Math 115
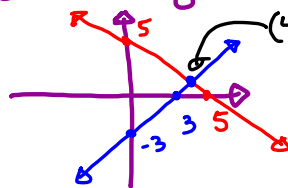
Spring 2018

Lecture 15

$? \ a^2 + b^2 = c^2 \ ?$
$?$
$y = mx + b \quad d = rt$

Class Quiz

① Solve by graphing: $\begin{cases} x + y = 5 \\ x - y = 3 \end{cases}$

② Solve by Substitution Method: $\begin{cases} x + 3y = -3 \\ y = 4 - 2x \end{cases}$

③ Solve by addition/elimination Method: $\begin{cases} x - 5y = -22 \\ 4x + 3y = 4 \end{cases}$

$(4,1)$

$x + 3(4-2x) = -3$
$x + 12 - 6x = -3$
$-5x = -15$
$\boxed{x = 3}$

$y = 4 - 2(3)$
$\boxed{y = -2}$
$(3, -2)$

$-4 \begin{cases} x - 5y = -22 \\ 4x + 3y = 4 \end{cases} \Rightarrow \begin{cases} -4x + 20y = 88 \\ 4x + 3y = 4 \end{cases}$
$\quad\quad\quad\quad\quad\quad 23y = 92$
$\quad\quad\quad\quad\quad\quad \boxed{y = 4}$

$x - 5(4) = -22$
$x - 20 = -22$
$\boxed{x = -2}$
$(-2, 4)$

The sum of two numbers is 12.
3 times the smaller one increased by the larger one is 20.
Find both numbers.

$S \rightarrow$ Smaller one

$L \rightarrow$ Larger one

$-1 \begin{cases} S + L = 12 \\ 3S + L = 20 \end{cases}$

$\begin{cases} -S - L = -12 \\ 3S + L = 20 \end{cases}$

$2S = 8 \rightarrow \boxed{S = 4}$

$4 + L = 12 \quad \boxed{L = 8}$

The numbers are 4 and 8.

Two angles are complementary. $\rightarrow$ Total $= 90°$
One of them is twice the other one.
Find both angles.

$\begin{cases} \boxed{x} + y = 90 \\ x = \boxed{2y} \end{cases}$

Angles are 30° & 60°.

$2y + y = 90$

$3y = 90$

$\boxed{y = 30}$

$x = 2(30)$

$\boxed{x = 60}$

Two angles are Complementary. → Total = 90°

The Sum of 3 times one of them and

5 times the other one is 400°.

find the larger angle.

$-3 \begin{cases} x + y = 90 \\ 3x + 5y = 400 \end{cases} \Rightarrow \begin{cases} -3x - 3y = -270 \\ 3x + 5y = 400 \end{cases}$

$$2y = 130$$

$$\boxed{y = 65}$$

$$x + 65 = 90 \qquad \boxed{x = 25}$$

The larger angle is 65°.

Two angles are Supplementary. → Total = 180°

Their difference is 20°.

find both angles.

$\begin{cases} x + y = 180 \\ x - y = 20 \end{cases}$

$$2x = 200$$

$$\boxed{x = 100}$$

$$100 + y = 180$$

$$\boxed{y = 80}$$

Two angles are 100° & 80°.

Two angles are Supplementary. → Total $= 180°$

one of them is $15°$ more than twice the other one.

Find both angles.

$$\begin{cases} x + y = 180 \\ x = 2y + 15 \end{cases}$$

$2y + 15 + y = 180$

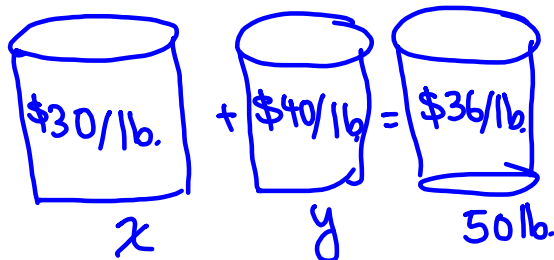$3y = 165$

$y = 55$

$x = 2(55) + 15$

$= 110 + 15$

$x = 125$

Two angles are $125°$ & $55°$.

---

we need 50 lb. of coffee at $36/lb.

we have unlimited supply of $30/lb. & $40/lb. coffee.

How many pounds of each should we mix to obtain what we need?

