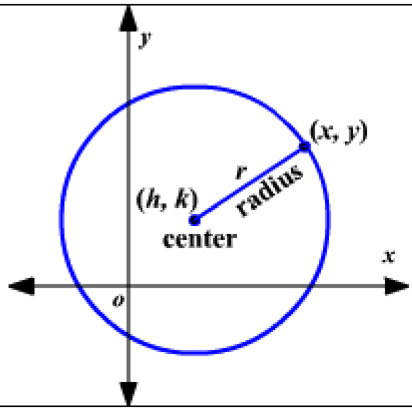
Geometry Notes Name: ________________________ Block: __

Equations of Circles



Standard form:
$(x-h)^2 + (y-k)^2 = r^2$

Center: (h,k) radius: r

General form:
$ax^2 + by^2 + cx + dy + e = 0$

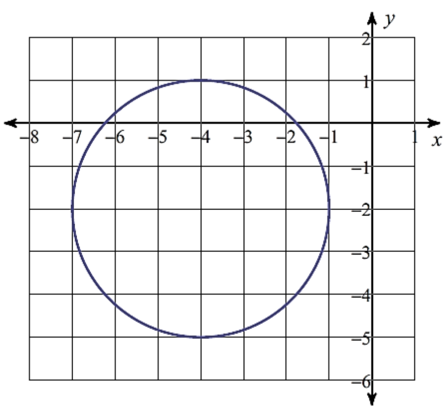
Ex.1 Write the equation of the circle given it has a center at (7, -10) and a radius of 9.

Ex.2 Find the coordinates of the center and the radius.

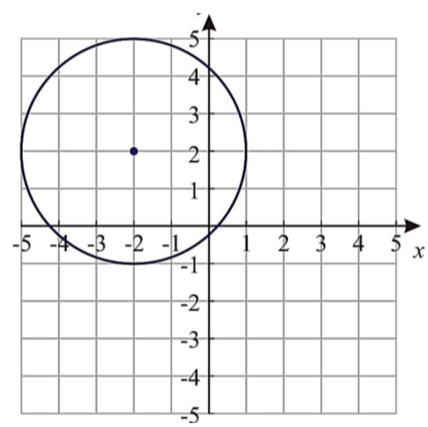
$$(x+13)^2 + (y-5)^2 = 49$$

Write the equation of the circle.

Ex. 3

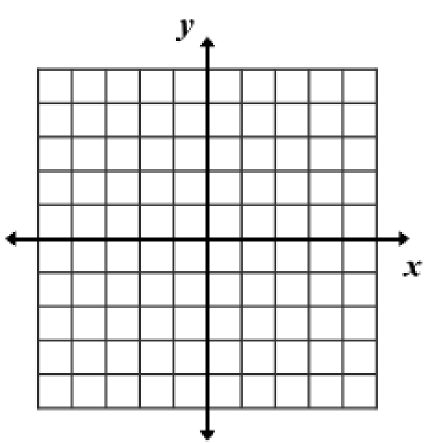


Ex.4

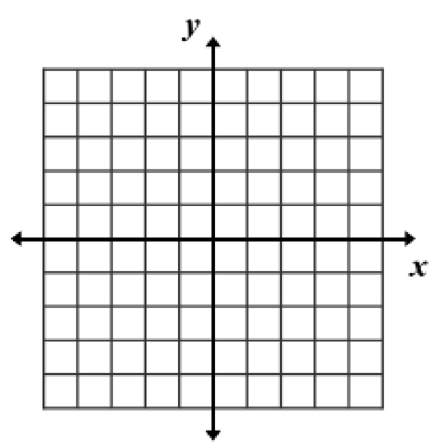


Graph the circle.

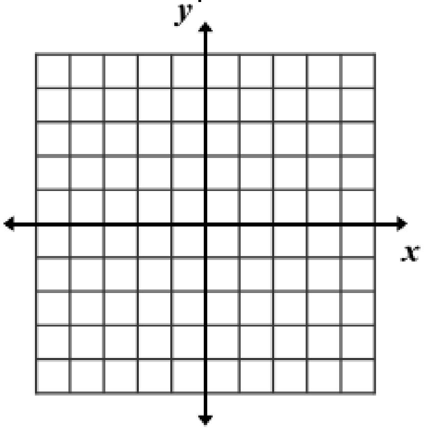
Ex.5 $(x-1)^2 + (y+3)^2 = 4$



Ex.6 $x^2 + y^2 = 24$



Ex.7 Write the equation of a circle given the point (2,1) on a circle with the center at (-1,3).



Converting from general form to standard form.

$$ax^2 + by^2 + cx + dy + e = 0 \quad \rightarrow \quad (x-h)^2 + (y-k)^2 = r^2$$

1. (a) needs to be one.
2. Move the x and y terms together.
3. Move (e) to the other side.
4. Complete the square.
5. Factor the left side.
6. Simplify.

