



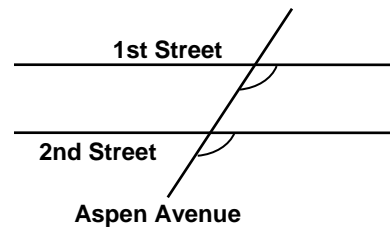
Name: _____ Date: _____

Student Exploration: Constructing Parallel and Perpendicular Lines

Vocabulary: construction, parallel lines, perpendicular lines

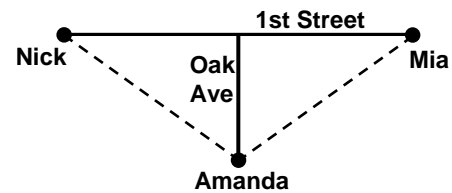
Prior Knowledge Questions (Do these BEFORE using the Gizmo.)

1. Nick is looking at a map of his neighborhood, shown to the right. He wonders if 1st Street and 2nd Street are **parallel** (never intersect).



What must be true about the marked angles if the streets are parallel? _____

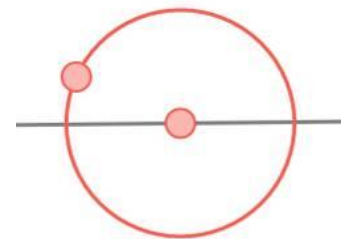
2. Nick notices that 1st Street and Oak Avenue are **perpendicular** (form a right angle). Nick and Mia live on 1st Street, and they both live the same distance from Oak Avenue. Their friend Amanda lives on Oak Avenue.



What is true about the direct routes marked by the dashed lines? _____

Gizmo Warm-up

An important skill in geometry is to complete a **construction** with only a compass and a straightedge. In the *Constructing Parallel and Perpendicular Lines* Gizmo, you will use the properties you reviewed above to construct parallel and perpendicular lines.



To begin, select **Construct a perpendicular line** from the dropdown menu. The circle shown is the Gizmo compass. To use the compass, first drag the center of the circle to any point.

1. Drag the center of the circle to point *N*. What happens to the circle? _____
2. Now drag the point on the circle. What happens to the radius? _____
3. What do you know about the distances from the center of the circle to the two points where the circle intersects the line? _____



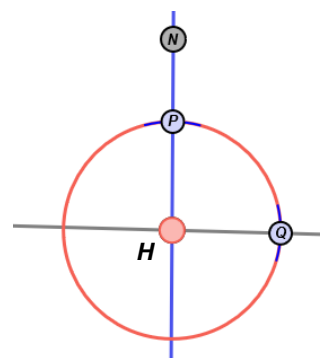
Activity A: Constructing parallel lines	<u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> Select Construct a parallel line. 	
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The Gizmo gives instructions for constructing a line parallel to a given line, through a point not on the given line. Follow the steps given in the Gizmo. After you complete each step, click **Continue** to go on to the next step.

At any time, if you wish to understand the overall strategy for this construction, click **How?** If you need help understanding the purpose of a particular step, click **Why?** If you want to start over on the construction, click **Reset**.

After you finish the Gizmo construction, click **Reset** and do the construction again. If possible, do the construction on a separate piece of paper using a compass and straightedge. Use the Gizmo as your guide to complete each step of the construction. Answer the following questions as you go along.

- At the beginning of step 4, points P and Q appear. What is the relationship of points P and Q to point H ?



- In step 6, why is it important to keep the compass opening the same as it was in step 5?

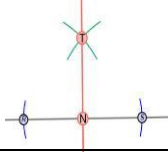
- In step 8, which two lines are parallel? _____

- Which two angles did you construct to be congruent? _____

Select **Show angle measure tool** to open the Gizmo protractors. Attach the “donuts” to points on each angle to check that they are congruent.

- Why do these two congruent angles guarantee that the lines are parallel? _____



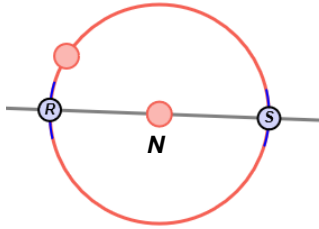
Activity B: Constructing perpendicular lines	<u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> • Turn off the Gizmo protractors. • Select Construct a perpendicular line. 	
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Follow the directions given in the Gizmo to construct a line perpendicular to line L that passes through point N . After you complete each step, click **Continue** to go on.

At any time, if you wish to understand the overall strategy for this construction, click **How?** If you need help understanding the purpose of a particular step, click **Why?** If you want to start over on the construction, click **Reset**.

After you finish the Gizmo construction, click **Reset** and do the construction again. If possible, do the construction on a separate piece of paper using a compass and straightedge. Use the Gizmo as your guide to complete each step of the construction. Answer the following questions as you go along.

1. At the beginning of step 2, points R and S appear in the diagram. What is the relationship of points R and S to point N ?



2. In step 2, place the compass point at R and make the radius very small. Click **Continue**.
- A. What feedback does the Gizmo give you? _____

- B. Why should the radius be greater than the distance between points R and N ?

3. In step 5, which lines are perpendicular? _____ Use the Gizmo protractor to verify.

4. Select **Show ruler** to open the Gizmo rulers. Attach the “donuts” of one ruler to points R and T , and the donuts of the other ruler to points S and T .

- A. What is the relationship between \overline{RT} and \overline{ST} ? _____

- B. How does this relationship guarantee that the lines you constructed are perpendicular? _____
