Math 115

Winter 2017

Lecture 4

Solve:

1) $4(2x-3)-8=2(5x-10)-2x$

$8x-12-8=10x-20-2x$

$8x-20=8x-20$

$8x-8x=-20+20$

$0=0$

True

infinitely many Solutions.

Equation is an identity.

2) $\frac{3}{4}(x-2)+3=\frac{1}{2}(x+2)-1$

$$\frac{3}{4}(x-2)+3=\frac{1}{2}(x+2)-1$$

LCD = 4

$$\cancel{4}\cdot\frac{3}{\cancel{4}}(x-2)+4\cdot 3=\overset{2}{\cancel{4}}\cdot\frac{1}{\cancel{2}}(x+2)-4\cdot 1$$

$$3(x-2)+12=2(x+2)-4$$

$$3x-6+12=2x+4-4$$

$$3x+6=2x$$

$$3x-2x=-6$$

$$\boxed{x=-6}$$

$$\{-6\}$$

Equation is conditional.

Solve

$$-3(4x-2)+5=6(-2x+1)-1$$

$$-12x+6+5=-12x+6-1$$

$$-12x+11=-12x+5$$

$$-12x+12x=5-11$$

$$0=-6$$

False

No Solution

$\emptyset$

Equation is Contradiction.

Linear Equation

When there	Equation is
is exactly one Soln.	Conditional
are infinitely many Solns.	Identity
is no Soln	Contradiction

2 more than 3 times the number of dimes is equal to the # of nickels. How many each if you have \$1.35 worth of coins in dimes & nickels.

Dimes $\rightarrow x$

Nickels $\rightarrow 3x+2$

10 Dimes + 5 Nickes = 135

$10x + 5(3x+2) = 135$

$10x + 15x + 10 = 135$

$25x = 125$

$$x = \frac{125}{25}$$

$\boxed{x=5}$ → 5 Dimes & 17 Nickels

Lisa has \$235 in \$20's & \$5's.
the # of \$5's bills is 1 fewer than twice # of \$20's bills.
How many of each?

\$20 bills → x

\$5 bills → $2x - 1$

$$20x + 5(2x-1) = 235$$
$$20x + 10x - 5 = 235$$
$$30x = 240$$
$$\boxed{x = 8}$$

8 of \$20's & 15 of \$5's

Sara works as a server at a local coffee shop. She collected $50 for serving two types of coffee. Small size @ $1.25, Large size @ $1.45. # of large size coffee she served was 3 more than twice the # of small size. How many of each?

Large → $2x + 3$

Small → x

$1.25 Small + $1.45 Large = $50

$$1.25x + 1.45(2x + 3) = 50$$

$$\underbrace{1.25x} + \underbrace{2.9x} + 4.35 = 50$$

$$4.15x = 50 - 4.35$$

$$4.15x = 45.65$$

$$x = \frac{45.65}{4.15} \rightarrow \boxed{x = 11}$$

11 Small
&
25 large

How to express Solns for inequalities:

1) Set-builder notation

$$\{x \mid \qquad \}$$

2) Graphing

3) Interval notation

use [,] when endpts have = sign, otherwise use (,).

Solve $-2x+5 \le 11$

$$-2x \le 11-5$$

$$-2x \boxed{\le} 6$$

$$x \ge \frac{6}{-2}$$

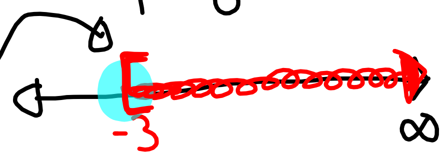
$$\boxed{x \ge -3}$$

S.B.N.

$$\{x \mid x \ge -3\}$$

Such that

Graphing



Interval notation

$[-3, \infty)$

∞, $-\infty$ always get (,).

Solve $-3x-5>7$

$-3x>7+5$

$-3x\boxed{>}12$

$\frac{-3}{-3}x<\frac{12}{-3}$

$x<-4$

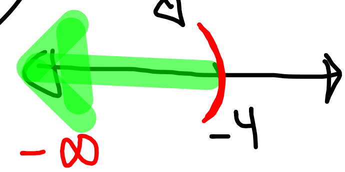
NO = Sign

S.B.N.

