In 3.2 we learned one method of solving systems of linear equations. In this section we will attempt to work some word problems that allow the use of systems of linear equations. We can employ our solving techniques to find the solutions.

## Mixture Problems

I DO Ex: 3.3.22

Eat My Nuts, sells salty and sweet nuts. They sell salty pistachio nuts for 6.50 $/lb and sweet candied almonds for 8.00 $/lb. If Dan Long star employee of Eat My Nuts wants to make his favorite mix, which is a 50lb. bag of pistachio and almonds that he can sell for 7.40 $/lb (the same price as buying the different nuts separately), how much of each type of nuts should he use?

Let $x=$ # lbs of pistachio nuts

Let $y=$ # lbs of almond nuts What do we know?

Total Weight: $x+y=50$

The cost of the mixed nuts is the same as the cost of the sum of the costs of the individual nuts before they were mixed.

Cost amount: $6.5x+8y=7.4(50)$

$$6.5x+8\left(50-x\right)=7.4\left(50\right)$$

$$-1.5x+400=370$$

$$30=1.5x$$

$$x=20\rightarrow y=30$$

They Do Ex: 3.3.24

Smells like Asstome, sells exotic spices from the nether regions of the world. If they sell minced Thyme for 1.35 $/oz and pickled Allspice for 1.85 $/oz and Al Coholic their importer wants to sell a brackish spice which is a 20 oz mix of these two spices for 1.65 $/oz, how much of each spice should Al have put into his mix?

Let T= # oz of Thyme

Let A= # oz of Allspice

Total Weight: $T+A=20$

Cost amount: $1.35T+1.85A=1.65(20)$

Solution:

8 oz of Thyme, 12 oz of Allspice

## Mixture Problems Involving percents

I DO Ex: 3.3.36

Scratch That Etch cleaning supply co uses one cleanser with 25% acid for cleaning mold and another that is 50% acid for cleaning harder to kill bacteria. If I.P. Freely their service manager wants 30L of a cleaner that is good for both which has a 40% acid concentration, how much of each should Mr. Freely use?

Let $x =$ # Liters of 25% acid

Let $y =$ # liters of 50% acid What do we know?

Total Volume: $x+y=30$

The amount of acid of the new cleaner is the same as the amount of acid in the sum of the other two cleaners before they were mixed.

 First, how do we find the amount of acid contained in 10L of the 25% acid? (Multiply) 10(.25)

Now lets try to translate what we know

Acid amount: $\left(.25\right)x+\left(.50\right)y=\left(.40\right)30$

$$25x+50\left(30-x\right)=\left(40\right)\left(30\right)$$

$$-25x+1500=1200$$

$$300=25x$$

$$x=12L\rightarrow y=18L$$

They DO: Ex:

You are tending bar at your math study group and someone asks you for an “Antifreeze”. The receipt calls for Midori (a 40 proof melon liquor) and Vodka (a 100 proof Vodka). If you want to mix up a 9 oz round for you and your 3 cohorts which has is 70 proof, how many ounces of each alcohol should you use? How many oz of pure alcohol will the entire mix contain?

Let V = amount of vodka in oz

Let M = amount of Midori in oz

Total volume: $M+V=9$

Alcohol amount: $.2M+.5V=.35(9)$

$$20M+50\left(9-M\right)=35\left(9\right)$$

$$-30M+450=315$$

$$135=30M$$

$$M=4.5\rightarrow V=4.5$$

$$.2(4.5)=.9 oz \& 4.5\left(.5\right)=2.25 oz\rightarrow 3.15 oz alcohol in total$$

## Simple Interest Problems

$$I\_{simple}=Prt$$

I Do: Ex: 3.3.30

Yo’ mama invests $15,000 the day you were born in two funds which earn 6% and 7.5% simple interest every 18 years. If these investments yielded $1023 in simple interest, how much was invested at each interest rate.

Let x = amt. of $ invested at 6%

Let y = amt. of $ invested at 7.5%

What do we know.

Total Invested: $x+y=15,000$

The interest from the first account + the interest from the second account is $1023.

Interest Amount: $.06x+.075y=1023$

$$.06x+.075\left(15,000-x\right)=1023$$

$$6x+7.5\left(15,000-x\right)=102300$$

$$10200=1.5x$$

$$x=\$6,800\rightarrow y=\$8,200$$

They Do: Ex: 3.3.30

The investment firm of Dewy Cheetem and Howe invested $200,000 a year ago in two funds which earn 8% and 11%. If these investments yielded $20,500 in simple interest, how much was invested at each interest rate. How much did they claim on their taxes?

Let x = amt. of $ invested at 8%

Let y = amt. of $ invested at 11%

What do we know.

Total Invested: $x+y=200,000$

Interest Amount: $.08x+.11y=20,500$

$$x=\$50,000\rightarrow y=\$150,000$$

## Distance, Rate, & Time Problems

$$D=rt\rightarrow r=\frac{D}{t}\rightarrow t=\frac{D}{r}$$

$$D=rt$$

Dirt Box Equation:

I DO: Ex: like Example 7

A jet flies 2,000 mi west with a 50 mph tailwind. The trip takes 4hr. The jet turns around for its return trip to fly against the wind and it takes 5 hrs. Find the speed of the jet in still air.

Let $s=speed of plain in still air$

$$2000=\left(s+50\right)4=\left(s-50\right)5$$

$$4s+200=5s-250$$

$$s=450$$

THEY DO: Ex: 3.3.38

Two cars leave Salt Lake City, traveling in opposite directions. One car travels at a speed of 80km/hr and the other at 96 km/hr. In how many hours will they be 528 km apart?

Let $t=time it takes to be 528 km apart.$

$$80t=d\_{1}$$

$$96t=d\_{2}$$

$$d\_{1}+d\_{2}=528=80t+96t=176t$$

$$\frac{528}{176}=3hr=t$$