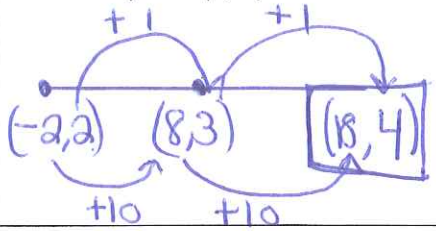
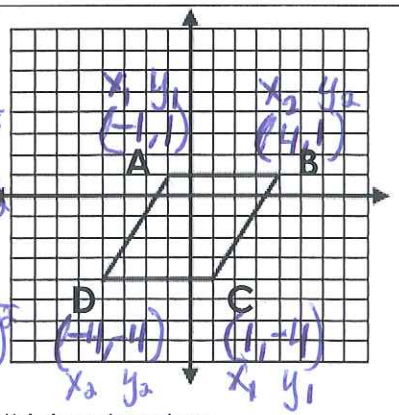
Reference Sheet **Unit 6: Connecting Algebra and Geometry Through Coordinates**

Directions: Use the following reference sheet to help you practice and review for your test.
Show all work where necessary!

What you need to know & be able to do	Things to remember	Problem	Problem
Midpoint	$\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$	**1.** Find the midpoint of (5, 1) and (6, 7). $\left(\frac{5+6}{2}, \frac{1+7}{2}\right)$ $\left(\frac{11}{2}, \frac{8}{2}\right)$ $(5.5, 4)$	**2.** Find the coordinates of the **other endpoint** of a segment with an endpoint of (-2, 2) and a midpoint (8, 3). 
Distance and Applications $d=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$	• Find the distance between two people. • Pay attention to Direction: North and East are positive, South and West are negative	**3.** Reed and Skylar are playing Hide-and-Seek with their brother. Reed runs and hides 30 ft south and 24 ft east of base. Skylar runs and hides 43 ft north and 12 ft west of base. How far apart are Skylar and Reed? Reed $(24,-30)$ $x_1\ y_1$ Skylar $(-12,43)$ $x_2\ y_2$ $d=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ $d=\sqrt{(-12-24)^2+(43-(-30))^2}$ $d\approx 81.4$ ft.	
	• Decide if a point lies on a circle: Find the length of the radius and see if the other distance is the same.	**4.** Determine whether Point A (-5, 8) lies on the circle whose center is Point C (1, 2) and which contains the Point P (7, -4). P $(7,-4)$ C $(1,2)$ A? $(-5,8)$ $\overline{PC}=\sqrt{(1-7)^2+(2-(-4))^2}\approx 8.49$ $\overline{AC}=\sqrt{(1-(-5))^2+(2-8)^2}\approx 8.49$ $\overline{PC}=\overline{AC}$ ✓ A Does lie on the circle.	
	• Use Slope and Distance to prove that a shape is a specific type of quadrilateral or triangle • Parallel and Perpendicular: Use Slope • Congruent: Use Distance	**5.** Given that a rhombus has **4 congruent sides**, prove this is a rhombus. $d=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ **Lengths** AB: 5 units (just count) BC: $\sqrt{(4-1)^2+(1-(-4))^2}\approx 5.83$ units CD: 5 units DA: $\sqrt{(-4-1)^2+(-4-1)^2}\approx 5.83$ units  Given that a rhombus has **both pair of opposite sides parallel**, prove this is a rhombus. **Slopes** AB: $\frac{1-(-1)}{4-(-1)}=\frac{0}{5}=0$ BC: $\frac{1-(-4)}{4-1}=\frac{5}{3}$ CD: $\frac{-4-(-4)}{-4-1}=\frac{0}{-5}=0$ DA: $\frac{-4-1}{-4-(-1)}=\frac{-5}{-3}=\frac{5}{3}$ slope: $\frac{y_2-y_1}{x_2-x_1}$

Perimeter and Area

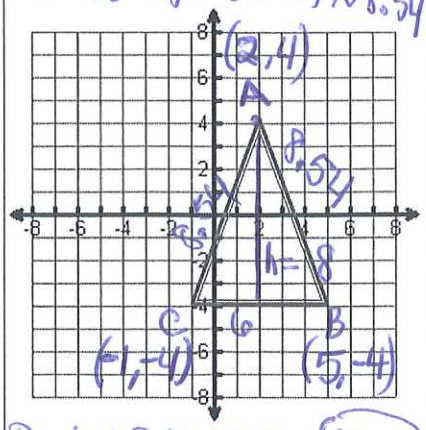
- Use distance formula to calculate the length of sides that aren't vertical or horizontal.
- Perimeter: Distance Around an Object
- Area of a Parallelogram: Length * Height
- Area of a Triangle: ½ (base)(height)
- Area of a Trapezoid: $\frac{1}{2}(b_1 + b_2)h$

6. Find the area and perimeter of the figure. $A = \frac{1}{2}bh$

$h = 8$ $b = 6$ $A = \frac{1}{2}(6)(8)$ $A = 24$ units²

$\overline{AB} = \sqrt{(5-2)^2 + (-4-4)^2} \approx 8.54$

$\overline{AC} = \sqrt{(-1-2)^2 + (-4-4)^2} \approx 8.54$



$P = 6 + 8.54 + 8.54 = 23.08$ units

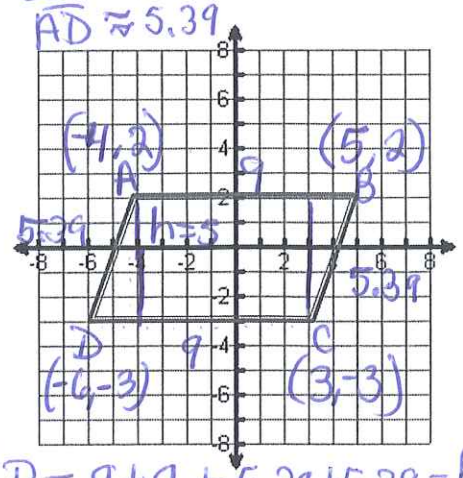
7. Find the area and perimeter of the figure. $A = bh$

