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 $x = 100$. To verify, substitute 100 for x and $5\sqrt{2}$ for a in the equation $2a = \sqrt{2x}$, which yields $2(5\sqrt{2}) = \sqrt{2)(100)}$; this is true since $2(5\sqrt{2}) = 10\sqrt{2}$ and $\sqrt{2)(100)} = \sqrt{2}\sqrt{100} = 10\sqrt{2}$.

Section 4: Math Test – Calculator

QUESTION 1

Choice B is correct. On the graph, a line segment with a positive slope represents an interval over which the target heart rate is strictly increasing as time passes. A horizontal line segment represents an interval over which there is no change in the target heart rate as time passes, and a line segment with a negative slope represents an interval over which the target heart rate is strictly decreasing as time passes. Over the interval between 40 and 60 minutes, the graph consists of a line segment with a positive slope followed by a line segment with a negative slope, with no horizontal line segment in between, indicating that the target heart rate is strictly increasing then strictly decreasing.

Choice A is incorrect because the graph over the interval between 0 and 30 minutes contains a horizontal line segment, indicating a period in which there was no change in the target heart rate. Choice C is incorrect because the graph over the interval between 50 and 65 minutes consists of a line segment with a negative slope followed by a line segment with a positive slope, indicating that the target heart rate is strictly decreasing then strictly increasing. Choice D is incorrect because the graph over the interval between 70 and 90 minutes contains horizontal line segments and no segment with a negative slope.

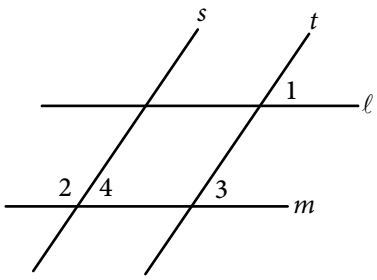
QUESTION 2

Choice C is correct. Substituting 6 for x and 24 for y in $y = kx$ gives $24 = (k)(6)$, which gives $k = 4$. Hence, $y = 4x$. Therefore, when $x = 5$, the value of y is $(4)(5) = 20$. None of the other choices for y is correct because y is a function of x, and so there is only one y-value for a given x-value.

Choices A, B, and D are incorrect. Choice A is the result of substituting 6 for y and substituting 5 for x in the equation $y = kx$, when solving for k. Choice B results from substituting 3 for k and 5 for x in the equation $y = kx$, when solving for y. Choice D results from using $y = k + x$ instead of $y = kx$.

QUESTION 3

Choice D is correct. Consider the measures of ∠3 and ∠4 in the figure below.



The measure of ∠3 is equal to the measure of ∠1 because they are corresponding angles for the parallel lines ℓ and m intersected by the transversal line t. Similarly, the measure of ∠3 is equal to the measure of ∠4 because they are corresponding angles for the parallel lines s and t intersected by the transversal line m. Since the measure of ∠1 is 35°, the measures of ∠3 and ∠4 are also 35°. Since ∠4 and ∠2 are supplementary angles, the sum of the measures of these two angles is 180°. Therefore, the measure of ∠2 is 180° − 35° = 145°.

Choice A is incorrect because 35° is the measure of ∠1, and ∠1 is not congruent to ∠2. Choice B is incorrect because it is the measure of the complementary angle of ∠1, and ∠1 and ∠2 are not complementary angles. Choice C is incorrect because it is double the measure of ∠1, which cannot be inferred from the information given.

QUESTION 4

Choice C is correct. The description "16 + 4x is 10 more than 14" can be written as the equation 16 + 4x = 10 + 14, which is equivalent to 16 + 4x = 24. Subtracting 16 from each side of 16 + 4x = 24 gives 4x = 8. Since 8x is 2 times 4x, multiplying both sides of 4x = 8 by 2 gives 8x = 16. Therefore, the value of 8x is 16.

