, not 1.8 seconds. *Choice C* is incorrect and may result from conceptual or calculation errors.

QUESTION 26

Choice D is correct. It's given that in triangle ABC, the measure of angle B is 90° and BD is an altitude of the triangle. Therefore, the measure of angle BDC is 90°. It follows that angle B is congruent to angle D and angle C is congruent to angle C. By the angle-angle similarity postulate, triangle ABC is similar to triangle BDC. Since triangles ABC and BDC are similar, it follows that $\frac{AC}{AB}=\frac{BC}{BD}$. It's also given that the length of $\overline{AB}$ is 15 and the length of $\overline{AC}$ is 23 greater than the length of $\overline{AB}$. Therefore, the length of $\overline{AC}$ is $15+23$, or 38. Substituting 15 for AB and 38 for AC in the equation $\frac{AC}{AB}=\frac{BC}{BD}$ yields $\frac{38}{15}=\frac{BC}{BD}$. Therefore, the value of $\frac{BC}{BD}$ is $\frac{38}{15}$.

Choice A is incorrect. This is the value of $\frac{BD}{BC}$. *Choice B* is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect and may result from conceptual or calculation errors.

QUESTION 27

The correct answer is -7. For a quadratic function defined by an equation of the form $f(x)=a(x-h)^2+k$, where a, h, and k are constants and $a>0$, the function reaches its minimum when $x=h$. In the given function, $a=1$, $h=-7$, and $k=4$. Therefore, the value of x for which $f(x)$ reaches its minimum is -7.

Math

Module 2
(27 questions)

QUESTION 1

Choice C is correct. The median of a data set represented in a box plot is given by the vertical line within the box. In the given box plot, the vertical line within the box occurs at 5. Therefore, the median of this data set is 5.

Choice A is incorrect. This is the minimum value of the data set. *Choice B* is incorrect and may result from conceptual errors. *Choice D* is incorrect. This is the maximum value of the data set.

QUESTION 2

Choice D is correct. The x-intercept of the graph shown is the point (x, y) on the graph where $y = 0$. At $y = 0$, the corresponding value of x is 4. Therefore, the x-intercept of the graph shown is $(4, 0)$.

Choice A is incorrect. This is the x-intercept of a graph in the xy-plane that intersects the x-axis at $x = -5$, not $x = 4$. *Choice B* is incorrect. This is the x-intercept of a graph in the xy-plane that intersects the x-axis at $x = 5$, not $x = 4$. *Choice C* is incorrect. This is the x-intercept of a graph in the xy-plane that intersects the x-axis at $x = -4$, not $x = 4$.

QUESTION 3

Choice B is correct. It's given that Henry uses his \$60.00 gift card to buy 3 movies for \$7.50 each. Therefore, Henry spends $3(\$7.50)$, or \$22.50, of his \$60.00 gift card to buy 3 movies. After buying 3 movies with his \$60.00 gift card, Henry has a gift card balance of $\$60.00 - \$22.50$, or \$37.50. It's also given that Henry spends the rest of his gift card balance on renting movies for \$1.50 each. Therefore, Henry can rent $\frac{\$37.50}{\$1.50}$, or 25, movies.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect and may result from conceptual or calculation errors. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 4

Choice A is correct. It's given that the graphs of the given equations intersect at the point (x, y) in the *xy*-plane. It follows that (x, y) represents a solution to the system consisting of the given equations. The first equation given is $x = 49$. Substituting 49 for x in the second equation given, $y = \sqrt{x} + 9$, yields $y = \sqrt{49} + 9$, which is equivalent to $y = 7 + 9$, or $y = 16$. It follows that the graphs of the given equations intersect at the point $(49, 16)$. Therefore, the value of y is 16.

Choice B is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect and may result from conceptual or calculation errors. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 5

Choice C is correct. It's given that the cherry pitting machine pits 12 pounds of cherries in 3 minutes. This rate can be written as $\frac{12 \text{ pounds of cherries}}{3 \text{ minutes}}$. If the number of minutes it takes the machine to pit 96 pounds of cherries is represented by x, the value of x can be calculated by solving the equation $\frac{12 \text{ pounds of cherries}}{3 \text{ minutes}} = \frac{96 \text{ pounds of cherries}}{x \text{ minutes}}$, which can be rewritten as $\frac{12}{3} = \frac{96}{x}$, or $4 = \frac{96}{x}$. Multiplying each side of this equation by x yields $4x = 96$. Dividing each side of this equation by 4 yields $x = 24$. Therefore, it takes the machine 24 minutes to pit 96 pounds of cherries.

