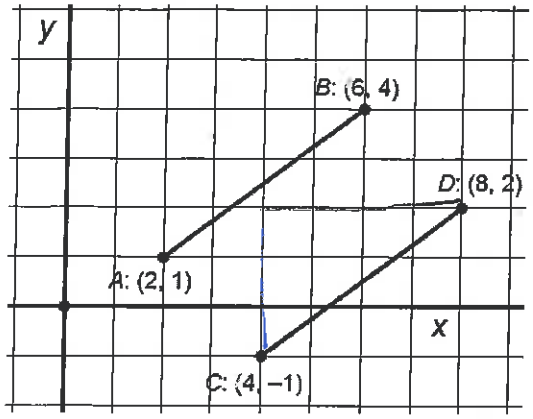
Geometry R – Mrs. Cowen
Unit 2A – Day 3 Notes

Name_____
Date_____

Parallel & Perpendicular Lines

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

In the picture, Segment AB is **parallel** to segment CD.



a. Find the slope of segment AB.

slope $\overline{AB} = \frac{4-1}{6-2} = \frac{3}{4}$

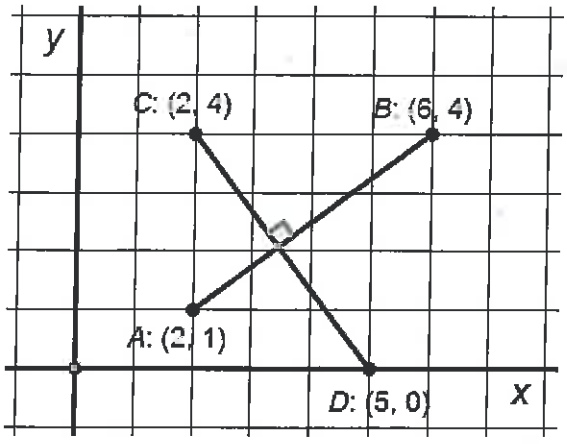
b. Find the slope of segment CD.

slope $\overline{CD} = \frac{2-(-1)}{8-4} = \frac{3}{4}$

c. What conclusion can be drawn about the slopes of parallel lines?

The slopes of parallel lines are equal (congruent)

In the picture, Segment AB is **perpendicular** to segment CD.



a. Find the slope of segment AB.

$m_{\overline{AB}} = \frac{3}{4}$

b. Find the slope of segment CD.

$m_{\overline{CD}} = \frac{4-0}{2-5} = \frac{4}{-3}$

c. What conclusion can be drawn about the slopes of perpendicular lines?

The slopes of perpendicular lines are negative reciprocals (flip & negate)

Determine if the lines are parallel, perpendicular, or neither and explain why.

a. $y = 6x - 7$ $m=6$
$y = 6x + 1$ $m=6$

The lines are parallel since the slopes are the same.

b. $2x - y = 8$
$x + 2y = 10$

$2x - y = 8$
$+y \quad +y$
$2x = y + 8$
$-8 \quad -8$
$2x - 8 = y$
$m = 2$

$x + 2y = 10$
$-x \quad -x$
$\frac{2y}{2} = \frac{-x}{2} + \frac{10}{2}$
$y = -\frac{1}{2}x + 5$
$m = -\frac{1}{2}$

The lines are $\perp$, the slopes are negative reciprocals.

c. $3x + 2y = 4$
$5x + 3y = 9$

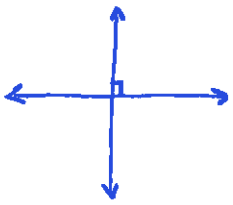
$3x + 2y = 4$
$-3x \quad -3x$
$\frac{2y}{2} = \frac{-3x}{2} + \frac{4}{2}$
$y = -\frac{3}{2}x + 2$
$m = -\frac{3}{2}$

$5x + 3y = 9$
$-5x \quad -5x$
$\frac{3y}{3} = \frac{-5x}{3} + \frac{9}{3}$
$y = -\frac{5}{3}x + 3$
$m = -\frac{5}{3}$

Neither.

d. $x = 8$
$y = -3$

The lines are $\perp$ since one is horizontal & one is vertical.



