

# Math Knowledge

## Subtest 5: Mathematics Knowledge

**Time:** 24 minutes for 25 questions

**Directions:** This section tests your ability to solve general mathematical problems. Select the correct answer from the choices given, and then mark the corresponding space on your answer sheet. Use scratch paper to do any figuring.

1. If  $x = 8$ , what's the value of  $y$  in the equation  $y = (x^2 \div 4) - 2$ ?  
(A) 14  
(B) 16  
(C) 18  
(D) 20
2. The cube of 5 is  
(A) 125  
(B) 25  
(C) 15  
(D) 50
3.  $2.5 \times 3^3 =$   
(A) 22.5  
(B) 75.0  
(C) 67.5  
(D) 675.0
4. The fourth root of 16 is  
(A) 4  
(B) 1  
(C) 3  
(D) 2
5. What's the equation of a line that passes through points  $(0, -1)$  and  $(2, 3)$ ?  
(A)  $y = 2x - 1$   
(B)  $y = 2x + 1$   
(C)  $x = 2y - 1$   
(D)  $x = 2y + 1$
6.  $(12 \text{ yards} + 14 \text{ feet}) \div 5 =$   
(A) 12 feet  
(B)  $5\frac{1}{5}$  feet  
(C) 10 feet  
(D)  $2\frac{1}{2}$  yards
7.  $x^3 \cdot x^4 =$   
(A)  $x^{12}$   
(B)  $2x^7$   
(C)  $2x^{12}$   
(D)  $x^7$
8.  $(x + 4)(x + 2) =$   
(A)  $x^2 + 6x + 6$   
(B)  $x^2 + 8x + 8$   
(C)  $x^2 + 8x + 6$   
(D)  $x^2 + 6x + 8$
9.  $1.5 \times 10^3 =$   
(A) 45  
(B) 150  
(C) 1,500  
(D) 15
10. Which of the following is a prime number?  
(A) 27  
(B) 11  
(C) 8  
(D) 4
11. What's the mode of the following series of numbers? 4 4 8 8 8 10 10 12 12  
(A) 9  
(B) 8  
(C) 11  
(D) 10
12. If  $a = 4$ , then  $a^3 \div a =$   
(A) 4  
(B) 12  
(C) 64  
(D) 16

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13. Solve:  $5!$

- (A) 25
- (B) 125
- (C) 120
- (D) 15

14.  $(900 \times 2) \div 6 =$

- (A) 30
- (B) 300
- (C) 150
- (D) 3,000

15. If  $x = 2$ , then  $x^x(x) =$

- (A) 8
- (B)  $2x^x$
- (C) 4
- (D) 6

16. If  $(5 + 1)(6 \div 3)(8 - 5) = (3 + 3)x$ , then  $x =$

- (A) 12
- (B) 3
- (C) 4
- (D) 6

17.  $\sqrt{49} \times \sqrt{64} =$

- (A) 56
- (B) 15
- (C) 42
- (D) 3,136

18. Which of the following fractions is the largest?

- (A)  $\frac{2}{5}$
- (B)  $\frac{3}{8}$
- (C)  $\frac{7}{10}$
- (D)  $\frac{13}{16}$

19. If  $2 + x \geq 4$ , then  $x \geq$

- (A) 6
- (B) 2
- (C) 4
- (D)  $\frac{1}{2}$

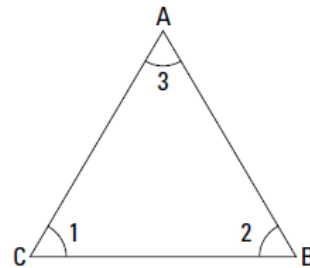
20. If a circle has a radius of 12 feet, what's its circumference most nearly?

- (A) 24 feet
- (B) 72 feet
- (C) 75 feet
- (D) 36 feet

21. An aquarium measures 16 inches long x 8 inches deep x 18 inches high. What's its volume?

- (A) 2,304 cubic inches
- (B) 128 cubic inches
- (C) 42 cubic inches
- (D) 288 cubic inches

22. Triangle  $ABC$  is a(n)



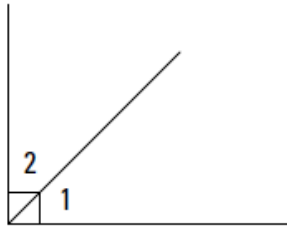
- (A) right triangle.
- (B) obtuse triangle.
- (C) equilateral triangle.
- (D) isosceles triangle.

