

Worked Examples

Value, Interest, and Mixture Problems – Problems Solved Using Systems of Equations

1. A 6000-seat theater has tickets for sale at \$28 and \$40. How many tickets should be sold at each price for a sellout performance to generate a total revenue of \$188,400?

$x = \text{number of } \$28 \text{ tickets}$   
 $y = \text{number of } \$40 \text{ tickets}$

$x + y = 6000$   
 $28x + 40y = 188400$   
 $-28x - 28y = -168000$

$12y = 20400$   
 $y = 1700$   
 $x + 1700 = 6000$   
 $x = 4300$

} ← define two variables  
 ← the "count" } write two equations  
 ← money (\$ = \$)  
 ← multiply the top equation by (-28) to eliminate x.

4300: \$28 tickets  
 1700: \$40 tickets

$(4300)(28) + 1700(40) = 188400$

answer check

2. Ms. Jones invested \$22,000 in two accounts, one yielding 8% interest and the other yielding 11%. If she received a total of \$2,120 in interest at the end of the year. How much did she invest in each account?

$x = \text{amount } (\$) \text{ invested at } 8\%$   
 $y = \text{amount } (\$) \text{ invested at } 11\%$

$x + y = 22000$   
 $.08x + .11y = 2120$   
 $-.08x - .08y = -1760$

$+.03y = 360$   
 $y = 12000$   
 $x + 12000 = 22000$   
 $x = 10000$

} define two variables  
 ← total invested } write two equations  
 ← interest equation

\$10,000 at 8%  
 \$12,000 at 11%

$(.08)(10000) + (.11)(12000) = 2120$

answer check

3. Mick Steiner, a nuclear physicist, needs 60 liters of a 70% acid solution. He currently has a 50% solution and a 80% solution. How many liters of each does he need to make the needed 70% acid solution?

$x = \text{amount (L) of } 50\% \text{ solution to use}$   
 $y = \text{amount (L) of } 80\% \text{ solution to use}$

$x + y = 60$   
 $.5x + .8y = (.7)(60)$   
 $.5x + .8y = 42$   
 $-.5x - .5y = -30$

$.3y = 12$   
 $y = 40$   
 $x = 20$

← total of mixtures  
 ← amount of pure acid

20 L of 50% solution  
 40 L of 80% solution

$20(.5) + 40(.8) = 42$

answer check