$\{x \mid x<-4\}$

Such that

Graph



Interval notation

$(-\infty,-4)$

Solve

$1<2x-3\leq 9$

$1+3<2x-\cancel{3}\cancel{+3}\leq 9+3$

$4<2x\leq 12$

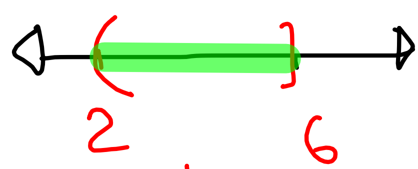
$\frac{4}{2}<\frac{2}{2}x\leq\frac{12}{2}$

$2<x\leq 6$

S.B.N.

$\{x \mid 2<x\leq 6\}$

Graphing



Interval notation

$(2,6]$

$-2 \le -3x + 4 < 7$

Subtract 4 $\rightarrow$ $-6 \le -3x < 3$

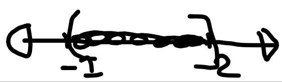
Divide by -3 $\rightarrow$ $2 \ge x > -1$

It is better to have smaller # of the left hand side $\rightarrow$ $-1 < x \le 2$

S.B.N. $\{x \mid -1 < x \le 2\}$

I.N. $(-1, 2]$

Graphing



Solve:

$2 < 2 - 3x \le 11$

$2 < -3x + 2 \le 11$ $\rightarrow$ $0 < -3x \le 9$

$\frac{0}{-3} > \frac{-3}{-3}x \ge \frac{9}{-3}$

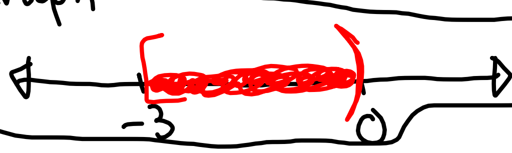
$0 > x \ge -3$

$-3 \le x < 0$

S.B.N.

$\{x \mid -3 \le x < 0\}$

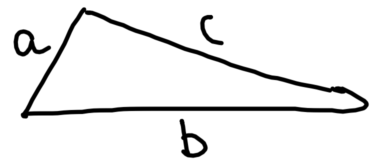
Graph



I.N. $[-3, 0)$

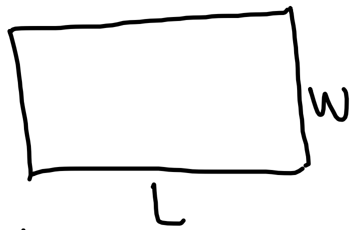
Geometric perimeters:

1) Triangle



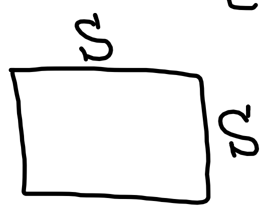
$P = a + b + c$

2) Rectangle



$P = 2L + 2W$

3) Square



$P = 4S$

A triangular room has a perimeter of 31 meters. One side is twice another side. the third side is 3 meters longer than the shortest side of first two sides. find all three sides.

Side 1 → x

Side 2 → $2x$

Side 3 → $x+3$

$$\underbrace{\text{Side 1}}_{\boxed{x}} + \underbrace{\text{Side 2}}_{\boxed{2x}} + \underbrace{\text{Side 3}}_{\boxed{x+3}} = 31$$

$$\boxed{x} + \boxed{2x} + \boxed{x+3} = 31$$

$$4x+3=31$$

$$4x=28$$

$$\boxed{x=7}$$

Side 1 → 7m
Side 2 → 14m
Side 3 → 10m

A rectangular pool has a perimeter of 76 ft.
The length is 6 ft longer than 3 times its width.
Find its dimensions.

$P = 76$

$W = x$

$L = 3x + 6$

$2L + 2W = 76$

$2(3x+6) + 2(x) = 76$

$6x + 12 + 2x = 76$

$8x = 64$

$\boxed{x=8}$

8 ft by 30 ft

A rectangular carpet has a perimeter of 64 m.

Its length is 4 m shorter than twice its width.

Find its area.