Ex.8 $x^2 + y^2 + 4x - 6y - 3 = 0$

Ex.9 $x^2 + y^2 - 8x + 7 = 0$

Ex.10 $2x^2 + 2y^2 - 16x + 4y + 20 = 0$

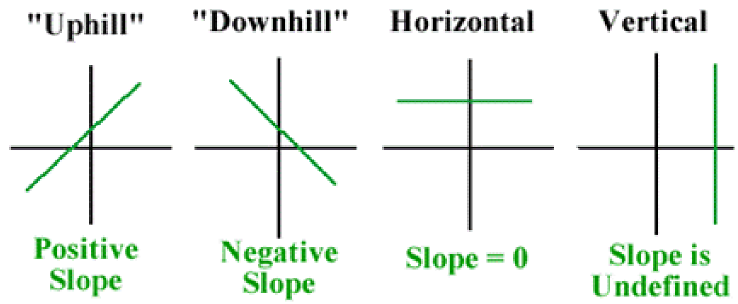
Ex.11 Standard to general form (expand and multiply).

$$(x-4)^2 + (y+3)^2 = 36$$

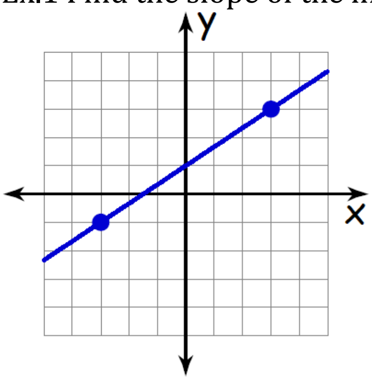
Slope

Slope – is the steepness of a line.

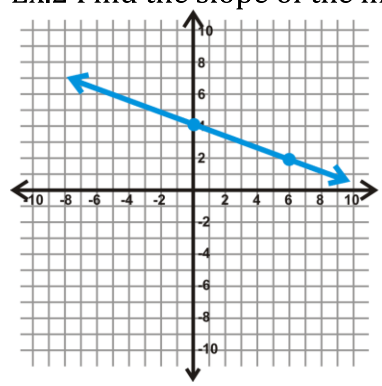
$$Slope = \frac{y_2 - y_1}{x_2 - x_1}$$



Ex.1 Find the slope of the line.



Ex.2 Find the slope of the line.



Ex.3 Find the slope between the points A(-2,-3) and B(6,4).

Ex.4 Find the slope between the points A(-5,4) and B(-10,4).

