# Math 115

# Spring 2019

# Lecture 10

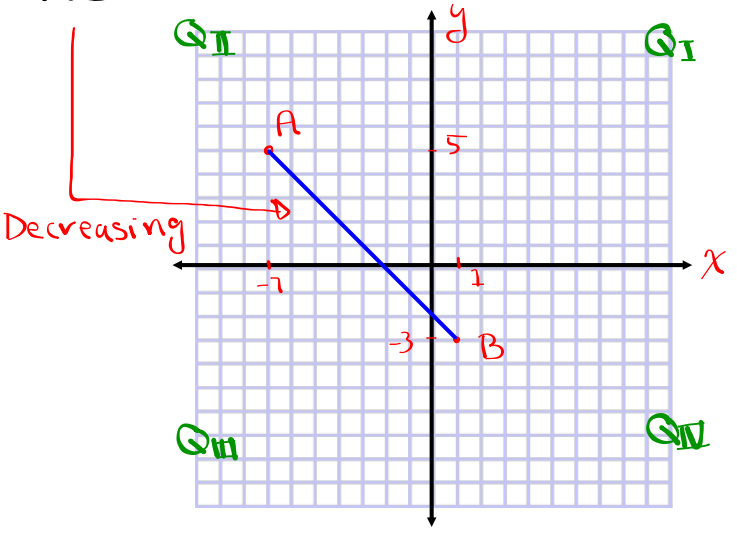
$? \; a^2 + b^2 = c^2 \; ?$

$y = mx + b \quad ? \quad d = rt$

Feb 19-8:47 AM

## Quick Review:

① Draw $\overline{AB}$ with A(-7,5) and B(1,-3).



Draw $x=4$, $y=-6$, and $3x-2y=12$ in the same coordinate system.

$x=4$
Vertical line

$y=-6$
Horizontal line

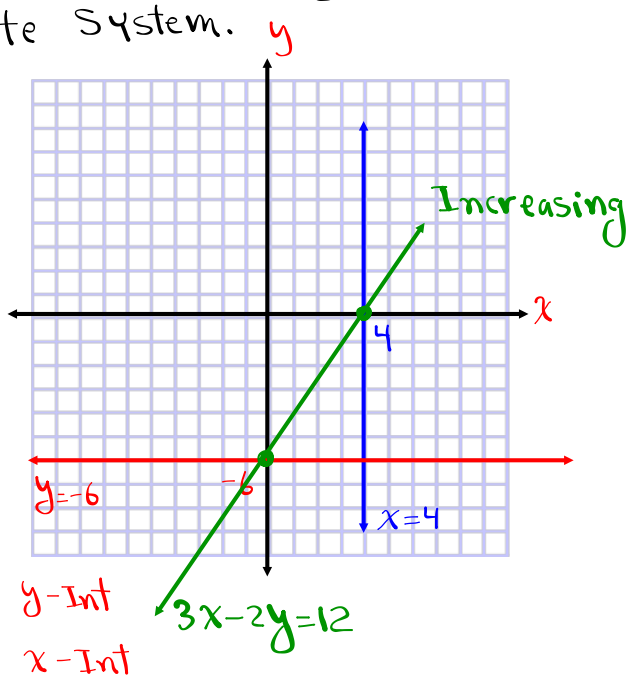
$3x-2y=12$
Slant line

| x | y |
|---|---|
| 0 | -6 |
| 4 | 0 |

Intercept Method

$(0,-6)$ y-Int

$(4,0)$ x-Int




New material

Midpoint of line segment $\overline{AB}$.

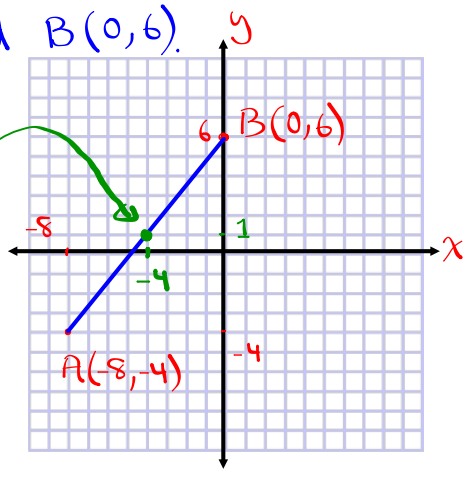
$A(x_1, y_1)$ & $B(x_2, y_2)$, Midpoint $M\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