Choice A is incorrect. This is the number of minutes it takes the machine to pit 32, not 96, pounds of cherries. *Choice B* is incorrect. This is the number of minutes it takes the machine to pit 60, not 96, pounds of cherries. *Choice D* is incorrect. This is the number of minutes it takes the machine to pit 144, not 96, pounds of cherries.

QUESTION 6

The correct answer is 54. Dividing both sides of the given equation by 2 yields $x = 6$. Multiplying both sides of this equation by 9 yields $9x = 54$. Thus, the value of $9x$ is 54.

QUESTION 7

The correct answer is $\frac{1}{4}$. It's given that line k is defined by $y = \frac{1}{4}x + 1$. It's also given that line j is parallel to line k in the *xy*-plane. A line in the *xy*-plane represented by an equation in slope-intercept form $y = mx + b$ has a slope of m and a *y*-intercept of $(0, b)$. Therefore, the slope of line k is $\frac{1}{4}$. Since parallel lines have equal slopes, the slope of line j is $\frac{1}{4}$. Note that 1/4 and .25 are examples of ways to enter a correct answer.

QUESTION 8

Choice B is correct. If a data set contains an odd number of data values, the median is represented by the middle data value in the list when the data values are listed in ascending or descending order. Since the data set shown has 7 data values and is in ascending order, it follows that the median is the fourth data value in the list, or 8. If a data set contains an even number of data values, the median is between the two middle data values when the values are listed in ascending or descending order. Since each of the choices consists of a data set with 6 data values in ascending order, it follows that the median is between the third and fourth data value. The third and fourth data values in choice B are 8 and 8. Thus, choice B represents a data set with a median of 8. Since the median of the data set shown is 8 and choice B represents a data set with a median of 8, it follows that choice B represents a data set that has the same median as the data set shown.

Choice A is incorrect. This list represents a data set with a median of 6, not 8. *Choice C* is incorrect. This list represents a data set with a median of 10, not 8. *Choice D* is incorrect. This list represents a data set with a median of 10, not 8.

QUESTION 9

Choice D is correct. It's given that the length of the base of the parallelogram is 89% of the height of the parallelogram. Since h is the height of the parallelogram, it follows that the length of the base of the parallelogram can be represented by the expression $\frac{89}{100}h$, or $0.89h$.

Choice A is incorrect. This expression represents 8,900%, not 89%, of the height of the parallelogram. *Choice B* is incorrect. This expression represents 8.9%, not 89%, of the height of the parallelogram. *Choice C* is incorrect. This expression represents 890%, not 89%, of the height of the parallelogram.

QUESTION 10

Choice A is correct. It's given that for a camping trip a group bought x one-liter bottles of water and y three-liter bottles of water. Since the group bought x one-liter bottles of water, the total number of liters bought from x one-liter bottles of water is represented as $1x$, or x. Since the group bought y three-liter bottles of water, the total number of liters bought from y three-liter bottles of water is represented as $3y$. It's given that the group bought a total of 240 liters; thus, the equation $x+3y=240$ represents this situation.

Choice B is incorrect and may result from conceptual errors. *Choice C* is incorrect and may result from conceptual errors. *Choice D* is incorrect. This equation represents a situation where the group bought x three-liter bottles of water and y one-liter bottles of water, for a total of 240 liters of water.

QUESTION 11

Choice C is correct. Each of the given choices gives three values of x: 0, 1, and 2. Substituting 0 for x in the given equation yields $y=-4(0)+40$, or $y=40$.

Therefore, when $x = 0$, the corresponding value of y for the given equation is 40. Substituting 1 for x in the given equation yields $y = -4(1) + 40$, or $y = 36$. Therefore, when $x = 1$, the corresponding value of y for the given equation is 36. Substituting 2 for x in the given equation yields $y = -4(2) + 40$, or $y = 32$. Therefore, when $x = 2$, the corresponding value of y for the given equation is 32. Choice C gives three values of x, 0, 1, and 2, and their corresponding values of y, 40, 36, and 32, respectively, for the given equation.

