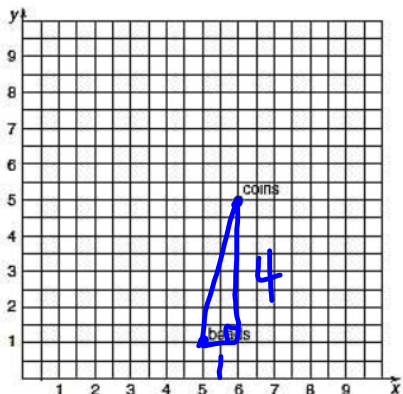


Don't forget
about the
Extra Credit!!!

Distance and Midpoint Formula

How would you find the distance between the coins and beads?



$$c^2 = 1^2 + 4^2$$

$$c = \sqrt{1^2 + 4^2}$$

$$(6-5) \quad (5-1)$$

The **Distance Formula** allows you to find the distance between two points. The subscripts (x_1, y_1) only indicate that there is a first and second point. However, whichever point is first or second is up to you.

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

1. Find the distance between $(1, -2)$ and $(-3, 6)$. x_1, y_1, x_2, y_2

$$d = \sqrt{(-3-1)^2 + (6-(-2))^2}$$

$$d = \sqrt{16 + 64}$$

$$d = \sqrt{80} \quad d \approx 8.9$$

3. Use the distance formula to find the value of x if the distance between $(1, 2)$ and $(x, 5)$ is 5 units.

$$5 = \sqrt{(x-1)^2 + (5-2)^2}$$

$$(5)^2 = (\sqrt{(x-1)^2 + 9})^2$$

$$\begin{array}{r} 25 = (x-1)^2 + 9 \\ -9 \quad -9 \\ \hline \sqrt{16} = \sqrt{(x-1)^2} \end{array}$$

$$\begin{array}{r} \pm 4 = x-1 \\ \quad \quad \quad +1 \\ \hline \pm 4 + 1 = x \end{array}$$

$$\begin{array}{l} 5 = x \\ -3 = x \end{array}$$

2. Find the distance between $(-2, -3)$ & $(-4, 4)$. x_1, y_1, x_2, y_2

$$d = \sqrt{(-4-(-2))^2 + (4-(-3))^2}$$

$$d = \sqrt{4 + 49}$$

$$d = \sqrt{53} \quad d \approx 7.28$$

4. Use the distance formula to find the value of y if the distance between $(-1, 4)$ & $(5, y)$ is 10 units.

$$10 = \sqrt{(5-(-1))^2 + (y-4)^2}$$

$$(10)^2 = (\sqrt{36 + (y-4)^2})^2$$

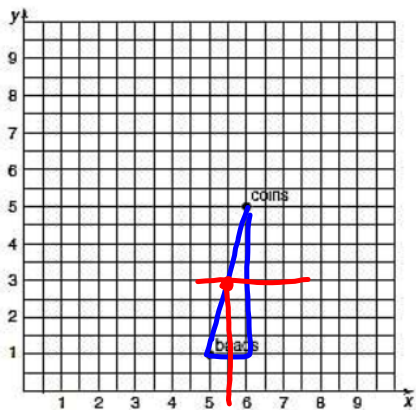
$$\begin{array}{r} 100 = 36 + (y-4)^2 \\ -36 \quad -36 \\ \hline \sqrt{64} = \sqrt{(y-4)^2} \end{array}$$

$$\begin{array}{r} \pm 8 = y-4 \\ \quad \quad \quad +4 \\ \hline \pm 8 + 4 = y \end{array}$$

$$\begin{array}{l} y = 12 \\ y = -4 \end{array}$$

Finding the Midpoint

How would you find the midpoint between the coins and beads?



The **Midpoint Formula** allows you to find the **midpoint** or **center** between two points.

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

5. Find the midpoint between (1, -2) and (-3, 6). 6. Find the midpoint between (6.4, 3) and (-10.7, 4).

$$\left(\frac{1 + (-3)}{2}, \frac{-2 + 6}{2}\right)$$

$$(-1, 2)$$

$$\frac{6.4 + (-10.7)}{2} \quad \frac{3 + 4}{2}$$

$$(-2.15, 3.5)$$

7. M is the midpoint of segment AB. The coordinates of A are (-2, 3) and the coordinates of M are (1, 0). Find the coordinates of B. (x, y)

$$2 \cdot \frac{x + (-2)}{2} = 1 \cdot 2 \quad \cdot \quad \frac{y + 3}{2} = 0 \cdot 2$$

$$x - 2 = 2 \quad y + 3 = 0$$

$$x = 4 \quad y = -3$$

$$(4, -3)$$

8. B is the midpoint of segment AC. The coordinates of A are (-10, 4) and the coordinates of B are (-2, 4). Find the coordinates of C. (x, y)