Ex. Find the midpoint of line segment $\overline{AB}$ with $A(-8,-4)$ and $B(0,6)$.

$$M\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$$

$$= M\left(\frac{-8+0}{2}, \frac{-4+6}{2}\right)$$

$$= M\left(\frac{-8}{2}, \frac{2}{2}\right) \Rightarrow \boxed{M(-4,1)}$$

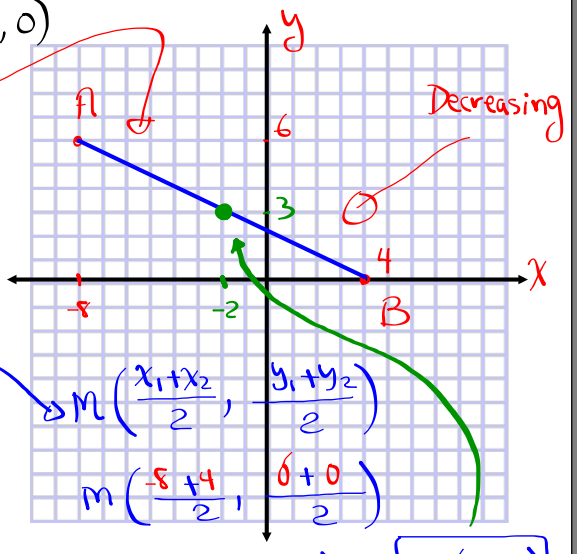


Given A(-8, 6) & B(4, 0)

1) Draw $\overline{AB}$.

2) Find the midpoint of $\overline{AB}$.

3) Plot the midpoint.




$M\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

$M\left(\frac{-8+4}{2}, \frac{6+0}{2}\right)$

$= M\left(\frac{-4}{2}, \frac{6}{2}\right) \Rightarrow \boxed{M(-2, 3)}$

Distance between A and B:

$A(x_1, y_1)$ & $B(x_2, y_2)$

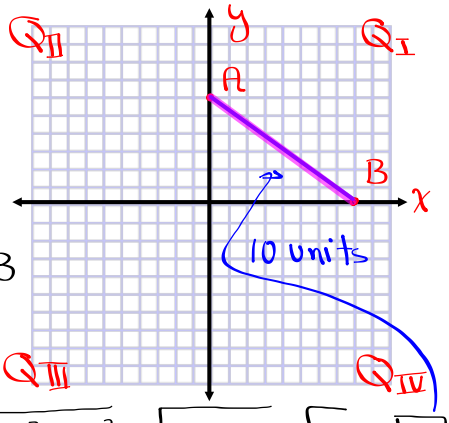
distance from A to B is $d(A,B)$

$$d(A,B) = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

then simplify

Ex: A(0, 6), B(8, 0)

Find the distance between A & B




$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$

$= \sqrt{(0-8)^2 + (6-0)^2} = \sqrt{(-8)^2 + (6)^2} = \sqrt{64+36} = \sqrt{100} = \boxed{10}$

Given $A(-4,7)$ & $B(0,3)$

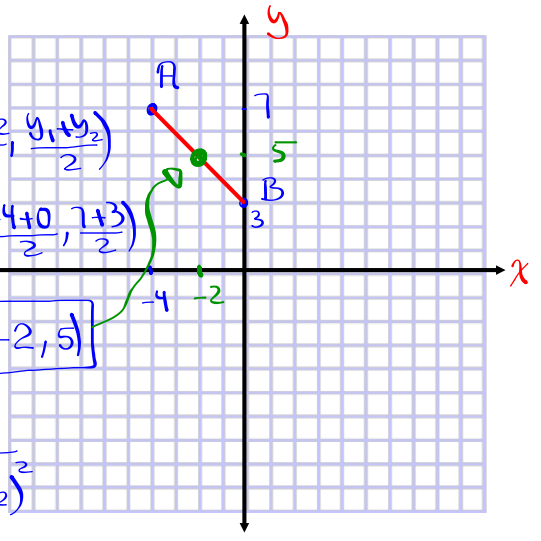
1) Draw $\overline{AB}$

2) Find and plot its midpoint M

$M\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

$= M\left(\frac{-4+0}{2}, \frac{7+3}{2}\right)$

$= \boxed{M(-2,5)}$




3) Find $d(A,B)$.

