

Day 3 - Problem Solving with Substitution - Practice

Directions: For the following scenarios, define your variables, create a system of equations, and then solve the system to answer the given questions.

1. Samantha is trying to decide which ice cream shop is the better buy. Dairy King charges \$2.50 per sundae plus an additional \$0.25 for each topping. Creamy King charges \$1.50 per sundae plus an additional \$0.50 for each topping. Determine the number of toppings for which both vendors charge the same amount. Explain which shop is the better buy depending on the number of toppings Samantha chooses.

a. Define your variables.

x : # of toppings

y : total cost

c. Solve your system to determine when they charge the same.

$$2.50 + 0.25x = 1.50 + 0.50x$$

$$1.00 = 0.25x$$

$$x = 4 \text{ toppings}$$

$$y = 2.50 + 0.25(4)$$

$$y = 2.50 + 1.00$$

$$y = \$3.50$$

At 4 toppings, both ice cream places will cost \$3.50.

b. Create a system to describe the scenario.

Equation 1: $y = 2.50 + 0.25x$

Equation 2: $y = 1.50 + 0.50x$

d. Create a table.

# of toppings	Dairy King $y = 2.50 + 0.25x$	Creamy King $y = 1.50 + 0.50x$
0	2.50	1.50
1	2.75	2.00
2	3.00	2.50
3	3.25	3.00
4	3.50	3.50
5	3.75	4.00
6	4.00	4.50

e. Conclusion on who is the better buy based off number of toppings purchased:

- If you buy less than 4 toppings, then Creamy King is the better option.
- If you buy more than 4 toppings, then Dairy King is the better option.

2. You are offered two different summer jobs and you need to decide which one will pay the most money. The first job, a camp counselor pays \$300 up front plus \$8 per hour. The second job, a cashier at the mall, pays \$11 per hour. When do the jobs pay the same amount? Which job is the better choice based on the number of hours worked?

a. Define your variables.

x : # of hours

y : amount you are paid

b. Create a system to describe the scenario.

Equation 1: $y = 8x + 300$

Equation 2: $y = 11x$

c. Solve your system to determine when they pay the same amount.

$$8x + 300 = 11x$$

$$300 = 3x$$

$$x = 100 \text{ hours pay } \$1100.$$

If you work for 100 hours, both jobs will pay \$1100.

$$y = 11(100)$$

$$y = \$1100$$

d. Conclusion on which is the better job choice based off the number of hours worked.

• Less than 100 hours, the camp counselor is the better job.

• More than 100 hours, the cashier is the better job.

3. Owen and Jim each want to run for president of the student body. In order to do so, they must collect a certain number of signatures and get a nomination. So far, Owen has 14 signatures and Jim has none. Owen is collecting signatures at an average rate of 13 per day and Jim is collecting 20 signatures per day. Assuming their rate of collection stays the same, eventually the two will have collected the same number of signatures.

How long will that take? How many signatures will they both have?

a. Define your variables (what two things are you comparing?)

x : # of days

y : total signatures

b. Create a system to describe the scenario.

Equation 1: $y = 13x + 14$

Equation 2: $y = 20x$

c. Solve your system to answer the above questions.

$$\begin{array}{r} 13x + 14 = 20x \\ -13x \quad -13x \\ \hline \end{array}$$

$$\frac{14}{7} = \frac{7x}{7}$$

$$x = 2 \text{ days}$$

$$y = 20(2)$$

$$y = 40$$

At 2 days, both of them will have collected 40 signatures.