A2a Part 2 Substituting to check equations are satisfied

Warm-up activity

Work out the values of the following:

1) $(-7)+(-3)$

2) $\frac{2}{3}\times 6$

3) -2×-7

4) $(-4)^2+5\times(-4)+3$

Alpha Exercise 1

1) Here is an equation: $2x=12$
Which of the following values of x satisfies this equation?
(a) 1 (b) 24 (c) 10 (d) 6

2) Here is an equation: $x+9=17$
Which of the following values of x satisfies this equation?
(a) 8 (b) 26 (c) -8 (d) -26

3) Here is an equation: $3x=1$
Which of the following values of x satisfies this equation?
(a) $\frac{1}{3}$ (b) 0 (c) 1 (d) -3

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Alpha Exercise 2

1) Here is an equation: $8 - x = 16$
Which of the following values of x satisfies this equation?
(a) -8 (b) 2 (c) -2 (d) 8

2) Here is an equation: $-7x = 42$
Which of the following values of x satisfies this equation?
(a) 6 (b) 49 (c) -6 (d) -35

3) Here is an equation: $\frac{x}{9} = 5$
Which of the following values of x satisfies this equation?
(a) $\frac{5}{9}$ (b) 45 (c) 95 (d) $\frac{9}{5}$

Alpha Exercise 3

1) Here is an equation: $-4x = -40$
Which of the following values of x satisfies this equation?
(a) 10 (b) 44 (c) 0 (d) -36

2) Here is an equation: $x - 10 = -3$
Which of the following values of x satisfies this equation?
(a) 13 (b) -13 (c) -7 (d) 7

3) Here is an equation: $2x = 7$
Which of the following values of x satisfies this equation?
(a) $\frac{2}{7}$ (b) 5 (c) 3 (d) $\frac{7}{2}$

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Alpha Exercise 4

On the left, are three values of x. On the right are six equations.
Match each value of x to any equation it satisfies.

Note that a given value of x may satisfy more than one equation. Also note that some equations may not be satisfied by any of the given values of x.

$x = 7$

$x = -4$

$x = \frac{2}{3}$

$3x = 21$

$5 + x = 1$

$2x = 27$

$5 - x = 1$

$-x + 29 = 22$

$9x = 6$

Beta Exercise 1

1) Here is an equation: $3x + 8 = 41$
Which of the following values of x satisfies this equation?
(a) 3 (b) 11 (c) 33 (d) -33

2) Here is an equation: $-17 = 4 - 3x$
Which of the following values of x satisfies this equation?
(a) 6 (b) 7 (c) 8 (d) 9

3) Here is an equation: $2x + 8 = 7x - 12$
Which of the following values of x satisfies this equation?
(a) 1 (b) 2 (c) 3 (d) 4

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Beta Exercise 2

1) Here is an equation: $2x + 1 = 7$
Which of the following values of x satisfies this equation?
(a) 3 (b) 4 (c) 5 (d) 6

2) Here is an equation: $2x + 1 = 8$
Which of the following values of x satisfies this equation?
(a) $\frac{7}{2}$ (b) 4 (c) $\frac{9}{2}$ (d) 5

3) Here is an equation: $2x + 11 = 8$
Which of the following values of x satisfies this equation?
(a) $-\frac{3}{2}$ (b) $-\frac{2}{3}$ (c) -5 (d) $\frac{19}{2}$

Beta Exercise 3

Given that $x = 4$ satisfies all of these equations, **fill in the blanks**:

1) $5x =$ ____

2) $3x - 7 =$ ____

3) ____ $= x + 14$

4) $8x -$ ____ $= 31$

5) $6x + 12 = 11x -$ ____

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Gamma Exercise 1

1) Here is an equation: $x^2 - 5x + 6 = 0$

(a) Does $x = 6$ satisfy this equation?

(b) Does $x = 2$ satisfy this equation?

(c) Does $x = 3$ satisfy this equation?

(d) Does $x = 0$ satisfy this equation?

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Gamma Exercise 1 (contd.)

2) Here is an equation: $x^2 - 12 = -4x$

(a) Does $x = 6$ satisfy this equation?

(b) Does $x = -6$ satisfy this equation?

(c) Does $x = 2$ satisfy this equation?

(d) Does $x = 3$ satisfy this equation?

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Gamma Exercise 2

On the left, are three values of x. On the right are five equations.
Match each value of x to any equation it satisfies.

Note that a given value of x may satisfy more than one equation. Also note that each equation need not be satisfied by *exactly* one value of x.

$x = 4$

$x = 3$

$x = -3$

$x^2 - 7x + 12 = 0$

$x^2 + 6x + 9 = 0$

$x^2 + x - 12 = 0$

$x^2 = 9$

$x^2 + 16 = 8x$

Delta Exercise 1

(a) Show that $\{x = 3, y = 7\}$ satisfies the equation $y = 2x + 1$

(b) Show that $\{x = 4, y = 9\}$ satisfies the equation $y = 2x + 1$

(c) Show that $\{x = 4, y = 9\}$ satisfies the equation $y = x + 5$

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Delta Exercise 1 (contd.)

(d) Show that $\{x = 4, y = 9\}$ satisfies the equation $4x + y = 25$

(e) Show that $\{x = 4, y = 9\}$ does *not* satisfy the equation $y = 3x - 2$

(f) Show that $\{x = -1, y = 1\}$ does *not* satisfy the equation $y = 3x - 2$

Delta Exercise 2

Here is a pair of equations:

$$3x + 2y = 4$$
$$4x - 3y = -23$$

Decide whether the following sets of values of x and y satisfy **one, both, or neither** of the two equations.

(a) $x = 4, y = -4$

(b) $x = -2, y = 5$

(c) $x = 5, y = -2$

(d) $x = 10, y = 21$

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Delta Exercise 3

On the left, are three sets of values of x and y.
On the right are three pairs of equations.
Match each set of values to the pair of equations they satisfy.

$x = 1, y = 7$	$3x + y = 10$ $x + y = 2$
$x = -3, y = 11$	$6x + y = 13$ $x + 2y = 15$
$x = 4, y = -2$	$4x + y = -1$ $x + y = 8$

Explain the mistake

Joe writes:

x = 6 satisfies the equation 4x + 12 = 36 + x because I can substitute x = 6 into the equation and see 4(6) + 12 = 36.

Joe is mistaken. Explain what's wrong with Joe's sentence.

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Exam-style question 1

Here are four equations:

$2 + t = \frac{5}{2}$

$\frac{t}{3} = \frac{1}{6}$

$2t = \frac{1}{4}$

$t^2 = \frac{1}{4}$

Circle any equations that are satisfied by $t = \frac{1}{2}$

Exam-style question 2

Given that $a = 3$ satisfies this equation, fill in the blank:

$7a - 29 =$ ____