

## Unit 5: Coordinate Geometry

I CAN:

- Determine the slope of a line given an equation, graph or ordered pairs.
- Write equations of lines given a graph, slope and y-intercept, slope and another point, or two points – in slope-intercept and standard forms
- Identify parallel and perpendicular lines and slopes
- Write equations of lines parallel or perpendicular to a given line
- Write equations of circles given a graph or center and radius
- Identify center and radius, given a graph or equation of a circle
- Convert circle equations general  $\leftrightarrow$  standard form
- Solve systems involving the intersections of circles and lines, algebraically and graphically
- Apply the distance, midpoint and partitioning formulas
- Apply properties of rectangles, rhombi, squares, kites, trapezoids, and isosceles trapezoids to solve problems

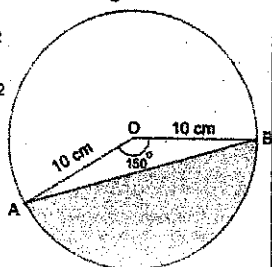


Monday	Tuesday	Wednesday	Thursday	Friday
16 Slope, y-intercept and writing equations of lines	17 Equations of Parallel and Perpendicular Lines, review of Standard Form	18 Graphing and Writing Equations of Circles	19 Intersections of Circles and Lines	20 <b>Quiz – Linear Equations</b> Midpoint and Partitioning a Line Segment
23 Distance Formula and Pythagorean Theorem	24 Properties of Parallelograms and Rectangles	25 <b>CTLS Quiz – Distance, Midpoint, Perimeter &amp; Area</b>  More Practice with Quadrilaterals	26 Review	27 <b>Unit 5 Test</b>

\*THIS PLAN IS SUBJECT TO CHANGE. PLEASE REFER TO CLASS NOTES AND BLOG FOR UPDATES.\*

The diagram shows a circle with center O and radius 10 cm. A and B are points on the circumference such that  $\angle AOB$  makes an angle of  $150^\circ$  at O. Calculate the area of the shaded region.

- A.  $7.475 \text{ cm}^2$     B.  $131 \text{ cm}^2$   
C.  $150 \text{ cm}^2$     D.  $106 \text{ cm}^2$



1

## I. How to Write an Equation of a Line Given m and b

1. Write down  $y = \_\_\_x + \_\_\_$
2. Substitute  $\_\_\_\_\_\_$  for m and  $\_\_\_\_\_\_$  for b.
3. Simplify the equation

2

Write the equation of the line given m and b.

Ex. 1 Slope is -5 and y-intercept is 2

Ex. 2 Slope is  $-1/2$  and y-intercept is -2

3

Write the equation of the line given m and b.

Ex. 3 Slope is 0 and y-intercept is 3

Ex. 4 Slope is  $1/3$  and y-intercept is 0

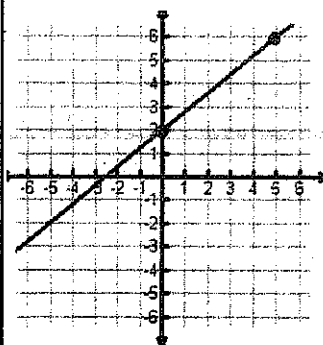
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## II. How to Write an Equation of a Line Given a Graph

1. Write down  $y = mx + b$
2. Use any 2 "good" points on the line to find the  $\_\_\_\_\_\_$  m.
3. Find the  $\_\_\_\_\_\_$  on the graph, b.
4. Substitute slope for  $\_\_\_\_\_\_$  and y-int for  $\_\_\_\_\_\_$  into the equation  $y = mx + b$ .

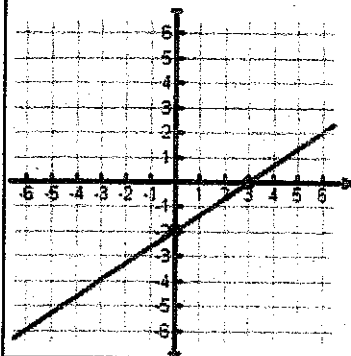
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Ex 5. Write the equation of this graph



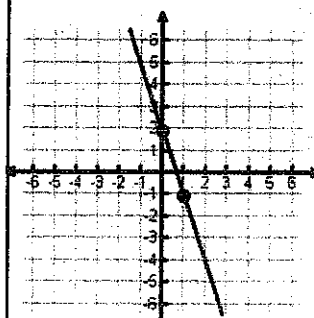
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Ex 6. Write the equation of this graph.



7

Ex 7. Write the equation of this graph.



8

### III. How to Write an Equation of a Line Given $m$ and a point

1. Write down  $y = mx + b$ .
2. Substitute \_\_\_\_\_ for  $m$  and the point  $(x, y)$ .
3. Solve for \_\_\_\_.
4. Substitute \_\_\_\_ and \_\_\_\_ back into the equation.

9

Write the equation of the line given  $m$  and a point

Ex 8:  $m = 2$  Point:  $(2, 3)$

10

Write the equation of the line given  $m$  and a point

Ex 9:  $m = 1/2$  Point:  $(4, -3)$

11

Write the equation of the line given  $m$  and a point

Ex 15:  $m = -2$  Point:  $(-5, 3)$

12

#### IV. How to Write an Equation of a Line Given TWO points

1. Write down  $y = mx + b$ .
2. Use the \_\_\_\_\_ formula to find  $m$ .
3. Pick one of the ordered pairs & substitute slope for  $m$  and the point  $(x, y)$ .
4. Solve for \_\_\_\_.
5. Substitute \_\_\_\_ and \_\_\_\_ into the equation.

13

#### Equation of a Line - Given 2 points

Ex: 21 (2, 3) (4, 5)

14

#### Equation of a Line - Given 2 points

Ex: 22 (2, 3) (-4, 15)

15

Name: \_\_\_\_\_ Date: \_\_\_\_\_

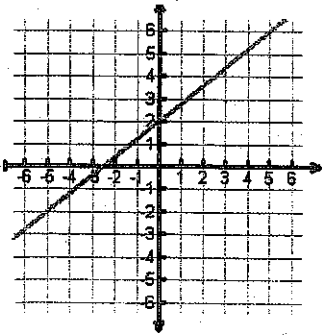
**Writing Equations of Lines:  $y = mx + b$** **Writing an equation of a line given m and b.**

- A. Substitute slope for  $m$  and  $y$ -intercept for  $b$ .  
B. Simplify the equation.

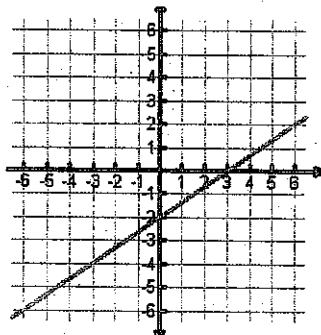
1. Slope is  $-5$  and  $y$ -intercept is  $3$ .2. Slope is  $-1/2$  and  $y$ -intercept is  $-3$ .3. Slope is  $0$  and  $y$ -intercept is  $1$ .4. Slope is  $1/3$  and  $y$ -intercept is  $8$ .**Writing an equation of a line given a graph.**

- A. Use any 2 "good" points on the graph to find the slope,  $m$ .  
B. Find the  $y$ -intercept on the graph,  $b$ .  
C. Substitute slope for  $m$  and  $y$ -intercept for  $b$  into the equation  $y = mx + b$ .

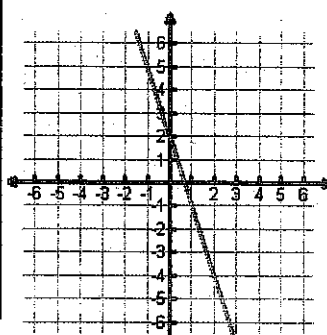
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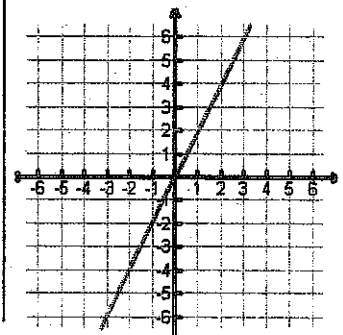
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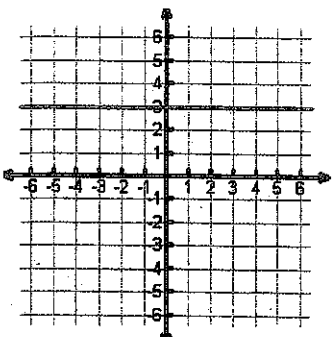
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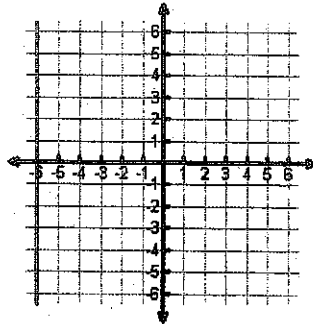
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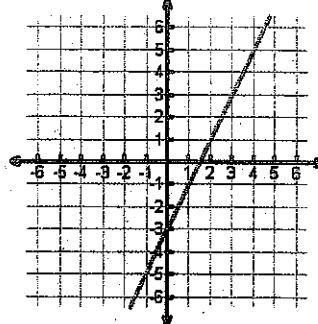
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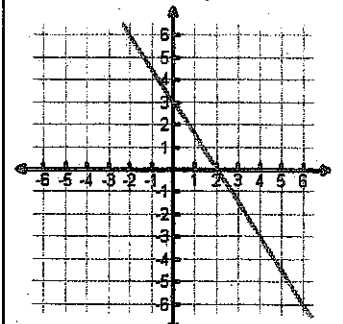
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11.