$$2 \cdot \frac{x + (-10)}{2} = -2 \cdot 2 \quad 2 \cdot \frac{y + 4}{2} = 4 \cdot 2$$

$$\frac{-10 + x}{2} = -2 \quad \frac{x - 10}{2} = -4 \quad \frac{y + 4}{2} = 8$$

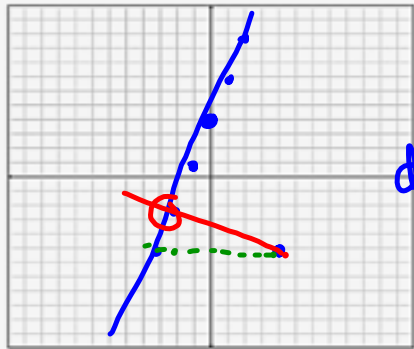
$$x = 6 \quad y = 4$$

$$(6, 4)$$

Class work answers

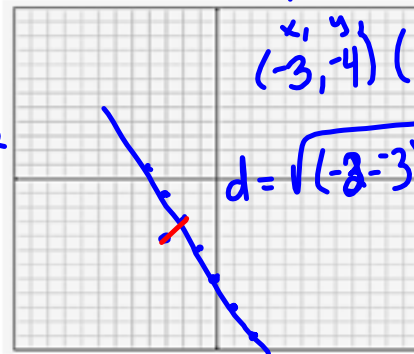
Use the formula to find the distance between the point and the line given.

1. $(4, -5)$ and $y = 3x + 4$ ^m y-int.



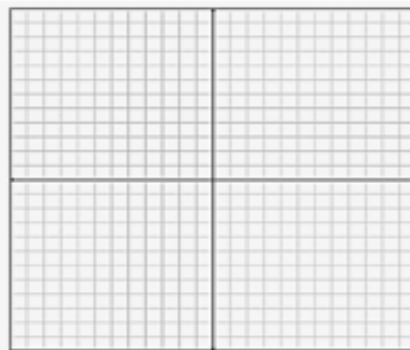
$(4, -5)$ $(-2, -2)$
 $d = \sqrt{(-2-4)^2 + (-2-5)^2}$

2. $(-3, -4)$ and $y = -2x - 7$



$(-3, -4)$ $(-2, -3)$
 $d = \sqrt{(-2-3)^2 + (-3-4)^2}$

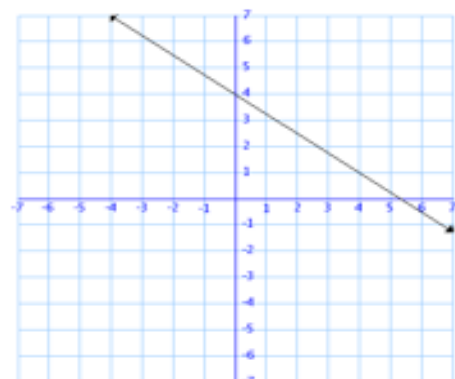
3. $(1, 8)$ and $y = \frac{5}{3}x - 1$



4. $(-5, 7)$ and the line in the graph.



5. $(-5, 7)$ and the line in the graph.



Parallel and Perpendicular Lines

OBJECTIVE: I CAN . . . Identify, graph, and write equations of parallel and perpendicular lines.

Parallel Lines:

- The slope (m) of parallel lines are the Same

Perpendicular Lines:

- The slope (m) of perpendicular lines are Opposite reciprocal $\frac{a}{b}$ $-\frac{b}{a}$

Determine if the lines are parallel, perpendicular, or neither.

1. $y = -2x - 4$
 $2x + y = 5$
 $\frac{-2x \quad -2x}{-2x \quad -2x}$
 $y = -2x + 5$

Parallel

2. $y = \frac{1}{2}x + 10$
 $4x + 2y = 7$

$$\frac{-4x \quad -4x}{\frac{2}{2} \quad \frac{-4x+7}{2}}$$

$$y = -2x + 3.5$$

Perpendicular

Write the equation of a line that is parallel to the given line and passes through the given point.

1. $y = 2x + 10$ $(0, 3)$

$$m = 2$$

$$y = mx + b$$

$$3 = 2(0) + b$$

$$3 = 0 + b$$

$$3 = b$$

$$y = 2x + 3$$

2. $y = -\frac{1}{5}x + 10$ $(4, -3)$

$$m = -\frac{1}{5}$$

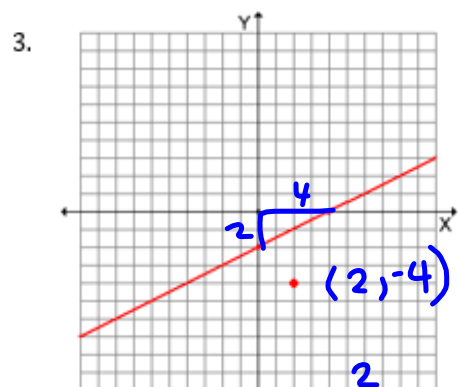
$$y = mx + b$$

$$-3 = -\frac{1}{5}(4) + b$$

$$-3 = -.8 + b$$

$$\begin{array}{r} +.8 \quad +.8 \\ \hline -2.2 = b \end{array}$$

$$y = -\frac{1}{5}x - 2.2$$



$$m = \frac{2}{4}$$

$$m = \frac{1}{2}$$

point $(2, -4)$

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

$$-4 = \frac{1}{2}(2) + b$$

$$-4 = 1 + b$$

$$\begin{array}{r} -1 \quad -1 \\ \hline -5 = b \end{array}$$

Write the equation of a line that is perpendicular to the given line and passes through the given point.