$30/lb. x + $40/lb y = $36/lb $50lb.

$$\div 10 \begin{cases} x + y = 50 \\ 30x + 40y = 36 \cdot 50 \end{cases}$$

$$\overset{-3}{\underset{\Rightarrow}{}} \begin{cases} x + y = 50 \\ 3x + 4y = 180 \end{cases}$$

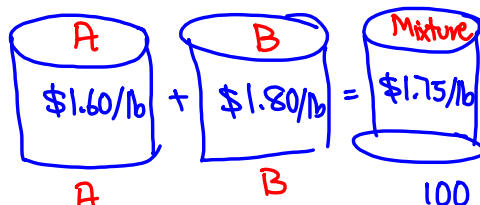$$\Rightarrow \begin{cases} -3x - 3y = -150 \\ 3x + 4y = 180 \end{cases}$$

$y = 30$

$x = 20$

20 lb. @ $30, 30 lb. @ 40.

Store has two brands of candies.
one brand is $1.60/ lb. , and other brand is $1.80/lb.

The manager needs 100 lb. of candy at $1.75/ lb.

How many pounds of each?

A $1.60/lb + B $1.80/lb = Mixture $1.75/lb

A   B   100

$\begin{cases} A + B = 100 \\ 1.60A + 1.80B = 1.75(100) \end{cases}$ $10\begin{cases} A + B = 100 \\ 1.6A + 1.8B = 175 \end{cases}$

$\begin{cases} A + B = 100 \\ {\div}2\ (16A + 18B = 1750) \end{cases}$ $\overset{-8}{\Rightarrow}\begin{cases} A + B = 100 \\ 8A + 9B = 875 \end{cases}$

$\begin{cases} -8A - 8B = -800 \\ 8A + 9B = 875 \end{cases}$

$\overline{\qquad\qquad B = 75}$

75 lb. of $1.80 brand
&
25 lb. of $1.70 brand

John needs 50 liters of 48% alcohol Solution. He has unlimited Supply of two alcohol Solution, one at 30% alcohol, and the other one at 60% alcohol.

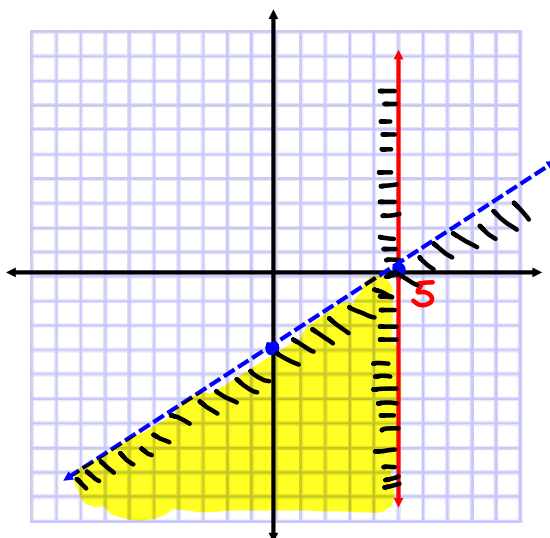How many liters of each should he combine to obtain what he needs?

30% + 60% = 48%

x y 50L
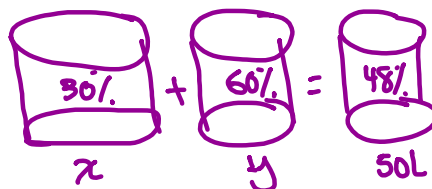
$\begin{cases} x + y = 50 \\ .3x + .6y = .48(50) \end{cases}$ $\Rightarrow$ $10\begin{cases} x + y = 50 \\ .3x + .6y = 24 \end{cases}$

$\begin{cases} x + y = 50 \\ {\div}3\ (3x + 6y = 240) \end{cases}$ $\overset{-1}{\Rightarrow}\begin{cases} x + y = 50 \\ x + 2y = 80 \end{cases}$ $\Rightarrow\begin{cases} -x-y=-50 \\ x+2y=80 \end{cases}$