Choice A is incorrect. This table gives three values of x and their corresponding values of y for the equation $y = -4x$. *Choice B* is incorrect. This table gives three values of x and their corresponding values of y for the equation $y = 4x + 40$. *Choice D* is incorrect. This table gives three values of x and their corresponding values of y for the equation $y = 4x$.

QUESTION 12

Choice D is correct. Since the shaded region shown represents solutions to an inequality, an ordered pair (x, y) is a solution to the inequality if it's represented by a point in the shaded region. Of the given choices, only $(4, 0)$ is represented by a point in the shaded region. Therefore, $(4, 0)$ is a solution to the inequality.

Choice A is incorrect and may result from conceptual errors. *Choice B* is incorrect and may result from conceptual errors. *Choice C* is incorrect and may result from conceptual errors.

QUESTION 13

The correct answer is 84. The sum of the measures of the interior angles of a triangle is 180°. It's given that in triangle JKL, the measures of $\angle K$ and $\angle L$ are each 48°. Adding the measures, in degrees, of $\angle K$ and $\angle L$ gives $48 + 48$, or 96. Therefore, the measure of $\angle J$, in degrees, is $180 - 96$, or 84.

QUESTION 14

The correct answer is 99. In the given system of equations, the second equation is $x + 8 = 11$. Subtracting 8 from both sides of this equation yields $x = 3$. In the given system of equations, the first equation is $y = x^2 + 14x + 48$. Substituting 3 for x in this equation yields $y = (3)^2 + 14(3) + 48$, or $y = 99$. Therefore, the solution to the given system of equations is $(x, y) = (3, 99)$. Thus, the value of y is 99.

QUESTION 15

Choice A is correct. It's given that the cleaning service cleans both offices and homes, where f is the number of offices and h is the number of homes the cleaning service can clean per day. Therefore, the expression $f + h$ represents the number of places the cleaning service can clean per day. It's also given that the cleaning service can clean at most 14 places per day. Since $f + h$ represents the number of places the cleaning service can clean per day and the service can clean at most 14 places per day, it follows that the inequality $f + h \leq 14$ represents this situation.

Choice B is incorrect. This inequality represents a cleaning service that cleans at least 14 places per day. *Choice C* is incorrect. This inequality represents a cleaning service that cleans at most 14 more offices than homes per day. *Choice D* is incorrect. This inequality represents a cleaning service that cleans at least 14 more offices than homes per day.

QUESTION 16

Choice A is correct. Since 2 is a common factor of each of the terms in the given expression, the expression can be rewritten as $2\left(x^2+19x+5\right)$. Therefore, the factors of the given expression are 2 and $x^2+19x+5$. Of these two factors, only 2 is listed as a choice.

Choice B is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect. This is a term of the given expression, not a factor of the given expression. *Choice D* is incorrect. This is a term of the given expression, not a factor of the given expression.

QUESTION 17

Choice B is correct. It's given that the equation $40x+20y=160$ represents the number of sweaters, x, and the number of shirts, y, that Yesenia purchased for $\$160$. If Yesenia purchased 2 sweaters, the number of shirts she purchased can be calculated by substituting 2 for x in the given equation, which yields $40\left(2\right)+20y=160$, or $80+20y=160$. Subtracting 80 from both sides of this equation yields $20y=80$. Dividing both sides of this equation by 20 yields $y=4$. Therefore, if Yesenia purchased 2 sweaters, she purchased 4 shirts.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect. This is the number of shirts Yesenia purchased if she purchased 0 sweaters. *Choice D* is incorrect. This is the price, in dollars, for each sweater, not the number of shirts Yesenia purchased.

QUESTION 18

Choice C is correct. In the given equation, x represents the number of days after a new product launched, where $0\le x\le 20$, and y represents the estimated stock price, in dollars, for a certain company. Therefore, the best interpretation of $\left(x, y\right)=\left(1, 83\right)$ in this context is that 1 day after the new product launched, the company's estimated stock price is $\$83$.

Choice A is incorrect and may result from conceptual errors. *Choice B* is incorrect and may result from conceptual errors. *Choice D* is incorrect and may result from conceptual errors.