$A = L \cdot W$

$= \boxed{240 m^2}$

$w = x$

$L = 2x - 4$

$P = 64$

$2L + 2W = 64$

$2(2x-4) + 2x = 64$

$4x - 8 + 2x = 64$

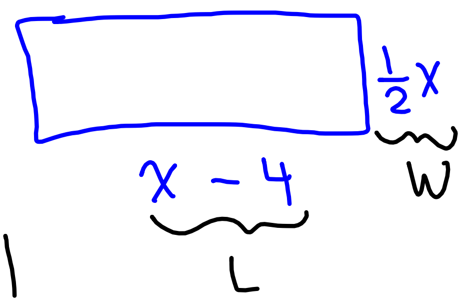
$6x = 72$

$\boxed{x = 12}$

$W = 12 m$
$L = 20 m$

Find all possible values for x such that the perimeter of the rectangle below is between 4 m and 21 m, inclusive.

$4 \le P \le 21$



$4 \le 2L + 2W \le 21$

$4 \le 2(x-4) + 2\left(\tfrac{1}{2}x\right) \le 21$

$4 \le 2(x-4)+2(\frac{1}{2}x) \le 21$

$4 \le 2x-8+x \le 21$

$4 \le 3x-8 \le 21$

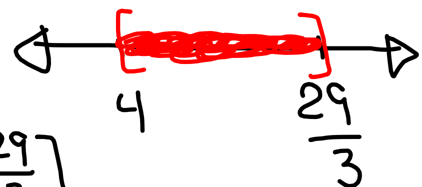
$12 \le 3x \le 29$

$4 \le x \le \frac{29}{3}$

S.B.N.

$\{x \mid 4 \le x \le \frac{29}{3}\}$

Graphing



I.N.

$[4, \frac{29}{3}]$

You need at least 90 to get an A.

Exam 1 → 84

Average ≥ 90

Exam 2 → 80

Final exam counts as 2 exams.

what Score on final exam You need to get an A?

$$\frac{84+80+2F}{4} \ge 90$$

$$84+80+2F \ge 360$$

$164 + 2F \geq 360$

$2F \geq 360 - 164$

$2F \geq 196$

$F \geq \frac{196}{2}$ → $F \geq 98$

at least 98 on the final exam to get A for class.

A handy man charged \$20 to show up and \$15 / hr to do the work. Total cost did not exceed \$125. How long did he work?

$20 + 15H \leq 125$

$15H \leq 105$

$H \leq 7$

at most 7 hrs

$4.25 for 8 notebooks

How much for 12 notebooks?

$$\frac{\$4.25}{8 \text{ Notebooks}} = \frac{\$x}{12 \text{ Notebooks}}$$

about $6.38

$$\frac{4.25}{8} = \frac{x}{12}$$

$$8x = 12(4.25)$$

$$x = \frac{51}{8}$$

$$x = 6.375$$

There were 53 questions on a test. Some were multiple-choice and the rest was show-work.

the # of multiple-choice questions was 1 more than 3 times the # of show-work questions. How many show-work questions?

$$\underbrace{\text{Multiple-Choice}}_{3x+1} + \underbrace{\text{Show-work}}_{x} = 53$$

$$3x + 1 + x = 53$$

$$4x + 1 = 53$$

$$4x = 52$$

$$\boxed{x = 13}$$

13 Show-work questions

PTA Sold 82 tickets for School play. Adults & kids only. The # of Kid's tkt was 3 fewer than 4 times the # of Adult's tkt. How many kids tkt did they sell?