$d(A,B) = \sqrt{(x_1-x_2)^2+(y_1-y_2)^2}$

$= \sqrt{(-4-0)^2+(7-3)^2}$

$= \sqrt{(-4)^2+4^2} = \sqrt{16+16} = \sqrt{32} \approx \boxed{5.7}$ units

Given $A(0,-5)$ and $B(4,7)$

① Draw $\overline{AB}$

② Identify quadrant for A & B. → QI

None

③ Find M for $\overline{AB}$.

$M\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

$= M\left(\frac{0+4}{2}, \frac{-5+7}{2}\right)$

$= M(2,1)$

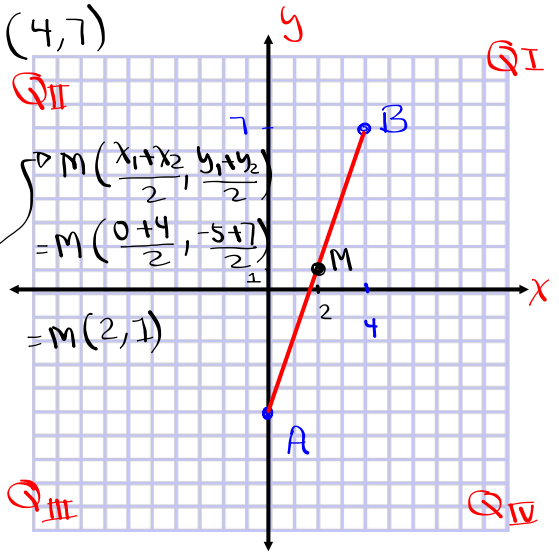
④ Find $d(A,B)$

$d = \sqrt{(x_1-x_2)^2+(y_1-y_2)^2}$

$= \sqrt{(0-4)^2+(-5-7)^2} = \sqrt{(-4)^2+(-12)^2}$

$= \sqrt{16+144} = \sqrt{160} \approx \boxed{12.6}$ units

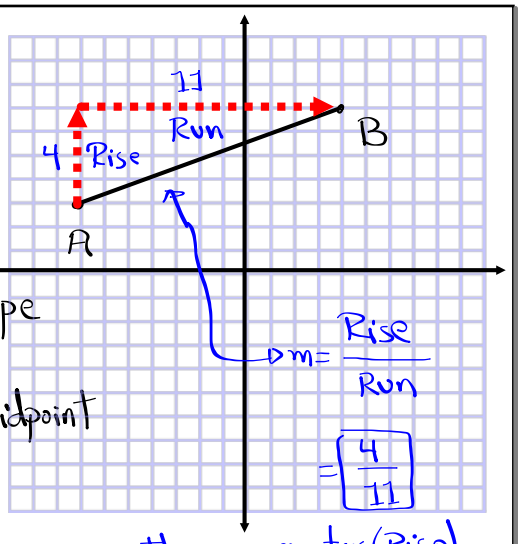
$\approx \boxed{12.65}$



Slope of a slant line is the fraction $\frac{\text{Rise}}{\text{Run}}$ then reduce

Lower case m for slope

Upper case M for midpoint

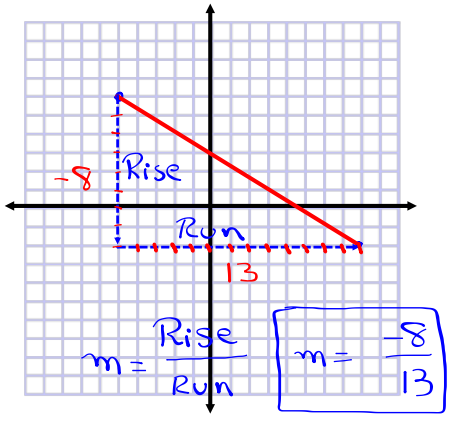


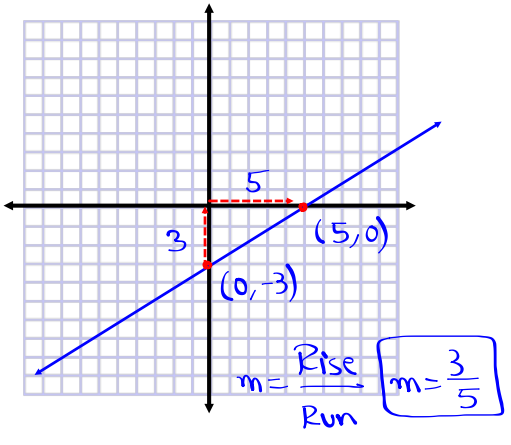

when Slope is −, Put it in the numerator (Rise)

when Rise is +, go up.

