

PRACTICE QUESTIONS

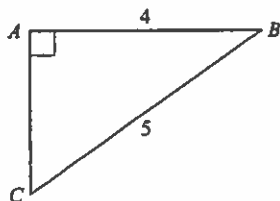
Following are simulated ACT Mathematics questions, along with explanations for all of the questions. Carefully read the directions, apply the information from this chapter, and attempt all of the questions.

DIRECTIONS: The following are problems that are representative of the kinds of questions you will see on the ACT Mathematics Test. Solve each problem and circle the letter of the correct answer. Do not linger over problems that take too much time; come back to them later. You are permitted to use a calculator,

but remember to use it wisely. The figures are NOT necessarily drawn to scale, all geometric figures lie in a plane, and the word *line* indicates a straight line. Answers and Detailed Explanations are included at the end of this section.

1. On a real number line, point X has a coordinate of -2 and point Y has a coordinate of 6 . What is the length of line segment \overline{XY} ?
A. -4
B. 0
C. 4
D. 6
E. 8

2. Given the right triangle below, how many units long is side AC ?



- F. 1
G. $\sqrt{5}$
H. 3
J. $\sqrt{41}$
K. 9
3. The area of a circle can be approximated by multiplying 3.14 by the radius squared. Which of the following expresses this approximation?
A. $A \approx (3.14)2r$
B. $A \approx \frac{3.14}{r^2}$
C. $A \approx \sqrt{3.14r}$
D. $A \approx 3.14r^2$
E. $A \approx (3.14r)^2$
 4. José has 7 blue shirts and 5 white shirts in one drawer in his dresser. Because he is late for school, he reaches into the drawer and randomly removes a shirt. What is the probability that José removes a white shirt?
F. $1:12$
G. $1:5$
H. $5:12$
J. $5:7$
K. $7:5$

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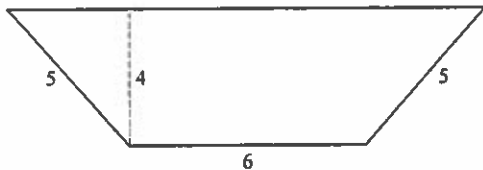
5. Ryan bought a pair of shorts on clearance for \$15.75. If the shorts were 30% off, what was the original price of the shorts?
- A. \$4.73
 - B. \$6.75
 - C. \$20.48
 - D. \$22.50
 - E. \$52.50
6. Stephanie was s years old 5 years ago. How old will she be 4 years from now?
- F. $s + 4$
 - G. $5(s + 4)$
 - H. $s + 9$
 - J. $s - 1$
 - K. $s + 1$
7. What is the sum of the polynomials $4x^2y + 2x^2y^3$ and $-2xy + x^2y^3$?
- A. $4x^2y + 3x^2y^3 - 2xy$
 - B. $4x^2y + 2x^2y^3 - 2x^2y^3$
 - C. $2x^2y + 2x^2y^3 + xy$
 - D. $2x^2 - 4x^2y^3 - 2xy^3$
 - E. $-2x^2y - 2x^2y^3 + x^2y^3$
8. If $t = -7$, what is the value of $|t - 2|$?
- F. -9
 - G. -5
 - H. 5
 - J. 9
 - K. 14
9. For all x , $4 - 2(x + 1) = ?$
- A. $2 - 2x$
 - B. $4 + x$
 - C. $3 - 2x$
 - D. $2x - 4$
 - E. $4 - x$
10. $(x^4)^{15}$ is equivalent to:
- F. x^{11}
 - G. x^{19}
 - H. x^{60}
 - J. $15x^4$
 - K. $60x$
11. What is the sum of the 2 solutions to the equation $x^2 - 2x - 15 = 0$?
- A. -8
 - B. -2
 - C. 2
 - D. 8
 - E. 15
12. What is the 209th digit after the decimal point in the repeating decimal $0.\overline{76234}$?
- F. 5
 - G. 4
 - H. 3
 - J. 2
 - K. 0

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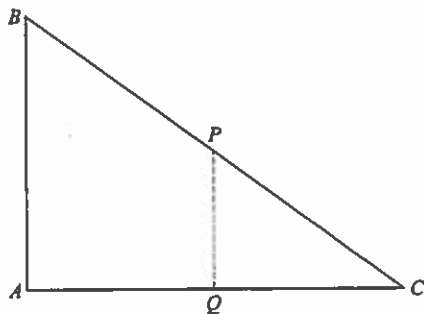
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13. How long, in minutes, would it take a car to travel 18 miles at a constant speed of 45 miles per hour?
- A. 20
 - B. 24
 - C. 28
 - D. 34
 - E. 40

14. The area of a trapezoid is found by using the equation $\frac{1}{2}h(b_1 + b_2)$, where h is the height and b_1 and b_2 are the lengths of the bases. What is the area of the trapezoid shown below?



