Systems of Equations – Substitution

Bell Work:

1. **Solve the equation. Show all work.** $\frac{3}{4}x + 8 = 2x - 1$

2. **What type of answer do you have if you have parallel lines?**

3. **What is the slope of the line with an equation of** $3x - 5y = 20$**?**

4. **What is the name of parent function with an equation of** $f(x) = |x|$**?**

Systems of Equations – Substitution

1. Solve by using substitution.

$$y = \frac{1}{6}x + 3$$

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

Substitution one equation into the other.

Solve.

$$\frac{1}{6}x + 3 = \frac{2}{3}x + 9$$

$$(6)\ \frac{1}{6}x + 3 = \frac{2}{3}x + 9\ (6)$$

$$x + 18 = 4x + 54$$

$$x - x + 18 - 54 = 4x - x + 54 - 54$$

$$-36 = 3x$$

$$-12 = x$$

Substitute this into one of the equations to solve for y.

$$y = \frac{1}{6}(-12) + 3 = -2 + 3 = 1$$

The answer: $(-12,\ 1)$

Systems of Equations – Substitution

2. Solve by using substitution.

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

$$y = -2x - 7$$

Substitution one equation into the other.

Solve.

$$\frac{2}{3}x + 9 = -2x - 7$$

$$(3)\ \frac{2}{3}x + 9 = -2x - 7\ (3)$$

$$2x + 27 = -6x - 21$$

$$2x + 6x + 27 - 27 = -6x + 6x - 21 - 27$$

$$8x = -48$$

$$x = -6$$

Substitute this into one of the equations to solve for y.

$$y = -2(-6) - 7 = 12 - 7 = 5$$

The answer: $(-6,\ 5)$

Systems of Equations – Substitution

3. Solve by using substitution.

$$y = \frac{3}{4}x + 5$$

$$y = -\frac{1}{2}x - 5$$

Substitution one equation into the other.

Solve.

$$\frac{3}{4}x + 5 = -\frac{1}{2}x - 5$$

$$(4)\frac{3}{4}x + 5 = -\frac{1}{2}x - 5\,(4)$$

$$3x + 20 = -2x - 20$$

$$3x + 2x + 20 - 20 = -2x + 2x - 20 - 20$$

$$5x = -40$$

$$x = -8$$

Substitute this into one of the equations to solve for y.

$$y = \frac{3}{4}(-8) + 5 = -6 + 5 = -1$$

The answer: $(-8,\ -1)$

Systems of Equations – Substitution

4. Solve by using substitution.

$$y = \frac{5}{3}x - 20$$

$$y = \frac{4}{5}x - 7$$

Substitution one equation into the other.

Solve.

$$\frac{5}{3}x - 20 = \frac{4}{5}x - 7$$

$$(15)\,\frac{5}{3}x - 20 = \frac{4}{5}x - 7\,(15)$$

$$25x - 300 = 12x - 105$$

$$25x - 12x - 300 + 300 = 12x - 12x - 105 + 300$$

$$13x = 195$$

$$x = 15$$

Substitute this into one of the equations to solve for y.

$$y = \frac{4}{5}(15) - 7 = 12 - 7 = 5$$

The answer: $(15,\ 5)$

Systems of Equations – Substitution

5. Solve by using substitution.

$y = 5x - 6$

$x + 3y = 14$

Substitution the slope-intercept into the standard.

$x + 3(5x - 6) = 14$

$x + 15x - 18 = 14$

Solve.

$16x - 18 + 18 = 14 + 18$

$16x = 32$

$x = 2$

Substitute this into one of the equations to solve for y.

$y = 5(2) - 6 = 10 - 6 = 4$

The answer: $(2,\ 4)$

Systems of Equations – Substitution

6. Solve by using substitution.

$y = 4x - 4$

$5x - 2y = -1$

Substitution the slope-intercept into the standard.

$5x - 2(4x - 4) = -1$

$5x - 8x + 8 = -1$

Solve.

$3x + 8 - 8 = -1 - 8$

$3x = -9$

$x = -3$

Substitute this into one of the equations to solve for y.

$4(-3) - 4 = -12 - 4 = -16$

The answer: $(-3, -16)$

Systems of Equations – Substitution

7. Solve by using substitution.

$$y = \frac{2}{3}x - 4$$

$$4x + 3y = -30$$

Substitution the slope-intercept into the standard.

$$4x + 3\left(\frac{2}{3}x - 4\right) = -30$$

$$4x + 2x - 12 = -30$$

Solve.

$$6x - 12 + 12 = -30 + 12$$

$$6x = -18$$

$$x = -3$$

Substitute this into one of the equations to solve for y.

$$y = \frac{2}{3}(-3) - 4 = -2 - 4 = -6$$

The answer: $(-3,\ -6)$

Systems of Equations – Substitution

8. Solve by using substitution.

$$y = -\frac{3}{4}x - 5$$

$$4x - y = 43$$

Substitution the slope-intercept into the standard.

Solve.

$$4x - \left(-\frac{3}{4}x - 5\right) = 43$$

$$(4)\quad (4)\quad (4)\quad (4)$$

$$4x + \frac{3}{4}x + 5 = 43$$

$$16x + 3x + 20 = 172$$

$$19x + 20 - 20 = 172 - 20$$

$$19x = 152$$

$$x = 8$$

Substitute this into one of the equations to solve for y.

$$y = -\frac{3}{4}(8) - 5 = -6 - 5 = -11$$

The answer: $(8,\ -11)$

Systems of Equations – Substitution

Assignment:

FLEUNCY PRACTICE: Systems of Equations – Substitution Worksheet