when Rise is −, go down

Give me slope of the line below,



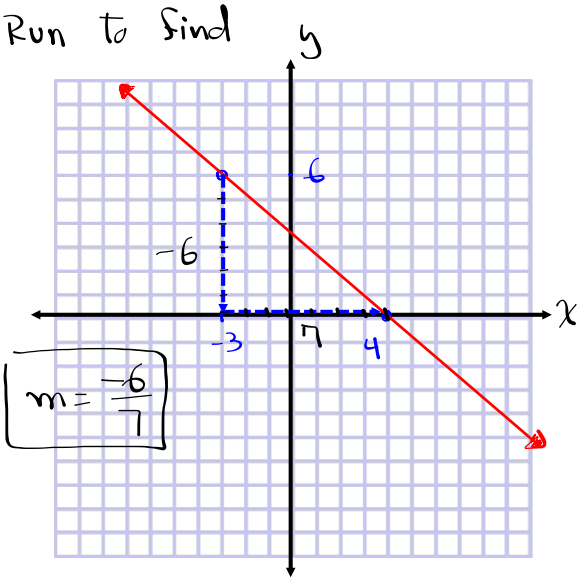



Draw a line that contains $(-3, 6)$ and $(4, 0)$, then use Rise & Run to find its Slope.

Rise $\rightarrow -6$

Run $\rightarrow 7$

Slope $m = \frac{\text{Rise}}{\text{Run}}$ $\boxed{m = \frac{-6}{7}}$



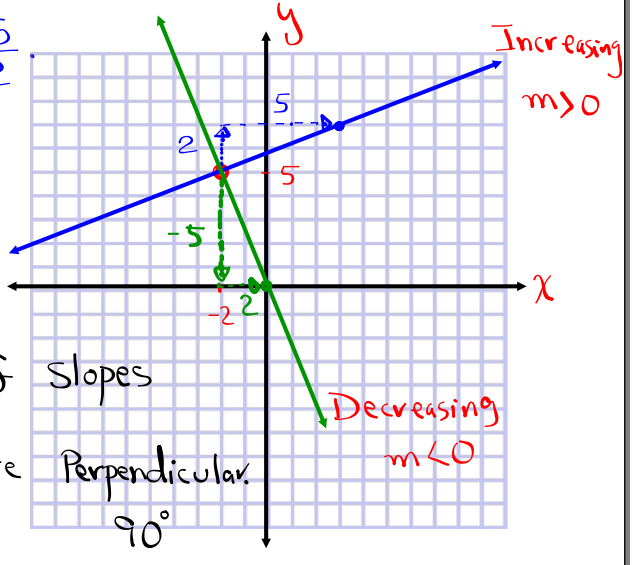

Draw two lines that contain $(-2, 5)$ with Slopes $\frac{2}{5}$ and $\frac{-5}{2}$.

$m = \frac{2}{5}$

$m = \frac{-5}{2}$

Whenever product of Slopes is $-1$, the lines are Perpendicular. 90°

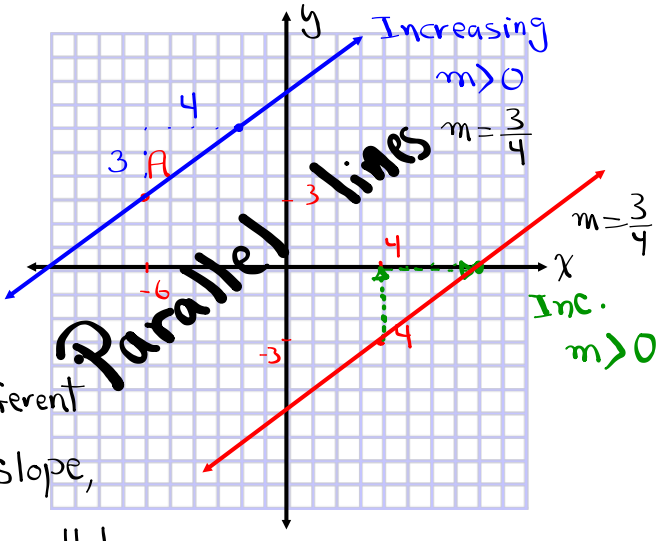
$\frac{2}{5} \cdot \frac{-5}{2} = \frac{-10}{10} = -1$



