SECTION 4.4 APPLICATIONS

Name: Key **Date:** ______ **Period:** ______

EXAMPLE 1

In a chemistry laboratory, Jeremy has a 75% acid solution and a 50% acid solution. How much of each solution should he mix to get 100 liters of a 60% acid solution?

x = liters of 75% acid solution
y = liters of 50% acid solution

$x + y = 100$ total liters

$y = 100 - x$

60% of the solution must be acid
$(.60 \cdot 100) = 60$ liters

$.75x + .5y = 60$

$.75x + .5y = 60$
$.75x + .5(100 - x) = 60$
$.75x + 50 + (-.5x) = 60$
$.25x = 10$
$x = \frac{10}{.25}$
$\boxed{x = 40}$ liters of 75% solution

$y = 100 - x$
$y = 100 - 40$
$\boxed{y = 60}$ liters of 50% solution

PROBLEM 1

Suppose a store sells two kinds of jellybeans. Candy A is sold for \$6 per pound and candy B for \$4 per pound. The manager wants to make a 100 pounds of a mixture that she could sell for \$4.50 per pound. How much of candy A and how much of candy B should she mix together to make the new \$4.50 per pound mixture?

x = pounds of Candy A
y = pounds of Candy B

$x + y = 100$

$6x + 4y = (4.5)(100)$

[(cost)(lbs) + (cost)(lbs) = (cost)(lbs)
Candy A Candy B total]

$-4(x + y) = (100)(-4)$
$-4x - 4y = -400$

$6x + 4y - 4x - 4y = -400 + (100)(4.5)$
$2x = -400 + 450$
$2x = 50$
$\boxed{x = 25}$ lbs of candy A

suggested methods:
substitution or
elimination

$x + y = 100$
$25 + y = 100$
$\boxed{y = 75}$ lbs of Candy B

EXAMPLE 2

Investment Anna decides to invest \$500 in two different accounts. One account offers an interest rate of 5% per year and another account offers an interest rate of 8% per year. If Anna earns \$35.50 in interest in one year, how much money did Anna invest in each account? First model the problem as two equations in two unknowns and then solve.

$I = Prt$

x = amount invested at 5%

y = amount invested at 8%

$x + y = 500$ is the total amount invested

(Total) Interest $= I = 35.50$

$y = 500 - x$

$I_x = x(.05)(1)$ $I_y = y(.08)(1)$

$I = x(.05) + y(.08)$

$(.05)x + y(.08) = 35.5$

$.05x + .08(500 - x) = 35.5$

$.05x + 40 - .08x = 35.5$

$-.03x = -4.5$ so $\boxed{x = 150}$

$y = 500 - x$

$y = 500 - 150$

$\boxed{y = 350}$

EXAMPLE 3

A boat on a river travels 96 miles upstream in 8 hours. The return trip takes the boat 6 hours. The rowers on the boat are doing the same amount of work at all times and travel at a constant speed in still water. Find the rate of the boat and the rate of the current.

$d = rt$

96 = miles of trip 1 way

8 = hours upstream

6 = downstream

x = rate of boat in still water

y = rate of current

$d = rt$

upstream: $96 = (x - y)8$, $12 = x - y$

downstream: $96 = (x + y)6$, $16 = x + y$

$12 + 16 = x - y + x + y$

$28 = 2x$

$\boxed{x = 14}$ mph

$16 = 14 + y$

$\boxed{2 = y}$

$y = 2$ mph

PROBLEM 2

A driver averages 40 mph going from town A to town B. On the return trip the driver averages 56 mph and takes 2 hours less. What is the distance between towns A and B and how many hours did the driver spend going from town A to town B? Model the problem as a system of two equations in two unknowns and then solve using an appropriate method.

$d = rt$

A to B: $d = 40t$

B to A: $d = 56(t - 2)$

d = distance

r = rate (speed)

t = time

$40t = 56(t - 2)$

$40t = 56t - 112$

$40t - 56t = 56t - 112 - 56t$

$-16t = -112$

$\boxed{t = 7 \text{ hours}}$

$d = 40t$

$d = 40(7)$

$\boxed{d = 280 \text{ miles}}$

EXAMPLE 4

A company sells DVDs for \$10 each. The company manufactures these DVDs at a cost of \$2 each with a fixed set-up cost of \$240. If the company manufactures and sells x of these DVDs:

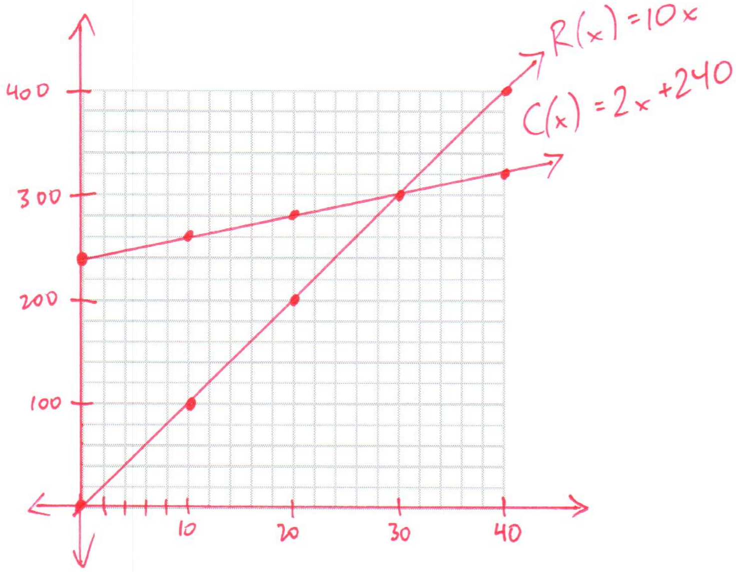
1. Write a function that expresses the cost to the company for making x DVDs to sell.

   $C(x) = 2x + 240$

2. Write a function that expresses the revenue the company makes when they sell x DVDs.

   $R(x) = 10x$

3. Graph the two functions on the same coordinate system noting the domain of the functions.



Domain of $C(x)$ is the integers

Domain of $R(x)$ is the integers

SUMMARY (What I learned today)