QUESTION 19

Choice B is correct. For the given linear function f, $f\left(x\right)$ must equal 39 for all values of x. Of the given choices, only choice B gives three values of x and their corresponding values of $f\left(x\right)$ for the given linear function f.

Choice A is incorrect and may result from conceptual errors. *Choice C* is incorrect and may result from conceptual errors. *Choice D* is incorrect and may result from conceptual errors.

QUESTION 20

The correct answer is 27. It's given that a triangular prism has a volume of 216 cubic centimeters $\left(\text{cm}^3\right)$ and the volume of a triangular prism is equal to Bh, where B is the area of the base and h is the height of the prism. Therefore, $216 = Bh$. It's also given that the triangular prism has a height of 8 cm. Therefore, $h = 8$. Substituting 8 for h in the equation $216 = Bh$ yields $216 = B(8)$. Dividing both sides of this equation by 8 yields $27 = B$. Therefore, the area, in cm^2, of the base of the prism is 27.

QUESTION 21

The correct answer is $\frac{1}{2}$. For the graph shown, x represents time, in seconds, and y represents momentum, in newton-seconds. Therefore, the average rate of change, in newton-seconds per second, in the momentum of the object between two x-values is the difference in the corresponding y-values divided by the difference in the x-values. The graph shows that at $x = 2$, the corresponding y-value is 6. The graph also shows that at $x = 6$, the corresponding y-value is 8. It follows that the average rate of change, in newton-seconds per second, from $x = 2$ to $x = 6$ is $\frac{8-6}{6-2}$, which is equivalent to $\frac{2}{4}$, or $\frac{1}{2}$. Note that 1/2 and .5 are examples of ways to enter a correct answer.

QUESTION 22

Choice C is correct. It's given that the system has infinitely many solutions. A system of two linear equations has infinitely many solutions when the two linear equations are equivalent. Dividing both sides of the given equation by 5 yields $-3x + 5y = 13$. Dividing both sides of choice C by 4 also yields $-3x + 5y = 13$, so choice C is equivalent to the given equation. Thus, choice C could be the second equation in the system.

Choice A is incorrect. The system consisting of this equation and the given equation has one solution, not infinitely many solutions. *Choice B* is incorrect. The system consisting of this equation and the given equation has one solution, not infinitely many solutions. *Choice D* is incorrect. The system consisting of this equation and the given equation has no solution, not infinitely many solutions.

QUESTION 23

Choice B is correct. If the bus traveled at an average speed of 55 miles per hour (mph) on the highway for x hours, then the bus traveled $55x$ miles on the highway. If the bus traveled at an average speed of 25 mph on local roads for y hours, then the bus traveled $25y$ miles on local roads. It's given that the trip was 160 miles. This can be represented by the equation $55x + 25y = 160$. It's also given that the trip took 4 hours. This can be

represented by the equation $x+y=4$. Therefore, the system consisting of the equations $55x+25y=160$ and $x+y=4$ represents this situation.

Choice A is incorrect. This system of equations represents a situation where the trip was 4 miles and took 160 hours. *Choice C* is incorrect. This system of equations represents a situation where the trip was 4 miles and took 160 hours, and the bus traveled at an average speed of 25 mph on the highway and 55 mph on local roads. *Choice D* is incorrect. This system of equations represents a situation where the bus traveled at an average speed of 25 mph on the highway and 55 mph on local roads.

QUESTION 24

Choice B is correct. It's given that quadrilateral $P'Q'R'S'$ is similar to quadrilateral $PQRS$, where P, Q, R, and S correspond to P', Q', R', and S', respectively. Since corresponding angles of similar quadrilaterals are congruent, it follows that the measure of angle P is equal to the measure of angle P'. It's given that the measure of angle P is 30°. Therefore, the measure of angle P' is 30°.

Choice A is incorrect. This is $\frac{1}{3}$ the measure of angle P'. *Choice C* is incorrect and may result from conceptual or calculation errors. *Choice D* is incorrect. This is 3 times the measure of angle P'.