Plot points $A(-6,3)$ and $B(4,-3)$.

Draw two lines that contain A & B with slope $\frac{3}{4}$.

$m = \frac{3}{4}$

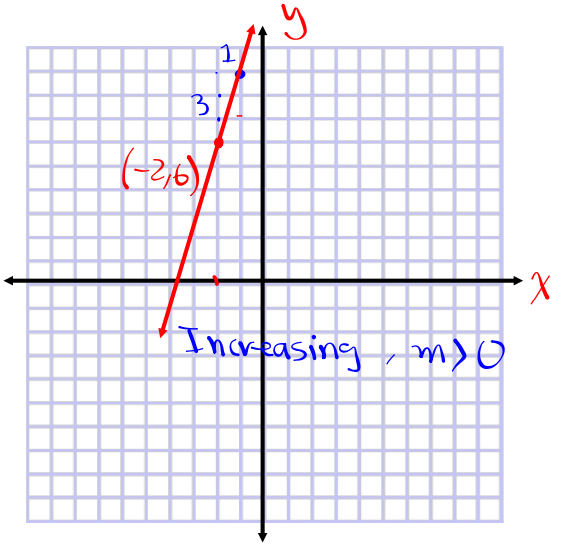



whenever two different lines have same slope, then they are parallel.

Draw a line that contains $(-2,6)$ with slope 3.

Hint: $a = \frac{a}{1}$

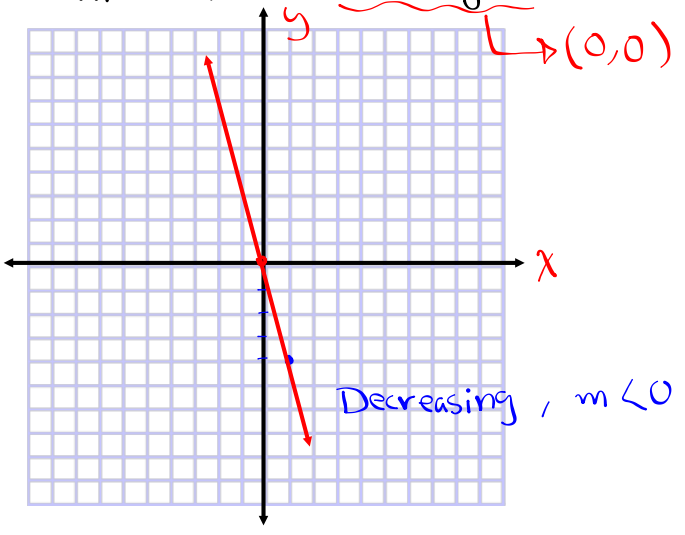
$m = 3$, $m = \frac{3}{1}$



Draw a line that contains the origin with slope $-4$.

$m = -4$

$m = \frac{-4}{1}$




(0,0)

Standard Form $Ax + By = C$ $\Rightarrow$ Slope - Int form $y = mx + b$

Solve for $y$

Write $2x + 3y = 9$ in Slope - Int. Form

$3y = -2x + 9$

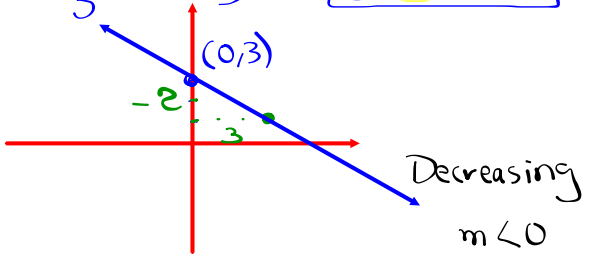
$y = \frac{-2}{3}x + \frac{9}{3} \Rightarrow \boxed{y = \frac{-2}{3}x + 3}$

(0,b)

slope - Int.