- F. 18
 - G. 20
 - H. 24
 - J. 30
 - K. 36
15. For the area of a square to triple, the new side length must be the original side length multiplied by what number?
- A. $\sqrt{3}$
 - B. 2
 - C. $2\sqrt{3}$
 - D. 3
 - E. 9
16. In the right triangles below, \overline{PQ} is 4 cm, \overline{QC} is 3 cm, \overline{AB} is 8 cm, and \overline{BP} is 5. How long, in cm, is \overline{AQ} ?



- F. 2
 - G. 3
 - H. 4
 - J. 5
 - K. 6
17. A rectangular classroom is 4 feet wider than it is long and has an area of 480 square feet. What is the length of the classroom in feet?
- A. 12
 - B. 16
 - C. 20
 - D. 24
 - E. 28

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DO YOUR FIGURING HERE.

18. In the standard (x, y) coordinate plane, a line has a slope of $\frac{2}{3}$ and passes through $(-1, 1)$. Through which of the following points does this line also pass?
- F. $(2, 3)$
G. $(2, 1)$
H. $(2, 2)$
J. $(3, 2)$
K. $(3, 3)$
19. If $\log_x 256 = 4$, then $x = ?$
- A. 4
B. 16
C. 64
D. $\frac{64}{\log_x}$
E. 256^4
20. What is the slope of the line with equation $2x - 3y = 6$?
- F. -3
G. -2
H. $\frac{2}{3}$
J. 1
K. $\frac{3}{2}$
21. $\frac{3}{5} \cdot \frac{4}{6} \cdot \frac{5}{7} \cdot \frac{6}{8} \cdot \frac{7}{9} = ?$
- A. $\frac{1}{2}$
B. $\frac{1}{3}$
C. $\frac{1}{6}$
D. $\frac{3}{8}$
E. $\frac{4}{9}$
22. The points $P(1, 2)$, $Q(5, 2)$, and $R(1, -2)$ in the standard (x, y) coordinate plane are 3 vertices of square $PQRS$. Which of the following points is the fourth vertex, S ?
- F. $(5, -2)$
G. $(1, 5)$
H. $(5, -1)$
J. $(2, -5)$
K. $(5, 2)$
23. The equation $x^2 - 12x + b = 0$ has only 1 solution for x . What is the value of b ?
- A. 0
B. 3
C. 4
D. 24
E. 36
24. If $0^\circ \leq x^\circ \leq 90^\circ$ and $(\tan x) - 1 = 0$, then $x^\circ = ?$
- F. 0
G. 15
H. 30
J. 45
K. 60

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25. The operation \otimes is defined by the following:

$$a \otimes b = 2 - a + b + a \times b$$

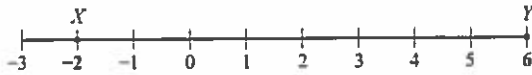
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For example, $2 \otimes 3 = 2 - 2 + 3 + 2 \times 3 = 9$.
If $a = -7$ and $b = 2$, then $a \otimes b = ?$

- A. -3
- B. 0
- C. 8
- D. 28
- E. 72

ANSWERS AND EXPLANATIONS

1. The correct answer is E. You are given that point X is -2 on the number line and point Y is 6 on the number line. Draw a number line and measure the distance between those 2 points:



The distance between point X and point Y on the number line is 8 units, answer choice E.