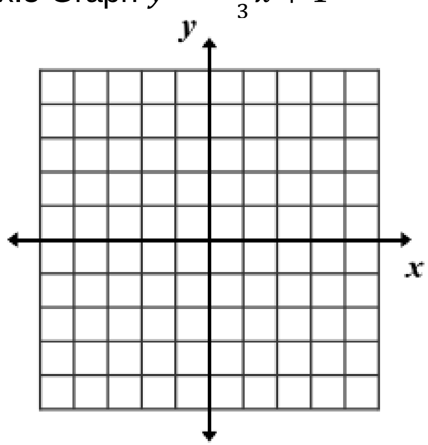
Graphing in slope intercept form

Slope intercept form $y = mx + b$

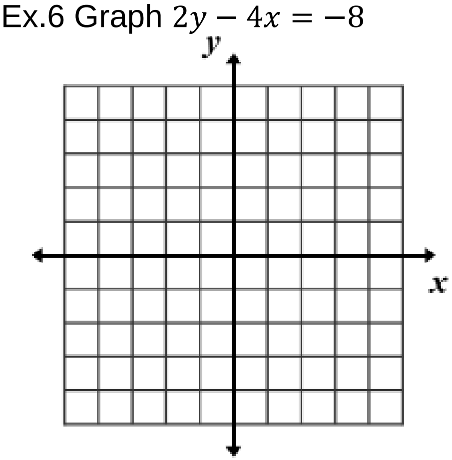
$m = slope$

$b = y\ intercept$

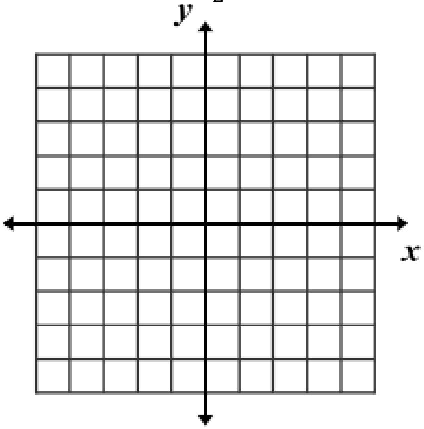
Ex.5 Graph $y = -\frac{2}{3}x + 1$



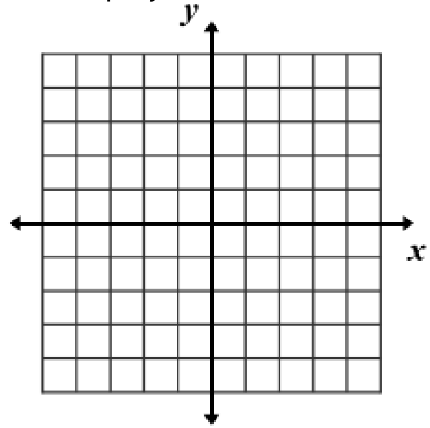
Ex.6 Graph $2y - 4x = -8$



Ex. 7 Graph $y = \frac{5}{2}x - 4$

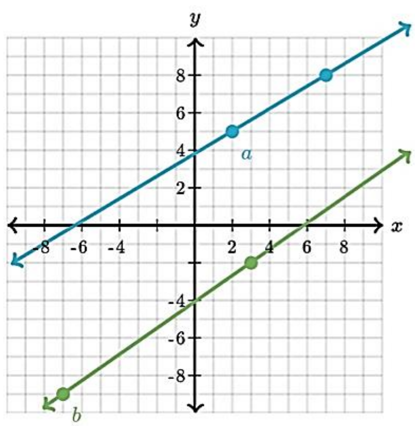


Ex.8 Graph $y = 2$

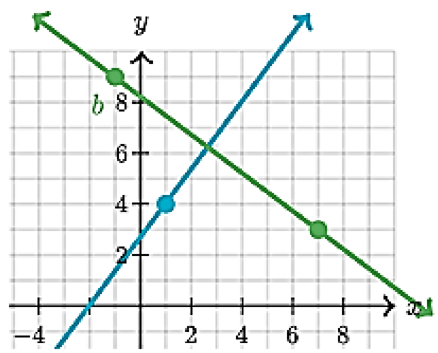


Parallel and Perpendicular Lines

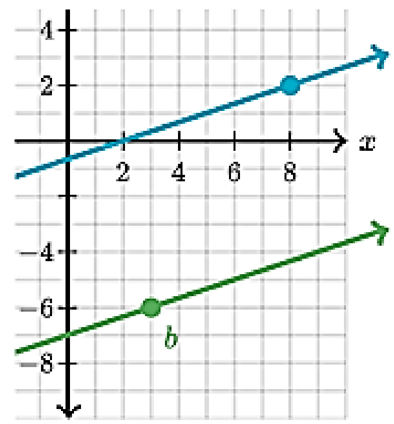
Intersecting lines
- have one common point.



Perpendicular Lines
- intersect at right angles
- slopes are opposite reciprocals



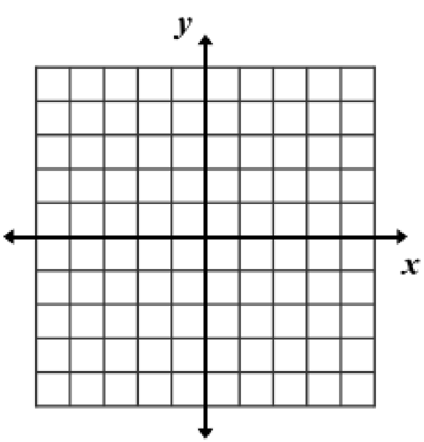
Parallel Lines
- do not intersect
- have the same slope



Are the lines parallel, perpendicular, or neither?

