

ACT Practice Questions - Mathematics

Note: Unless otherwise stated, all of the following should be assumed.

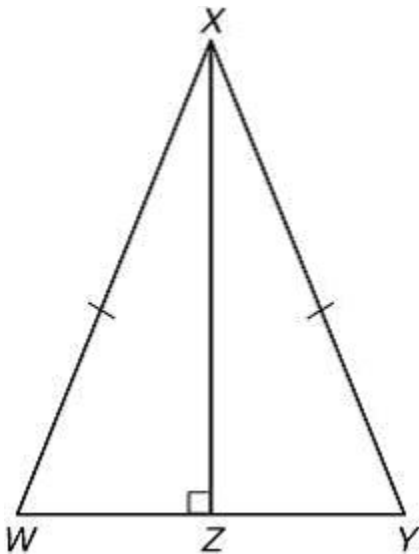
Illustrative figures are NOT necessarily drawn to scale.

Geometric figures lie in a plane.

The word line indicates a straight line.

The word average indicates arithmetic mean.

1. If $x^2 - mx - 27 = 0$ when $x = 6$, what is the value of m ?
 - A. 1.5
 - B. 2
 - C. 3.5
 - D. 5
2. For all x , what is the simplest equivalent of $(2x)(x)(2x)(x)(x)$?
 - A. $2x^6$
 - B. $4x^6$
 - C. $4x^5$
 - D. $6x^3$



3. Given that the above triangle is isosceles, if angle WXY is 44° , what measurement must angle XWY have?
 - A. 64°
 - B. 68°
 - C. 72°
 - D. 76°
4. If segment WY is 16 units long and segment XZ is 15 units long, how long is segment WX?
 - A. 17
 - B. 18
 - C. 19
 - D. 20
5. Given the equations $2x + 2y = 16$ and $4x - 3y = -3$, what are the values of x and y ?

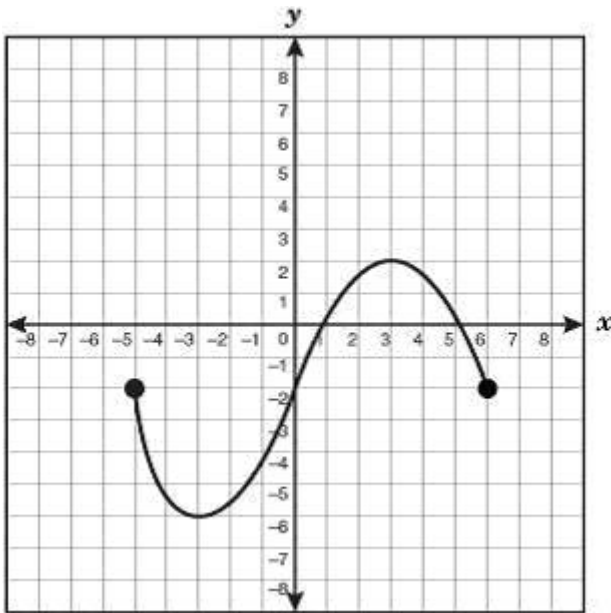
- A. $x = 4, y = 6$
- B. $x = 2, y = 4$
- C. $x = 3, y = 5$
- D. $x = 5, y = 3$

6. Two friends take a drive around the city. When they get home, they look at the odometer and their watches, and determine they traveled 54 miles in 72 minutes. What was their average speed in miles per hour?

- A. 40 miles/hr
- B. 45 miles/hr
- C. 50 miles/hr
- D. 55 miles/hr

7. Provide the simplest equivalent expression to $\sqrt{72}$.

- A. $8\sqrt{3}$
- B. $4\sqrt{18}$
- C. $8\sqrt{12}$
- D. $6\sqrt{2}$



8. Given the curve as sketched out on this graph, what is the domain of the function seen here?

- A. $-5 < x < 6$
- B. $-6 \leq x \leq 2$
- C. $-5 \leq x \leq 6$
- D. $-6 < x < 2$

9. Given the curve as sketched on this graph, what is the range of the function seen here?

- A. $-5 < y < 6$
- B. $-6 \leq y \leq 2$
- C. $-5 \leq y \leq 6$
- D. $-6 < y < 2$

10. A student cuts out a cardboard circle that has a radius of 8 inches. What is the total circumference of the circle?

- A. 8π inches
- B. 12π inches

- C. 16π inches
- D. 20π inches

11. As part of a wood shop project, two students build a cabinet that is 6 feet tall, 2 feet wide and 3 feet deep. Half of the cabinet's interior volume will be used for storing tools, leaving the other half free for personal items. How much volume will be available for students to use?