Choice A is incorrect because it is the value of x, not 8x. Choices B and D are incorrect and may be the result of errors made when solving the equation 16 + 4x = 10 + 14 for x. For example, choice D could be the result of subtracting 16 from the left side of the equation and adding 16 to the right side of the equation 16 + 4x = 10 + 14, giving 4x = 40 and 8x = 80.

QUESTION 5

Choice D is correct. A graph with a strong negative association between d and t would have the points on the graph closely aligned with a line that has a negative slope. The more closely the points on a graph are aligned with a line, the stronger the association between d and t, and a negative slope indicates a negative association. Of the four graphs, the points on graph D are most closely aligned with a line with a negative slope. Therefore, the graph in choice D has the strongest negative association between d and t.

Choice A is incorrect because the points are more scattered than the points in choice D, indicating a weaker negative association between d and t. Choice B is incorrect because the points are aligned to either a curve or possibly a line with a small positive slope. Choice C is incorrect because the points are aligned to a line with a positive slope, indicating a positive association between d and t.

QUESTION 6

Choice D is correct. Since there are 10 grams in 1 decagram, there are $2 \times 10 = 20$ grams in 2 decagrams. Since there are 1,000 milligrams in 1 gram, there are $20 \times 1{,}000 = 20{,}000$ milligrams in 20 grams. Therefore, 20,000 1-milligram doses of the medicine can be stored in a 2-decagram container.

Choice A is incorrect; 0.002 is the number of grams in 2 milligrams. Choice B is incorrect; it could result from multiplying by 1,000 and dividing by 10 instead of multiplying by both 1,000 and 10 when converting from decagrams to milligrams. Choice C is incorrect; 2,000 is the number of milligrams in 2 grams, not the number of milligrams in 2 decagrams.

QUESTION 7

Choice C is correct. Let x represent the number of installations that each unit on the y-axis represents. Then $9x$, $5x$, $6x$, $4x$, and $3.5x$ are the number of rooftops with solar panel installations in cities A, B, C, D, and E, respectively. Since the total number of rooftops is 27,500, it follows that $9x + 5x + 6x + 4x + 3.5x = 27{,}500$, which simplifies to $27.5x = 27{,}500$. Thus, $x = 1{,}000$. Therefore, an appropriate label for the y-axis is "Number of installations (in thousands)."

Choices A, B, and D are incorrect and may result from errors when setting up and calculating the units for the y-axis.

QUESTION 8

Choice D is correct. If the value of $|n - 1| + 1$ is equal to 0, then $|n - 1| + 1 = 0$. Subtracting 1 from both sides of this equation gives $|n - 1| = -1$. The expression $|n - 1|$ on the left side of the equation is the absolute value of $n - 1$, and the absolute value of a quantity can never be negative. Thus $|n - 1| = -1$ has no solution. Therefore, there are no values for n for which the value of $|n - 1| + 1$ is equal to 0.

Choice A is incorrect because $|0 - 1| + 1 = 1 + 1 = 2$, not 0. Choice B is incorrect because $|1 - 1| + 1 = 0 + 1 = 1$, not 0. Choice C is incorrect because $|2 - 1| + 1 = 1 + 1 = 2$, not 0.

QUESTION 9

Choice A is correct. Subtracting 1,052 from both sides of the equation $a = 1{,}052 + 1.08t$ gives $a - 1{,}052 = 1.08t$. Then dividing both sides of $a - 1{,}052 = 1.08t$ by 1.08 gives $t = \frac{a - 1{,}052}{1.08}$.

Since the coefficient of x is −2, this equation can be written in terms of $(x - 1)^2 = x^2 - 2x + 1$ as follows: $y = x^2 - 2x - 15 = (x^2 - 2x + 1) - 16 = (x - 1)^2 - 16$. From this form of the equation, the coefficients of the vertex can be read as (1, −16).

Choices A and C are incorrect because the coordinates of the vertex A do not appear as constants in these equations. Choice B is incorrect because it is not equivalent to the given equation.