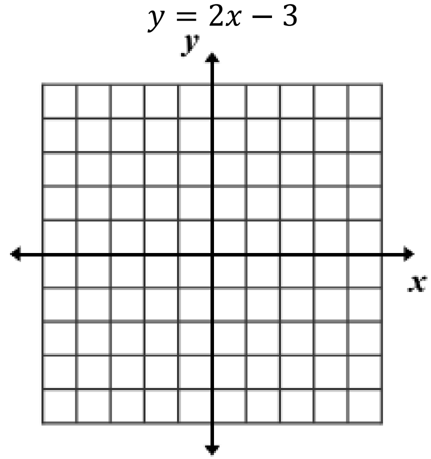
Ex.9

$$y = -3x + 4$$
$$y = -3x - 2$$



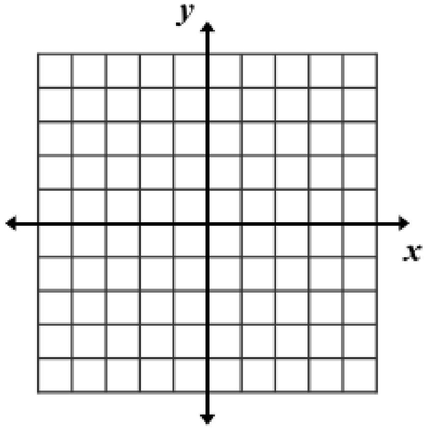
Ex.10

$$y = \frac{1}{2}x$$
$$y = 2x - 3$$



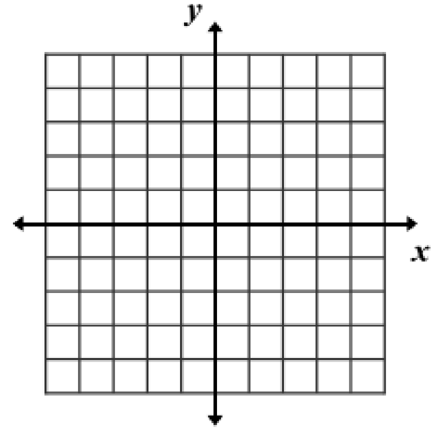
Ex.11

$$2y = x + 6$$
$$y = \frac{1}{2}x + 3$$



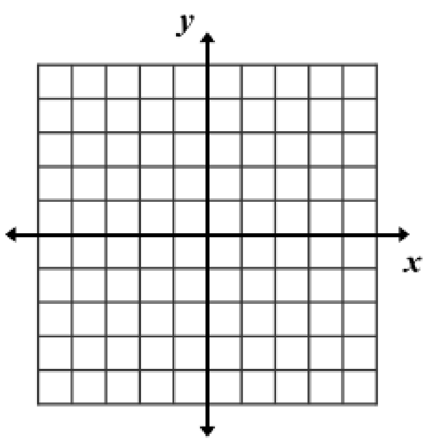
Ex.12

$$y = \frac{1}{3}x - 1$$
$$y = -3x + 4$$



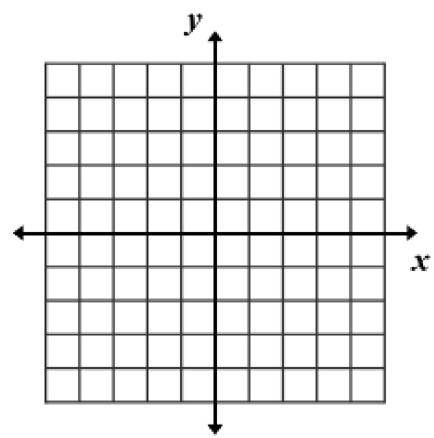
Ex.13

$$y = 4$$
$$x = -2$$

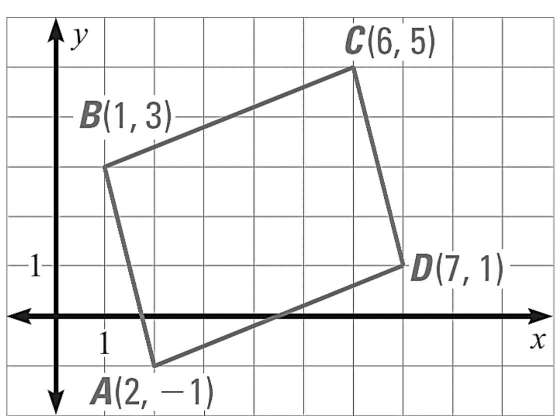


Ex.14

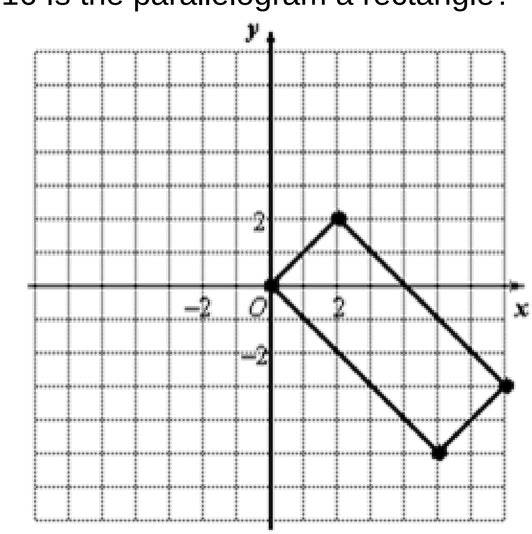
$$y = \frac{1}{4}x - 3$$
$$x = 3$$



Ex.15 Is quadrilateral ABCD a parallelogram?



Ex.16 Is the parallelogram a rectangle?



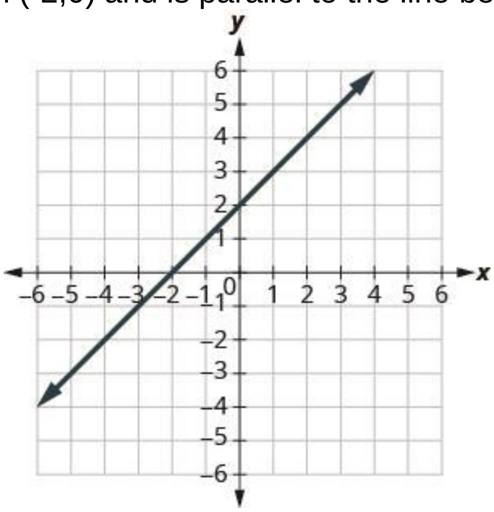
Writing equations of parallel and perpendicular lines

Finding equations of parallel lines given a line and a point.	Finding equations of perpendicular lines given a line and a point.
1. Put the equation of the line in slope intercept form. $$y = mx + b$$ 2. Take out the slope (m) and plug in the point (x,y) into the point slope formula. $$y - y_1 = m(x - x_1)$$ 3. Solve for y.	1. Put the equation of the line in slope intercept form. $$y = mx + b$$ 2. Plug in the opposite reciprocal slope from step 1 and plug in the point (x,y) into the point slope formula. $$y - y_1 = m(x - x_1)$$ 3. Solve for y.