- A. 18 cubic feet
- B. 24 cubic feet
- C. 36 cubic feet
- D. 48 cubic feet

12. Given two variables x and y that are directly proportional such that $x = 3$ when $y = 8$, what value will y have when $x = 6$?

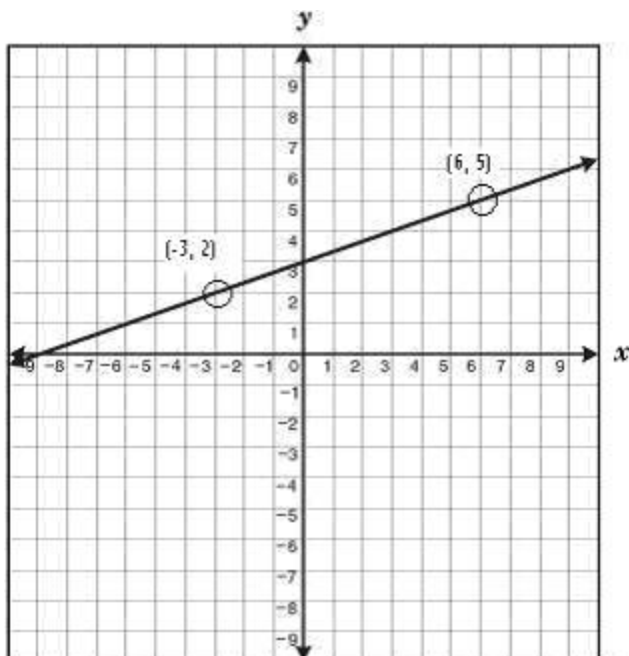
- A. 12
- B. 16
- C. 20
- D. 24

13. A student enrolls in a course where the final grade is an average of four exams. Before the final exam, the student reviews the previous three exam scores, which were 89, 97 and 88. What score would the student have to receive on the last exam to achieve at least a 90 average for the course?

- A. 78
- B. 82
- C. 86
- D. 90

14. A teacher goes to the local big box store to purchase supplies for a class activity. The teacher buys two bags of apples for a class snack, and four bottles of glue. The total comes to \$5.00 for the apples and \$6.50 for the glue. Sales tax for food items is 6%, and for non-food items is 4%. How much total tax does the teacher pay for the purchases?

- A. \$0.36
- B. \$0.42
- C. \$0.49
- D. \$0.56



15. Given the points on the line with the labeled coordinates, what is the slope?
- A. $\frac{1}{3}$
 - B. $\frac{1}{4}$
 - C. $\frac{1}{5}$
 - D. $\frac{1}{6}$
16. Having determined the slope of the line, what is the slope-intercept equation of the line shown passing through (6,5)?
- A. $y = \frac{2}{3}x + 2$
 - B. $y = \frac{1}{3}x + 1$
 - C. $y = \frac{2}{3}x + 4$
 - D. $y = \frac{1}{3}x + 3$
17. A rectangle is three times as long as it is wide. If the total area of the rectangle is 48 square inches, what is the length of the rectangle?
- A. 3 inches
 - B. 9 inches
 - C. 12 inches
 - D. 18 inches
18. As a prize for winning a game at school, a student gets to pick a colored egg from a box. Each egg has a slip of paper inside it describing the prize. Red eggs are for candy, blue eggs are for toys, and green eggs are for books. There were 12 red eggs in the box, 8 blue eggs and 15 green eggs. Students must draw blind, and the previous student to draw pulled out an egg for a book. What are the chances that the next student to draw will get an egg for a toy?
- A. $\frac{15}{34}$
 - B. $\frac{8}{34}$
 - C. $\frac{12}{35}$
 - D. $\frac{20}{35}$
19. A physicist is studying a radioactive element in a lab that has a half-life of 21 days, meaning after 21 days, half of the sample would be inert. If the initial sample of the element was 500 grams, and the study was scheduled to continue for a total of 12 weeks, how much of the element would still be radioactive at the end of the study?
- A. 125 grams
 - B. 93.75 grams
 - C. 62.5 grams
 - D. 31.25 grams
20. A student has to finish up work on a project for metal shop. The last piece that needs to be finished is the painting of a metal sphere for the top of a large diorama. The sphere has a radius of 8 inches, and must be painted with two coats of paint in order to be presentable. A quart of the paint the student has in shop class will cover 450 square inches of metal. How many quarts will be sufficient to paint the sphere with two coats?
- A. 3
 - B. 4
 - C. 5
 - D. 6