2. The correct answer is H. To find the length of the sides of a right triangle, use the Pythagorean Theorem: $a^2 + b^2 = c^2$, where c is the hypotenuse, and a and b are the remaining two sides. The hypotenuse is the side opposite the right angle. According to the information given, the hypotenuse is side \overline{BC} , which has a length of 5 units. Side \overline{AB} has a length of 4 units, so you must find the length of side \overline{AC} . Simply plug the given lengths into the Pythagorean Theorem and solve the equation.
- $$4^2 + b^2 = 5^2$$
- $$b^2 = 5^2 - 4^2$$
- $$b^2 = 25 - 16$$
- $$b^2 = 9, \text{ so } b \text{ equals } \sqrt{9}, \text{ or } 3, \text{ answer choice H.}$$
3. The correct answer is D. The first step in answering this question is to square the radius. The radius squared is equivalent to r^2 . Eliminate answer choices A and C, which do not square the radius. Since you are told that you must multiply 3.14 by the radius squared, eliminate answer choice B, which divides 3.14 by the radius squared. You can also eliminate answer choice E, which squares the quantity $(3.14r)$; you are only required to square the radius, r . This leaves $3.14r^2$, answer choice D.
4. The correct answer is H. *Probability* refers to how likely it is that something will happen. In this case, how likely it is that José will remove a white shirt from the drawer? José has 5 white shirts and 7 blue shirts in the drawer; therefore he has a total of 12 shirts in the drawer. He has 5 chances to remove a white shirt out of the 12 total shirts, because he has 5 white shirts. So, the likelihood of José removing a white shirt is 5 out of 12, which can also be expressed as 5:12, answer choice H.
5. The correct answer is D. This question asks you to solve for an unknown price. Call the unknown price (the original price) P . Since the shorts were on sale for 30% off, Ryan paid $100\% - 30\%$, or 70% of the original price, P . Multiply P by 0.70, the decimal equivalent of 70%:
- $$P \times 0.70 = \$15.75.$$
- Set up a proportion to solve for P :
- $$\begin{array}{l} \$15.75 \text{ is to } P \text{ as } 70\% \text{ is to } 100\% \\ \frac{15.75}{P} = \frac{70}{100}; \text{ cross-multiply and solve for } P. \\ 70P = 1,575 \\ P = \$22.50, \text{ answer choice D.} \end{array}$$
6. The correct answer is H. If Stephanie was s years old 5 years ago, she must $s + 5$ years old today. In 4 years, she will be $(s + 5) + 4$ or $s + 9$ years old, answer choice H.
7. The correct answer is A. To find the sum of the polynomials, you must add the like terms together. Like terms have the same variables raised to the same powers. The only like terms given in the problem are $2x^2y^3$ and x^2y^3 ; add them together to get $3x^2y^3$. Therefore, the correct answer is $4x^2y + 3x^2y^3 - 2xy$, answer choice A.
8. The correct answer is J. The absolute value of any number is always a positive value. The first step in solving this problem is to perform the math function inside the absolute value signs. Substitute -7 for t in the equation $t - 2$: $-7 - 2 = -9$. Now take the absolute value: The absolute value of -9 is 9, answer choice J.
9. The correct answer is A. This is an order of operations question, so the first step is to multiply the quantity in the parenthesis by 2:
- $$2(x + 1) = 2x + 2.$$
- Next, subtract this quantity from 4, combining like terms and keeping track of the negative sign:
- $$4 - (2x + 2) = 4 - 2x - 2$$
- Remember to distribute the negative sign.
- $$2 - 2x, \text{ answer choice A.}$$
10. The correct answer is H. When exponents are raised to an exponential power, the rules state that you must multiply the exponents by the power to which they are raised. So, $(x^4)^{15} = x^{(4 \times 15)} = x^{60}$, answer choice H.

11. The correct answer is C. The first step in solving this problem is to factor the equation $x^2 - 2x - 15 = 0$. Set up the quantities:

$$(x - \underline{\quad})(x + \underline{\quad}) = 0$$

Find 2 numbers that when multiplied together give you -15 , and when added together give you -2 . The only numbers that satisfy both operations are -5 and 3 .

$$(x - 5)(x + 3) = 0$$

$$x - 5 = 0; x = 5$$

$$x + 3 = 0; x = -3$$

Since the problem asks for the sum of the 2 solutions, add 5 and -3 to get 2 , answer choice C.

12. The correct answer is H. Notice that there are 5 digits in the repeating decimal (only count the digits after the decimal point). The fifth digit is the number 4, so every place that is a multiple of 5 will be the number 4. Since 210 is a multiple of 5, the 210th digit will be 4. In the repeating decimal, the number 4 always follows the number 3, so the 209th digit will be 3, answer choice H.