12.



**Writing an equation of a line given  $m$  and a point.**

- A. Substitute slope for  $m$  and the point  $(x, y)$  into  $y=mx+b$  and solve for  $b$ .  
 B. Substitute  $m$  and  $b$  back into the equation.

13.  $m = 2$  and Point:  $(4, 7)$

14.  $m = 1/2$  and Point:  $(2, -3)$

15.  $m = -2$  and Point:  $(-7, 1)$

16.  $m = 4$  and Point  $(1, 4)$

17.  $m = 1/2$  and Point:  $(-1, -2)$

18.  $m = 2$  and Point  $(0, 3)$

19.  $m = 3$  and Point:  $(3, 0)$

20.  $m = \text{undefined}$  and Point  $(3, 6)$

**Writing an equation of a line given TWO points.**

- A. Use the slope formula to find  $m$ .  
 B. Pick one point, substitute slope for  $m$ , the point  $(x, y)$  and then solve for  $b$ .  
 C. Substitute  $m$  and  $b$  back into the equation.

21.  $(2, 3)$  and  $(5, 0)$

22.  $(1, 5)$  and  $(-4, 15)$

23.  $(2, 2)$  and  $(0, 4)$

24.  $(2, 3)$  and  $(1, 4)$

25.  $(4, 5)$  and  $(5, 2)$



**Geometry in the Coordinate Plane**  
**Writing Equations of Lines Given Two Points**

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Find the slope and the y-intercept, and then write the equation of the line.

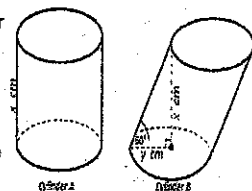
$m = \frac{y_2 - y_1}{x_2 - x_1}$	Solve for b $y = mx + b$	Write the equation $y = mx + b$
1. (1, 5) and (2, 7) $m =$		$y = mx + b$
2. (0, 1) and (3, -8) $m =$		$y = mx + b$
3. (2, -3) and (4, -2) $m =$		$y = mx + b$
4. (2, 5) and (4, 2) $m =$		$y = mx + b$
5. (-3, -5) and (-1, 3) $m =$		$y = mx + b$



$m = \frac{y_2 - y_1}{x_2 - x_1}$	Solve for b $y = mx + b$	Write the equation $y = mx + b$
6. (3, -1) and (-6, -4) m =		$y = mx + b$
7. (4, 1) and (-4, 7) m =		$y = mx + b$
8. (-1, 2) and (3, 4) m =		$y = mx + b$
9. (-1, -4) and (2, 0) m =		$y = mx + b$
10. (3, -1) and (-3, 5) m =		$y = mx + b$

Two different cylinders are shown. Both cylinders have the same height,  $x$  cm, and same radius,  $y$  cm. The only difference is Cylinder B has been slanted by  $60^\circ$ . Which statement below is true?

- A. Cylinder A has a greater volume than Cylinder B
- B. Cylinder A has a lower volume than Cylinder B
- C. Cylinder A has the same volume than Cylinder B
- D. Not enough information is provided to determine which has a larger volume.



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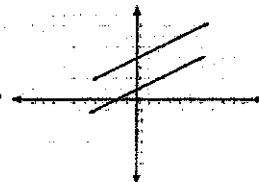
## PARALLEL LINES

- **Graphs:** Lines Never intersect and are in the same plane (coplanar)

- **Equations:**

\_\_\_\_\_ slope

\_\_\_\_\_ y-intercept



2

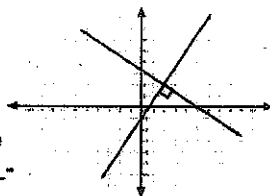
## PERPENDICULAR LINES

- **Graphs:** Lines intersect at right angles ( $90^\circ$  angles)

- **Equations:**

\_\_\_\_\_ slopes

Can have the same or different \_\_\_\_\_



3

Find the Opposite (negative) Reciprocal Slopes

1.  $-\frac{2}{3}$

2.  $\frac{11}{12}$

3. 7

4.  $-\frac{1}{9}$

4

Are these lines parallel, perpendicular, or neither?

1.  $y = -2x + 1$

$y = -2x - 4$

2.  $y = 3x - 4$

$y = -3x + 1$

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

$y = -5x + 6$

5

Are these lines parallel, perpendicular, or neither?

4.  $y = -2x + 1$

$y = -\frac{1}{2}x - 4$

5.  $2y - 3x = -4$

$-6x + 4y = 4$

6. Line through  $(-6, -3)$  and  $(0, 2)$

Line through  $(-5, 12)$  and  $(5, 0)$

6

**How to Write an Equation of a Line  
PARALLEL to another and given a point**

1. Given equation should be solved for \_\_\_\_.  
( $y = mx + b$ )
2. Identify the \_\_\_\_\_ of that line
3. Substitute \_\_\_\_ and (\_\_\_\_, \_\_\_\_ ) into  
 $y = mx + b$ .
4. Solve for \_\_\_\_.
5. Write Parallel equation using \_\_\_\_ and \_\_\_\_.

7

Ex. 1 Write a line parallel to the line  $y = 3x - 5$  and passes through the point  $(-5, -2)$ .

8

Ex. 2 Write a line parallel to the line  $2x + y = 3$  and passes through the point  $(-2, 5)$ .

9

Ex. 3 A line passes through the points  $(2, -7)$  and  $(1, -3)$ . Write the equation of a line that is parallel to it and passes through the point  $(2, -1)$ .

10

**How to Write an Equation of a Line  
PERPENDICULAR to another and given a point**

1. Given equation should be solved for \_\_\_\_.  
( $y = mx + b$ )
2. Identify the \_\_\_\_\_  
slope of that line. ( $m$  for the  $\perp$  line)
3. Substitute \_\_\_\_ and (\_\_\_\_, \_\_\_\_ ) in  $y = mx + b$ .
4. Solve for \_\_\_\_.
5. Write the equation using  $m$  and  $b$ .

11

Ex. 4 Write a line perpendicular to the line  $y = \frac{1}{2}x - 2$  and passes through the point  $(1, 0)$ .

12

Ex. 5 Write a line perpendicular to the line  $2x + 3y = 9$  and passes through the point  $(6, -1)$ .

13

Ex. 6 A line passes through the points  $(3, 5)$  and  $(6, 11)$ . Write the equation a line that is perpendicular to it and passes through the point  $(2, 4)$ .

14

Name: \_\_\_\_\_

Date: \_\_\_\_\_

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**Parallel Lines**

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• **Graphs:**

- Lines \_\_\_\_\_ intersect and are in the \_\_\_\_\_ plane.

• **Equations:**

- \_\_\_\_\_ slopes
- \_\_\_\_\_ y - intercepts

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Are these lines parallel?

1.  $y = -3x + 1$  and  $y = -3x - 4$

2.  $y = x - 4$  and  $y = 1 + x$

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**Writing an Equation of a Line PARALLEL to another and given a point.**

- A. Given equation should be solved for  $y$  ( $y = mx + b$ ).
- B. Write down the slope of that line.
- C. Substitute  $m$  and  $(x, y)$  in  $y = mx + b$ . Solve for  $b$ .
- D. Write the equation using the slope and y-intercept.

3. Write a line parallel to  $-x + y = 3$  that passes through the point  $(-4, 2)$ .

4. Write a line parallel to  $y = \frac{1}{2}x - 1$  and passes through the point  $(6, -2)$ .

5. Write a line parallel  $2y + 6x = 2$  that passes through the point  $(3, -1)$ .

6. A line goes through  $(-2, 3)$  and  $(4, -3)$ .  
Write the equation of a parallel line that passes through the point  $(8, -4)$ .

**Perpendicular Lines**

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- Graphs:

- Lines intersect at a \_\_\_\_\_ angle.

- Equations:

- \_\_\_\_\_ slopes
    - \_\_\_\_\_ y - intercepts
- 

**Writing an Equation of a Line PERPENDICULAR to another and given a point.**

- A. Given equation should be solved for y. ( $y = mx + b$ ).
  - B. Write down the perpendicular slope of that line.
  - C. Substitute the new slope and (x, y) in  $y = mx + b$ . Solve for b.
  - D. Write the equation using m and b.
- 

7. Write a line perpendicular to the line  $y = \frac{1}{2}x - 4$  and passes through the point (3, 0).

8. Write a line perpendicular to the line  $y = -3x + 2$  and passes through the point (6, 5).

- 
9. Write a line perpendicular to the line  $2x + 3y = 9$  and passes through the point (6, -1).

10. A line passes through the points (-1, -3) and (2, 3). Write the equation of a perpendicular line that passes through the point (2, 4).

## Equations of Parallel and Perpendicular Lines Classwork

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**A. Determine whether the lines are parallel, perpendicular, or neither given the equations. Explain how you know.**

1)  $y = -2x + 5$ ;  $y = 2x - 3$

2)  $3x - 8y = -16$ ;  $32x + 12y = -18$

3)  $9x + 3y = 12$ ;  $27x + 9y = 40$

4)  $3x - 4y = 19$ ;  $8x + 6y = 12$

**B. Determine whether the lines through the pairs of points are parallel, perpendicular, or neither.**

5)  $(2, 5)$  and  $(-2, 7)$ ;  $(0, 4)$  and  $(1, 6)$

6)  $(1, 2)$  and  $(5, 4)$ ;  $(0, 3)$  and  $(2, 4)$

7)  $(0, -5)$  and  $(2, -4)$ ;  $(-1, -5)$  and  $(1, -6)$

8)  $(0, 2)$  and  $(-4, 8)$ ;  $(-4, 0)$  and  $(4, -12)$

**C. Find the equation of a line through the given point A that satisfies the given condition.**

9) Point A (4, -5); Parallel to the line that goes through (5,6) and (3, 9)

10) Point A(-3, 7); Perpendicular to the line that goes through (-2, 6) and (-7, 9)

**D. Find the equation of a line through the given point A that satisfies the given condition. Check your answers on your graphing calculator.**

11) Point A (2,1)

a. parallel to the y-axis

b. perpendicular to the y-axis

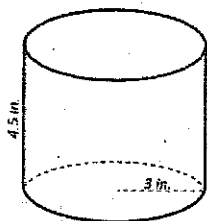
12) Point A(2,-4); parallel to the line  $5x - 2y = 4$ .