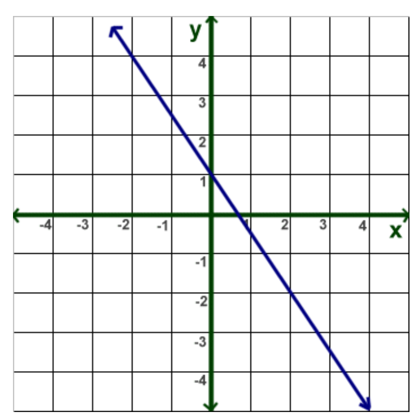
Ex.1 Write the equation of the line that passes through (-1,6) and is parallel to $y = 2x + 4$.

Ex.2 Write the equation of the line that passes through (-2,8) and is perpendicular to $y = 4x + 1$.

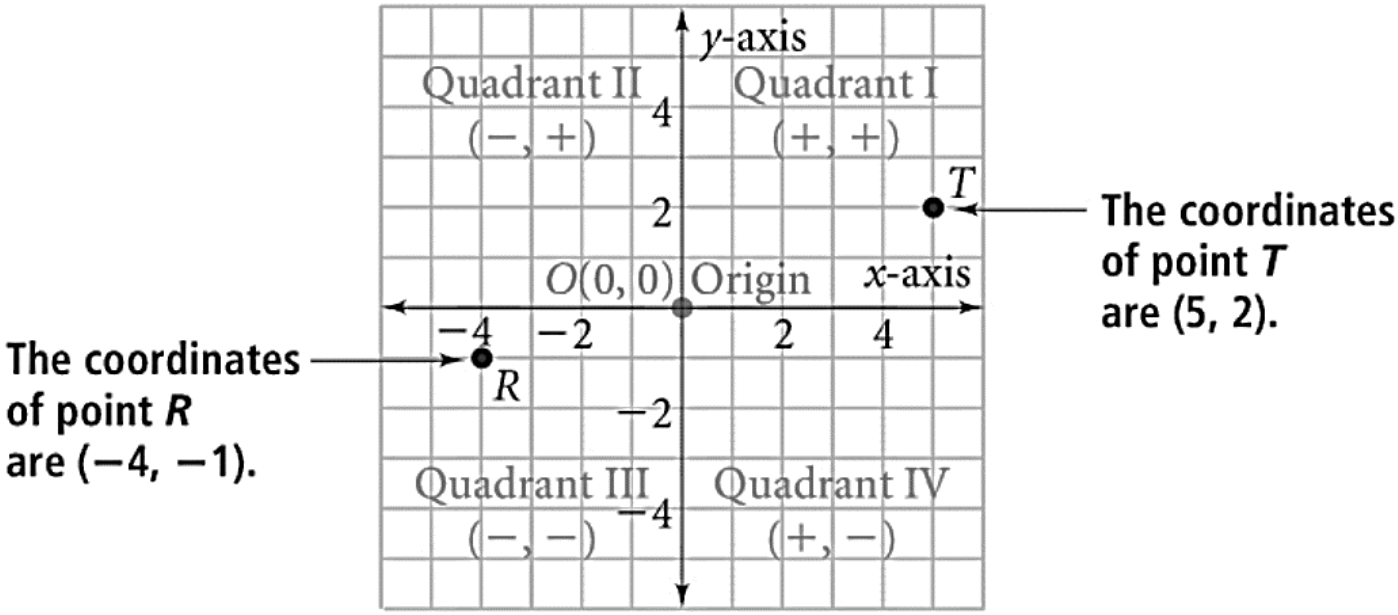
Ex.3 Write the equation of the line that passes through (-2,0) and is parallel to the line below.



Ex.4 Write the equation of the line that passes through (2,-2) and is perpendicular to the line below.



Coordinate Plane



Examples: Give the coordinates of each point:

A(____, ____) B(____, ____) C(____, ____)

D(____, ____) E(____, ____) G(____, ____)