QUESTION 31

The correct answer is any number between 4 and 6, inclusive. Since Wyatt can husk at least 12 dozen ears of corn per hour, it will take him no more than $\frac{72}{12} = 6$ hours to husk 72 dozen ears of corn. On the other hand, since Wyatt can husk at most 18 dozen ears of corn per hour, it will take him at least $\frac{72}{18} = 4$ hours to husk 72 dozen ears of corn. Therefore, the possible times it could take Wyatt to husk 72 dozen ears of corn are 4 hours to 6 hours, inclusive. Any number between 4 and 6, inclusive, can be gridded as the correct answer.

QUESTION 32

The correct answer is 107. Since the weight of the empty truck and its driver is 4500 pounds and each box weighs 14 pounds, the weight, in pounds, of the delivery truck, its driver, and x boxes is $4500 + 14x$. This weight is below the bridge's posted weight limit of 6000 pounds if $4500 + 14x < 6000$. Subtracting 4500 from both sides of this inequality and then dividing both sides by 14 yields $x < \frac{1500}{14}$ or $x < 107\ \frac{1}{7}$. Since the number of packages must be an integer, the maximum possible value for x that will keep the combined weight of the truck, its driver, and the x identical boxes below the bridge's posted weight limit is 107.

QUESTION 33

The correct answer is $\frac{5}{8}$ or .625. Based on the line graph, the number of portable media players sold in 2008 was 100 million, and the number of portable media players sold in 2011 was 160 million. Therefore, the number of portable media players sold in 2008 is $\frac{100 \text{ million}}{160 \text{ million}}$ of the portable media players sold in 2011. This fraction reduces to $\frac{5}{8}$. Either 5/8 or its decimal equivalent, .625, may be gridded as the correct answer.

QUESTION 34

The correct answer is 96. Since each day has a total of 24 hours of time slots available for the station to sell, there is a total of 48 hours of time slots available to sell on Tuesday and Wednesday. Each time slot is a 30-minute interval, which is equal to a $\frac{1}{2}$-hour interval. Therefore, there are $\frac{48 \text{ hours}}{\frac{1}{2} \text{ hours/time slot}} = 96$ time slots of 30 minutes for the station to sell on Tuesday and Wednesday.

QUESTION 35

The correct answer is 6. The volume of a cylinder is $\pi r^2 h$, where r is the radius of the base of the cylinder and h is the height of the cylinder. Since the storage silo is a cylinder with volume 72π cubic yards and height 8 yards, it follows that $72\pi = \pi r^2(8)$, where r is the radius of the base of the cylinder, in yards. Dividing both sides of the equation $72\pi = \pi r^2(8)$ by 8π gives $r^2 = 9$, and so the radius of the base of the cylinder is 3 yards. Therefore, the diameter of the base of the cylinder is 6 yards.

QUESTION 36

The correct answer is 3. The function $h(x)$ is undefined when the denominator of $\frac{1}{(x-5)^2 + 4(x-5) + 4}$ is equal to zero. The expression $(x-5)^2 + 4(x-5) + 4$ is a perfect square: $(x-5)^2 + 4(x-5) + 4 = ((x-5) + 2)^2$, which can be rewritten as $(x-3)^2$. The expression $(x-3)^2$ is equal to zero if and only if $x = 3$. Therefore, the value of x for which $h(x$ is undefined is 3.

QUESTION 37

The correct answer is 1.02. The initial deposit earns 2 percent interest compounded annually. Thus at the end of 1 year, the new value of the account is the initial deposit of \$100 plus 2 percent of the initial deposit: $\$100 + \frac{2}{100}(\$100) = \$100(1.02)$. Since the interest is compounded annually, the value at the end of each succeeding year is the sum of the previous year's value plus 2 percent of the previous year's value. This is again equivalent to multiplying the previous year's value by 1.02. Thus, after 2 years, the value will be $\$100(1.02)(1.02) = \$100(1.02)^2$; after 3 years, the value will be $\$100(1.02)^3$; and after t years, the value will be $\$100(1.02)^t$. Therefore, in the formula for the value for Jessica's account after t years, $\$100(x)^t$, the value of x must be 1.02.