13) Point A(4,5); perpendicular to the line  $3x + 2y = 7$



What is the volume of a cylinder with a radius of 3 inches and a height of  $\frac{9}{2}$  inches?

- A.  $\frac{81}{2}\pi \text{ in}^3$     B.  $\frac{27}{4}\pi \text{ in}^3$   
 C.  $\frac{27}{8}\pi \text{ in}^3$     D.  $\frac{9}{4}\pi \text{ in}^3$

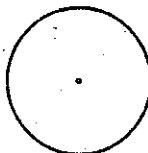


1

### Standard Form of a Circle

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

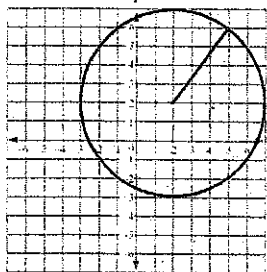
The center of the circle is (\_\_, \_\_)



\_\_\_\_ is the radius of the circle

2

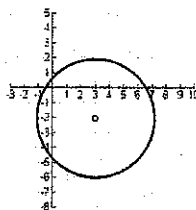
Where does this formula come from?



3

EX 1 Write an equation of a circle with center (3, -2) and a radius of 4.

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



4

EX 2 Write an equation of a circle with center (-4, 0) and a diameter of 10.

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

5

EX 3 Write an equation of a circle with center (2, -9) and a radius of  $\sqrt{11}$ .

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

6

EX 4 Find the coordinates of the center and the measure of the radius.

$$(x - 6)^2 + (y + 3)^2 = 25$$

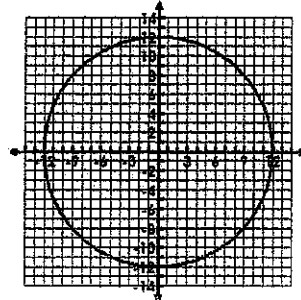
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5. Find the center, radius, & equation of the circle.

The center is

The radius is .

The equation is



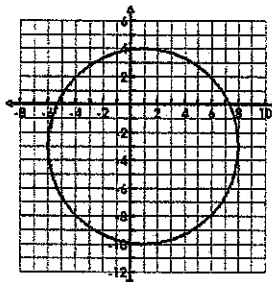
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6. Find the center, radius, & equation of the circle.

The center is

The radius is

The equation is



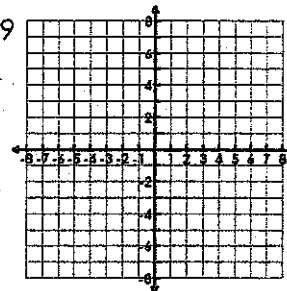
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7. Identify the center & radius, then graph the circle

$$(x - 3)^2 + (y - 2)^2 = 9$$

Center

Radius



10

## General Form of a Circle

$$Ax^2 + By^2 + Cx + Dy + E = 0$$

- Squared binomials have been \_\_\_\_\_ out.
- Every term is on the \_\_\_\_\_ side, and equal to \_\_\_\_\_.
- Squared terms go first in alpha order.

11

## Converting from General to Standard

1. 'A' needs to be \_\_\_\_\_. Divide if needed.
2. Reorder terms so all \_\_\_\_\_ terms are together and all \_\_\_\_\_ terms are together.
3. Move \_\_\_\_\_ to the other side of the equal sign.
4. Complete the \_\_\_\_\_ (as needed) for \_\_\_\_\_.
5. \_\_\_\_\_ the square (as needed) for \_\_\_\_\_.
6. \_\_\_\_\_ the left & \_\_\_\_\_ the right.

12

8. Write the **standard** equation of the circle.  
*State the center & radius.*

$$x^2 + y^2 - 8x + 7 = 0$$

13

9. Write the **standard** equation of the circle.  
*State the center & radius.*

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

14

10. Write the **standard** equation of the circle.  
*State the center & radius.*

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

15

11. Write the **general** form of the equation  
of the circle.

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

16

Name: \_\_\_\_\_ Date: \_\_\_\_\_

## Equations of Circles

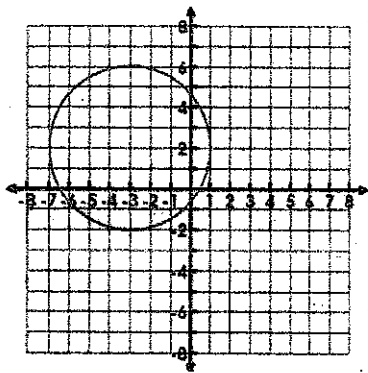
### Standard Form of a Circle

### General Form of a Circle

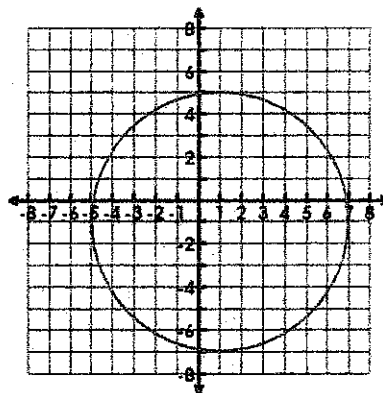
1. Write an equation of a circle with center  $(-2, 5)$  and a radius of 3.
  2. Write an equation of a circle with center  $(4, -5)$  and a diameter of 12.
  3. Write an equation of a circle with center  $(5, 6)$  and a radius of  $\sqrt{14}$ .
- 
4. Find the coordinates of the center and the measure of the radius.  $(x - 4)^2 + (y + 7)^2 = 49$

Find center, radius, & equation of the circle.

5.

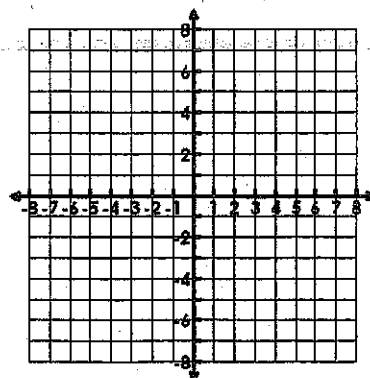


6.



Graph the circle, identify the center & radius.

7.  $(x + 1)^2 + (y - 4)^2 = 16$



**Converting from General to Standard Form**

- A. A needs to be 1. Divide if needed.
- B. Move the x terms together and the y terms together.
- C. Move E to the other side of the equals sign.
- D. Complete the square (as needed) for x. Complete the square (as needed) for y.
- E. Factor the left & simplify the right.

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**Write the standard form of the equation for the circle. State the center and radius.**

8.  $x^2 + y^2 + 4x - 14 = 0$

9.  $x^2 + y^2 - 2x + 8y - 3 = 0$

10.  $2x^2 + 2y^2 - 20x + 8y + 16 = 0$

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**Write the general form of the equation for the circle.**

11.  $(x - 5)^2 + (y + 2)^2 = 25$

12.  $(x + 6)^2 + (y + 1)^2 = 9$

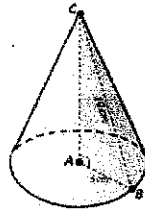
The cone shown has a base with a radius of AB. The length of AB=6 cm and the length of BC=10 cm. What is the volume of the cone?

A.  $288\pi\text{ cm}^3$

B.  $360\pi\text{ cm}^3$

C.  $\frac{640}{3}\pi\text{ cm}^3$

D.  $96\pi\text{ cm}^3$



1

### A Circle and Line May:

\* Never Intersect



\* 1 Point of Intersection



\* 2 Points of Intersection



2

### Solve by Graphing

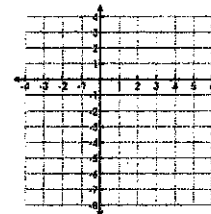
- Graph the circle and the line.
- Tell the point(s) of intersection as an ordered pair.
- *Not as exact as algebraically.*

3

### 1. Solve by Graphing

$$x^2 + y^2 = 4$$

$$2x - y = 5$$

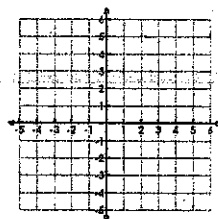


4

### 2. Solve by Graphing

$$x^2 + y^2 = 9$$

$$x + y = 3$$

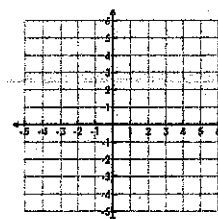


5

### 3. Solve by Graphing

$$x^2 + (y+1)^2 = 16$$

$$y = -1$$



6

### Solve by Algebraically

- ☐ Solve the linear for one of the \_\_\_\_\_.
- ☐ Substitute the linear into the \_\_\_\_\_.
- ☐ Solve for the \_\_\_\_\_.
- ☐ Substitute your solution back into the \_\_\_\_\_ to find the other variable.

