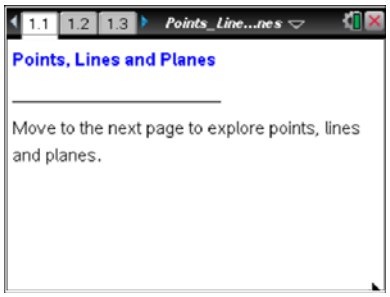
Points, Lines, and Planes
Student Activity

Name _____
Class _____

Open the TI-Nspire document *Points_Lines_and_Planes*.



Points, lines, and planes are the basic components in geometry. In this activity, you will explore relationships among the three components.

Move to page 1.2.

Press ctrl ▶ and ctrl ◀◀ to navigate through the lesson.

The cube is a representation of three dimensions. Although the cube is bounded, planes extend infinitely in all directions.

1. Grab and drag the open circles located on the left side of the screen. What happens when the open circles are moved?

2. A plane is created by three noncollinear points.

   a. Click on three noncollinear points that are connected to each other by solid segments. Identify the plane formed by these three points. Hover over one of the flashing points. Press tab until it says **polygon** and the name of the plane you chose. Press ⬚. The plane will highlight.

   b. Identify a plane that is not a face of the cube.

3. Press esc to unselect the points from the previous problem. Then, click on the segments of plane *ABCD* to make them flash. Rotate the cube until plane *ABCD* looks like a floor of a room and $\overline{AE}$ is vertical.

   a. Identify the planes that form the ceiling and walls of the room.

   b. Which of the planes do you think are parallel? Explain your thinking.

c. Which of the planes do you think are perpendicular? Explain your thinking.

d. Rotate the cube. Are the planes you identified in 3b still parallel? Are the planes you identified in 3c still parallel? Explain your thinking.

4. Press esc to unselect the segments from the previous problem. Then, click on $\overline{FB}$. Click on and identify all of the segments that are parallel to $\overline{FB}$.

5. Is it possible to have two lines that do not intersect and are not parallel? Explain your thinking.

6. Press esc to unselect the segments from the previous problem. Then, click on $\overline{BF}$ and $\overline{CD}$. $\overline{BF}$ and $\overline{CD}$ are skew lines.

   a. What kind of relationship exists between these lines?

   b. Rotate the cube and identify two other segments that are parts of skew lines.

7. Press esc to unselect the segments from the previous problem. Then, click on $\overline{BD}$ and $\overline{HF}$. Identify the relationship between these two segments.

8. Name a segment perpendicular to $\overline{HF}$. Explain your thinking.

Move to page 1.3.

9. Carefully read the question. Select all correct answers to the question. To check your answers, select each question and press **Menu > Check Answer.**

Move to page 2.1. Your teacher will help you investigate the intersection of two planes.

10. Grab the open circles and move the planes to show the intersection of the planes. What can you say about the intersection of any two planes?

Extension:

11. Page 2.2 shows that the intersection of three planes can be a point. Grab and move the open points to show that the planes rotate in space, but the intersection of any two planes is a line. The three lines that are formed by the intersection of these planes intersect at one point. Grab and move the open points to show that the intersection of three planes can be a point.

12. Page 2.3 shows that the intersection of three planes can also be a line. Grab and move the open points to show that the planes rotate in space, but the intersection of any two planes is a line. Then show that the intersection of three planes can be a line.