$m = \frac{-2}{3}$

y-Int (0, 3)



Write $3x - 5y = 10$ in Slope-Int. Form, then draw the line using slope & y-Int.

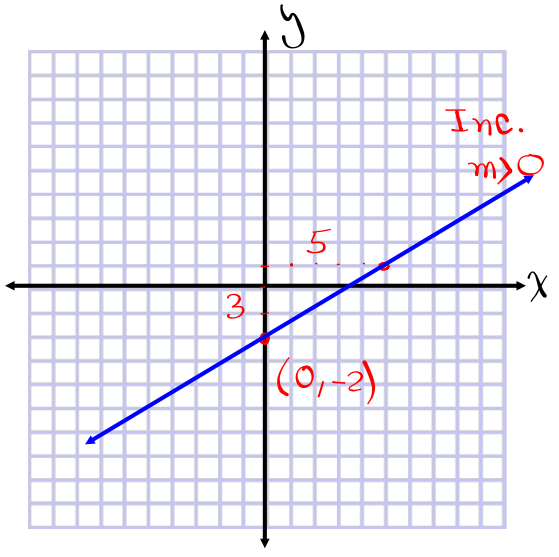
$-5y = -3x + 10$

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

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

$y = mx + b$

$m = \frac{3}{5}$, Y-Int $(0,-2)$




Graph $y = \frac{5}{2}x + 3$ and $y = \frac{-2}{5}x - 4$ in the same coordinate system.

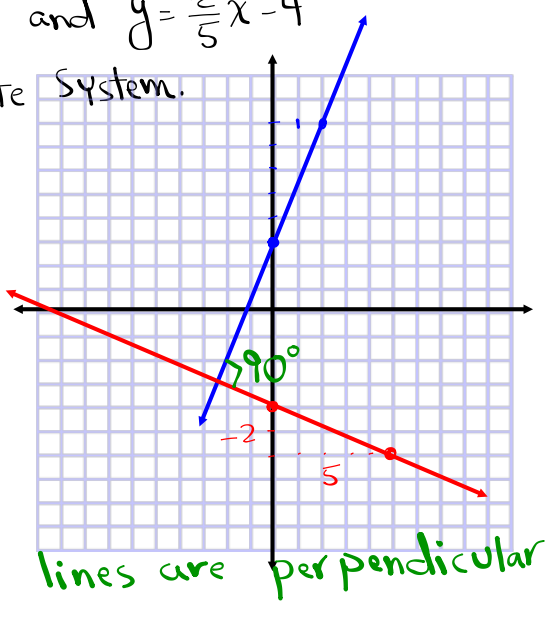
$y = \frac{5}{2}x + 3$

$m = \frac{5}{2}$, Y-Int $(0,3)$

$y = \frac{-2}{5}x - 4$

$m = \frac{-2}{5}$, Y-Int $(0,-4)$

$\frac{5}{2} \cdot \frac{-2}{5} = \frac{-10}{10} = -1$




lines are perpendicular

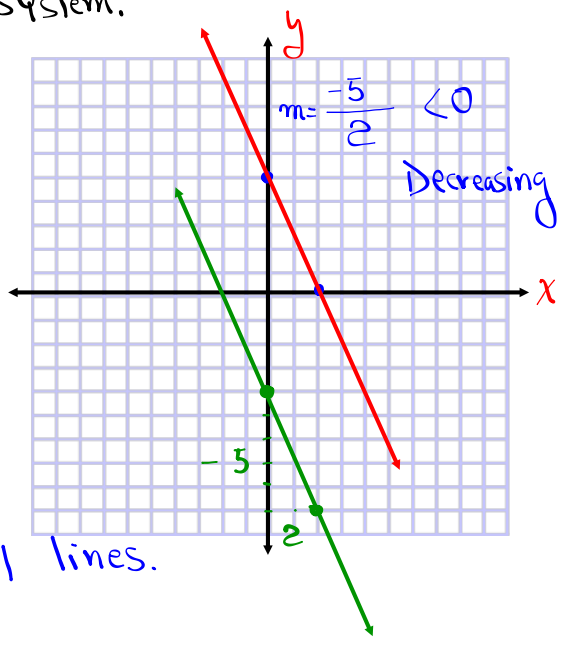
Graph $5x + 2y = 10$ and $y = \frac{-5}{2}x - 4$ in the same coordinate system.

