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SAT Constants in Equations: Warm-Up Questions

Assume $a, b, c, p, q, m,$ and r are constants in any of the following equations and expressions.

$$\begin{aligned}0.3x + 0.7y &= 1.8 \\ ax + 14y &= 12\end{aligned}$$

1. Find the value of a such that the system of equations above has no solution.

$$\begin{aligned}0.3x + 0.7y &= 0.9 \\ ax + 14y &= 18\end{aligned}$$

2. Find the value of a such that the system of equations above has infinitely many solutions.

$$\begin{aligned}\frac{2}{3}x - \frac{7}{9}y &= \frac{5}{12} \\ ax + by &= c\end{aligned}$$

3. If the system of the equations above has infinitely many solutions, what is the value of $\frac{a}{b}$?

$$(ax + 3)(bx - 2) = 12x^2 + x - 6$$

4. If the above equation is true for all values of x :
 - What is ab ?
 - What is $3b - 2a$?

5. If $(ax - 2)(3x + 4) = 9x^2 + bx - 8$ is true for all values of x :
- What is a ?
 - What is b ?
 - What is $4a - 6$?
6. If $4x^2 + 12x + 9 = 16$ and $2x + 3 = b$, what is b^2 ?
7. Line l can be written as $3x - 2y = 7$. Line n is parallel to line l and can be written as $y = mx$. Find m .
8. Line l is parallel to the line with equation $y = 2x - 3$ and contains the points $(3, -3)$ and $(0, b)$. Find b .
9. Line l is perpendicular to the line with equation $y = 2x + 5$ and goes through the point $(6, -3)$. If line l crosses the y -axis at point $(0, b)$, find b .

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SAT Constants in Equations Quiz

Multiple Choice

$$3ax + 6(2x - 8) = -48$$

1. In the equation above, a is a constant. For what value of a does the equation have infinitely many solutions?

A) -6
B) -4
C) 4
D) 6

2. If $ax + 2a = 5$, where a is a constant, which of the following must be equal to $x + 2$?

A) a
B) 2
C) $\frac{5}{a}$
D) $\frac{2a}{5}$

3. In the xy -plane, the point (p, r) lies on the line with equation $y = x + b$, where b is a constant. The point with coordinates $(3p, 4r)$ lies on the line with equation $y = 2x + b$. If $p \neq 0$, what is the value of $\frac{r}{p}$?

A) $\frac{3}{5}$
B) $\frac{3}{4}$
C) $\frac{4}{3}$
D) $\frac{5}{3}$

$$3ax + 9 = 2(2x - 3) + 5(x + 2)$$

4. In the equation above, a is a constant. If no value of x satisfies the equation, what is the value of a ?

- A) 0
- B) $\frac{1}{3}$
- C) 3
- D) 9

$$ax^2 + x + a = 5x(2x - 3) + 2(8x + 5)$$

5. In the equation above, a is a constant. If any real value of x satisfies the equation, what is the value of a ?

- A) -5
- B) 5
- C) 10
- D) 26

$$(ax - 2)(4x^2 + bx + 5) = 6x^3 + 4x^2 - 8.5x - 10$$

6. The equation above is true for all x , where a and b are constants. What is the value of ab ?

- A) $\frac{3}{2}$
- B) 4
- C) 8
- D) 12

7. In the equation $(ax - 5)^2 = 49$, a is a constant. If $x = -2$ is one solution to the equation, what is a possible value of a ?
- A) -6
 - B) -2
 - C) 0
 - D) 3
8. If $(ax + 3)(bx + 12) = 12x^2 + cx + 36$ for all values of x , and $a + b = 7$, what are the two possible values for c ?
- A) 3 and 4
 - B) 7 and 12
 - C) 36 and 48
 - D) 48 and 57
9. If $f(x) = 3x^2 - 5$ and $f(x + a) = 3x^2 - 12x + 7$, what is the value of a ?
- A) -4
 - B) -2
 - C) 2
 - D) 5

$$(3x - 5)(2ax + 3) - 3x^2 + 15$$

10. In the expression above, a is a constant. If the expression is equivalent to bx , where b is a constant, what is the value of b ?
- A) -2
B) $\frac{1}{2}$
C) 3
D) 4
11. In the xy -plane, the graph of the polynomial function f crosses the x -axis at exactly two points, $(a, 0)$ and $(b, 0)$ and crosses the y -axis at exactly one point, $(0, c)$, where a , b , and c are all positive. Which of the following could define f ?
- A) $f(x) = cx(x - a)(x - b)$
B) $f(x) = \frac{c}{ab}(x - a)(x - b)$
C) $f(x) = (x - a)(x - b)(x - c)$
D) $f(x) = \frac{c}{ab}(x + a)(x + b)$
12. The equation $9x^2 + bx + 16 = 0$ has exactly one solution, and b is a constant, what is a possible value of b ?
- A) -12
B) 6
C) 24
D) 36

$$f(x) = -(x + 2)^2 + a$$

13. In the function above, a is a constant. Which of the following is true about the graph of $f(x)$?
- A) Its minimum occurs at $(-2, a)$.
 - B) Its minimum occurs at $(2, a)$.
 - C) Its maximum occurs at $(-2, a)$.
 - D) Its maximum occurs at $(2, a)$.

