

SC Algebra 1
7.2 Solving Systems by Substitution

Example 3:

Use Substitution to solve each system of equations.

$$\begin{aligned} 4x + 2y &= -8 \\ y &= 2x - 4 \end{aligned}$$

$$4x + 2(2x - 4) = -8$$

$$4x + 4x - 8 = -8$$

$$8x - 8 = -8$$

$$8x = 0$$

$$x = 0$$

$$y = 2(0) - 4 = -4$$

Infinitely Many Solutions

$$\begin{aligned} x &= y - 1 \\ -x + y &= -1 \end{aligned}$$

$$-(y - 1) + y = -1$$

$$-y + 1 + y = -1$$

$$1 = -1$$

No Solution

- ① Graphing
- ② substitution
- ③ elimination

$$\begin{aligned} y &= 5 \\ 2y - 4 &= 6 \\ 2(5) - 4 &= 6 \\ 10 - 4 &= 6 \\ 6 &= 6 \end{aligned}$$

Example 4: Write and Solve a System of Equations

A town ordinance defines an adult tree as having a diameter greater than 10 inches and a sapling as having a diameter less than 10 inches. The ordinance requires that on a new building project, two new trees are planted for each adult tree felled and six new trees are planted for every sapling felled. Last year, there were 167 trees felled. Last year, there were 742 replacement trees. How many of each type of tree were felled?

Let a = # of adult trees felled
Let s = # of saplings felled

adult plus saplings is 167 trees

$$a + s = 167$$

$$2a + 6s = 742 \rightarrow 2(-s + 167) + 6s = 742$$

$$-2s + 334 + 6s = 742$$

$$4s + 334 = 742$$

$$4s = 408$$

$$s = 102$$

$$a = -102 + 167$$

$$a = 65$$

65 adult and 102 saplings were felled.

Kymani has two equal-sized large pitchers and two equal-sized small pitchers. All the pitchers together hold 40 cups of water. The capacity of one large pitcher minus the capacity of the small pitcher is 12 cups. How many cups can each type of pitcher hold?

Let s = capacity of small pitcher
Let l = capacity of large pitcher

2 small and 2 large holds 40 cups
1 large minus 1 small is 12 cups

$$\begin{aligned} 2s + 2l &= 40 \\ l - s &= 12 \end{aligned}$$

$$2s + 2(s + 12) = 40$$

$$2s + 2s + 24 = 40$$

$$4s + 24 = 40$$

$$4s = 16$$

$$s = 4$$

$$l = 4 + 12$$

$$l = 16$$

s = 4 cups
l = 16 cups

$$\begin{aligned} a &= \underline{\hspace{2cm}} \\ s &= \underline{\hspace{2cm}} \end{aligned}$$

REMEMBER the Steps to Writing and Solving Equations

1. Define your variables
2. State the relationships in words.
3. Translate the words into equations to write a system.
4. Solve the system using substitution

$$\begin{aligned} \text{Large} &= 16 \text{ cups} \\ \text{Small} &= 4 \text{ cups} \end{aligned}$$