

Category 7 Algebra

<BASIC LEVEL QUESTIONS>

1. If $(a - 1)(b - 2) = 0$, which of the following must be true?
- I. $a = 1$ and $b = 2$.
 - II. If $a \neq 1$, then $b = 2$
 - III. If $a = 1$, then $b \neq 2$.
- (A) I only
(B) II only
(C) III only
(D) I and II
(E) II and III
2. If $(x - 5)(y + 2) = 0$, which of the following must be true?
- (A) $x = y$
(B) $x > y$
(C) $x < y$
(D) $xy = -10$
(A) None of the above
3. If r and s are the two roots of the equation $x^2 + 8x + 15 = 0$, and $r < s$, what is the value of $s - r$?
- (A) -8
(B) -2
(C) 2
(D) 7
(E) 8

4. If $(-2, k)$ is a point on the graph of $y = 2x^2 - 3x + 1$, then $k =$
- (A) -13
 - (B) -1
 - (C) 3
 - (D) 11
 - (E) 15
5. The product of two positive integers m and n is twice their sum. If n is 6, what is the value of m ?
- (A) 8
 - (B) 6
 - (C) 4
 - (D) 3
 - (E) 2
6. If $x : y = 2 : 3$, $y : z = 3 : 4$, and $x = 8$, then $z - y =$
- (A) 1
 - (B) 4
 - (C) 6
 - (D) 8
 - (E) 12

7. If S is the set of all numbers x such that $1 - 2x \leq 3$, which of the following is true about S ?
- (A) The least number in S is -1 .
 - (B) The least number in S is 0 .
 - (C) The least number in S is 3 .
 - (D) The greatest number in S is -2 .
 - (E) The greatest number in S is -1 .
8. If $rt > st$ and $r > s$, then which of the following must be true?
- (A) $t > 0$
 - (B) $s > 0$
 - (C) $r > 0$
 - (D) $t < 0$
 - (E) $rs > 0$
9. If $-3 \leq x \leq 7$ and $-6 \leq y \leq 2$, what is the smallest possible value of $x - 2y$?
- (A) -15
 - (B) -9
 - (C) -7
 - (D) 0
 - (E) 9

10. For any integer x , \overline{x} is defined by the equation $\overline{x} = x + 1$. Which of the following is equal to $(\overline{x})^2 - \overline{x^2}$ for all integers x ?

(A) 0
(B) 2
(C) $\overline{2x}$
(D) $2x$
(E) $\overline{2x}$

11. An operation $*$ defined on whole numbers gives results such as the following:

$$2 * 3 = 7$$

$$3 * 4 = 13$$

$$1 * 5 = 6$$

$$0 * 6 = 1$$

According to the equations above, which of the following could define the operation $*$?

(A) $x * y = x + y$
(B) $x * y = 2x + y$
(C) $x * y = y^2 - x$
(D) $x * y = x^2 + y$
(E) $x * y = xy + 1$

12. If $r \circ s = rs + r + s$, then for what value of s is $r \circ s$ equal to r for all values of r ?

(A) -1
(B) 0
(C) 1
(D) $\frac{1}{r+1}$
(E) r

13. Marie's monthly salary is determined by the formula $s = 850 + \frac{x}{10}$, where s is her salary and x is the total amount of her monthly sales, both expressed in dollars. If the total of Marie's sales for July was \$22,000, then her salary for July was
- (A) \$2,115
 - (B) \$3,050
 - (C) \$5,620
 - (D) \$6,410
 - (E) \$10,700
14. The total cost C , in dollars, of manufacturing x items of a certain type is given by $C = \frac{1}{2}x^2 + 5,000$. When the total cost is \$10,000, exactly how many such items are manufactured?
- (A) 100
 - (B) 140
 - (C) 200
 - (D) 30,000
 - (E) 50,000,000
15. A loaf of bread and 2 one-pound containers of butter cost a total of \$4.95. If a pound of butter costs \$0.90 more than a loaf of bread, how much does a pound of butter cost?
- (A) \$1.05
 - (B) \$1.58
 - (C) \$1.95
 - (D) \$2.03
 - (E) \$2.93