$$\underbrace{\text{Adults}}_{x} + \underbrace{\text{Kids}}_{4x-3} = 82$$

$$x + 4x - 3 = 82$$

$5x - 3 = 82$

$5x = 85$

$x = \frac{85}{5}$

$x = 17$

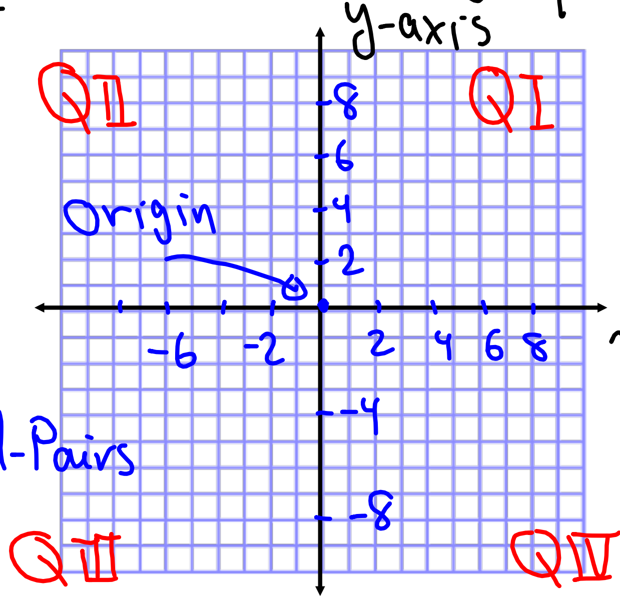
Kid's tkt $= 4x - 3$

$= 4(17) - 3$

$= 68 - 3$

$= \boxed{65 \text{ kid's tkt}}$

Ch. 3: Intro to graphing



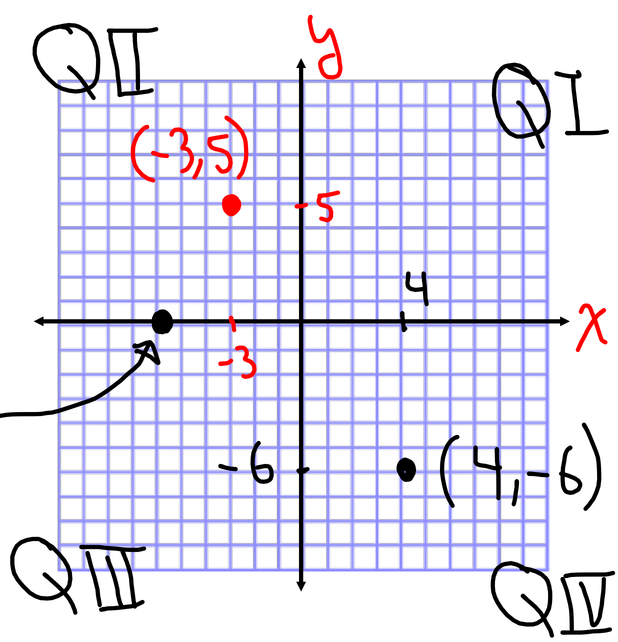
Rectangular Coordinate System

Points
⇒ ordered-Pairs
(x, y)

Plot (-3,5)

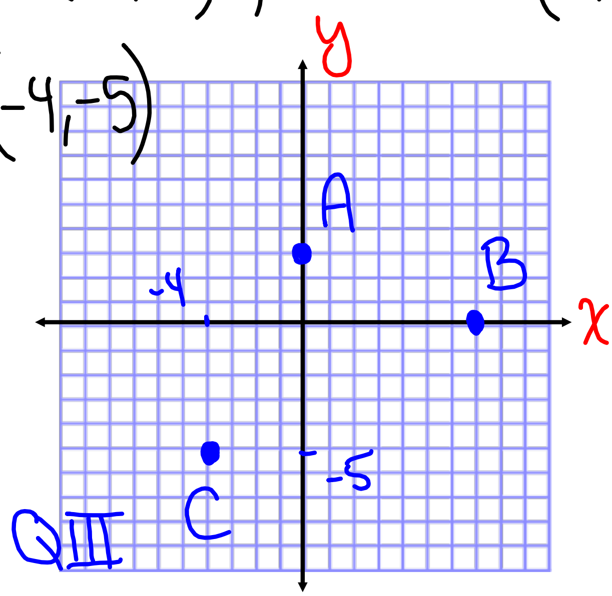
Plot (4,-6)

Plot (-6,0)



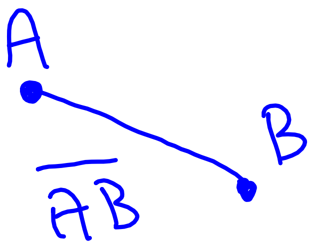
Plot A(0,3), and B(7,0)

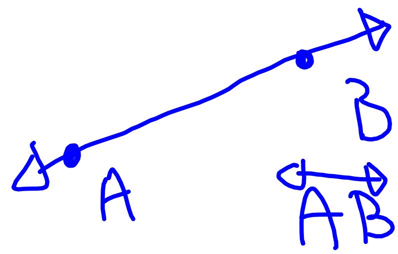
Plot C(-4,-5)



$\overline{AB}$ → line segment connecting points A & B.

