4.7 Equation of a Line Given Two Points

Recall:

Find the equation of a line passing through the point (5,-3) and having a slope of -2.

$$y = mx + b$$
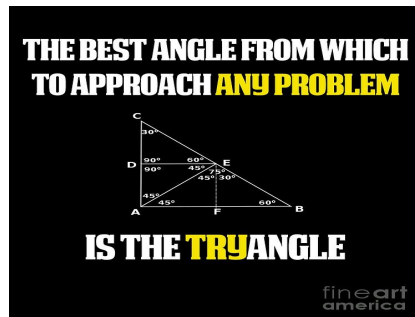
$$\boxed{m = -2}$$

$$y = -2x + b$$

Sub in (5,-3)

$$-3 = -2(5) + b$$

$$-3 = -10 + b$$

$$-3 + 10 = b$$

$$\boxed{7 = b}$$

$$\therefore y = -2x + 7$$

THE BEST ANGLE FROM WHICH TO APPROACH ANY PROBLEM

IS THE TRYANGLE

fine art america

THE NEXT STEP

Do not fear.

What if you are not given the value of slope but you want to find the equation of a line? What information do you need in order to <u>calculate</u> slope?

Ex.1 Write an equation that defines each of the following relations:

a)

x	y	1st diff
-1	3	
0	5	+2
1	7	+2
2	9	+2

(+1 between each x)

y-int $\boxed{b = 5}$

$$m = \frac{\Delta y}{\Delta x}$$

$$= \frac{2}{1}$$

$$\boxed{m = 2}$$

$$\therefore y = 2x + 5$$

b)

x	y	1st diff
-24	61	
-20	66	+5
-16	71	+5

(+4 between each x)

$$y = \frac{5}{4}x + b$$

Sub in (-20, 66)

$$66 = \frac{5}{4}(-20) + b$$

$$66 = \frac{-100}{4} + b$$

$$66 = -25 + b$$

$$66 + 25 = b$$

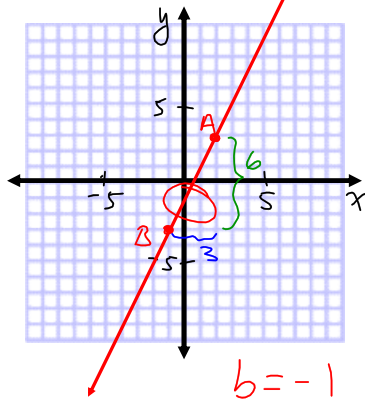$$\boxed{91 = b}$$

$$m = \frac{\Delta y}{\Delta x}$$

$$\boxed{m = \frac{5}{4}}$$

$$\therefore y = \frac{5}{4}x + 91$$

Ex. 2 Find an equation for the line passing through A(2,3) and B(-1,-3).

Remember you need the slope and y-int

Graphically

$m = \dfrac{rise}{run}$

$= \dfrac{6}{3}$

$= 2$

$\therefore y = 2x - 1$

DO NOT USE THIS APPROACH UNLESS ASKED.

INNACURATE & SLOW

Table

x	y
2	3
-1	-3

$-3 \left(\right) -6$

$m = \dfrac{\Delta y}{\Delta x}$

$= \dfrac{-6}{-3}$

$\boxed{m = 2}$

$y = 2x + b$

Sub in (2,3)

$3 = 2(2) + b$

$3 = 4 + b$

$3 - 4 = b$

$\boxed{-1 = b}$

$\therefore y = 2x - 1$

Algebraically

$m = \dfrac{y_2 - y_1}{x_2 - x_1}$

Sub in

$A \left(\underset{x_1}{2}, \underset{y_1}{3} \right)$

$B \underset{x_2 \quad y_2}{(-1, -3)}$
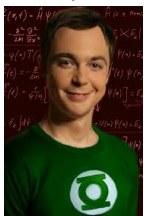
$m = \dfrac{-3 - 3}{-1 - 2}$

$= \dfrac{-6}{-3}$

$\boxed{m = 2}$

Next is solve for b

Ex. 3 Sheldon is walking at a constant rate in front of a motion detector. After 1 second, he is 2.5 metres from the sensor. After 2 s he is 4 m from the sensor.
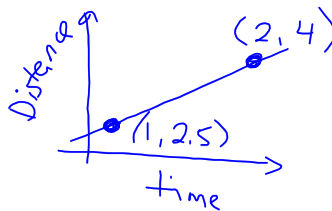
a) Find the equation of his path.

x	y
1	2.5
2	4

$+1$ ⟶ $+1.5$

$m = \dfrac{\Delta y}{\Delta x}$

$m = \dfrac{1.5}{1}$ $b = 1$

$\therefore y = 1.5x + 1$

(2,4)   (1, 2.5)

Distance / time

⚠ CAUTION

SLIPPERY SLOPE

b) Explain what the slope and y-intercept mean for this question.

y-int represents how far he was when the clock started.
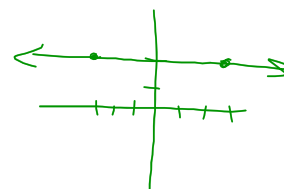
Slope represents his rate of change (m/s) "speed"

Ex. 4

a) What is the equation of a line passing through the points (3,2) and (-5,2) ?

x	y
3	2
-5	2

-8 $+0$

$m = \dfrac{\Delta y}{\Delta x}$

$= \dfrac{0}{-8}$

$= 0$

$\therefore y = 2$

b) What is the equation of a line passing through the points (4,-6) and (4,7)?

x	y
4	-6
4	7

$m =$ undefined

Vertical Line!

$x = 4$
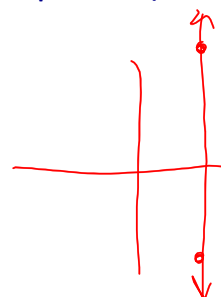
Toughie time!

Ex. 5 Find the equation of a line with the same y-intercept as 4x - 3y = 12 and an x-intercept of -2.

   Can you find a way to calculate the slope or y-int?

Step 1 – Solve $4x - 3y = 12$
          into $y = mx + b$
       – Look at b

Step 2 – Use x-intercept as point to
          sub in
          $(-2, 0)$

Can you do this one? Make the x-int a point!