23. The sum of the measures of the angles of a trapezoid is

- (A) 360 degrees.
- (B) 540 degrees.
- (C) 180 degrees.
- (D) 720 degrees.

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24. Angles 1 and 2 are



- (A) supplementary.
- (B) complementary.
- (C) both obtuse.
- (D) both right angles.

25. Convert 24% to a fraction.

- (A)  $\frac{6}{25}$
- (B)  $\frac{1}{25}$
- (C)  $\frac{6}{24}$
- (D)  $\frac{1}{24}$

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## Answers

### *Subtest 5: Mathematics Knowledge Answers*

This subtest is also used to calculate your AFQT score, so it's important. If you miss more than four or five, consider brushing up on your basic math skills. Chapter 8 can help with this.



The following books may also be of some help: *Algebra For Dummies* and *Algebra II For Dummies* by Mary Jane Sterling, *Geometry For Dummies* and *Calculus For Dummies* by Mark Ryan, and *SAT II Math For Dummies* by Scott Hatch (all books published by Wiley). Chapter 9 also has some additional practice questions.

1. **A.** Substitute 8 for  $x$  in the equation and then solve for  $y$ :

$$\begin{aligned}y &= (x^2 \div 4) - 2 \\ &= (8^2 \div 4) - 2 \\ &= (64 \div 4) - 2 \\ &= 16 - 2 \\ &= 14\end{aligned}$$

2. **A.** The cube of 5 is  $5^3$ , which is  $5 \times 5 \times 5 = 125$ .

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3. C. Because of the order of operations, you need to find  $3^3$  first and then multiply by 2.5:

$$\begin{aligned} & 2.5 \times 3^3 \\ & = 2.5(3 \times 3 \times 3) \\ & = 2.5 \times 27 \\ & = 67.5 \end{aligned}$$

4. D. Because  $2^4 = 16$ , the fourth root of 16 is 2.

5. A. To get the equation of the line, you need to know the line's slope and y-intercept. The slope of the line is equal to the change in  $y$  values divided by the change in  $x$  values. The change in  $y$  values is  $3 - (-1) = 4$ . The change in  $x$  values is  $2 - 0 = 2$ . Thus, the slope is  $\frac{4}{2} = 2$ . The line passes through the point  $(0, 1)$ , so to find the intercept, substitute 0 for  $x$  and  $-1$  for  $y$  in the equation  $y = 2x + b$ :

$$\begin{aligned} -1 &= 2(0) + b \\ b &= -1 \end{aligned}$$

Therefore,  $b = -1$ , so the full equation is  $y = 2x - 1$ .

6. C. Do what's in parentheses first. You need consistent units of measurement, so convert 12 yards to feet; then add 14 feet:

$$\begin{aligned} & (12 \text{ yd.} \times 3 \text{ ft./yd.}) + 14 \text{ ft.} \\ & = 36 \text{ feet} + 14 \text{ feet} \\ & = 50 \text{ feet} \end{aligned}$$

The original problem asks for  $(12 \text{ yards} + 14 \text{ feet}) \div 5$ , so divide by 5 as instructed:  
 $50 \text{ feet} \div 5 = 10 \text{ feet}$ .

7. D. If two powers have the same base, you multiply them by keeping the base the same and adding the powers together:  $x^3 \cdot x^4 = x^{3+4} = x^7$ .
8. D. To find  $(x + 4)(x + 2)$ , you need to multiply every term in the first set of parentheses by every term in the second set and then add the results. The acronym FOIL (First, Outside, Inside, Last) can help you keep track of which terms you're multiplying:

- ✔ **First:** Multiply the first variable in the first set of parentheses by the first variable in the second set of parentheses:  $x(x) = x^2$ .
- ✔ **Outside:** Next, multiply the first variable in the first set of parentheses by the second number in the second set of parentheses:  $x(2) = 2x$ . So far, the results are  $x^2 + 2x$ .
- ✔ **Inside:** Now multiply the second number in the first set of parentheses by the first variable in the second set of parentheses:  $4(x) = 4x$ .
- ✔ **Last:** Next, multiply the second number in the first set of parentheses by the second number in the second set of parentheses:  $4(2) = 8$ .