7

### 3. Solve Algebraically

$$x^2 + y^2 = 34$$

$$x - y = 2$$

8

### 4. Solve Algebraically

$$x^2 + y^2 = 10$$

$$x + 3y = 10$$

9

### 5. Solve Algebraically

$$(x - 3)^2 + y^2 = 8$$

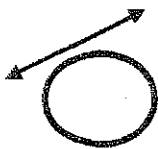
$$x = 5$$

10

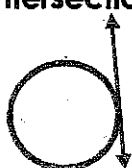
Name: \_\_\_\_\_ Date: \_\_\_\_\_

## Intersections of Circles & Lines – Practice

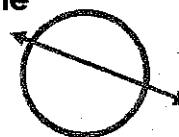
### 3 Possibilities for Intersection of a Circle and a Line



**0 points of intersection**  
(no real solution)



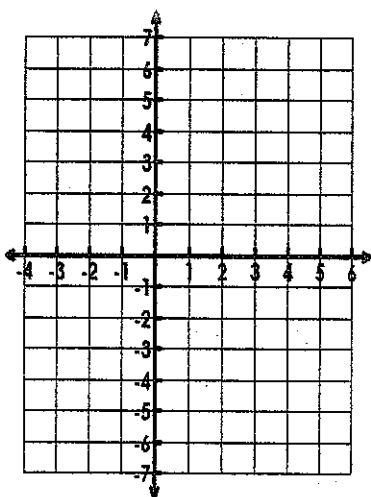
**1 point of intersection**  
(one real solution)



**2 points of intersection**  
(2 real solutions)

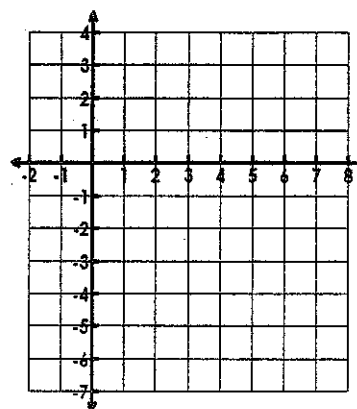
### Solve Systems Graphically:

$$\begin{aligned} 1. \quad & x^2 + y^2 = 9 \\ & -2x + y = 3 \end{aligned}$$



$$2. \quad (x - 2)^2 + (y + 4) = 4$$

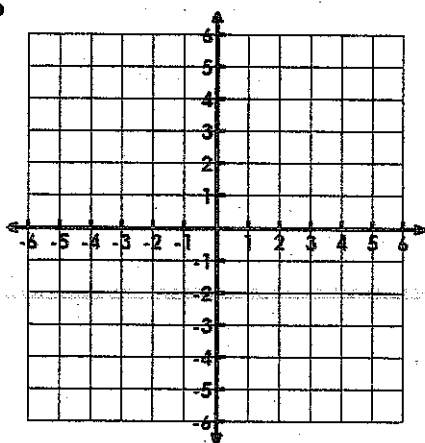
$$y + 2 = 0$$



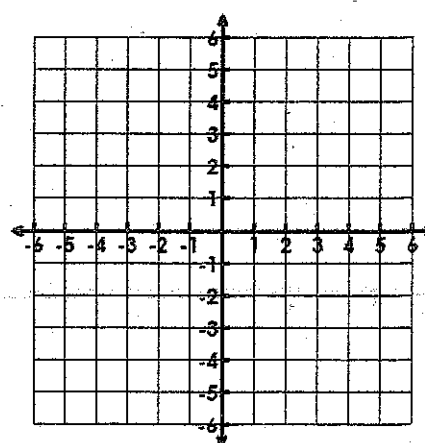
Point(s) of intersection: \_\_\_\_\_

Point(s) of intersection: \_\_\_\_\_

$$\begin{aligned} 3. \quad & x^2 + y^2 = 16 \\ & x - y = 4 \end{aligned}$$



$$\begin{aligned} 4. \quad & x^2 + y^2 = 9 \\ & 2y = x + 8 \end{aligned}$$



Point(s) of intersection: \_\_\_\_\_

Point(s) of intersection: \_\_\_\_\_



**Solve Algebraically:**

1. Solve the linear equation for a variable.
2. Then, substitute the linear equation into the equation representing the circle.
3. Solve for a variable by using one of the methods for solving a quadratic equation.
4. Substitute the value(s) back into the linear equation to get the 2<sup>nd</sup> variable.

---

5.  $x^2 + y^2 = 10$   
 $x - y = 2$

6.  $(x - 2)^2 + (y)^2 = 5$   
 $x - 3y = -3$

Point(s) of intersection: \_\_\_\_\_

Point(s) of intersection: \_\_\_\_\_

---

7.  $x^2 + y^2 = 20$   
 $x + 2y = 10$

8.  $x^2 + y^2 = 20$   
 $y = 2$

Point(s) of intersection: \_\_\_\_\_

Point(s) of intersection: \_\_\_\_\_

## Lines and Circles Recap

Date \_\_\_\_\_ Period \_\_\_\_\_

**Write the equation of a line parallel to the given line through the given point.**

1)  $x + y = -2$   $(-2, 5)$

2)  $3x - 5y = 20$   $(-5, 8)$

**Write the equation of a line perpendicular to the given line through the given point.**

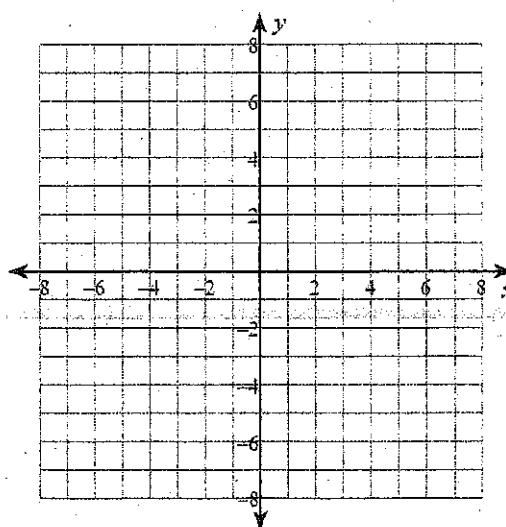
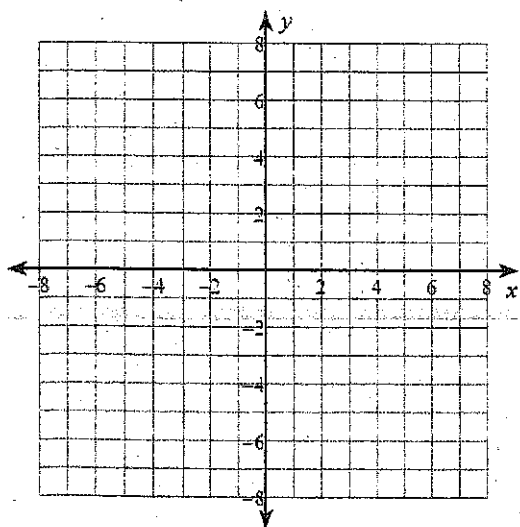
3)  $8y = 40 - 2x$   $(3, 7)$

4)  $0 = -3y - 4x$   $(8, -2)$

**Identify the center and radius of each. Then sketch the graph.**

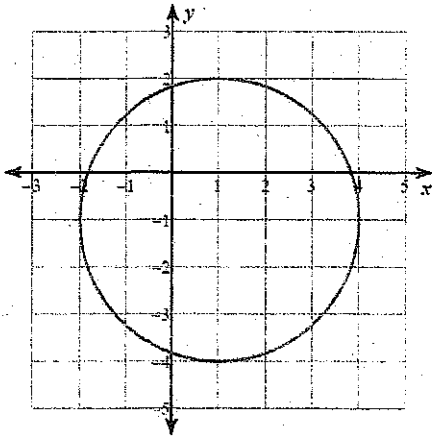
5)  $(x - 3)^2 + (y + 4)^2 = 9$

6)  $(x - 1)^2 + (y - 4)^2 = 4$

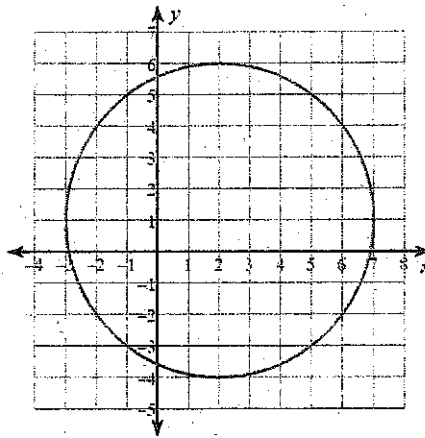


Use the information provided to write the equation of each circle.

7)



8)



9) Center:  $(11, -13)$   
Radius:  $\sqrt{26}$

10) Center:  $(-4, 2)$   
Radius: 10

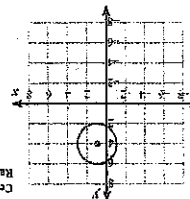
Identify the center and radius of each.

11)  $x^2 + y^2 + 10x - 22y + 141 = 0$

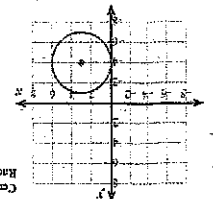
12)  $x^2 + y^2 - 4x - 22y + 109 = 0$

13)  $3x^2 + 3y^2 - 30x - 36y + 36 = 0$

14)  $x^2 + y^2 + 14x - 18y + 9 = 0$



6)



5)

1)  $y = -x + 3$

2)  $y = \frac{5}{3}x + 11$

3)  $y = 4x - 5$

4)  $y = \frac{4}{3}x - 8$

7)  $(x - 1)^2 + (y + 1)^2 = 9$

10)  $(x + 4)^2 + (y - 2)^2 = 100$

13) Center:  $(5, 6)$   
Radius: 7

14) Center:  $(-7, 9)$   
Radius: 11

8)  $(x - 2)^2 + (y - 1)^2 = 25$

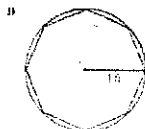
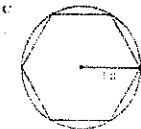
11) Center:  $(-5, 11)$   
Radius:  $\sqrt{5}$

12) Center:  $(2, 11)$   
Radius: 4

9)  $(x - 11)^2 + (y + 13)^2 = 26$

1)  $y = -x + 3$

Which polygon inscribed in a circle has an area closest to  $\pi$  square feet?