MaQ1-Answer: The answer is A. If the expression $x^2 - mx - 27 = 0$ when $x = 6$, then substituting 6 for x yields $(6)^2 - m(6) - 27 = 0$, which simplifies to $36 - 6m - 27 = 0$. Adding 27 to both sides of the equation yields $36 - 6m = 27$, and adding $6m$ to both sides yields $36 = 27 + 6m$. Subtracting 27 from both sides shows $9 = 6m$; dividing both sides of the equation thus yields $m = 1.5$. To check, substituting 1.5 for the value of m when $x = 6$ gives $36 - (1.5)(6) - 27 = 0$; since $(1.5)(6) = 9$, the equation simplifies to $36 - 9 - 27 = 0$, which is correct. Thus, option A is correct.

MaQ2-Answer: The answer is C. For any expression of x , multiplying a quantity of x by another quantity causes the exponent of the result to be the sum of the previous exponents. Thus, $(2x)(2x) = (2 * 2)(x * x) = 4(x * x)$; since x is understood to have an exponent of 1, this is equivalent to $4(x^1 * x^1)$, which yields $4x^2$. Now, the original expression can be simplified to $4x^2(x)(x)(x)$. By the same token that the first part was reduced to $4x^2$, $(x)(x)(x)$ can be simplified to x^3 , which leaves the original expression reduced to $(4x^2)(x^3)$. Finally, the compound expression $(4x^2)(x^3)$ can be simplified to $4x^5$, which demonstrates that option C is the correct answer.

MaQ3-Answer: The answer is B. Due to the properties of a triangle, angles that abut sides of an isosceles triangle must be the same size, so automatically angles XWY and XYW must have the same measurement. Since the sum of internal angles of a triangle must add up to 180° in plane geometry, the first step to determining the measurement of XWY is to subtract 44 from 180, which yields an answer of 136. This is the sum of the two base angles of the triangle; thus, by dividing the sum by two, we get the measure of each of the angles. Dividing 136 by 2 yields the answer of 68, which is the measurement of angle XWY; thus, option B is the correct answer.

MaQ4-Answer: The answer is A. Since segment XZ makes a right angle with WY, the properties of a triangle indicate that segment WY is bisected by XZ, meaning segment WZ is 8 units long. Thus, since triangle WZX is a right triangle with segments that are 8 units and 15 units long, the Pythagorean theorem can be used to determine the length of triangle WZX's hypotenuse, which in this case is segment WX. So, by plugging in the known values into the equation form of the theorem $a^2 + b^2 = c^2$, the result is $(8)^2 + (15)^2 = c^2$, c in this case being segment WX. Thus, the equation gives the result $64 + 225 = c^2$, which simplifies to $c^2 = 289$. The square root of 289 is 17, so $c = 17$, which demonstrates that option A is the answer.

MaQ5-Answer: The answer is C. One method of solving these equations would be to multiply both equations by numbers that create equivalent y terms, then add the equations and cancel out the y term to solve for x . So, if the first equation is multiplied by 3 and the second equation is multiplied by 2, the new equations are $6x + 6y = 48$ and $8x - 6y = -6$. Adding these equations together cancels the y terms, and leaves $14x = 42$. Divide both sides by 14 to get x by itself, and the result is $x = 3$. Solving for y in the first equation yields $6 + 2y = 16$; subtract 6 from both sides to get $2y = 10$, and thus $y = 5$. Placing the values for x and y in the second equation yields $12 - 15 = -3$, which is correct. Thus, option C is correct.

MaQ6-Answer: The answer is B. In order to determine the average speed in miles per hour, determine the average speed per minute by dividing the distance traveled by the time it took to travel the distance, then multiply that result by 60 (since there are 60 minutes in an hour) to get the average speed in miles/hr. Thus, if they traveled 54 miles in 72 minutes, their average speed in miles per minute was $54/72$, which equals 0.75 miles/minute. Since there are 60 minutes in an hour, multiply 0.75 miles/minute by 60 minutes/hour, which yields $(0.75)(60)$ miles/hour, which equals 45 miles/hour. Thus, their average speed was 45 miles/hr, which demonstrates that option B is the correct answer.