$$\frac{3}{x+3} + \frac{2}{x-2} = \frac{sx+r}{(x+3)(x-2)}$$

14. The equation above is true for all $x > 2$, where s and r are constants. What is the value of sr ?
- A) -3
 - B) -2
 - C) 0
 - D) 6

$$\begin{aligned} kx - y &= 1 \\ y &= -x^2 + 2k \end{aligned}$$

15. In the system of equations above, k is a constant. When the equations are graphed in the xy -plane, the graphs intersect at exactly two points. Which of the following CANNOT be the value of k ?
- A) -1
 - B) 0
 - C) 1
 - D) 2

16. In the xy -plane, the graph of the exponential function $y = h(x)$, has a y -intercept of d , where d is a positive constant. Which of the following could define the function h ?

- A) $h(x) = -5(d)^x$
- B) $h(x) = 5(x)d$
- C) $h(x) = d(-x)^5$
- D) $h(x) = d(5)^x$

$$\frac{3}{x-12} - \frac{2}{x+12} = \frac{sx+r}{x^2-144}$$

17. The equation above is true for all $x > 12$, where s and r are constants. What is the value of sr ?

- A) -24
- B) 12
- C) 36
- D) 60

$$3x(ax-5) + 7(3x-a) + 14 = 3ax(x+1)$$

18. The equation above is true for all x , where a is a constant. What is the value of $a + 1$?

- A) 0
- B) 1
- C) 2
- D) 3

$$\frac{2}{3}x + \frac{3}{4}y = a$$

$$8x + by = 12$$

19. The system of equations above is true for infinitely many points in the xy -plane, and a and b are constants. What is the value of $\frac{a}{b}$?

- A) $\frac{1}{9}$
- B) $\frac{3}{4}$
- C) 9
- D) 12

$$0.6x - 1.8y = 0.5$$

$$ax + by = 3$$

20. In the system of equations above, a and b are constants. If the system of equations has no solution, what is the value of $-\frac{a}{b}$?

- A) $\frac{1}{3}$
- B) 1
- C) 2
- D) 3

Grid-In

$$a(x - b) = 5x - 8$$

21. In the equation above, a and b are constants. If the equation has infinitely many solutions for x , what is the value of b ?

22. In the xy -plane, where c is a constant, the system of equations $2x - 3y = 12$ and $\frac{1}{2}x - \frac{3}{4}y = c$ has infinite solutions. What is the value of c ?

$$\frac{2}{3}x + \frac{5}{9}y = 6$$

$$ax + by = 3$$

23. The system of equations above has no solutions. If a and b are constants, what is the value of $\frac{a}{b}$?

24. The relationship between x and y can be written as $y = mx$, where m is a constant. If $y = 6$ when $x = 2a$, what is the value of y when $x = 3a$?
25. In the xy -plane, line l has a y -intercept of 11 and is perpendicular to the line with equation $y = -\frac{3}{5}x + 10$. If the point $(-6, b)$ is on line l , what is the value of b ?
26. In the xy -plane, line l has a y -intercept of 7 and is parallel to the line with equation $y = -\frac{2}{3}x - 6$. If the point $(9, b)$ is on line l , what is the value of b ?
27. In the xy -plane, a line that has the equation $y = c$ for some constant c intersects a parabola at exactly one point. If the parabola has the equation $y = -2x^2 + 12x - 16$, what is the value of c ?

$$y = a(x - 2)(x + 1)$$

$$y = ax - 1$$

28. In the system of equations above, a is a constant. If the system has a solution on the x -axis and a second solution on the y -axis, what is the value of a ?

29. If i is defined as $\sqrt{-1}$ and $(2a - 3i)(3 + bi) = 48 + 19i$, where a and b are constants, what is the value of $6a + 3b$?

30. A set of 9 consecutive even integers has a mean value of a and a median value of b . What is the value of $|a - b|$?

$$|ax - 3| = 7$$

$$|3y + a| = 8$$

31. In the equations above, a is a constant. If $(5, -\frac{10}{3})$ and $(-2, 2)$ are two solutions to the system, what is the value of a ?