



Name: _____

Date: _____

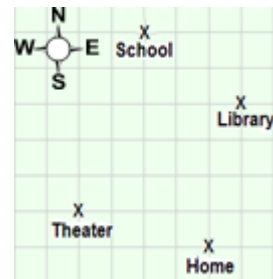
Student Exploration: Points, Lines, and Equations

Vocabulary: coordinates, equation, input, ordered pair, output, x-intercept, y-intercept

Prior Knowledge Questions (Do these BEFORE using the Gizmo.)

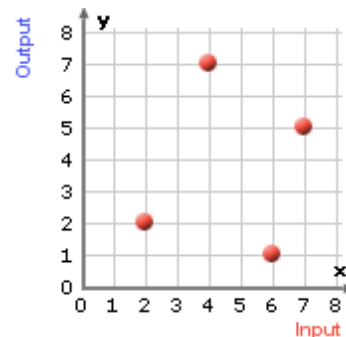
You can use words or pictures to give directions.

- On the street map to the right, each square represents one block. To get from place to place, stay on the streets shown.



- Draw a path on the map to show how you could get from the theater to the library. (Stay on the street grid shown.)
 - Use the compass points (north, south, east, and west) to describe the path you drew along the streets.
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- Points on a grid are another way to represent locations on a map. The location of a point is given by its **coordinates**, a pair of numbers written in the form (x, y) or *(input, output)*.

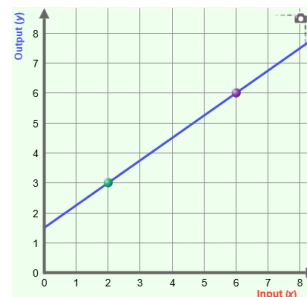


- What are the coordinates of the theater? _____
- What are the coordinates of the library? _____

Gizmo Warm-up

In the *Points, Lines, and Equations* Gizmo, you can plot two points and see the line through them and their coordinates.

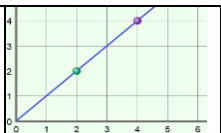
- Drag a point in the Gizmo and describe what happens.



- Drag the points to $(2, 3)$ and $(6, 5)$. What is the equation of this line? _____

- Select **Show Probe** and drag the red probe. What do the **Input (x)** and **Output (y)** mean?



Activity A: Points and lines	<u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> • Turn off Show Probe. 	
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- Plot the points (2, 2) and (4, 4). The Gizmo shows part of the line through the points.
 - What is the Input-Output equation for this line? _____
 - What is the x-and-y equation for this line? _____

2. Select **Show Probe**.

- Drag the probe and complete the table for the given values of x below.

Input (x)	Output (y)
0	
1.5	
3	
4	

- Using the equation, what is the output if the input value is 125? _____
 If the input value is $-\frac{1}{2}$? _____

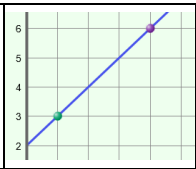
3. Click the **Table** tab and study the values in the input-output table.

- What do you notice about the pairs of input-output values in the table? _____

- Change the **Step** value under the table to 0.5 and press **Enter**. Use the equation of the line to explain why these also must be points on the line. _____

4. Click the **Probe** tab and plot (2, 3) and (4, 5). Select **Show Probe** and drag the probe over the line. Explain how the input-output values relate to the equation and the graph of the line.



Activity B: Points and equations	<u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> • Select Show Probe. 	
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1. In the Gizmo, plot the points (1, 3) and (4, 6).

A. What is the equation of this line? _____

B. Drag the probe so that it passes through the point (1, 3). Substitute the Input (x) and Output (y) values into the equation. Describe the result. _____

C. Drag the probe through the point (4, 6). What is the result when you substitute those coordinates into the equation? _____

D. Identify the coordinates of another point on the line and record it here. _____

E. What is the result when you substitute these coordinates into the equation? _____

2. With (1, 3) and (4, 6) still plotted in the grid, drag the probe across the grid.


A. Record the (x, y) coordinates of a point that lies on the vertical line (the probe) but is not on the line containing (1, 3) and (4, 6). _____

B. Substitute these coordinates into the equation of the line. Describe the result. _____

C. What appears to be true when you substitute the coordinates of a point not on a line into the equation of the line? _____

D. Explain why the point (20, 22) lies on this line but the point (35, 33) does not.



Activity C: The y-intercept	<u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> Select Show Probe. 	
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1. In the Gizmo, plot the points (8, 4) and (6, 2).

- A. What is the equation of the line through these points? _____
- B. Use the equation and complete the table below for each Input (x). Then click the **Table** tab and check your answers.

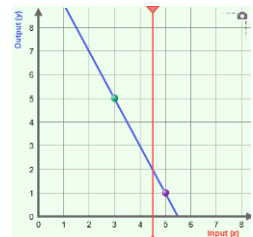
Input (x)	Output (y)
0	
1	
2	
3	
4	
5	

C. What is the relationship between the x- and y-coordinates in the table?

D. Select the **Probe** tab and click **Show Probe**. Drag the probe to 5.5. What is the value of y when $x = 5.5$? _____ Click **Show y-value calculation**. How is the value of y calculated? _____

2. Turn off **Show y-value calculation** and plot (3, 5) and (5, 1).

A. The **y-intercept** is the y-value of the point where the line crosses the y-axis. What is the y-intercept of this line? _____
 Drag the probe to check your answer.



B. The **x-intercept** of a line is the x-value of the point where the line crosses the x-axis. Drag the probe to identify the x-intercept of this line. _____

C. Explain how you can use the equation of a line to calculate its x- and y-intercepts.