1. $y = 5x - 2$ & $(0, 4)$

$$m = -\frac{1}{5}$$

$$4 = -\frac{1}{5}(0) + b$$

$$4 = 0 + b$$

$$4 = b$$

$$y = -\frac{1}{5}x + 4$$

2. $y = -\frac{1}{7}x + 1$ & $(-3, 5)$

$$m = 7$$

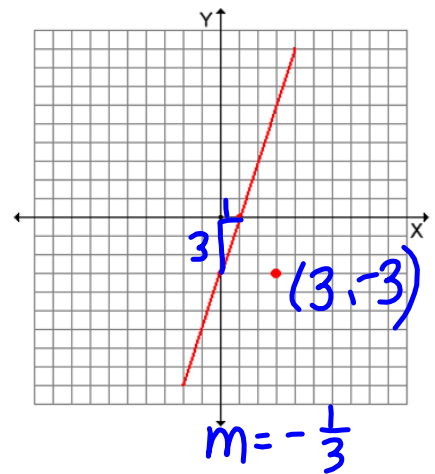
$$5 = 7(-3) + b$$

$$5 = -21 + b$$

$$26 = b$$

$$y = 7x + 26$$

3.

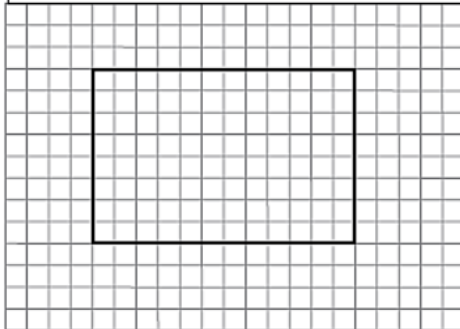


$$y = -\frac{1}{3}x - 2$$

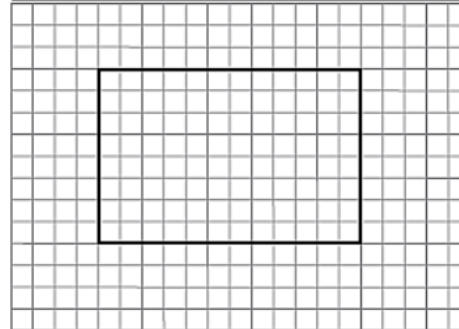
Perimeter and Area with the Distance Formula

Now that you have learned how to calculate the distance between two points, you can use the distance formula to help you calculate the area and perimeter of figures on a coordinate plane.

Perimeter: Sum of the length of each side of a shape



Area: Amount of square units or space inside of a shape

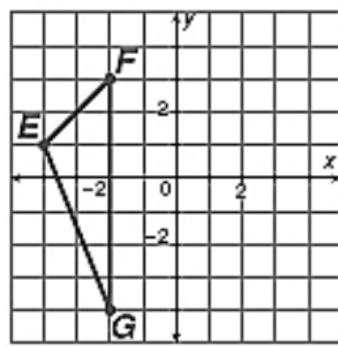
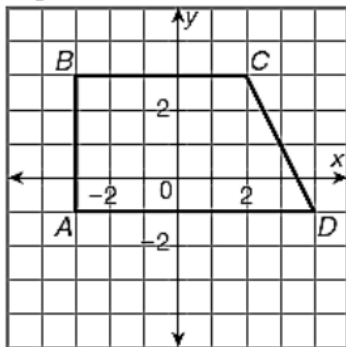


In order to calculate the perimeter or area of a shape, you have to know the length of certain sides and heights. If those sides or heights lie along the grid lines, you can just count the number of squares from one end of the side to the other.

However, if the figure is rotated or slanted, the sides or heights may not lie along the grid lines because they are diagonal. It is not enough to estimate the side lengths; you must be accurate in determining the lengths of the necessary sides and heights.

What formula can you use if the sides are slanted/diagonal to find the lengths? _____

Practice: Calculate the perimeter of the following figures. Think about which sides you need to calculate the lengths.



Area Formulas

Rectangle: $A = lw$ Triangle: $A = \frac{1}{2}bh$ or $A = \frac{bh}{2}$

Practice: Calculate the area of the following figures. Think about which sides you need to calculate the lengths.