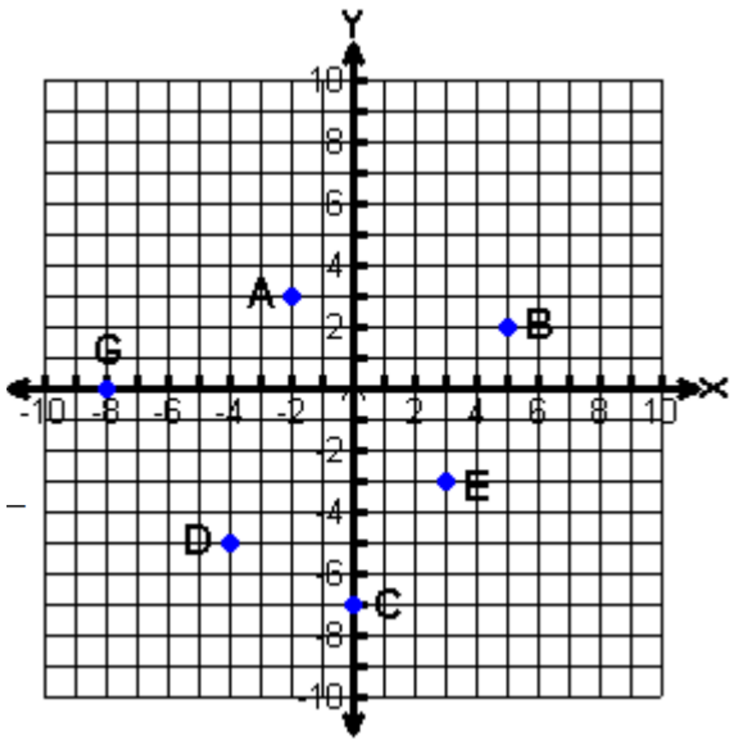
Which quadrant contains the following points:

A: _____ B:_____ C:_____

D:_____ E:_____ G: _____

Graph the following points:

H (7 , 10) J (-5 , 2) K (-1 , -8)



Distance

To find distance between two points on a coordinate plane:

- If Horizontal or Vertical Line: Use Ruler Postulate (count the spaces between the points)
- Not a Horizontal or Vertical Line: Use Distance Formula or Pythagorean Theorem

Distance Formula

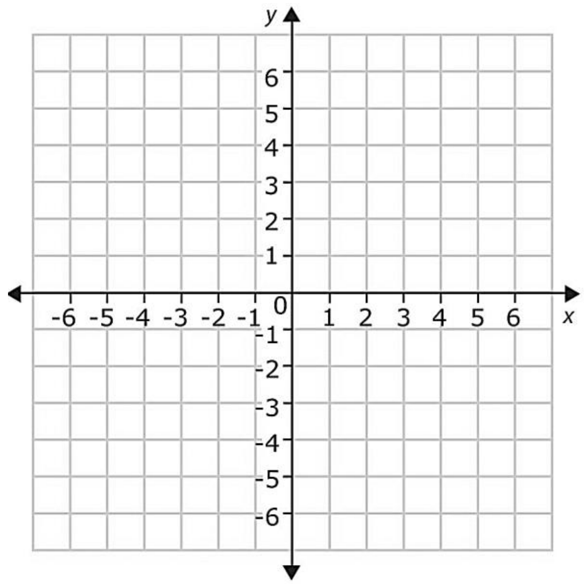
The distance between any two points with coordinates (x_1, y_1) and (x_2, y_2) is given by the formula

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

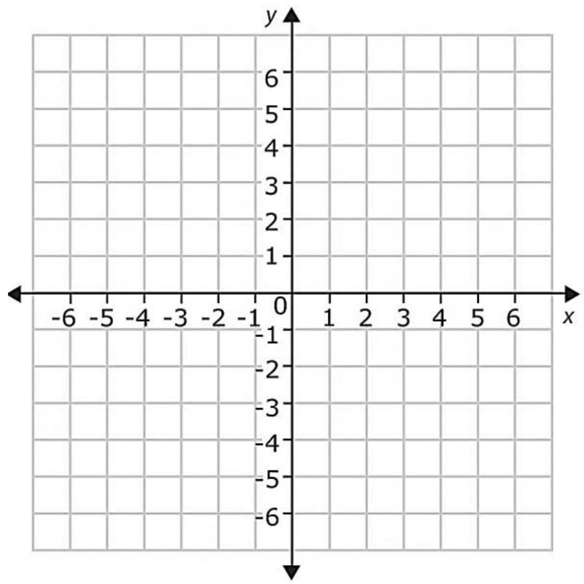
Pythagorean Theorem

$$a^2 + b^2 = c^2$$

Ex.1 Find the distance between T(5, 2) and R(1,1).



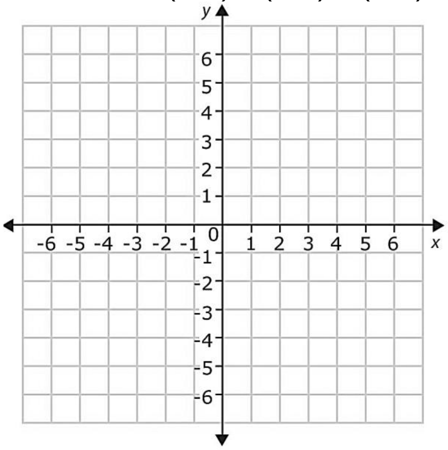
Ex.2 Find $\overline{PQ}$ if P(-3,-5) and Q(2, 3).



