

Conceptual Task: The Town Square

Exploration Questions Sample Responses

- a. What are the characteristics of rectangles?

Students might talk about the 90° angles and opposite sides being the same length or parallel. Students should be prompted to think about how we know two lines make a 90° angle and are perpendicular.

- b. What are some similarities and differences between the four given equations? How might this help someone determine that the park is a rectangle?

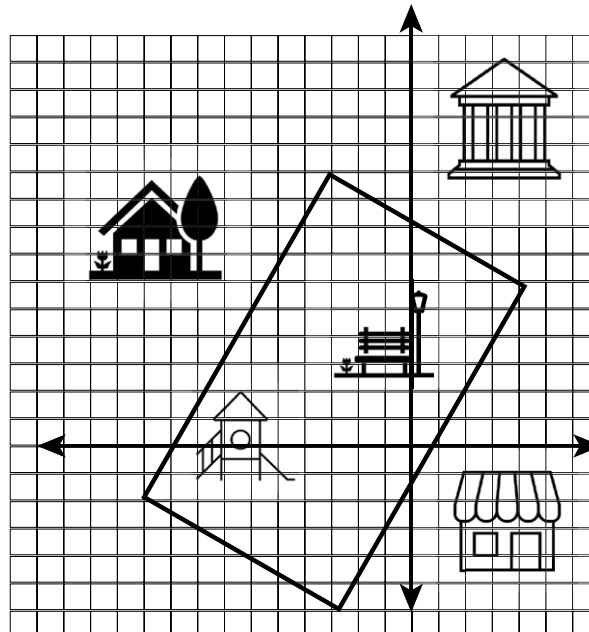
Two equations have the same slope of 2. Two equations have the same slope of $-\frac{1}{2}$.

The equations all have different y -intercepts. The two equations that have the same slope are the parallel lines. To make the 90° angle, the lines must be perpendicular to the parallel lines.

The equations with opposite reciprocal slopes are the perpendicular lines. The equation $y = 2x$ is perpendicular to $y = -\frac{1}{2}x$ and $y = -\frac{1}{2}x + 10$, because the slopes 2 and $-\frac{1}{2}$ are opposite reciprocals. The equation $y = 2x + 15$ is also perpendicular to those equations for the same reason.

- c. Given the following equations, draw in the new roads for the park that includes the playground:

$y = 2x + 18$, $y = 2x - 2$, $y = -\frac{1}{2}x + 8$, and $y = -\frac{1}{2}x - 7$. How do you know that this is still a rectangle?



We know this is still a rectangle because the slopes are still the same. We still have two sets of parallel lines: one set with a slope of 2 and one set with a slope of $-\frac{1}{2}$. There are also still pairs of perpendicular lines using the slopes of 2 and its opposite reciprocal of $-\frac{1}{2}$.

- d. What differences and similarities do you see from the first set of equations for the first rectangle to the second set of equations for the second rectangle?

The equations in the second set have the same slopes as the first set. The difference is that all of the equations have different y -intercepts.

- e. Write a new set of equations that the city planner can use to map out the roads around a new park.

Students can write any set of equations that include two equations with a slope of 2 and two equations with a slope of $-\frac{1}{2}$. They may want to sketch their graphs onto the map to make sure the “roads” do not run through existing buildings.

Students could also rotate the rectangle slightly and come up with different slopes, such as 4 and $-\frac{1}{4}$. Check to make sure that the slopes are still opposite reciprocals.