1

# Midpoint

Given 2 ordered pairs, it's the

\_\_\_\_\_ of the x's and  
\_\_\_\_\_ of the y's.

2

## Midpoint Formula

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

3

## Find the midpoint.

1. (3, 7) and (-2, 4)

2. (5, -2) and (6, 14)

4

## Find the midpoint.

3. (3, -9) and (14, 16)

4. (12, 17) and (-7, 9)

5

Given the midpt and one endpt, find the other endpt.

7. Midpoint (3, -6)

Endpoint (7, -3)

6

Given the midpoint and one endpoint, find the other endpoint.

8. Midpoint (-1, 2)  
Endpoint (3, 0)

7

Given the midpoint and one endpoint, find the other endpoint.

9. Midpoint (-4, 6)  
Endpoint (2, 1)

8

What if you want to cut it some other way?

Instead of in half, divide it in a ratio 1:2 or 1/3<sup>rd</sup> of the way? Or some other ratio?

9

## Partition Line Segments

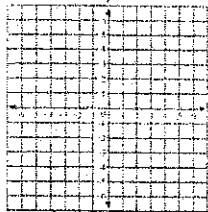
$$\left( \frac{bx_1 + ax_2}{b+a}, \frac{by_1 + ay_2}{b+a} \right)$$

10

### Partition a Line Segment

$$\left( \frac{bx_1 + ax_2}{b+a}, \frac{by_1 + ay_2}{b+a} \right)$$

Ex. 1 Line segment AB has endpoints (5,6) and (-4,0).  
What coordinate divides A to B in the ratio of 1:2?

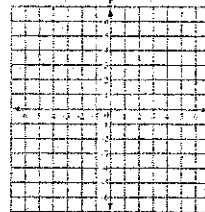


11

### Partition a Line Segment

$$\left( \frac{bx_1 + ax_2}{b+a}, \frac{by_1 + ay_2}{b+a} \right)$$

Ex. 2 Line segment AB has endpoints (-4,2) and (6,-3).  
What coordinate divides A to B in the ratio of 3:2?

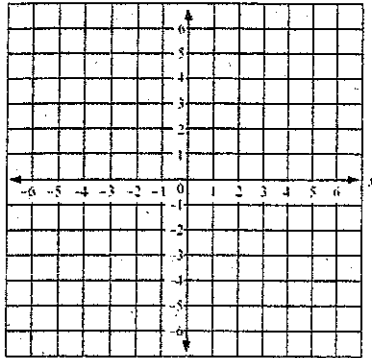


12

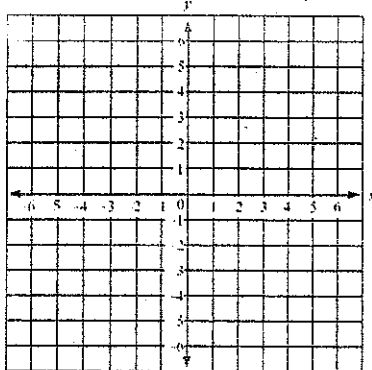
Section Formula  $(x, y) = \left( \frac{bx_1+ax_2}{b+a}, \frac{by_1+ay_2}{b+a} \right)$

Name \_\_\_\_\_ Block \_\_\_\_\_

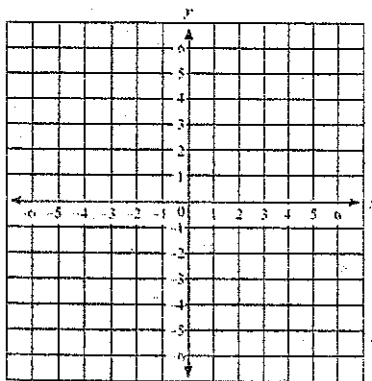
1. Line segment AB has endpoints (-2, 4) and (6, 0). What are the coordinate divides A to B in the ratio of 5:3?



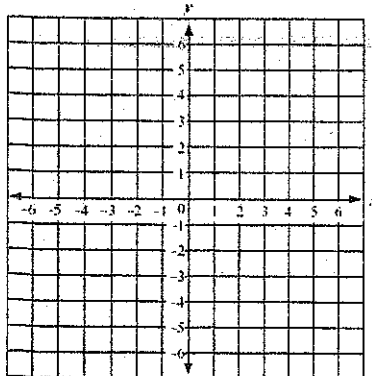
2. Line segment AB has endpoints (-6, 1) and (1, -6). What coordinate divides B to A in the ratio of 4:3?



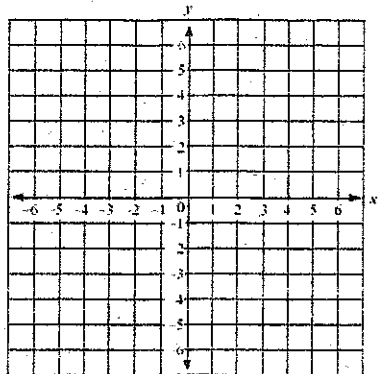
3. Line segment AB has endpoints (2,6) and (-1,-3). What coordinate divides A to B in the ratio of 1:2?



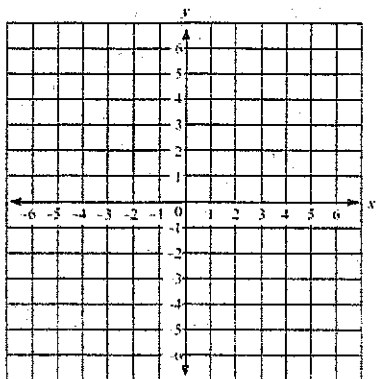
4. Line segment AB has endpoints (-5, 1) and (5, 5). What coordinate divides B to A in the ratio of 2:2?



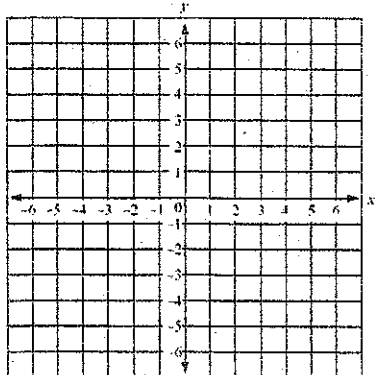
5. Line segment AB has endpoints  $(7, 2)$  and  $(4, 6)$ . What coordinate divides A to B in the ratio of 2:3?



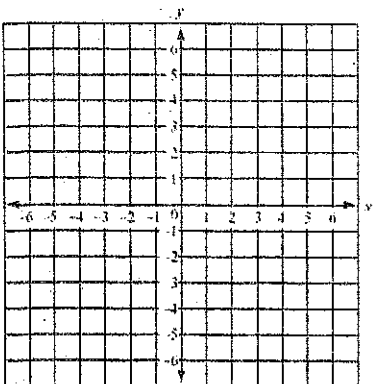
6. Line segment AB has endpoints  $(-3, 8)$  and  $(3, -4)$ . What coordinate divides B to A in the ratio of 4:2?



7. In line segment AB, point A is  $(1, 6)$  and  $(0, 3)$  is a coordinate that divides A to B in the ratio 1:2. What is point B?



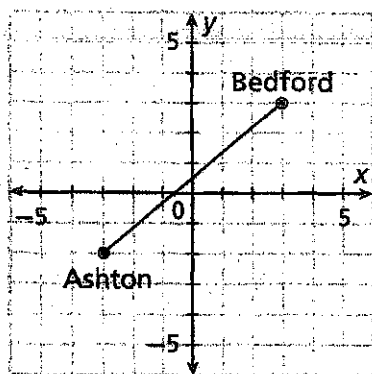
8. In line segment AB, point A is  $(-5, 4)$  and  $(-2, 3)$  is a coordinate that divides B to A in the ratio 3:1. What is point B?



Name: \_\_\_\_\_ Date: \_\_\_\_\_

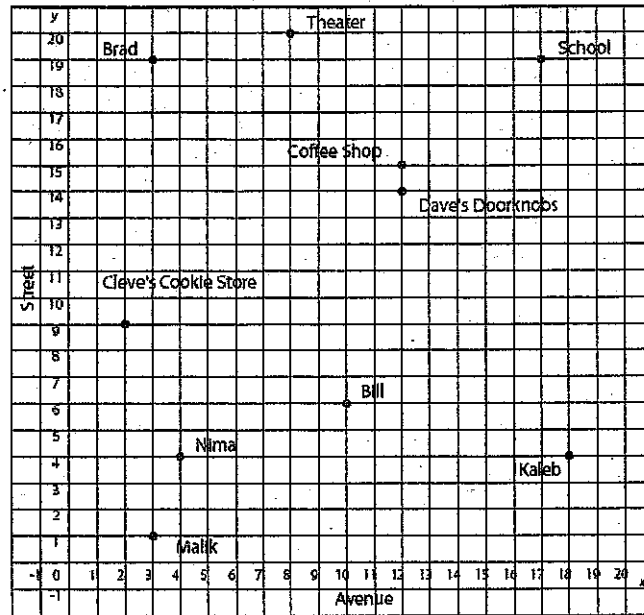
**Partitioning Line Segments in 2 Dimensions Homework****MCC9-12.G.GPE.6** Find the point on a directed line segment between two given points that partitions the segment in a given ratio.