MaQ7-Answer: The answer is D. In order to determine the simplest expression of a square root, it is generally best to factor out the square root to its smallest numbers and simplify those. For example, since $72 = 8 * 9$, $\sqrt{72}$ can be written as the product of $\sqrt{8}$ and $\sqrt{9}$. Thus, $\sqrt{72} = \sqrt{8} * \sqrt{9}$. Since $\sqrt{9} = 3$, $\sqrt{72} = 3\sqrt{8}$. However, by the same token as the previous simplification, $\sqrt{8}$ can be written as $\sqrt{4} * \sqrt{2}$. Since $\sqrt{4} = 2$, the expression can now be written as $\sqrt{72} = 3 * 2 * \sqrt{2}$, which is equal to $6\sqrt{2}$. Thus, it is demonstrated that $\sqrt{72}$ is equal to $6\sqrt{2}$, and therefore option D is correct.

MaQ8-Answer: The answer is C. In this example, the domain would be the set of all values of x available on the curve plotted on the graph. The outer limits of the function are defined by the endpoints; thus, all the possible points in the domain must lie between the x -values of the endpoints. Since the endpoints are filled-in circles, this indicates that the x -values of the endpoints are included in the domain. Thus, since the left side of the curve terminates in a closed circle at $x = -5$, that means that x can be equal to or more than -5 . Similarly, since the right side of the function terminates in a closed circle at $x = 6$, x can be equal to or less than 6. Therefore, the relationship of x in this domain is $-5 \leq x \leq 6$, thus demonstrating that C is the correct answer.

MaQ9-Answer: The answer is B. Similarly to the answer to the previous question, the range of the function is, in this case, the set of y -values available on the curve plotted on the graph. Unlike the domain, however, the range is not defined

by the endpoints, but the extremes of the curve that are reached along the y-axis. For example, the smallest value for y is reached at $x = -3$, instead of $x = -5$ as would be expected if the endpoints were the defining part of the curve for the y-values. As seen on the graph, the smallest value of y on the curve is -6, so -6 is the lower bound for the range. By the same token, the highest y-value the function reaches is 2. Therefore, the range is best written as $-6 \leq y \leq 2$, demonstrating that option B is correct.

MaQ10-Answer: The answer is C. In order to determine the circumference, or the distance around the outer edge of a geometric figure (which can also be thought of as the perimeter) of a circle, it is necessary to use the formula C (circumference) = $2\pi r$, where r is the radius, or distance from the center of the circle to its edge. In this case, the problem gives the radius as being 8 inches, so in order to compute the circumference, plug in the value of 8 inches for the radius, which yields $C = 2\pi(8 \text{ inches})$. Multiplying through yields an answer of $C = 16\pi$ inches, which demonstrates that option C is the correct choice.

MaQ11-Answer: The answer is A. In order to figure out the volume of a rectangular solid, the formula used is $V = hwd$, where h is height, w is width and d is depth. In this case, the variable h is 6 feet, the variable w is 2 feet and the variable d is 3 feet. Plug the values into the formula, and the result is $V = 6 * 2 * 3$, or 36 cubic feet. However, the preconditions listed in the problem state that only half of the total interior volume will be available for use, so that figure will have to be divided by 2. Thus, we get $36/2$, or 18, which yields the answer of 18 cubic feet. Thus, option A is the correct choice.

MaQ12-Answer: The answer is B. Since the information given states that x and y are in direct proportion such that their ratio is the same as 3 to 8, the best way to visualize the problem is to set up two ratios side by side, presented as $x/y = 3/8$. Since the problem asks the reader to solve for y when $x = 6$, the ratio can be further modified to read $6/y = 3/8$. In order to set up the relationship for y , perform cross-multiplication of terms to get the equation $3y = 6 * 8$, or $3y = 48$. Dividing both sides of the equation by 3 yields $y = 16$, thus demonstrating that option B is the correct answer.

MaQ13-Answer: The answer is C. In order to achieve a 90 average over the course of four exams, the scores of the exams must add up to 360, which when divided by the number of exams comes out to 90. According to the information given in the problem, the student received 89, 97 and 88 for the first three tests. When summed, $89 + 97 + 88 = 274$. So, in order to get a 90 average, the student must make up the difference between the present score total and 360 in order to average out to 90. Thus, $360 - 274 = 86$, which is the minimum score the student must get to achieve a 90 average, demonstrating that option C is the answer.