13. The correct answer is B. There are 60 minutes in 1 hour. This means that the car is traveling at a constant speed of 45 miles per 60 minutes. Set up a proportion to calculate the number of minutes it would take the car to travel 18 miles:

18 miles is to 45 miles as x minutes is to 60 minutes.

$$\frac{18}{45} = \frac{x}{60}; \text{ cross-multiply and solve for } x.$$

$$45x = 1,080$$

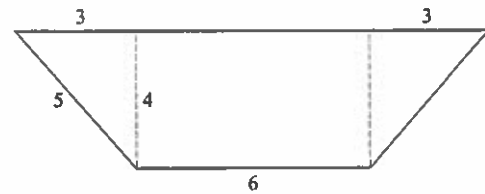
$$x = 24 \text{ minutes, answer choice B.}$$

14. The correct answer is K. You are given the height (4) and the length of b_2 (6). The first step in solving this problem is to calculate the length of b_1 . A trapezoid is formed by adding 2 right triangles to opposite ends of a rectangle. Notice how the nonparallel sides both have lengths of 5. Therefore, the two right triangle pieces of the trapezoid are congruent. To find the length of the other leg, use the Pythagorean Theorem with the values given, or simply recognize that the triangles are special-case 3-4-5

right triangles. Compute the length of the long base:

$$b_1 = 3 + 6 + 3 = 12$$

Draw a diagram to help visualize the dimensions:



Substitute the values for h , b_1 , and b_2 into the equation and calculate the area:

$$\frac{1}{2}(b_1 + b_2)h$$

$$\frac{1}{2}(12 + 6)(4)$$

$$\frac{1}{2}(18)(4)$$

$$(9)(4) = 36, \text{ answer choice K.}$$

15. The correct answer is A. The area of a square $= s^2$. Translate the question into an equation:

3 times the area equals the side length times some number then squared:

$$3A = (xs)^2$$

$$3A = (x^2)(s^2)$$

Recall the original formula:

$$A = s^2$$

Multiply by 3:

$$3A = 3(s^2)$$

Compare to the new formula:

$$3A = (xs)^2$$

$$3A = (x^2)(s^2)$$

Thus, $x^2 = 3$

$$x = \sqrt{3}$$

Alternatively, you can use chosen values, such as $s = 1$:

$$A = 1^2$$

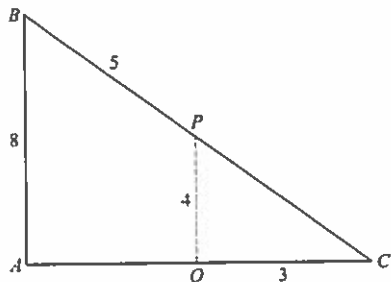
$$A = 1$$

The area triples:

$$3 = s^2$$

$$\sqrt{3} = s$$

16. The correct answer is G. The best way to solve this problem is to show the given values on the triangle:



According to information in the problem, both of the triangles are right triangles. Therefore, you can use the Pythagorean Theorem to determine the missing lengths. The first step is to calculate the length of \overline{PC} . The Pythagorean Theorem states that $a^2 + b^2 = c^2$, where c is the hypotenuse. Substitute the known values and solve for c :

$$4^2 + 3^2 = c^2$$

$$25 = c^2, \text{ so } c = 5.$$

Therefore, the length of \overline{PC} is 5, and the length of \overline{BC} is $5 + 5$, or 10. Now use the Pythagorean Theorem again to calculate the length of \overline{AC} :

$$8^2 + b^2 = 10^2$$

$$64 + b^2 = 100$$

$$b^2 = 36, \text{ so } b = 6$$

Finally, you can calculate the length of \overline{AQ} .

$$\overline{AC} = \overline{AQ} + \overline{QC}$$

$$6 = \overline{AQ} + 3$$

$$\overline{AQ} = 3, \text{ answer choice G.}$$

17. The correct answer is C. The area of a Rectangle = length \times width. Since the classroom is 4 feet wider than it is long, set the length to x feet, and the width to $x + 4$ feet. You are given that the area is equal to 480 square feet. Plug these values into the equation and solve for x :

$$x(x + 4) = 480$$

$$x^2 + 4x = 480$$

$$x^2 + 4x - 480 = 0$$

$$(x + 24)(x - 20) = 0$$

$$x + 24 = 0; \quad x = -24$$

$$x - 20 = 0; \quad x = 20$$

Since the length cannot be a negative number, the length of the classroom must be 20 feet, answer choice C.