1. Given the points  $A(-1, 2)$  and  $B(7, 14)$ , find the coordinates of the point  $P$  on directed line segment  $\overline{AB}$  that partitions  $\overline{AB}$  in the ratio 1:3.
2. Given the points  $A(-2, 4)$  and  $B(7, -2)$ , find the coordinates of the point  $P$  on directed line segment  $\overline{AB}$  that is located  $\frac{1}{4}$  the way from  $A$  to  $B$ .
3. Given the points  $A(-3, -4)$  and  $B(5, 0)$ , find the coordinates of the point  $P$  on directed line segment  $\overline{AB}$  that is located  $\frac{2}{5}$ ths of the way from  $A$  to  $B$ .
4. The map shows a straight highway between two towns. Highway planners want to build two new rest stops between the towns so that the two rest stops divided the highway into three equal parts. Find the coordinates of the points at which the rest stops should be built.

Problems #5-9 Adapted from: Walch Education Resources: CCGPS Coordinate Algebra Teacher Resource Binder



Use the map and the information given to solve each problem that follows.



- Luis works at a theater on 8th Avenue and 20th Street. Kaleb lives at the corner of 18th Avenue and 4th Street. What is a possible location that is midway between them?
- Nima lives at the corner of 4th Avenue and 4th Street. Bill lives at the corner of 10th Avenue and 6th Street. Their favorite bakery is located midway between them. What is one possible location for the bakery?
- Cleve's Cookie Store is located at the corner of 2nd Avenue and 9th Street. Dave's Doorknobs is located at the corner of 12th Avenue and 14th Street. Located  $\frac{1}{5}$  of the distance from Cleve's Cookie Store is the post office. Where is the post office?
- Malik and Brad both live on 3rd Avenue. Malik lives at the corner of 1st Street, and Brad lives at the corner of 19th Street.  $\frac{2}{3}$  the distance from Malik's apartment to Brad's apartment is a market. Where is the market?
- The main entrance to the high school is located at the corner of 17th Avenue and 19th Street. On his way from school to the bank, Luis stops at the coffee shop located at 12th Avenue and 15th Street. The coffee shop is the midpoint of this trip. What is the location of the bank?

Jason constructed two cylinders using solid metal washers. The cylinders have the same height, but one of the cylinders is slanted as shown.

Which statement is **TRUE** about Jason's cylinders?

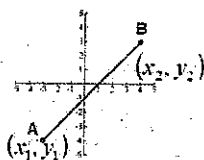
- A. The cylinders have the **same volume** because they have the **same cross-sectional area** at every plane parallel to the bases and the **same height**.
- B. The cylinders have **different volumes** because they have **different radii**.
- C. The cylinders have **different volumes** because they have **different surface areas**.
- D. None of these



1

## The Distance Formula

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



2

### Example

Find the distance between (1, 4) and (-2, 3). Round to the nearest hundredths.

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

3

### Example

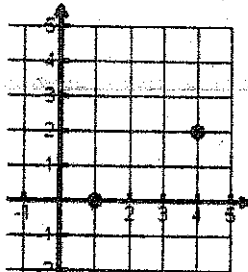
Find the distance between the points, (10, 5) and (40, 45). Round to the nearest hundredths.

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

4

3. Find the distance between the points. Round to the nearest tenths.

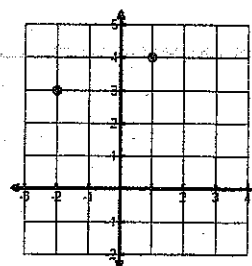
$$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$



5

4. Find the distance between the points. Round to the nearest tenths.

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



6

## Pythagorean Theorem

$$\text{leg}^2 + \text{leg}^2 = \text{hyp}^2$$



7

## Pythagorean Theorem Word Problems

- A square has a diagonal with length of 20 cm. What is the measure of each side? Round to the nearest tenths.
- What is the length of the altitude of an equilateral triangle if a side is 12 cm? Round to the nearest tenths.

8

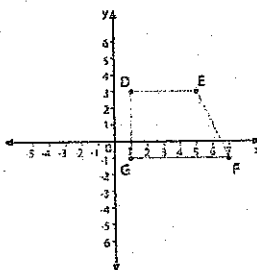
## Pythagorean Theorem Word Problems

- Jaylen travels 2 miles east, then 4 miles south, to get to Harrison High School. Kyle travels 3 miles west and 5 miles north to get to Harrison High School. How far apart were Jaylen and Kyle before they left for the school?

9

## On the Coordinate Plane

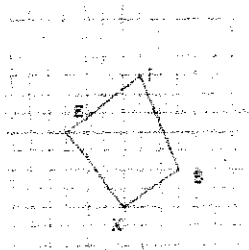
Find the perimeter of each figure.



10

## On the Coordinate Plane

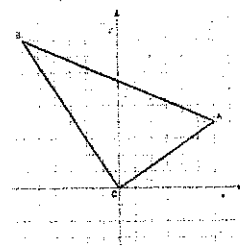
Find the perimeter of each figure.



11

## On the Coordinate Plane

Find the area of triangle ABC.

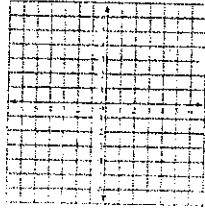


12

**Bringing it all back aROUND to make  
a Circle Equation**

- If a circle has center at  $(-1, 2)$  and a point on the circle at  $(-5, 5)$  what is the standard form equation of the circle?

- Graph it.

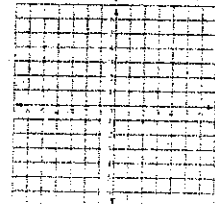


13

**Bringing it all back aROUND to make  
a Circle Equation**

- If a circle has diameter with endpoints at  $(7, -2)$  and  $(-1, 4)$  what is the standard form equation of the circle?

- Graph it.



14

**Bringing it all back aROUND to make  
a Circle Equation**

- If a circle has diameter with endpoints at  $(10, 5)$  and  $(-6, -7)$ , is the point  $(-8, 1)$  on the circle?

15

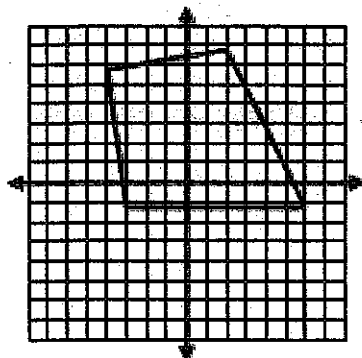
Name: \_\_\_\_\_ Date: \_\_\_\_\_

## Perimeter and Area of Geometric Figures

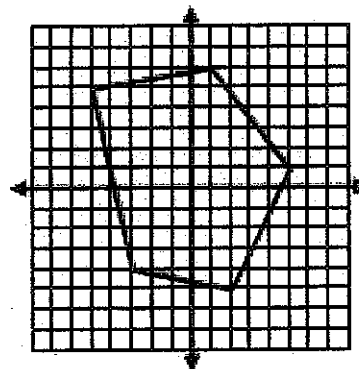
**MCC9-12.G.GPE.7** Use coordinates to compute perimeters of polygons and areas of triangles and rectangles.

1. Find the perimeter of each shape.

a.

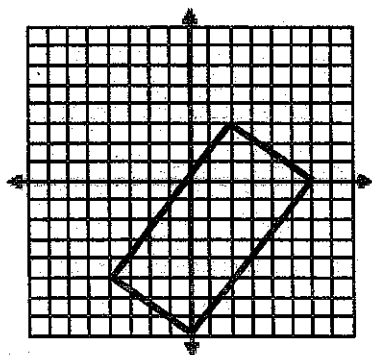


b.

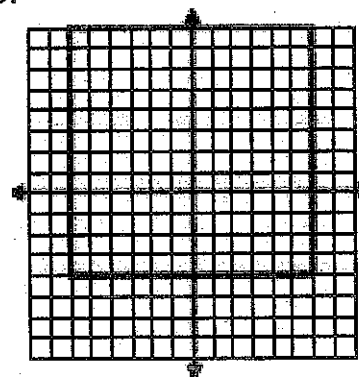


2. Find the area of each shape.

a.

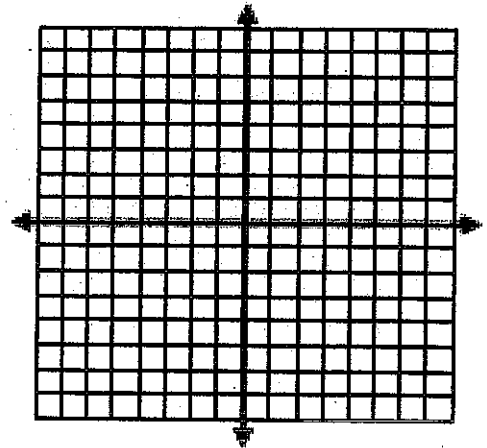


b.