16. Pat bought n apples at a cost of 3 for \$0.20 and then sold the n apples at a price of 4 for \$0.35. If Pat's revenue from the sale of the apples was \$2.50 more than the cost of the apples, what is the value of n ?
- (A) 150
(B) 120
(C) 90
(D) 80
(E) 60
17. The total cost of 3 pounds of hamburger and 4 pounds of hot dogs is \$12.39. At the same rates, if the cost of 5 pounds of hamburger is \$9.45, what is the cost per pound of hot dogs?
- (A) \$1.59
(B) \$1.68
(C) \$1.77
(D) \$1.89
(E) \$2.03
18. At a certain bowling alley, it costs \$0.50 to rent bowling shoes for the day and \$1.25 to bowl 1 game. If a person has \$12.80 and must rent shoes, what is the greatest number of complete games that person can bowl in one day?
- (A) 7
(B) 8
(C) 9
(D) 10
(E) 11

19. A mother and her child have a combined weight of 150 pounds. If the mother's weight is 5 times her child's weight, what is the weight, in pounds, of the child?
- (A) 32
(B) 30
(C) 28
(D) 25
(E) 24
20. Jim multiplied a number by 5 when he should have divided it by 4. If the result he got was 10, what would have been the result if he had not made the error?
- (A) $\frac{1}{20}$
(B) $\frac{1}{10}$
(C) $\frac{1}{5}$
(D) $\frac{1}{4}$
(E) $\frac{1}{2}$
21. An instructor scored a student's test of 50 questions by subtracting 2 times the number of incorrect answers from the number of correct answers. If the student answered all of the questions and received a score of 38, how many questions did that student answer correctly?
- (A) 19
(B) 38
(C) 41
(D) 44
(E) 46

22. The area of a rectangular region with length $2x+1$ and width $x-3$ is
- (A) $2x^2 - 3$
 - (B) $2x^2 + x - 3$
 - (C) $2x^2 - 5x - 3$
 - (D) $2x^2 - 6x - 3$
 - (E) $2x^2 + 7x + 3$
23. The total price of $n(n > 1)$ equally priced copies of a certain book is \$50. In terms of n , which of the following gives the total price of $n - 1$ of these copies?
- (A) $50(n - 1)$
 - (B) $\frac{50}{n - 1}$
 - (C) $\frac{50(n - 1)}{n}$
 - (D) $\frac{50n}{n - 1}$
 - (E) $\frac{50}{n(n - 1)}$
24. The supply of a certain commodity is given by the formula $S = 9x + x^2$ and the demand for the commodity is given by the formula $D = 2,475 - x$, where x is the price of the commodity in dollars. At which of the following values of x will the supply of the commodity equal the demand for the commodity?
- (A) 9
 - (B) 45
 - (C) 55
 - (D) 275
 - (E) 2,475

$$d = \frac{3v^2}{20} \text{ and } t = \frac{2d}{v}, \text{ where}$$

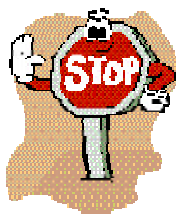
d is the distance traveled, in meters, after the brakes are applied

v is the velocity, in meters per second, before the brakes are applied

t is the time, in seconds, it takes to stop after the brakes are applied.

25. The formulas above are used to compute the distance a car travels after the brakes are applied. If the driver of a car applied the brakes just as a traffic light turned yellow and stopped exactly 6 seconds later, what is the value of v ?

- (A) 20
- (B) $\frac{80}{3}$
- (C) 30
- (D) 40
- (E) 60





Category 7 Algebra

1. If $(a-1)(b-2) = 0$, which of the following must be true?

- I. $a = 1$ and $b = 2$.
- II. If $a \neq 1$, then $b = 2$
- III. If $a = 1$, then $b \neq 2$.

- (A) I only
- ☒ (B) II only
- (C) III only
- (D) I and II
- (E) II and III

$$a = 1 \quad b = 2 \quad (a-1)(b-2) = 0 \quad . \quad a \neq 1 \quad b = 2 \quad 274$$

$$. \quad a = 1 \quad b = 2 \quad b \neq 2 \quad .$$

(B) .

2. If $(x-5)(y+2) = 0$, which of the following must be true?

- (A) $x = y$
- (B) $x > y$
- (C) $x < y$
- (D) $xy = -10$
- ☒ (E) None of the above

$$x = 5 \quad y = -2 \quad (x-5)(y+2) = 0 \quad .$$

(E) .