The solution is  $x^2 + 2x + 4x + 8$ . Combining the like terms results in  $x^2 + 6x + 8$ .

9. C. You need to do powers (exponents) first, so find  $10^3$  and then multiply by 1.5:

$$\begin{aligned} & 1.5 \times 10^3 \\ & = 1.5 \times (10 \times 10 \times 10) \\ & = 1.5 \times 1,000 \\ & = 1,500 \end{aligned}$$

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10. **B.** A *prime number* is a number that can be divided evenly by itself or by 1 but not by any other number. Choices (A), (C), and (D) can all be divided evenly by other numbers.
11. **B.** The *mode* of a series of numbers is the number that appears in the series the most frequently. In this case, it's 8.
12. **D.** Substitute 4 for all  $a$ 's in the problem and then solve, doing the powers first:

$$\begin{aligned}4^3 \div 4 \\ &= (4 \times 4 \times 4) \div 4 \\ &= 64 \div 4 \\ &= 16\end{aligned}$$

13. **C.** The factorial (!) of a number is the number multiplied by the next-smallest whole number, then by the next smallest whole number, and so on down to 1:

$$5! = 5 \times 4 \times 3 \times 2 \times 1 = 120$$

14. **B.** Do what's in parentheses first:

$$(900 \times 2) \div 6 = 1,800 \div 6 = 300$$

15. **A.** Substitute 2 for all  $x$ 's in the problem and then solve, starting with the powers:

$$2^2(2) = 4(2) = 8$$

16. **D.** The problem asks you to solve  $(5 + 1)(6 \div 3)(8 - 5) = (3 + 3)x$  for  $x$ . Solve the first half of the equation, finding the values in parentheses first:

$$(6)(2)(3) = 36$$

Therefore, the whole equation becomes  $36 = (3 + 3)x$ , which turns into  $36 = 6x$ . Isolate  $x$ :

$$36 \div 6 = 6x \div 6$$

$$6 = x$$

To check your answer, substitute 6 for  $x$ .

17. **A.** The square root of 49 is 7; the square root of 64 is 8. And  $7 \times 8 = 56$ .
18. **D.** Find a common denominator for the fractions. In this case, 80 works for all the fractions. Convert all the fractions using the following method:

$$\frac{2}{5} \times \frac{16}{16} = \frac{32}{80}$$

$$\frac{3}{8} \times \frac{10}{10} = \frac{30}{80}$$

$$\frac{7}{10} \times \frac{8}{8} = \frac{56}{80}$$

$$\frac{13}{16} \times \frac{5}{5} = \frac{65}{80}$$

Comparing the fractions, you can see that  $\frac{65}{80}$  (or  $\frac{13}{16}$ ) is the largest fraction.

19. **B.** Solve as you would solve for any unknown:

$$2 + x \geq 4$$

$$2 + x - 2 \geq 4 - 2$$

Therefore,  $x \geq 2$ . To check your answer, substitute 2 for  $x$ :  $2 + 2 \geq 4$ . That's true, so the answer is correct.

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20. **C.** Circumference equals  $\pi \times$  diameter, and diameter is equal to two times the radius (or mathematically,  $C = \pi d$  and  $d = 2r$ ). For this problem,  $C = \pi \times 24$ . If you round  $\pi$  to 3.14, the answer is about 75.36, or about 75 feet.
21. **A.** Volume equals length  $\times$  width  $\times$  height ( $V = lwh$ ), so plug in the numbers and solve:  
 $16 \times 8 \times 18 = 2,304 \text{ in.}^3$
22. **C.** In an equilateral triangle, all sides are equal and all angles are equal.
23. **A.** All quadrilaterals (four-sided figures) have angles that total 360 degrees.
24. **B.** If the sum of two angles equals 90 degrees, they're called *complementary angles*.
25. **A.**  $24\% = \frac{24}{100}$ . You further reduce this fraction to  $\frac{6}{25}$  by dividing the numerator and denominator by 4.