18. The correct answer is F. The slope of a line is defined as the change in the y -values over the change in the x -values in the standard (x, y) coordinate plane. Slope can be calculated by using the following formula:

$$\frac{(y_1 - y_2)}{(x_1 - x_2)}$$

Since the slope is $\frac{2}{3}$, for every positive change in 2 along the y -axis, there must be a positive change in 3 along the x -axis. In other words, as you go up 2 in the value of y , you also must go 3 to the right in the value of x . Therefore, the line will pass through the x -coordinate with value $-1 + 3$ or 2, and will pass through the y -coordinate with value $1 + 2$, or 3. That point is $(2, 3)$, answer choice F.

19. The correct answer is A. Logarithms are used to indicate exponents of certain numbers called bases. This problem tells you that log to the base x of 4 equals 256. By definition, $\log_a b = c$, if $a^c = b$. So, the question is, when x is raised to the power of 4, you get 256; what is x ? By definition, $\log_x 256 = 4$ when $x^4 = 256$. The fourth root of 256 is 4 ($4 \times 4 \times 4 \times 4 = 256$), answer choice A.

20. The correct answer is H. The standard form of the equation of a line is $y = mx + b$, where m is the slope. Put the equation in the standard form:

$$(1) \quad 2x - 3y = 6$$

$$(2) \quad -3y = -2x + 6$$

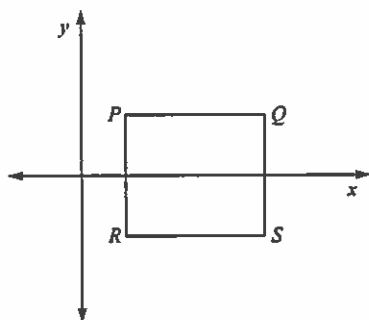
$$(3) \quad y = \frac{2}{3}x - 2$$

The slope of the line is $\frac{2}{3}$, answer choice H.

21. The correct answer is C. A simple way to solve this problem is to create one fraction, then cancel values that appear in both the numerator and denominator, as follows:

$$\frac{(3)(4)(5)(6)(7)}{(5)(6)(7)(8)(9)} = \frac{(3)(4)}{(8)(9)} = \frac{12}{72} = \frac{1}{6}$$

22. The correct answer is F. Draw a diagram to help visualize this problem:



Based on the diagram, point S must have a negative y -coordinate. Eliminate answer choices G and K because they have positive y -coordinates. Since point P is at $(1, 2)$ and point Q is at $(5, 2)$, you know that the distance between the points along the x -axis is 4. A square has 4 sides of equal length, so the distance from point Q to point S must also be 4. Since the y -coordinate of point Q is 2, the y -coordinate of point S must be -2 . The only remaining answer choice with a y -coordinate of -2 is answer choice F.

23. The correct answer is E. Since the equation $x^2 - 12x + b = 0$ has only 1 solution for x , the equation is a perfect square. This means that $x^2 - 12x + b$ is equivalent to $(x - 6)^2$. Use the FOIL method as follows to solve for b :

$$(x - 6)(x - 6) = 0$$

$$\text{First terms: } (x)(x) = x^2$$

$$\text{Outside terms: } (-6)(x) = -6x$$

$$\text{Inside terms: } (-6)(x) = -6x$$

$$\text{Last terms: } (-6)(-6) = 36$$

So, $(x - 6)(x - 6) = x^2 - 12x + 36$; b is 36, answer choice E.

24. The correct answer is J. You are given that $\tan x - 1 = 0$, so $\tan x = 1$. By definition, $\tan 45^\circ = 1$, so x must equal 45, answer choice J.

25. The correct answer is A. Don't be alarmed by this "new operation." It is strictly a substitution problem. Since the new operation is defined, you can simply plug the values given for a and b into the operation and solve (keep track of the negative signs and remember the order of the operations!):

$$a \otimes b = 2 - a + b + a \times b$$

You are given that $a = -7$ and $b = 2$.

$$\text{So, } a \otimes b = 2 - (-7) + (2) + (-7) \times 2.$$

$$a \otimes b = 2 - (-7) + 2 + (-14)$$

$$a \otimes b = 2 + 7 + 2 - 14$$

$$a \otimes b = 11 - 14, \text{ or } -3, \text{ answer choice A.}$$