30L of 60% Alcohol & 20L of 30% Alcohol $\underline{y = 30}$

Graph & Shade
$$\begin{cases} x \leq 5 \\ y < \frac{3}{5}x - 3 \end{cases}$$

5

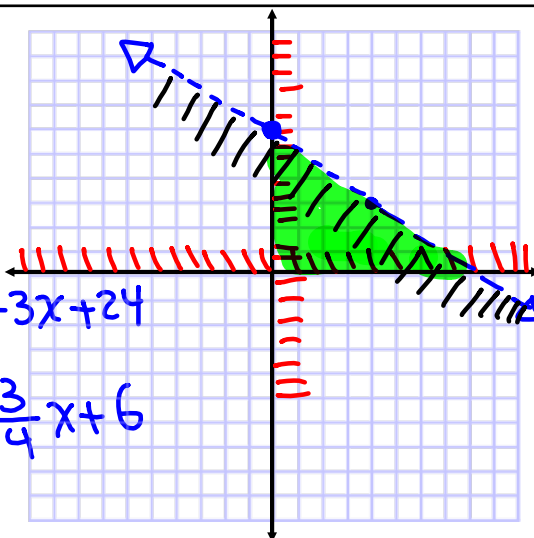Graph & Shade
$$\begin{cases} x \geq 0 \quad \text{V.L. } y\text{-axis} \\ y \geq 0 \quad \text{H.L. } x\text{-axis} \\ 3x + 4y < 24 \end{cases}$$

$4y < -3x + 24$

$y < \frac{-3}{4}x + 6$

Hint:
convert this
to Slope-Int
form

find eqn of a line that contains $(4, -5)$ and is parallel to $3x - 2y = -10$.

Same slope
$m = \frac{3}{2}$

$-2y = -3x - 10$
$y = \frac{3}{2}x + 5$

$y - y_1 = m(x - x_1)$

$\boxed{y - ^-5 = \frac{3}{2}(x - 4)}$

$y + 5 = \frac{3}{2}x - 6$

↳ Point-Slope form

$\boxed{y = \frac{3}{2}x - 11}$ Slope-Int form

$2y = 3x - 22$

$-3x + 2y = -22$

$\boxed{3x - 2y = 22}$ Standard form

---

find the equation of a line that contains $(-3, 6)$ and is perpendicular to to the line $3x - 4y = 12$.

Slopes are opposite reciprocal.

Convert to Slope-Int form

$-4y = -3x + 12$ $\boxed{y = \frac{3}{4}x - 3}$ $-\frac{4}{3}$

Now use Point-Slope formula

$y - y_1 = m(x - x_1)$

$y - 6 = \frac{-4}{3}(x - ^-3)$

$\boxed{y - 6 = \frac{-4}{3}(x + 3)}$ Point-Slope

$y - 6 = \frac{-4}{3}x - 4$

$\boxed{y = \frac{-4}{3}x + 2}$ Slope-Int

$3y = -4x + 6$

$\boxed{4x + 3y = 6}$

Standard form

find the eqn of a line that contains
(3, -2) and (-1, 5).

$$m = \frac{-2 - 5}{3 - (-1)} = \frac{-7}{4} \qquad \boxed{m = \frac{-7}{4}}$$

Point-Slope

$$y - y_1 = m(x - x_1)$$

$$y - 5 = \frac{-7}{4}(x - -1)$$

Point-Slope $\boxed{y - 5 = \frac{-7}{4}(x + 1)}$

LCD = 4

$$4y - 20 = -7(x + 1)$$

$$4y - 20 = -7x - 7$$

$\boxed{7x + 4y = 13}$ Standard form

$$4y = -7x + 13$$

$\boxed{y = \frac{-7}{4}x + \frac{13}{4}}$ Slope-Int. form

---

find eqn of a line that contains (-7, 5)
with

ⓐ Zero Slope
   H.L.   y-only
     $\boxed{y = 5}$

ⓑ no slope
   V.L.   x-only
     $\boxed{x = -7}$

ⓒ undefined slope
   V.L.   x-only $\boxed{x = -7}$

ⓓ Slope $\frac{2}{3}$.
$$y - y_1 = m(x - x_1)$$

$$y - 5 = \frac{2}{3}(x - -7)$$

$\boxed{y - 5 = \frac{2}{3}(x + 7)}$

$$3y - 15 = 2(x + 7)$$

Point-Slope form

$$3y - 15 = 2x + 14$$

$$-2x + 3y = 29$$

$\boxed{2x - 3y = -29}$ ⟵ Standard form

$$-3y = -2x - 29$$

$$y = \frac{-2}{-3}x - \frac{29}{-3}$$

Slope-Int form $\boxed{y = \frac{2}{3}x + \frac{29}{3}}$

Use graphing Page posted on my website
for Problems 1-10 & 47-50
Use work page Posted on my website
for Problems 11-46.

This is due on Monday

You make Your own Cover Page

I will try to give You a
nice folder. Presentation matters.