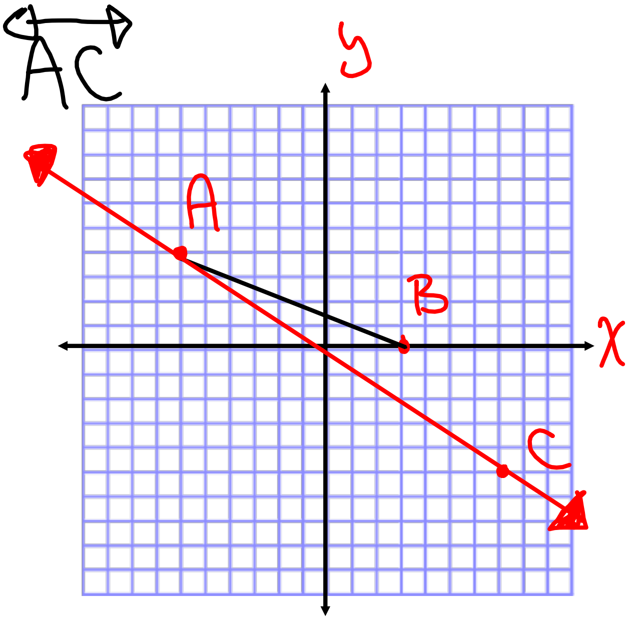
$\overleftrightarrow{AB}$ → line that contains both points A & B.