QUESTION 25

Choice B is correct. It's given that $f(x)=2x+244$ represents the perimeter, in centimeters (cm), of a rectangle with a length of x cm and a fixed width. If w represents a fixed width, in cm, then the perimeter, in cm, of a rectangle with a length of x cm and a fixed width of w cm can be given by the function $f(x)=2x+2w$. Therefore, $2x+2w=2x+244$. Subtracting $2x$ from both sides of this equation yields $2w=244$. Dividing both sides of this equation by 2 yields $w=122$. Therefore, the width, in cm, of the rectangle is 122.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect and may result from conceptual or calculation errors. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 26

Choice B is correct. Functions f and g are both exponential functions with a base of 0.40. Since 0.40 is less than 1, functions f and g are both decreasing exponential functions. This means that $f(x)$ and $g(x)$ decrease as x increases. Since $f(x)$ and $g(x)$ decrease as x increases, the maximum value of each function occurs at the least value of x for which the function is defined. It's given that functions f and g are defined for $x\geq 0$. Therefore, the maximum value of each function occurs at $x=0$. Substituting 0 for x in the equation defining f yields $f(0)=33(0.4)^{0+3}$, which is equivalent to $f(0)=33(0.4)^3$, or $f(0)=2.112$. Therefore, the maximum value of f is 2.112. Since the equation $f(x)=33(0.4)^{x+3}$ doesn't display the value 2.112, the equation defining f doesn't display the maximum value of f. Substituting 0 for x in the equation defining g yields

$g(0)=33(0.16)(0.4)^{0-2}$, which can be rewritten as $g(0)=33(0.16)\left(\frac{1}{0.4^2}\right)$, or $g(0)=33(0.16)\left(\frac{1}{0.16}\right)$, which is equivalent to $g(0)=33$. Therefore, the maximum value of g is 33. Since the equation $g(x)=33(0.16)(0.4)^{x-2}$ displays the value 33, the equation defining g displays the maximum value of g. Thus, only equation II displays, as a constant or coefficient, the maximum value of the function it defines.

Choice A is incorrect and may result from conceptual or calculation errors.
Choice C is incorrect and may result from conceptual or calculation errors.
Choice D is incorrect and may result from conceptual or calculation errors.

QUESTION 27

The correct answer is $\frac{1}{16}$. Let p and q represent the solutions to the given equation. Then, the given equation can be rewritten as $64(x-p)(x-q)=0$, or $64x^2-64(p+q)+pq=0$. Since this equation is equivalent to the given equation, it follows that $-(16a+4b)=-64(p+q)$. Dividing both sides of this equation by -64 yields $\frac{16a+4b}{64}=p+q$, or $\frac{1}{16}(4a+b)=p+q$. Therefore, the sum of the solutions to the given equation, $p+q$, is equal to $\frac{1}{16}(4a+b)$. Since it's given that the sum of the solutions to the given equation is $k(4a+b)$, where k is a constant, it follows that $k=\frac{1}{16}$. Note that 1/16, .0625, 0.062, and 0.063 are examples of ways to enter a correct answer.

Alternate approach: The given equation can be rewritten as $64x^2-4(4a+b)x+ab=0$, where a and b are positive constants. Dividing both sides of this equation by 4 yields $16x^2-(4a+b)x+\frac{ab}{4}=0$. The solutions for a quadratic equation in the form $Ax^2+Bx+C=0$, where A, B, and C are constants, can be calculated using the quadratic formula, $x=\frac{-B+\sqrt{B^2-4AC}}{2A}$ and $x=\frac{-B-\sqrt{B^2-4AC}}{2A}$. It follows that the sum of the solutions to a quadratic equation in the form $Ax^2+Bx+C=0$ is $\frac{-B+\sqrt{B^2-4AC}}{2A}+\frac{-B-\sqrt{B^2-4AC}}{2A}$, which can be rewritten as $\frac{-B+-B+\sqrt{B^2-4AC}-\sqrt{B^2-4AC}}{2A}$, which is equivalent to $\frac{-2B}{2A}$, or $-\frac{B}{A}$. In the equation $16x^2-(4a+b)x+\frac{ab}{4}=0$, $A=16$, $B=-(4a+b)$, and $C=\frac{ab}{4}$. Substituting 16 for A and $-(4a+b)$ for B in $-\frac{B}{A}$ yields $-\frac{-(4a+b)}{16}$, which can be rewritten as $\frac{1}{16}(4a+b)$. Thus, the sum of the solutions to the given equation is $\frac{1}{16}(4a+b)$. Since it's given that the sum of the solutions to the given equation is $k(4a+b)$, where k is a constant, it follows that $k=\frac{1}{16}$.