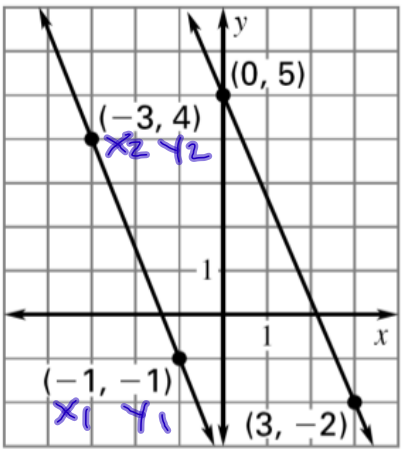
Bellwork:

1. What is the slope of the line that passes through the points $(3, 4)$ and $(-2, 6)$?

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

2. Find the slope of each line. Are the lines parallel?



$\frac{5+2}{0-3} = \frac{7}{-3}$

$x_2 y_2$

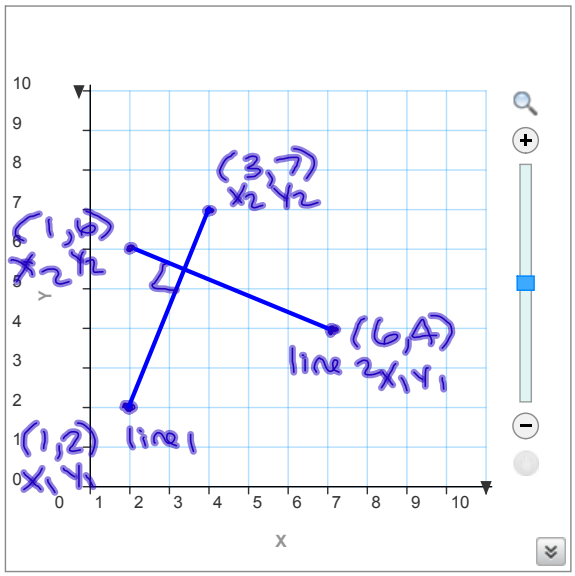
$\frac{4-1}{-3+1} = \frac{5}{-2} = \frac{-5}{2}$

$x_1 y_1$

3. Write an equation of the line whose slope is 2 and whose y-intercept is -1.

$y = 2x - 1$ $y = 2x + (-1)$

3.7 Perpendicular Lines



$m_1 = \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{7-2}{3-1} = \frac{5}{2}$

$m_2 = \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{6-4}{1-6} = \frac{2}{-5}$

When two slopes are opposite reciprocals, they are ⊥. $\frac{-10}{10}$

test by multiplying slopes: $\left(\frac{5}{2}\right)\left(\frac{-2}{5}\right) = -1$

EX 1 Are the lines $\perp$? is $\overline{AC} \perp \overline{BD}$?

$A(-2,2)$ $C(0,0)$ $B(1,1)$ $D(-2,-2)$

$x_1\ y_1$ $x_2\ y_2$ $x_1\ y_1$ $x_2\ y_2$

① Find each slope:

$$m_{AC} = \frac{y_2 - y_1}{x_2 - x_1} \qquad m_{BD} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{0-2}{0-2} = \frac{-2}{2} = -1 \qquad = \frac{-2-1}{-2-1} = \frac{-3}{-3} = 1$$

② multiply the slopes

$$m_{AC} \cdot m_{BD} = (-1)(1) = -1$$

③ Since $m_{AC} \cdot m_{BD} = -1$, $AC \perp BD$

EX 2 Is $\overline{AC} \perp \overline{BD}$ $\quad m = \frac{y_2 - y_1}{x_2 - x_1}$

$A(2,-3)$ $C(-1,3)$ $B(0,3)$ $D(-3,1)$

$x_1\ y_1$ $x_2\ y_2$ $x_1\ y_1$ $x_2\ y_2$

① find both slopes

$$m_{\overline{AC}} = \frac{3+3}{-1-2} \qquad m_{\overline{BD}} = \frac{1-3}{-3-0}$$

$$= \frac{6}{-3} \qquad = \frac{+2}{+3}$$

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

② multiply the slopes

$$(m_{AC})(m_{BD}) = \left(\frac{-2}{1}\right)\left(\frac{2}{3}\right) = \frac{-4}{3}$$

③ are they $\perp$? $-\frac{4}{3} \neq -1$ not $\perp$

Ex3 are the lines $\perp$?

$y = 3x + 5 \quad m_1 = 3$

$y = \frac{1}{3}x + 5 \quad m_2 = \frac{1}{3}$

① Find slope of each

② multiply the slopes

$(\frac{3}{1})(\frac{1}{3}) = \frac{3}{3} = 1$

③ since $m_1 \cdot m_2 = +1 \neq -1$

not $\perp$

Ex4 Are these $\perp$?

$4 + 7y = 9x$

$-4 \quad\quad -4$

$\frac{7y}{7} = \frac{9x}{7} - \frac{4}{7}$

$y = \frac{9}{7}x - \frac{4}{7}$

$7x + 9y = -5$

$-7x \quad\quad -7x$

$\frac{9y}{9} = \frac{-7x}{9} - \frac{5}{9}$

$y = \frac{-7}{9}x - \frac{5}{9}$

① $m_1 = \frac{9}{7} \quad m_2 = \frac{-7}{9}$

② $(m_1)(m_2) = (\frac{9}{7})(\frac{-7}{9}) = \frac{-63}{63} = -1$

③ yes, $\perp$

Ex5 Write a $\perp$ equation

Given: $y = \frac{1}{6}x + 5$ passing through $(-3, 1)$

1. find given slope $m = \frac{1}{6}$
2. change to $\perp$ slope (flip over, change sign) $m_\perp = \frac{-6}{1} = -6$
3. start equation $y = -6x + b$
4. plug in passthrough point $1 = -6(-3) + b$
5. solve for b $1 = 18 + b$, $-17 = b$
6. write equation $y = -6x - 17$