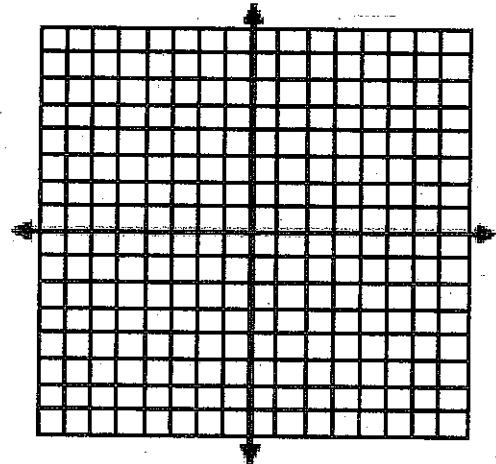


3. Plot the given points, and find the perimeter.

A  $(-4, 5)$ , B  $(1, 5)$ , C  $(2, -1)$ , D  $(-3, -1)$



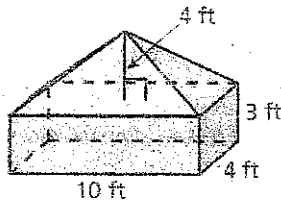
4. Plot the given points, and find the area.  
A  $(-1, 5)$ , B  $(2, -1)$ , C  $(-2, -3)$ , D  $(-5, 3)$



5. Justin and Austin decide to play catch after school. They start at the same point. Justin walks 10 feet north and 60 feet west. Austin walks 30 feet south and 10 feet east. How far apart are they?
6. Susan and Larry decide to walk to the QT to meet up and get a Slushie. Susan has to walk 3 blocks north and 2 blocks west. Larry walks 5 blocks south and 1 block east. How far apart were they when they started?

Find the total volume of the figure.  
Round the nearest tenth if needed.

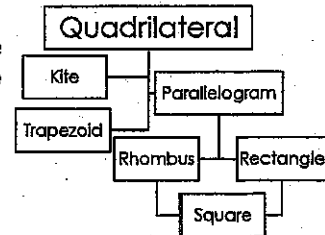
- A.  $280 \text{ ft}^3$
- B.  $173.3 \text{ ft}^3$
- C.  $160 \text{ ft}^3$
- D.  $66.7 \text{ ft}^3$



1

## Proving shapes in the Coordinate Plane

Properties/definitions are used to prove the type of quadrilateral on the coordinate plane.



2

## KITE

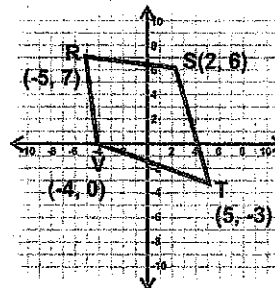
A quadrilateral with 2 pairs of adjacent congruent sides, but opposite sides are NOT parallel

Special Properties of Kite

- Diagonals are \_\_\_\_\_.

3

Show that RSTV is a kite.



4

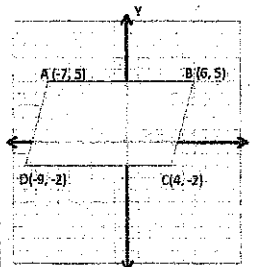
## PARALLELOGRAMS

Properties of Parallelograms

- Opposite sides are \_\_\_\_\_
- Opposite sides are \_\_\_\_\_
- Diagonals \_\_\_\_\_ each other
- Opposite Angles are \_\_\_\_\_
- Consecutive Angles are \_\_\_\_\_

5

Is ABCD a parallelogram?



6

## Rectangle

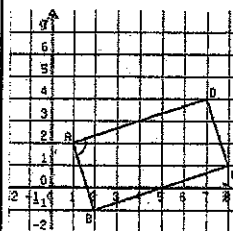
A parallelogram with 4 right angles

Some Special Properties of Rectangles

- All the properties of a parallelogram
- Diagonals are \_\_\_\_\_.
- 4 \_\_\_\_\_ angles

7

Is ABCD a rectangle?



8

## RHOMBUS

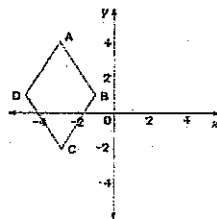
A parallelogram with 4 congruent sides

Special Properties of Rhombus

- All the properties of a parallelogram
- Diagonals are \_\_\_\_\_
- 4 \_\_\_\_\_ sides

9

Show that ABCD is a rhombus.



10

## SQUARE

A parallelogram with 4 congruent sides and 4 right angles

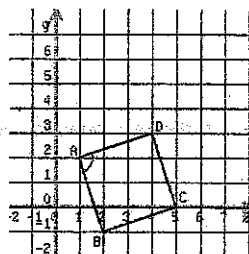
Special Properties of Square

- All the properties of a \_\_\_\_\_
- & \_\_\_\_\_

\*Like the child of a rhombus and a rectangle

11

Show that ABCD is a square.



12

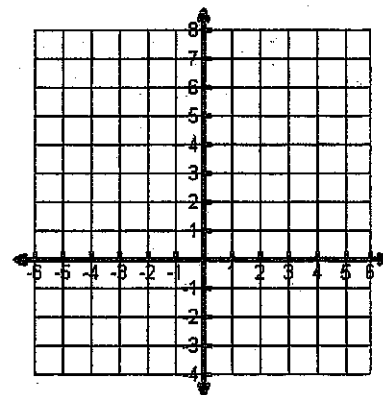


Name: \_\_\_\_\_ Date: \_\_\_\_\_

## Connecting Algebra & Geometry through Coordinates

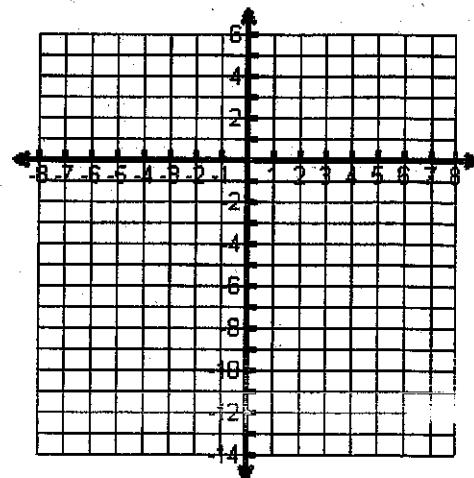
The goal of this assignment is to use the distance and slope formulas to prove statements about geometric figures on the coordinate plane. Since the purpose is to prove a statement, you **must show work**.

1. **Quadrilateral 1:** Plot and label each point.  $A(-5, 6)$ ,  $B(3, 7)$ ,  $C(4, -1)$ , and  $D(-4, -2)$ .
2. **Definition:** A parallelogram is a quadrilateral with two pairs of opposite sides that are parallel. Using the definition of parallelogram, prove that Quadrilateral 1 is a parallelogram.



3. **Theorem:** A parallelogram with four right angles is a rectangle. Using the theorem, prove that Quadrilateral 1 is a rectangle.
4. **Definition:** A rhombus is a parallelogram with all sides congruent. Using the definition, prove that Quadrilateral 1 is a rhombus.
5. **Definition:** A square is a rectangle and a rhombus. Using the definition, is Quadrilateral 1 a square? Why?
6. **Theorem:** The diagonals in a rhombus are perpendicular. Prove that the theorem is true for Quadrilateral 1.

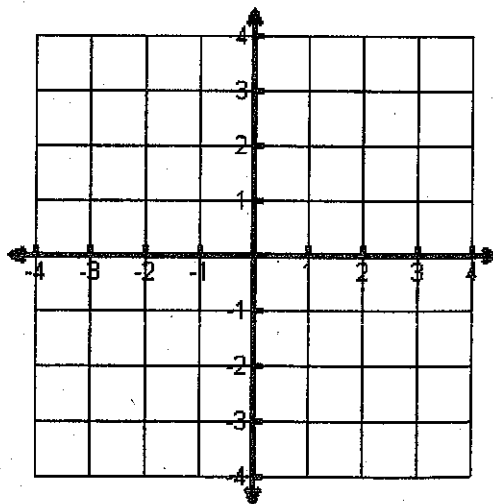
7. **Quadrilateral 3:** Plot and label each point.  $A(-6, -13)$ ,  $B(-3, 3)$ ,  $C(4, 5)$ , and  $D(6, -2)$ .
8. *Definition:* A kite is a quadrilateral with two pair of consecutive sides that are congruent. Using the definition of a kite, prove that Quadrilateral 3 is a kite.



9. *Theorem:* The diagonals of a kite are perpendicular. Prove that the theorem is true for Quadrilateral 3.

10. **Quadrilateral 4:** Plot and label each point.  $A(-1, 3)$ ,  $B(3, 1)$ ,  $C(1, -2)$ , and  $D(-3, 0)$ .

11. *Definition:* A parallelogram is a quadrilateral with two pair of opposite sides that are parallel. Using the definition of a parallelogram, prove that Quadrilateral 4 is a parallelogram.



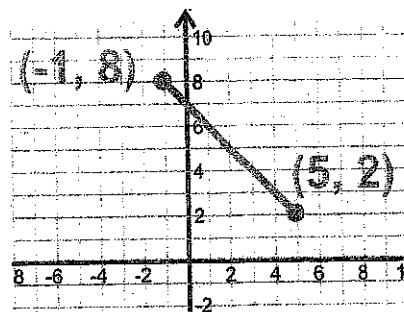
12. *Definition:* A rectangle is a parallelogram with four right angles. Using the definition of a rectangle, prove that Quadrilateral 4 is **NOT** a rectangle.

13. *Definition:* A rectangle is a parallelogram with congruent diagonals. Using the definition of a rectangle, prove that Quadrilateral 4 is **NOT** a rectangle.