$A(-6,4)$, $B(3,0)$, $C(7,-5)$

Draw $\overline{AB}$, $\overleftrightarrow{AC}$



Equation of a line

$Ax + By = C$

$y = mx + b$

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

Slant lines

$x = a$ Vertical , $y = b$ horizontal

Graph

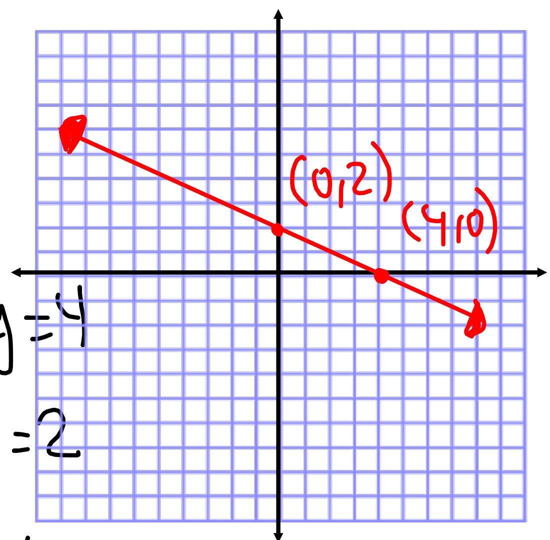
$x + 2y = 4$

x	y
0	2
4	0

$0 + 2y = 4$

$y = 2$

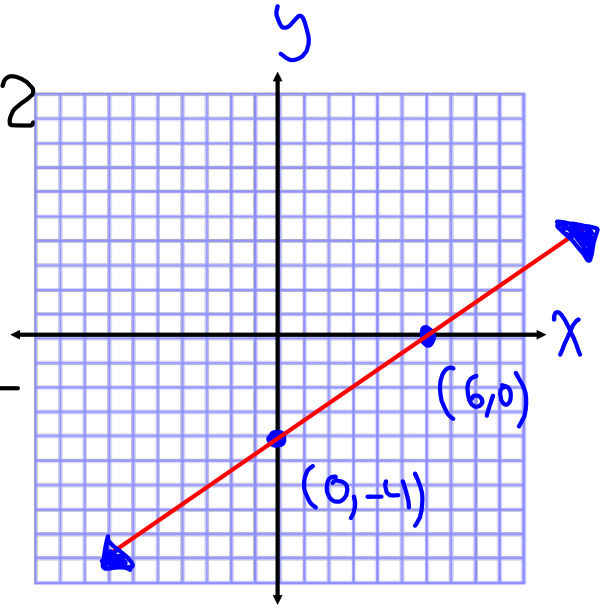
$x + 2(0) = 4$ $x = 4$



Graph

$2x - 3y = 12$

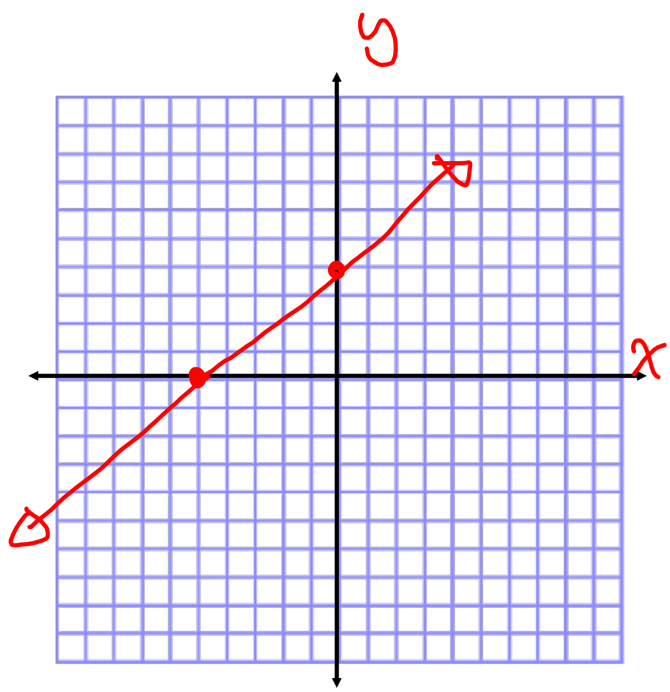
x	y
0	-4
6	0



Graph

$4x - 5y = -20$

x	y
0	4
-5	0

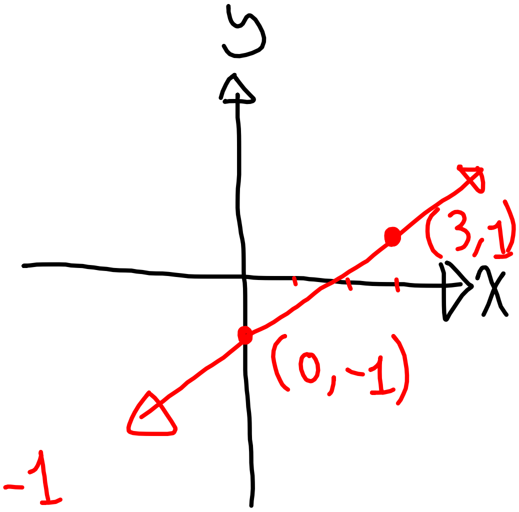


$$y = \frac{2}{3}x - 1$$

x	y
0	-1
3	1