Find the equation of the line that passes through the point (8, -2) and is *parallel* to the line $y = 2x + 3$?

point (8, -2)
slope = 2

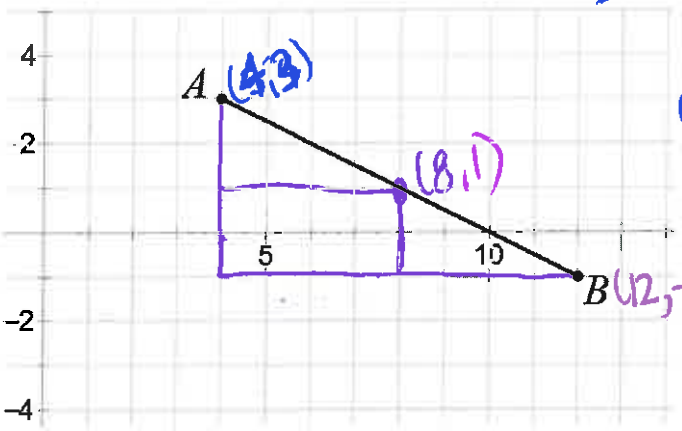
$m = 2$

$y - y_1 = m(x - x_1)$
$y - -2 = 2(x - 8)$
$y + 2 = 2(x - 8)$

$y + 2 = 2x - 16$
$-2 \quad -2$
$y = 2x - 18$

Find the equation of the **perpendicular bisector** of $\overline{AB}$.

① passes thru midpt
② Forms a right angle



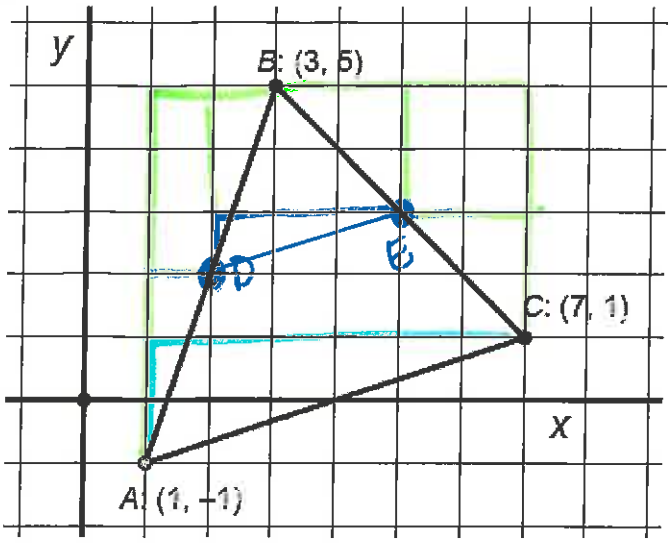
① slope $= \frac{-4}{8} = -\frac{1}{2}$
$\perp m = 2$

③ midpoint
$M = \left(\frac{12+4}{2}, \frac{3+-1}{2}\right)$
$M = (8, 1)$

③ use point-slope
$y - 1 = 2(x - 8)$

Putting it All Together

A **Mid-segment** of a triangle is a segment that connects the midpoints of 2 of the sides of the triangle.



a. Create Mid-segment DE by finding and connecting the midpoints of sides $\overline{AB}$ and $\overline{CB}$.

$\overline{DE}$ is a midsegment of $\triangle ABC$.

b. Find the slopes of Mid-segment DE and side AC. What conclusion can you draw from your results?

slope $\overline{DE} = \frac{1}{3}$

slope $\overline{AC} = \frac{2}{6} = \frac{1}{3}$

$\overline{DE}$ and $\overline{AC}$ have equal slopes. So $\overline{DE} \parallel \overline{AC}$. So the midsegment is $\parallel$ to the third side of the $\triangle$.

c. Find DE and AC (remember this mean distance). What conclusion can you draw from you results?

$DE = \sqrt{1^2 + 3^2}$

$= \sqrt{1 + 9}$

$= \sqrt{10}$

≈ 3.16

$AC = \sqrt{2^2 + 6^2}$

$= \sqrt{4 + 36}$

$= \sqrt{40}$

≈ 6.32

$AC = 2(DE)$

The midsegment is half the length of the 3rd side of the triangle.