3. If r and s are the two roots of the equation $x^2 + 8x + 15 = 0$, and $r < s$, what is the value of $s - r$?

(A) -8
 (B) -2
 (C) 2
 (D) 7
 (E) 8

$$x^2 + 8x + 15 = 0 \quad (\text{two roots}) \quad r, s \quad s - r$$

$$x^2 + 8x + 15 = (x + 3)(x + 5) = 0, \quad r = -5, s = -3$$

(C) .

4. If $(-2, k)$ is a point on the graph of $y = 2x^2 - 3x + 1$, then $k =$

(A) -13
 (B) -1
 (C) 3
 (D) 11
 (E) 15

$$(-2, k) \text{ 가 } y = 2x^2 - 3x + 1 \text{ 에서 } k$$

(E) .

5. The product of two positive integers m and n is twice their sum. If n is 6, what is the value of m ?

(A) 8
 (B) 6
 (C) 4
 (D) 3
 (E) 2

$$m, n \quad (m + n) \quad n = 6 \quad m$$

(D) .

6. If $x:y=2:3$, $y:z=3:4$, and $x=8$, then $z-y=$

- (A) 1
- ✓(B) 4
- (C) 6
- (D) 8
- (E) 12

$x=8$ $y=12$, , $y:z=3:4=12:16$
(B) .

7. If S is the set of all numbers x such that $1-2x \leq 3$, which of the following is true about S ?

- ✓(A) The least number in S is -1 .
- (B) The least number in S is 0 .
- (C) The least number in S is 3 .
- (D) The greatest number in S is -2 .
- (E) The greatest number in S is -1 .

$$1-2x \leq 3 \Rightarrow x \geq -1$$

(A) .

8. If $rt > st$ and $r > s$, then which of the following must be true?

- ✓(A) $t > 0$
- (B) $s > 0$
- (C) $r > 0$
- (D) $t < 0$
- (E) $rs > 0$

(A) .

9. If $-3 \leq x \leq 7$ and $-6 \leq y \leq 2$, what is the smallest possible value of $x - 2y$?

- (A) -15 (B) -9 (C) -7 (D) 0 (E) 9

$$x = -3, y = 2$$

(C)

10. For any integer x , \overline{x} is defined by the equation $\overline{x} = x + 1$. Which of the following is equal to $(\overline{x})^2 - \overline{x^2}$ for all integers x ?

- (A) 0
 (B) 2
 (C) $\overline{2x}$
 (D) $2x$
 (E) $2\overline{x}$

$$(\overline{x})^2 - \overline{x^2} = (x+1)^2 - x^2 - 1 = 2x$$

(D)

11. An operation $*$ defined on whole numbers gives results such as the following:

$$2 * 3 = 7$$

$$3 * 4 = 13$$

$$1 * 5 = 6$$

$$0 * 6 = 1$$

According to the equations above, which of the following could define the operation $*$?

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 (B) $x * y = 2x + y$
 (C) $x * y = y^2 - x$
 (D) $x * y = x^2 + y$
 (E) $x * y = xy + 1$

가

(E)

15. A loaf of bread and 2 one-pound containers of butter cost a total of \$4.95. If a pound of butter costs \$0.90 more than a loaf of bread, how much does a pound of butter cost?

(A) \$1.05
 (B) \$1.58
 (C) \$1.95
 (D) \$2.03
 (E) \$2.93

(x) 1 (y) 2 가 \$4.95 . (x + 2y = 4.95) 가
 가 \$0.90 (y - 0.90 = x) 1 가 .

(C) .

16. Pat bought n apples at a cost of 3 for \$0.20 and then sold the n apples at a price of 4 for \$0.35. If Pat's revenue from the sale of the apples was \$2.50 more than the cost of the apples, what is the value of n ?

(A) 150 (B) 120 (C) 90 (D) 80 (E) 60

n 3 \$0.20 4 \$0.35
 \$2.50 n 가 .

) n .

$$\frac{n}{4}(0.35) - \frac{n}{3}(0.20) = 2.50$$

) 3 4 가 12 12 12
 (1.05 - 0.8 = 0.25).

. (2.50 ÷ 0.25 = 10 , 12 10 .)

(B) .

17. The total cost of 3 pounds of hamburger and 4 pounds of hot dogs is \$12.39. At the same rates, if the cost of 5 pounds of hamburger is \$9.45, what is the cost per pound of hot dogs?