$$y = \frac{2}{3}(0) - 1 = 0 - 1 = -1$$

$$y = \frac{2}{\cancel{3}}(\cancel{3}) - 1 = 2 - 1 = 1$$



Graph

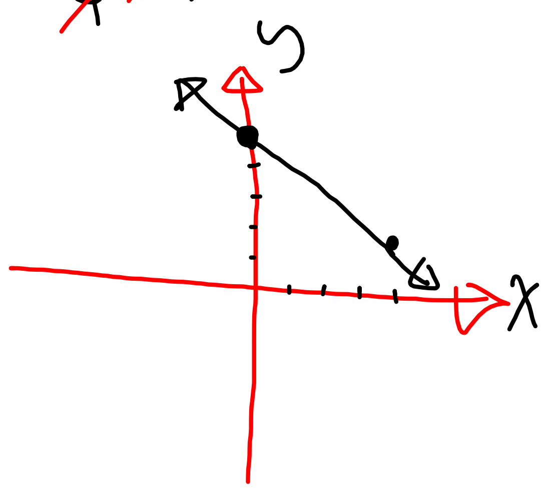
$$y = \frac{-3}{4}x + 5$$

x	y
0	5
4	2

$$y = \frac{-3}{4}(0) + 5$$

$$= 0 + 5 = 5$$

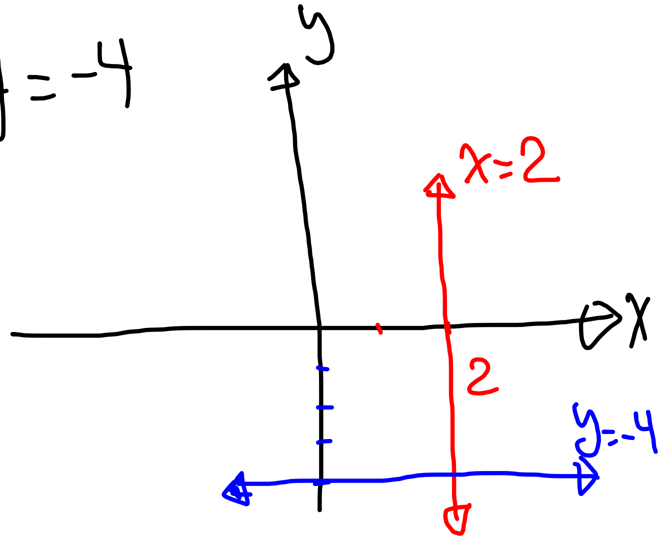
$$y = \frac{-3}{\cancel{4}}(\cancel{4}) + 5 = -3 + 5 = 2$$



x-only Vertical

y-only horizontal

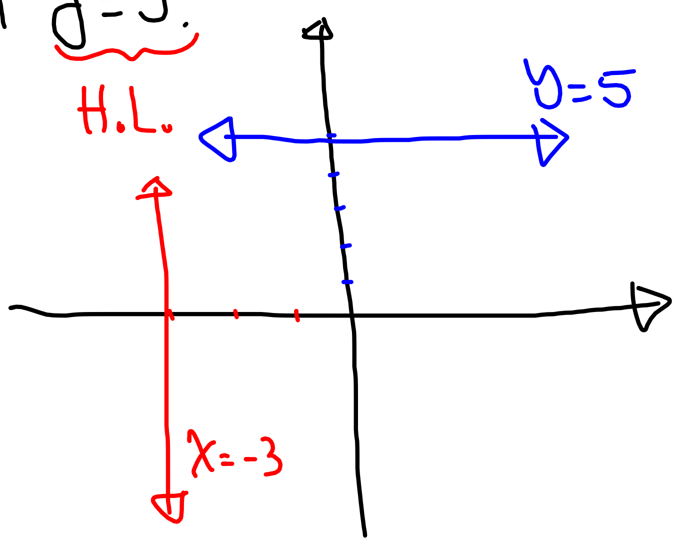
$x = 2$ & $y = -4$



Graph

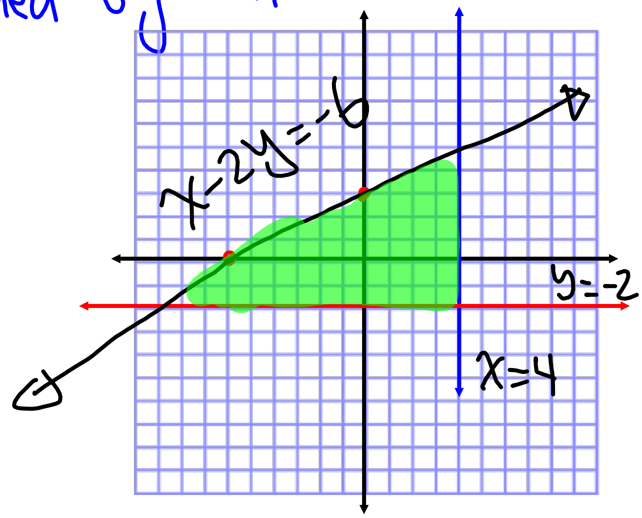
$x = -3$, and $y = 5$.

V.L. H.L.



Graph $x=4$, $y=-2$, and $x-2y=-6$. Shade the region that is bounded by all three lines.

