

System of Equations Word Problems (Algebraically)

Example #1: A Carpenter and a Painter are doing a job on a house. The Carpenter charges \$25 for just coming into the house and \$15 per hour of labor. The Painter charges \$15 for just for coming into the house and \$20 per hour of labor. Last week, the Carpenter and Painter went to a job site together, spent the same amount of time working, and earned the same amount of money. How many hours did they work to earn the same amount and how much did they earn?



Let $x = \#$ of hours
Let $y = \text{total } \$$

↳ set equal

Carpenter: $y = 15x + 25$
Painter: $y = 20x + 15$

$$\begin{array}{r|l} 15x + 25 & = 20x + 15 \\ -15x & -15x \\ \hline 25 = & 5x + 15 \\ -15 & -15 \\ \hline 10 = & 5x \\ \frac{10}{5} = & \frac{5x}{5} \end{array}$$

$$\begin{aligned} y &= 15x + 25 \\ y &= 15(2) + 25 \\ y &= 55 \end{aligned}$$

$$2 = x$$

They worked 2 hours. and earned \$55

Example #2: A jar contains nickels and dimes. There is a total of 200 coins in the jar. The value of the coins is \$14.00. How many nickels and how many dimes are in the jar?

Let $n = \text{nickels}$
Let $d = \text{dimes}$

Total: $n + d = 200$
\$: $.05n + .10d = 14$

$$\begin{aligned} n + d &= 200 \\ -n & \\ \hline d &= 200 - n \end{aligned}$$

$$\begin{aligned} .05n + .10(200 - n) &= 14 \\ .05n + 20 - .10n &= 14 \\ -.05n + 20 &= 14 \\ -.05n &= -6 \\ \frac{-0.05n}{-.05} &= \frac{-6}{-.05} \\ n &= 120 \end{aligned}$$

$$\begin{aligned} n + d &= 200 \\ 120 + d &= 200 \\ -120 & \\ \hline d &= 80 \end{aligned}$$

There are 120 nickels and 80 dimes.