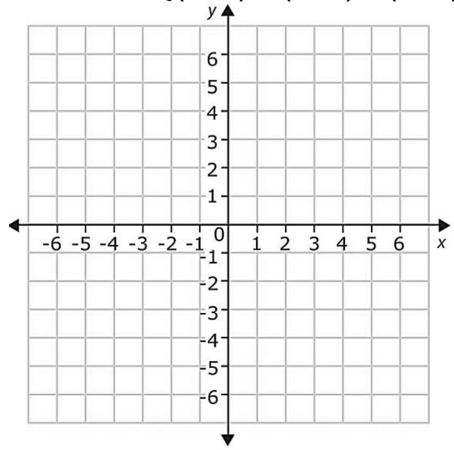
Area and Perimeter in the Coordinate Plane

Area Formulas	**Distance Formula**	**Perimeter** is the sum of all the sides.
$Circle = \pi r^2$ $Triangle = \frac{1}{2} b \cdot h$ $Rectangle = b \cdot h$	$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ **Pythagorean Theorem** $a^2 + b^2 = c^2$	$\boldsymbol{Circumference} = 2\pi r$

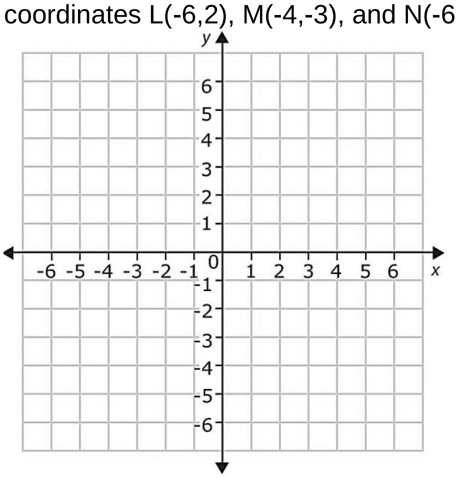
EX.1 Find the area and perimeter of figure ABCD with coordinates A(-1,0), B(1,-1), C(0,-3), and D(-2,-2).



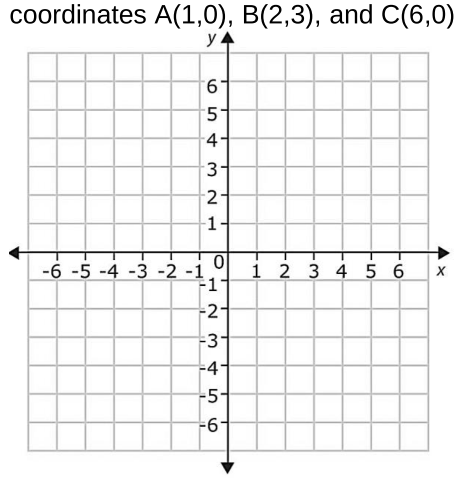
EX.2 Find the area and perimeter of figure QRST with coordinates Q(-7,-4), R(-3,-4), S(-2,-7), and T(-6,-7).



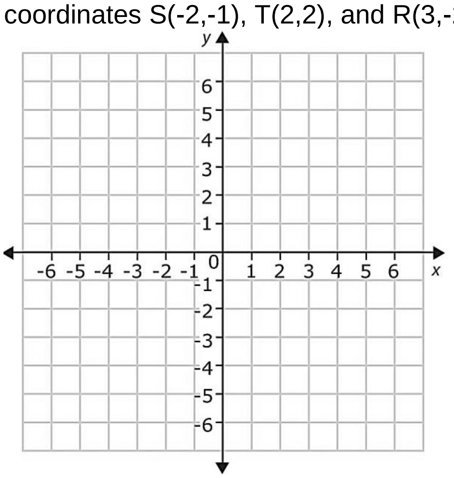
EX.3 Find the area and perimeter of figure LMN with coordinates L(-6,2), M(-4,-3), and N(-6,-3).



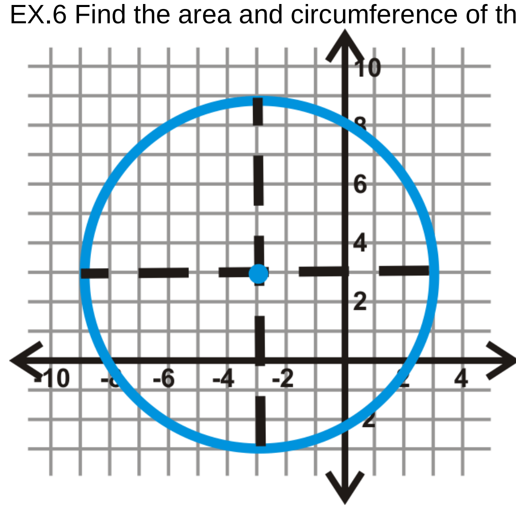
EX.4 Find the area and perimeter of figure ABC with coordinates A(1,0), B(2,3), and C(6,0).



EX.5 Find the area and perimeter of figure STR with coordinates S(-2,-1), T(2,2), and R(3,-2).