(A) \$1.59
 (B) \$1.68
 (C) \$1.77
 (D) \$1.89
 (E) \$2.03

the cost of 5 pounds of hamburger가 \$ 9.45

the cost of 3 pound of hamburger

$$\$5.67 \quad \left(\frac{3}{5} \times 9.45 = 5.67\right).$$

the cost of 3 pounds of hamburger + the cost of 4 pounds

of hot dogs = \$12.39

the cost per pound of hot dogs

.

(B) .

18. At a certain bowling alley, it costs \$0.50 to rent bowling shoes for the day and \$1.25 to bowl 1 game. If a person has \$12.80 and must rent shoes, what is the greatest number of complete games that person can bowl in one day?

(A) 7

(B) 8

☒ (C) 9

(D) 10

(E) 11

\$0.50,

\$1.25 ,

\$12.80 가

. 가 \$12.80

. ($(12.80 - 0.50) \div 1.25$)

(C) .

19. A mother and her child have a combined weight of 150 pounds. If the mother's weight is 5 times her child's weight, what is the weight, in pounds, of the child?

(A) 32

(B) 30

(C) 28

☒ (D) 25

(E) 24

150 pounds

가

5 ,

.

Mother's weight + child's weight = 150

Mother's weight = 5 Child's weight

(D) .

20. Jim multiplied a number by 5 when he should have divided it by 4. If the result he got was 10, what would have been the result if he had not made the error?

(A) $\frac{1}{20}$ (B) $\frac{1}{10}$ (C) $\frac{1}{5}$ (D) $\frac{1}{4}$ (E) $\frac{1}{2}$

4 5 10
 . 10 5가 . 5가
 2 .
 (E) .

21. An instructor scored a student's test of 50 questions by subtracting 2 times the number of incorrect answers from the number of correct answers. If the student answered all of the questions and received a score of 38, how many questions did that student answer correctly?

(A) 19
 (B) 38
 (C) 41
 (D) 44
 (E) 46

2
 . 38 .
 . x 50 - x .
 .
 $x - 2(50 - x) = 38$
 (E) .

22. The area of a rectangular region with length $2x+1$ and width $x-3$ is

(A) $2x^2 - 3$
 (B) $2x^2 + x - 3$
 (C) $2x^2 - 5x - 3$
 (D) $2x^2 - 6x - 3$
 (E) $2x^2 + 7x + 3$

가 $2x+1$, 가 가 $x-3$.
 $(2x+1)(x-3) = 2x^2 - 5x - 3$
 (C) .

23. The total price of $n(n > 1)$ equally priced copies of a certain book is \$50. In terms of n , which of the following gives the total price of $n - 1$ of these copies?

(A) $50(n - 1)$

(B) $\frac{50}{n - 1}$

☒ (C) $\frac{50(n - 1)}{n}$

(D) $\frac{50n}{n - 1}$

(E) $\frac{50}{n(n - 1)}$

가 n $\$50$ $n - 1$.
 n $\$50$ $\$ \frac{50}{n}$ $n - 1$.
 $\$ \frac{50}{n}(n - 1)$.
 (C) .

24. The supply of a certain commodity is given by the formula $S = 9x + x^2$ and the demand for the commodity is given by the formula $D = 2,475 - x$, where x is the price of the commodity in dollars. At which of the following values of x will the supply of the commodity equal the demand for the commodity?

(A) 9

☒ (B) 45

(C) 55

(D) 275

(E) 2,475

x 가 가 $S = 9x + x^2$ $D = 2,475 - x$
 , 가 x .
 가 .
 $9x + x^2 = 2,457 - x$
 (B) .

$$d = \frac{3v^2}{20} \text{ and } t = \frac{2d}{v}, \text{ where}$$

d is the distance traveled, in meters, after the brakes are applied

v is the velocity, in meters per second, before the brakes are applied

t is the time, in seconds, it takes to stop after the brakes are applied.

25. The formulas above are used to compute the distance a car travels after the brakes are applied. If the driver of a car applied the brakes just as a traffic light turned yellow and stopped exactly 6 seconds later, what is the value of v ?

- (A) 20
(B) $\frac{80}{3}$
(C) 30
(D) 40
(E) 60

d 가 , v , t 가
6 가 .

$$t = \frac{2d}{v} \quad d = 3v \quad d = \frac{3v^2}{20} \quad d = 3v \quad v$$

(A) .