MaQ14-Answer: The answer is D. Since the sales tax differs for different kinds of items, the separate tax bills must be calculated and then added together to determine the total. If the teacher paid \$5 for food and the sales tax is 6%, then the sales tax is calculated by multiplying \$5 by 0.06, which equals \$0.30 or 30 cents. Next, the sales tax for non-food items is calculated by multiplying \$6.50 by 0.04, which equals \$0.26 or 26 cents. Thus, the total tax bill is determined by adding the two separate tax totals together; $\$0.30 + \$0.26 = \$0.56$, or 56 cents, which demonstrates that option D is the correct answer.

MaQ15-Answer: The answer is A. The slope of a line is defined by the total of the rise on the y-axis divided by the total of the run on the x-axis, using the formula m (slope) = $(y_2 - y_1) / (x_2 - x_1)$. In this case, if (6, 5) is used as the second pair and (-3, 2) is used as the first pair, the value for m with the given values becomes $(5 - 2) / (6 - (-3))$. Since subtracting a negative number is the same operation as adding a positive number, the formula yields $m = 3/9$, which simplifies to $m = 1/3$. Thus, the slope of the line is $1/3$, demonstrating that option A is the correct answer.

MaQ16-Answer: The answer is D. The slope-intercept equation of a line is given as $y = mx + b$, where m is the slope and b is the constant where the line crosses the y-axis. There are different approaches to figuring out the equation, but given the slope and the set of coordinates the line passes through, solving for b to obtain the intercept equation is the simplest. Substituting the slope and the coordinates into the formula yields $5 = 1/3(6) + b$, which simplifies quickly to $5 = 2 + b$, and by subtracting 2 from both sides, $3 = b$. Thus, with the value for b in hand (which is corroborated by the graph in the previous question), the slope-intercept equation can be written as $y = 1/3 x + 3$, demonstrating that option D is correct.

MaQ17-Answer: The answer is C. The area of a rectangle is determined by multiplying length by width. In this case, if width is assigned the value x , then the length must be $3x$ as given in the problem. Thus, the area is $(3x)(x)$, or $3x^2$. Since the value of the area is given as 48 square inches, it is clear that $3x^2 = 48$. Dividing both sides by 3 yields $x^2 = 48/3$, or $x^2 = 16$. By taking the square root of both sides of the equation, it demonstrates that x , or the width of the rectangle, is 4 inches. Since the length was given as three times the width, the next step is to multiply the width of the rectangle by 3, which yields $3 * 4 = 12$. Thus, the length of the rectangle is 12 inches, demonstrating that option C is correct.

MaQ18-Answer: The answer is B. The odds are figured by comparing the total number of a chosen option versus the total number of options that can be selected. To begin with, there were a total of 35 eggs in the box ($12+8+15=35$), 8 of which were blue, which means there were 8 that would yield a toy if chosen. The previous student to draw pulled a green egg, which does not yield a toy; thus, the total number of options decreased by one to 34, but the total number of blue eggs remained at 8. Thus, for the next draw, the chances of pulling a blue egg and getting a toy were 8 out of a total of 34 eggs in total. Therefore, the chances of getting a toy were $8/34$, demonstrating that option B is correct.

MaQ19-Answer: The answer is D. If half of the sample decays into an inert state every 21 days, or three weeks, then determining the amount of sample left is a matter of plotting the decay against the time frame. Since the initial sample was 500 grams, the remaining radioactive part of the sample would be half that at 21 days, or 250 grams. After another three weeks, at the 6-week point, the sample would have halved again, to 125 grams still radioactive. At the 9-week point, the sample would have halved again, this time to 62.5 grams. Finally, at the 12-week point and the end of the study, the sample would have halved again, this time to 31.25 grams. Thus, option D is the correct answer.

MaQ20-Answer: The answer is B. The surface area of a sphere is defined by the formula $S = 4\pi r^2$, where r is the radius of the sphere. Since the radius is given as 8 inches, S can be determined by plugging in the values, which yields $S = 4\pi(8)^2$, which yields $S = 256\pi$ square inches, which is roughly equal to 804 square inches. However, since the sphere must be given two coats, the amount of paint must be sufficient to cover roughly 1608 square inches, or two coats of 804 square inches. Since the paint must cover 1608 square inches, and each quart covers 450 square inches, the number of quarts needed is determined by dividing 1608 by 450, which yields $1608/450$, roughly equal to 3.57 quarts. Through rounding, the number of quarts needed is determined to be 4, thus demonstrating that option B is correct.