Investigating the Slopes of Parallel and Perpendicular Lines

Approximate Total Time: 25 minutes

ACTIVITY OVERVIEW:

In this activity we will

- Draw a line
- Draw a line parallel to the original line
- Draw a line perpendicular to the original line
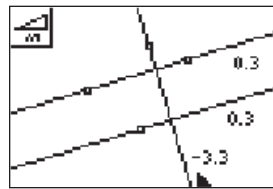- Explore the relationships between the slopes of parallel and perpendicular lines

How are the equations of parallel and perpendicular lines related? The drawing and measurement tools allow us to set the stage for investigation as we explore the slopes of lines.

NCTM Geometry Standards: Analyze characteristics and properties of 2- and 3-dimensional geometric shapes and develop mathematical arguments about geometric relationships. Specify locations and describe spatial relationships using coordinate geometry and other representational systems.
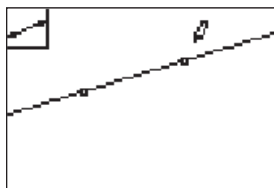
1

Press [APPS]. Move down to the CabriJr APP and press [ENTER]. Press [Y=] for the F1 menu and select **New**. (If asked to **Save changes?** press [◄] [ENTER] to choose "No.")

2

Press [WINDOW] for F2, move to **Line** and press [ENTER]. Move to the desired location and press [ENTER] to mark one point on the line. Move the pencil to the desired location of the other point defining the line and press [ENTER].
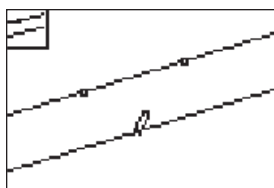
3

Press [ZOOM] for the F3 menu, move **Parallel** and press [ENTER]. Move until the line is flashing and press [ENTER]. Move the pencil to a new location to mark a point through which the parallel line will pass, then press [ENTER].

4

Press [ZOOM] for the F3 menu, move **Perp.** and press [ENTER]. Move until the original line is flashing and press [ENTER]. Move the pencil to a new location to mark a point through which the perpendicular line will pass, then press [ENTER].

5

How are the slopes of these lines related?

Press [GRAPH] for F5 and move to **Measure** then right and down to **Slope**. Press [ENTER]. Move the arrow until one line is flashing and press [ENTER]. Move the measurement to a convenient location then press [CLEAR] to turn off the *hand*. With the **Slope** tool still active, move until another line is flashing and press [ENTER]. Move the measurement to a convenient location then press [CLEAR] to turn off the *hand*. The **Slope** tool is still active so move to the third line is flashing and press [ENTER]. Move this measurement and press [CLEAR] to turn off the *hand*.

6

The parallel lines have the same slopes, but the perpendicular lines do not. To explore the relationship between the slopes of the perpendicular lines, we can find the product of their slopes.
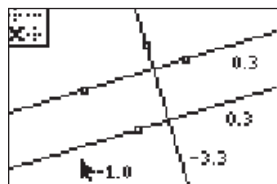
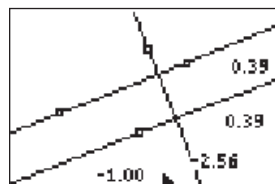Press [GRAPH] for the F5 menu and move to **Calculate** then press [ENTER].

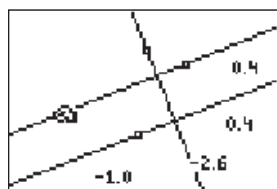# Investigating the Slopes of Parallel and Perpendicular Lines

7

Move until one of the slope values has a flashing underline then press [ENTER]. Move until the slope of a perpendicular line has a flashing underline and press [ENTER]. At this time, both of the slope values should be flashing. Press [×] and the product of these slopes will be displayed. Move this value to a convenient location and press [CLEAR] to turn off the *hand*. Press [CLEAR] again to turn off the **Calculate** tool.

8

Move the pointer to the first point marked on the original line. Press [ALPHA] to activate the *hand* and move the point around the screen. Since the parallel line and the perpendicular line were drawn with respect to the original line, they will both move as you move the point on the original line. Observe the changes in the slopes and in the product. Press [CLEAR] to deactivate the *hand*.

9

When using the **Calculate** tool, rounding errors may occur. To display the values rounded to hundredths, move until the value has a flashing underline and press [+]. Repeat this for the remaining values. (This can also be done when the slope values are originally found by pressing [+] when the *hand* is on the value.)

10

To exit the APP, press [Y=] for the F1 menu. Move to **Quit**, then press [ENTER]. (Or you can press [2nd] [MODE] for [QUIT].)