$5x + 2y = 10$

| x | y |
|---|---|
| 0 | 5 |
| 2 | 0 |

$y = \frac{-5}{2}x - 4$

$m = \frac{-5}{2}$ Y-Int $(0, -4)$




Same Slope $\Rightarrow$ Parallel lines.

---

Vertical Lines $x = a$

No Slope or undefined Slope

---

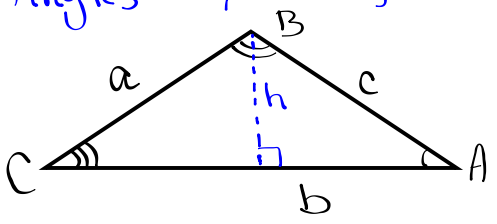
Horizontal line $y = b$

Zero Slope or $m = 0$

---

$m > 0$ Increasing | $m < 0$ Decreasing

# Angles & Triangles



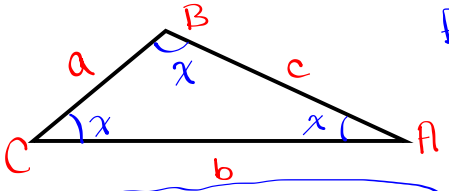

$P = a + b + c$

$A = \frac{bh}{2}$

Sum of All 3 angles is $180^\circ$

$A + B + C = 180^\circ$

Ex: In triangle ABC, all three angles are equal. Find the measure of all three angles.




All are $60^\circ$ each

Fact: $A + B + C = 180^\circ$

$\angle A + \angle B + \angle C = 180^\circ$

$x + x + x = 180^\circ$

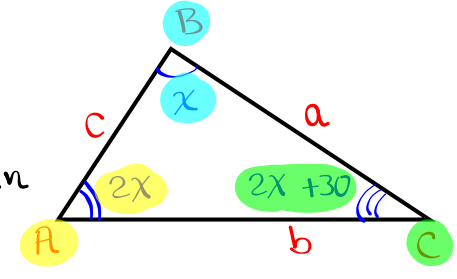
$3x = 180$ $\quad x = 60$

---

In triangle ABC,

angle A is twice angle B.

angle C is $30^\circ$ more than angle A.




1) Draw & label

2) Find all three angles.

A → $60^\circ$
B → $30^\circ$
C → $90^\circ$

FACT:

$A + B + C = 180^\circ$

$2x + x + (2x+30) = 180^\circ$

$5x + 30 = 180$

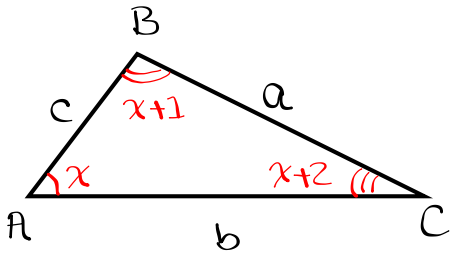
$5x = 150$

$x = 30$

The measure of 3 angles in triangle ABC are three consecutive integers.

1) Draw & label

2) Find all three angles.



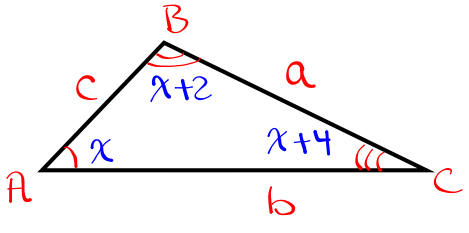

FACT: $A + B + C = 180^\circ$

$x + x+1 + x+2 = 180$

$3x + 3 = 180$ $\quad 3x = 177$ $\quad \boxed{x = 59}$

$59^\circ, 60^\circ, 61^\circ$

Find the measure of all three angles in triangle ABC such that they are 3 consecutive even integers.




$A + B + C = 180^\circ$

$x + x+2 + x+4 = 180$

$3x + 6 = 180$

$3x = 174$

$\boxed{x = 58}$

$58^\circ, 60^\circ, 62^\circ$

Thursday → 5G.5 work on WP angles & triangles