x	y
0	3
-6	0



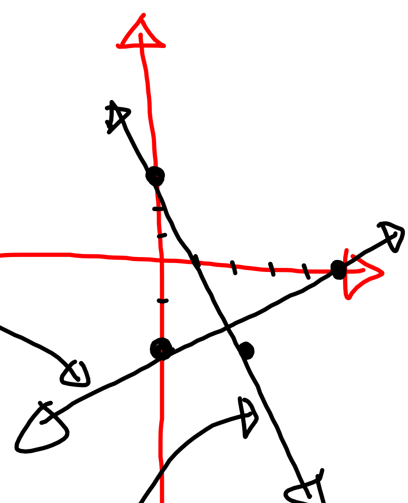
Graph

$y=\frac{2}{5}x-2$

x	y
0	-2
5	0

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

x	y
0	3
2	-2



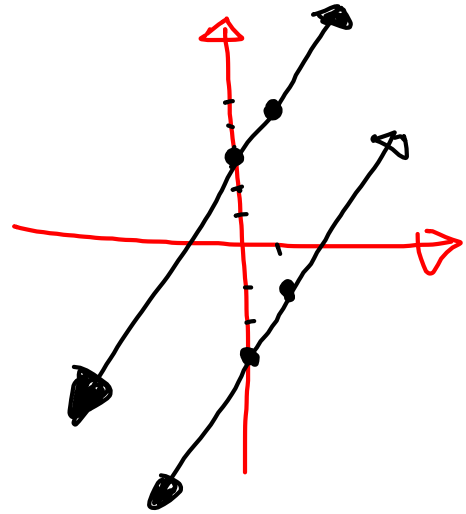
Graph

$y = 2x + 3$

x	y
0	3
1	5

$y = 2x - 3$

x	y
0	-3
1	-1



Due Tuesday

SG 3, WP 4, WP 5

Exam 1:

Thursday Ch. 1, 2, and Part of 3.

from 6:00 AM to 7:30 AM.

Consecutive Integers:

1, 2, 3, 4, ...

23, 24, 25, 26, ...

$-15, -14, -13, \ldots$

98, 99, 100, ...

$x,\ x+1,\ x+2,\ x+3, \ldots$

Find two consecutive integers such that their sum is 51.

x & $x+1$

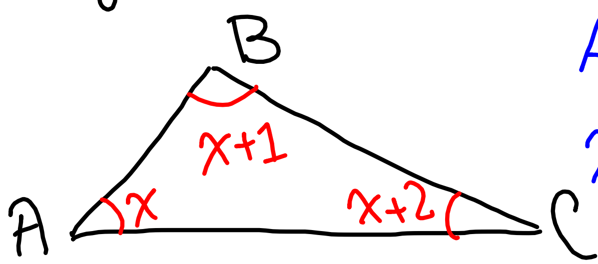
$x + x+1 = 51$

$2x+1=51$

$2x=50$ $\boxed{x=25}$

25 & 26

The measure of 3 angles in triangle ABC are 3 Cons. integers. Find all three.



$A + B + C = 180°$

$x + x+1 + x+2 = 180°$

$3x + 3 = 180$

$3x = 177$

$x = 59$

59°, 60°, and 61°

Find two Consecutive integers Such that twice the smaller one is equal to the difference of 168 and three times the larger one.

Smaller → x

Larger → $x+1$

$2x = 168 - 3(x+1)$

$2x = 168 - 3x - 3$

$2x = 165 - 3x$

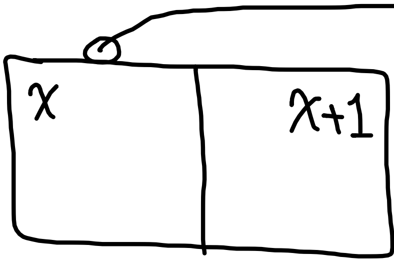
$$2x + 3x = 165$$

$$5x = 165$$

$$x = 33$$

33 & 34

The sum of page numbers of two facing pages is 203. Find the larger page number.



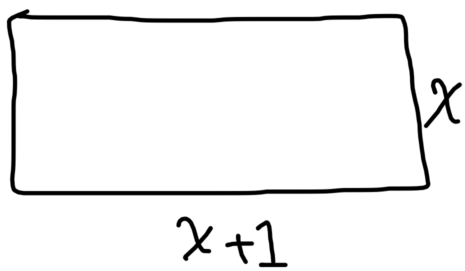
$$x + x + 1 = 203$$

$$2x = 202$$

$$x = 101$$

Larger Page # is 102.

length and width of a rectangular garden with perimeter 230 ft are two cons. integers. find its length.



$$P = 230$$

$$2L + 2W = 230$$

$$2(x+1) + 2x = 230$$

$$2x + 2 + 2x = 230$$

$$4x + 2 = 230$$

$$4x = 228$$

$$x = 57$$

58 ft

You can work on WP6.