Sample Problems

1. Consider the equation $2x^2 + x + 34 = 21x - 8$.
   a) Is the number 1 a solution of the equation?
   b) Is 3 a solution of the equation?
   c) Is $x = 4$ a solution of the equation?
   d) Is 7 a solution of the equation?
2. Consider the equation $3a - 2b - 1 = (a - b)^2 + 4$.
   a) Is the pair of numbers $a = 8$ and $b = 5$ a solution of the equation?
   b) Is the pair of numbers $a = 10$ and $b = 7$ a solution of the equation?

Practice Problems

1. Consider the equation $\dfrac{2x^2 - 11x - 21}{2x + 3} = 3x - (2x + 7)$.
   a) Is the number 8 a solution of the equation?
   b) Is 13 a solution of the equation?
   c) Is $x = 10$ a solution of the equation?
2. Consider the equation $y = \dfrac{5x - 3}{2}$.
   a) Is the pair of numbers $x = 1$ and $y = 1$ a solution of the equation?
   b) Is the pair of numbers $x = 9$ and $y = 4$ a solution of the equation?
   c) Is the pair of numbers $x = 3$ and $y = 6$ a solution of the equation?
   d) Is the pair of numbers $x = 17$ and $y = 41$ a solution of the equation?
3. Consider the equation $(p - q)^2 + \dfrac{3p - 1}{6 - q} = 4\,(p + 1)$.
   a) Is the pair of numbers $p = 8$ and $q = 5$ a solution of the equation?
   b) Is the pair of numbers $p = 7$ and $q = 1$ a solution of the equation?

Sample Problems - Answers

1. a) no, since $37 \neq 13$ b) yes, since $55 = 55$ c) no, since $70 \neq 76$
   d) yes, since $139 = 139$
2. a) yes, since $13 = 13$ b) no, since $15 \neq 13$

Practice Problems - Answers

1. a) yes, since $1 = 1$ b) yes, since $6 = 6$ c) yes, since $3 = 3$
2. a) yes, since $1 = 1$ b) no, since $21 \neq 4$ c) yes, since $6 = 6$
   d) yes, since $41 = 41$
3. a) no, since $32 \neq 36$ b) yes, since $40 = 40$

Sample Problems - Solutions

1. Consider the equation $2x^2 + x + 34 = 21x - 8$.

   a) Is the number 1 a solution of the equation? no, since $37 \neq 13$
   Solution: We need to substitute 1 for x into both the left-hand side and right-hand side of the equation and evaluate those algebraic expressions to see whether the left-hand side equals to the right-hand side.
   The left-hand side:

$$\begin{aligned} \text{LHS} &= 2x^2 + x + 34 = 2(1)^2 + (1) + 34 = 2 \cdot 1 + 1 + 34 \\ &= 2 + 1 + 34 = 3 + 34 = 37 \end{aligned}$$

   The right-hand side:

$$\text{RHS} = 21x - 8 = 21(1) - 8 = 21 - 8 = 13$$

   When $x = 1$, the two expressions are not equal. Thus 1 is NOT a solution of the equation.

   b) Is 3 a solution of the equation? yes, since $55 = 55$
   Solution: We need to substitute 3 for x into both the left-hand side and right-hand side of the equation and evaluate those algebraic expressions to see whether the left-hand side equals to the right-hand side.
   The left-hand side:

$$\begin{aligned} \text{LHS} &= 2x^2 + x + 34 = 2(3)^2 + (3) + 34 \\ &= 2 \cdot 9 + 3 + 34 = 18 + 3 + 34 = 21 + 34 = 55 \end{aligned}$$

   The right-hand side:

$$\text{RHS} = 21x - 8 = 21(3) - 8 = 63 - 8 = 55$$

   When $x = 3$, the two expressions are equal. Thus 3 IS a solution of the equation.

   c) Is $x = 4$ a solution of the equation? no, since $70 \neq 76$
   Solution: We need to substitute 4 for x into both the left-hand side and right-hand side of the equation and evaluate those algebraic expressions to see whether the left-hand side equals to the right-hand side.
   The left-hand side:

$$\begin{aligned} \text{LHS} &= 2x^2 + x + 34 = 2(4)^2 + (4) + 34 \\ &= 2 \cdot 16 + 4 + 34 = 32 + 4 + 34 = 36 + 34 = 70 \end{aligned}$$

   The right-hand side:

$$\text{RHS} = 21x - 8 = 21(4) - 8 = 84 - 8 = 76$$

   Since the two expressions are not equal when $x = 4$, 4 is NOT a solution of the equation.

   d) Is 7 a solution of the equation? yes, since $139 = 139$
   Solution: We need to substitute 7 for x into both the left-hand side and right-hand side of the equation and evaluate those algebraic expressions to see whether the left-hand side equals to the right-hand side.
   The left-hand side:

$$\begin{aligned} \text{LHS} &= 2x^2 + x + 34 = 2(7)^2 + (7) + 34 \\ &= 2 \cdot 49 + 7 + 34 = 98 + 7 + 34 = 105 + 34 = 139 \end{aligned}$$

The right-hand side:

$$\text{RHS} = 21x - 8 = 21\,(7) - 8 = 147 - 8 = 139$$

Since the two expressions are equal when $x = 7$, 7 IS a solution of the equation.

2. Consider the equation $3a - 2b - 1 = (a - b)^2 + 4$.

a) Is the pair of numbers $a = 8$ and $b = 5$ a solution of the equation? yes, since $13 = 13$
Solution: We need to substitute $a = 8$ and $b = 5$ into both the left-hand side and right-hand side of the equation and evaluate those algebraic expressions to see whether the left-hand side equals to the right-hand side.
The left-hand side:

$$\begin{aligned} \text{LHS} &= 3a - 2b - 1 = 3\,(8) - 2\,(5) - 1 = 3 \cdot 8 - 2 \cdot 5 - 1 \\ &= 24 - 2 \cdot 5 - 1 = 24 - 10 - 1 = 14 - 1 = 13 \end{aligned}$$

The right-hand side:

$$\text{RHS} = (a - b)^2 + 4 = ((8) - (5))^2 + 4 = (8 - 5)^2 + 4 = 3^2 + 4 = 9 + 4 = 13$$

Since the two expressions are equal when $a = 8$ and $b = 5$, this pair IS a solution of the equation.

b) Is the pair of numbers $a = 10$ and $b = 7$ a solution of the equation? no, since $15 \neq 13$
Solution: We need to substitute $a = 10$ and $b = 7$ into both the left-hand side and right-hand side of the equation and evaluate those algebraic expressions to see whether the left-hand side equals to the right-hand side.
The left-hand side:

$$\begin{aligned} \text{LHS} &= 3a - 2b - 1 = 3\,(10) - 2\,(7) - 1 = 3 \cdot 10 - 2 \cdot 7 - 1 \\ &= 30 - 2 \cdot 7 - 1 = 30 - 14 - 1 = 16 - 1 = 15 \end{aligned}$$

The right-hand side:

$$\text{RHS} = (a - b)^2 + 4 = ((10) - (7))^2 + 4 = (10 - 7)^2 + 4 = 3^2 + 4 = 9 + 4 = 13$$

Since the two expressions are not equal when $a = 8$ and $b = 5$, this pair is NOT a solution of the equation.