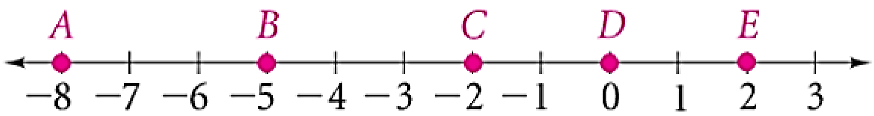
EX.6 Find the area and circumference of the circle.



Midpoint

Midpoint: On a Number Line The coordinate of the midpoint is the AVERAGE of the coordinates of the endpoints The midpoint between a and b is: $\frac{a+b}{2}$

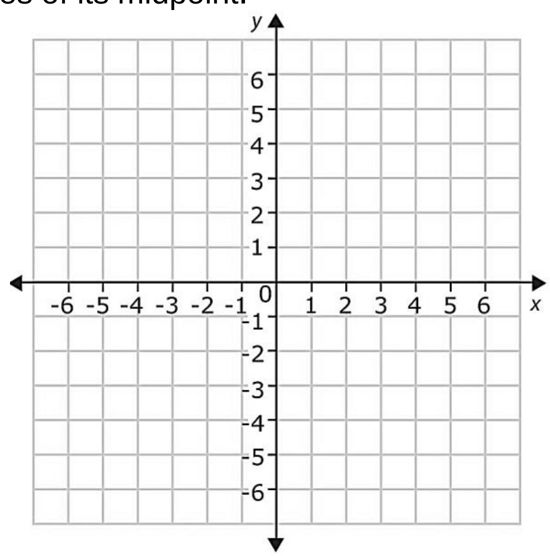
Ex.3 Find the midpoint between A and D.



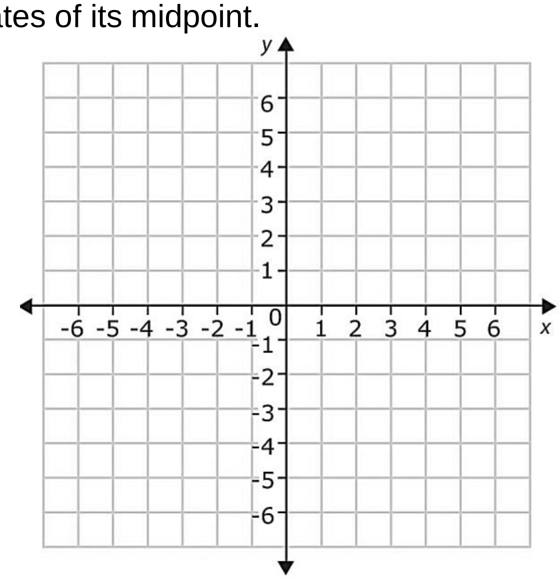
Midpoint: In the Coordinate Plane The coordinate of the midpoint between (x_1, y_1) *and* (x_2, y_2) is the average of the x coordinates and the average of the y coordinates:

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

Ex.4 $\overline{QS}$ has endpoints Q(3, 5) and S(7, -5). Find the coordinates of its midpoint.

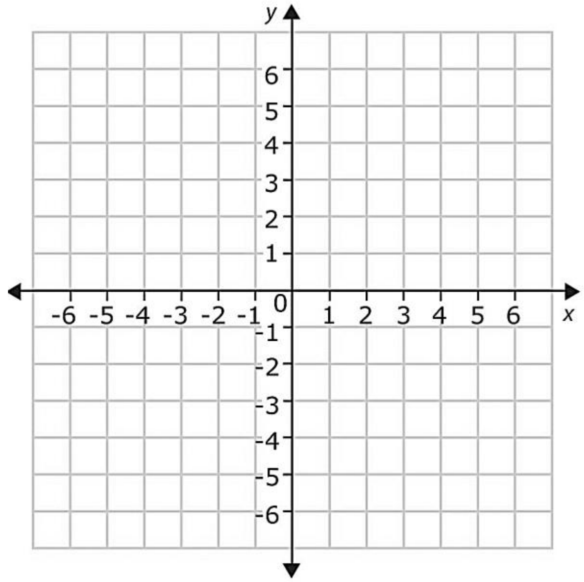


Ex.5 $\overline{CD}$ has endpoints C(-2, 6) and D(5, 4). Find the coordinates of its midpoint.



Use the midpoint formula to find the missing endpoint in the following examples.

Ex.6 The midpoint of $\overline{AB}$ is M(0,1) . One endpoint is A(-3,-2). Find the coordinates of the other endpoint B.



Step 1: Plug in everything given. Let the coordinates of B be (x_2, y_2)

Step 2: Set the x coordinate on the left equal to the x coordinate equation on the right. Do this for the y coordinates also.

Step 3: Solve using algebra.

Ex.7 The midpoint of $\overline{ST}$ has coordinates (2,-3). S has coordinates (4,-6). Find the coordinates of T.