Name \_\_\_\_\_

Date \_\_\_\_\_

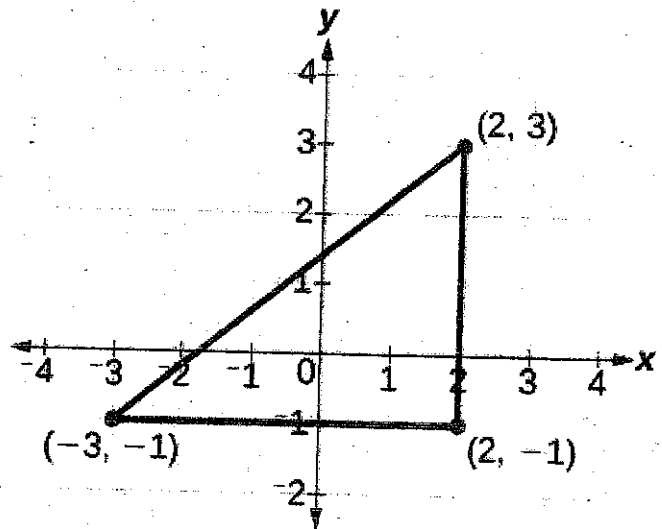
1. Find the perimeter of a figure with vertices at L(7, 1), E(4,5), A(0, 2), R(0, -5), and N(7, -2)
  
2. Find the area of the right triangle with vertices, H(3, -2), O(8, -1) and W(6, 9).
  
3. A line segment has endpoints T(-3,4) and O(7, -1). What point would partition the line segment from T to O by a ratio of 2:3?
  
4. What is the area of a rectangle with points M(4, 5), A(1,5), T(1, -3) and H(4, -3).
  
5. A circle in the coordinate plane has a center at (5,3). What other point on the circle could create a line segment with the point on the circle (2, -1) to form a diameter of the circle.
  
6. What is the distance between the two graphed points? Round to the nearest tenth if necessary.



7. What is the midpoint of the graphed line segment?
  
8. What point would partition this line segment in a ratio of 1:2 from (-1,8) to (5,2)?

Midpoints/Partitioning/Distance and Pythagorean/ Perimeter and Area Quiz Review

9. What is the perimeter of the triangle to the right?



10. What is the area of the triangle to the right?

11. Bill goes to We Sell All the Things by first going 3 miles North, then 1 mile West. Joe leaves from the same place Bill did but goes to the Fun Fun Park by first traveling 9 miles south then 4 miles East. How far is We Sell All the Things from the Fun Fun park?

12. If endpoints of a circles diameter are  $(3, 11)$  and  $(-2, -1)$ , what is the center of the circle?

13. Points  $W(-12, 8)$  and  $Y(16, -13)$  are endpoints of directed line segment  $WY$ . What are the coordinates of point  $H$  that partitions  $WY$  in the ratio of 4 to 3?

14. Point  $D(-5, 3)$  is one end of segment  $DG$ . If  $O(3, 7)$  is the midpoint of  $DG$ , what is point  $G$ ?

**CHALLENGE:** If the area of right triangle  $ABC$  is 42 square feet. For triangle  $ABC$ ,  $A(3, 7)$ ,  $B(10, 7)$ ,  $AC$  is the hypotenuse, and point  $C(10, y)$ . What are the two possible values of  $y$ ?

Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Coordinate Plane Review**

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1. Write the equation of the circle centered at  $(-4, 6)$  with a diameter of 16.

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2. Write an equation of the line that passes through  $(5, -3)$  and is perpendicular to  $y = -\frac{5}{2}x + 1$ .

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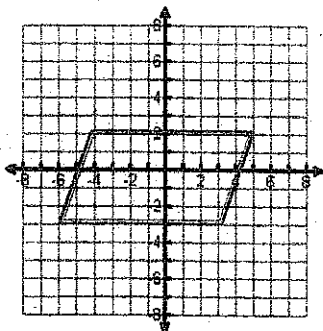
3. Reed and Skylar are playing Hide-and-Seek. Reed runs and hides 30 ft south and 24 ft east of base. Skylar runs and hides 43 ft north and 12 ft west of base. How far apart are Skylar and Reed?

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4. A circular skylight has a diameter with endpoints at  $(-6, 32)$  and  $(2, 26)$ . Find the center and radius of the skylight.

---

5. Find the perimeter of the figure.



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

7. Find the intersection of the circle and line algebraically.  $x^2 + y^2 = 100$   
 $x - y = 2$
- 

8. Put the equation of the circle in standard form.  $x^2 + y^2 - 6x - 2y + 1 = 0$
- 

9. Put the equation of the circle in general form.  $(x - 2)^2 + (y + 3)^2 = 16$
- 

10. Circle C has a center of (5, 2) and a radius of 6. Does the point (8, 7) lie on circle C?
-

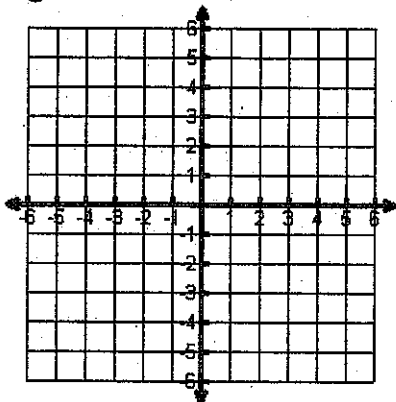
Name: \_\_\_\_\_ Per: \_\_\_\_\_ Date: \_\_\_\_\_

**Coordinate Plane Review #2****Graph the following circles. State the center and radius.**

1.  $x^2 + y^2 = 24$

Center: \_\_\_\_\_

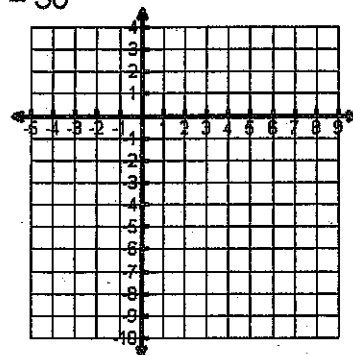
Radius: \_\_\_\_\_



2.  $(x-2)^2 + (y+3)^2 = 30$

Center: \_\_\_\_\_

Radius: \_\_\_\_\_

**Write the standard equation for the circle.**

3.  $x^2 + y^2 - 10x - 2y = -10$

Center: \_\_\_\_\_ and  $r =$  \_\_\_\_\_**Write the general form for circle.**

4.  $(x-2)^2 + (y+1)^2 = 9$

5. A circular disk drive has a diameter with endpoints at  $(-9, 2)$  and  $(15, 12)$ . Find the center and radius of the disk drive. Write the equation of the circle in standard form.

Center: \_\_\_\_\_

 $r =$  \_\_\_\_\_

Equation: \_\_\_\_\_

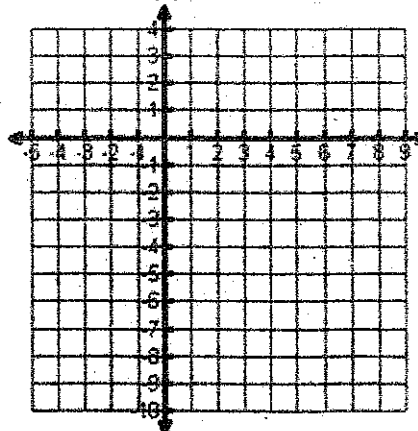
**Find the intersection of the two equations:**

6. Algebraically:  $x^2 + y^2 = 34$   
 $y = x + 2$

Intersection(s): \_\_\_\_\_

7. Graphically:  $(x-4)^2 + (y+1)^2 = 16$   
 $y = x - 1$

Intersection(s): \_\_\_\_\_

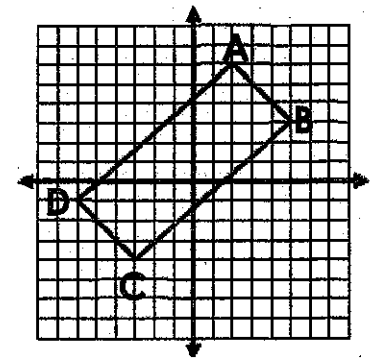


8. The following shape is a rectangle.

a) Prove that it's a parallelogram using the distances and slopes.

b) The diagonals of a rhombus are perpendicular. Find the slopes of the diagonals to prove that it's not a rhombus.

c) Find the perimeter and area of the rectangle.



9. Find the **midpoint** of the points.

a.  $(-5, 3)$   $(2, 6)$

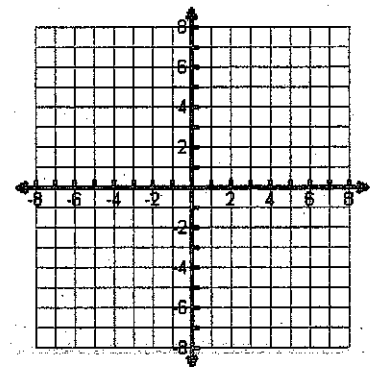
b.  $(3, -2)$   $(-1, 5)$

10. Find the coordinates of the **other endpoint** of a segment with an endpoint of  $(-1, 5)$  and a midpoint  $(2, -3)$ .

11. Josh and Drake decide to play catch after school. They start at the same point. Josh walks 50 feet north and 20 feet west. Drake walks 40 feet south and 10 feet east. How far apart are they?

12. Determine whether Point A lies on the circle whose center is Point C and which contains the Point P(0, 4). Justify your answer algebraically showing work.

Point A(3,  $\sqrt{7}$ ); Point C(0, 0); Point P(0, 4)



13. Find the equation of the line that is **parallel** to  $y = 2x + 8$  that passes through  $(-6, 1)$ .

14. Find the equation of the line that is **perpendicular** to  $y = 3x + 1$  that passes through

15. Find the coordinates of point T so that it partitions AB into a ratio of 1:3. A  $(-8, -1)$  and B(12, 11)