$b = 9$ $h = 5$ $A = 9(5) = 45$ units²

$\overline{BC} = \sqrt{(3-5)^2 + (-3-2)^2}$

$\overline{BC} \approx 5.39$

$\overline{AD} \approx 5.39$



$P = 9 + 9 + 5.39 + 5.39 = 28.78$ units

Writing the Equation of a Line

- Parallel: Use the same slope.
- Perpendicular: Use the opposite reciprocal slope.
- Substitute the slope and point into the point-slope formula $y = m(x - x_1) + y_1$ and then simplify.

8. Write an equation of the line that passes through (-3, 4) and is parallel to $y = -3x - 1$. $m = -3$ (x_1, y_1)

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

$y = -3(x - -3) + 4$

$y = -3x - 9 + 4$

$y = -3x - 5$

9. Write an equation of the line that passes through (5, -3) and is perpendicular to $y = -5/2x + 1$. (x_1, y_1)

$m =$ opp. reciprocal: $\frac{2}{5}$

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

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

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

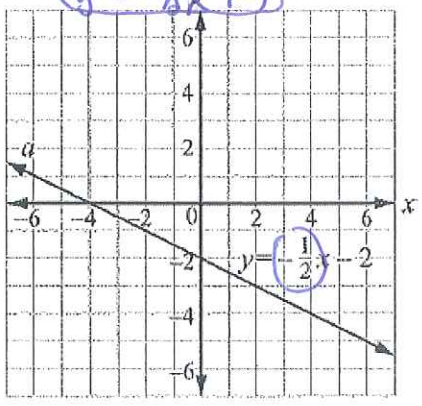
$y = \frac{2}{5}x - 5$

10. Write an equation of a line that is parallel to the given line and passes through the point (0, 5). $m = -1/2$ x_1 y_1

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

$y = -\frac{1}{2}(x - 0) + 5$

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



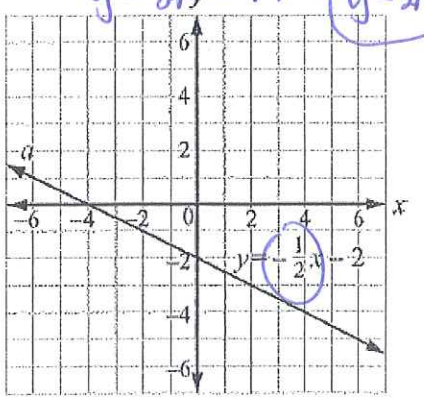
11. Write an equation of a line that is perpendicular to the given line and passes through the point (2, -2). $m =$ opp. reciprocal: 2 x_1 y_1

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

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

$y = 2x - 4 + -2$

$y = 2x + 6$



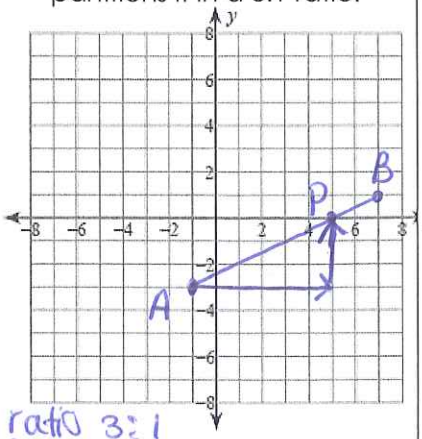
Partitions

$$(x_2 - x_1)\left(\frac{a}{a+b}\right) + x_1$$

$$(y_2 - y_1)\left(\frac{a}{a+b}\right) + y_1$$

- Use formulas
  OR
- Change ratio to fraction.
- Graph segment.
- Find the distance between the x's.
- Multiply the distance by the fraction.
- Move this many places left or right on the graph.
- Repeat for the y's (move up or down on graph)
- Write your answer as an ordered pair

7. Find a point P on the segment with endpoints **A(-1, -3)** and **B(7, 1)** that partitions it in a 3:1 ratio.



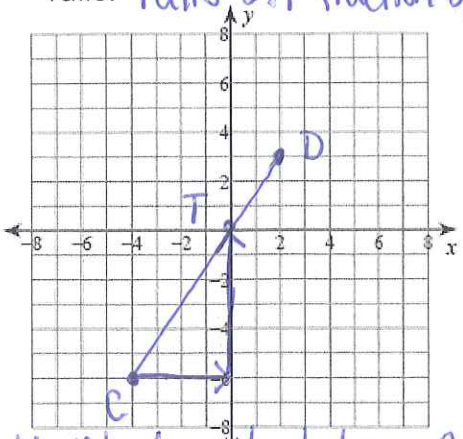
ratio 3:1
fraction 3/4

$|x_2 - x_1| = |7 - -1| = |8| = 8 \cdot \frac{3}{4} = (6)$

$|y_2 - y_1| = |1 - -3| = |4| = 4 \cdot \frac{3}{4} = (3)$

P(5, 0)

8. Find a point T on the segment with endpoints **C(-4, -6)** and **D(2, 3)** that partitions it in a 2:1 ratio. ratio 2:1 fraction 2/3



$|x_2 - x_1| = |2 - -4| = |6| = 6 \cdot \frac{2}{3} = (4)$

$|y_2 - y_1| = |3 - -6| = |9| = 9 \cdot \frac{2}{3} = (6)$

T(0, 0)