

EXPLORATION 8.9 Definitions and Language

This exploration is designed to help you see definitions from a different perspective. Follow this process for each term you are asked to define. Additional steps are given for specific terms.

Step 1: Write your “first draft” definition, in your own words, of this term.

Step 2: With your partner(s):

- One person reads his or her definition.
- The other persons first comment on validity; that is, do they think the definition is valid? If not, discuss the definition until all members agree that the definition is valid or invalid. If all agree that it is invalid, then discuss how to change it to make it valid.
- The other persons now comment on clarity; that is, are there aspects of the definition that are not clear or are ambiguous? Discuss those aspects of the person’s definition. Work together to rewrite words or phrases that are ambiguous or not clear.
- Move to the second person and repeat the process.

Step 3: Class discussion

Step 4: What did you learn about this term and/or what did you learn about the process of defining terms?

- Do Steps 1–4 for the term *perpendicular*.
- Do Steps 1–4 for the term *angle*.

Now read the article “The Role of Definition” in *Mathematics Teaching in the Middle School*, April 2000, pp. 506–511. See the many different ways in which the children thought about angle. What did you learn from reading the article?

- Do Steps 1–4 for the term *adjacent angle*.

Now look at the definition of this term in the textbook. Does it make sense? If it was different from yours, why do you think I (the author) chose that definition?

- Do Steps 1–4 for the term *diagonal*.
- Do Steps 1–4 for the term *quadrilateral*.
- Do Steps 1–4 for the term *polygon*.

Step 5: What is wrong with the following definition: A polygon is a geometric figure with a certain number of sides. Can you make a counterexample that fits the definition but is not a polygon?

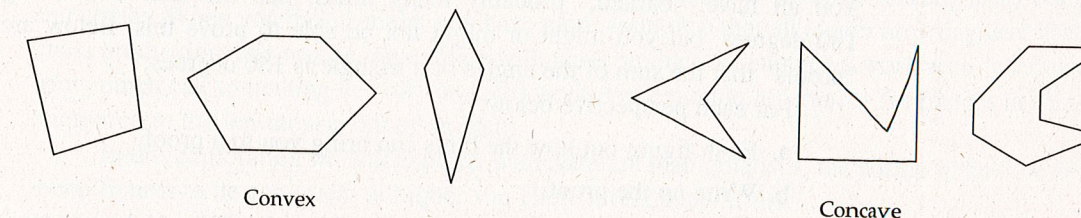
Step 6: Here are several other definitions. Discuss the definitions. What do they all have in common? Which one do you like best? Why?

Polygon: the union of several line segments that are joined together so as to completely enclose an area.

Polygon: a closed plane figure with n sides.

Polygon: plane closed figure whose sides are straight lines.

- Below are several examples of concave and convex polygons. Look and see what it is that all convex figures have in common and what it is that all concave figures have in common. I will tell you ahead of time that there is not one “right” way. Now do Steps 1–4 for the term *convex*.



Step 5: Give your definition to a roommate or friend who is not taking this course. Ask him or her to tell you what *convex* and *concave* mean. Ask for feedback.

Step 6: What if we didn’t limit ourselves to polygons but included simple, closed curves where not all the sides were line segments (for example, curves, ellipses, and figures like the one at the right). Would all of the definitions of convex apply to non-polygons or would some apply better than others?



- Consider the term *corner*. How many corners does a cube have? Defining *corner* was not originally in this exploration because mathematical dictionaries don’t define *corner*. Then I read an article called “What Makes a Corner a Corner?” in *Teaching Children Mathematics*, September 1998, pp. 6–9. The teacher didn’t realize that *corner* is not a mathematically defined word, and then she realized that her students were becoming confused. However, she stayed with their thinking and some neat things came from the quest.

Do Steps 1–4 for the term *corner*.

Step 5: How is *corner* related to the mathematical terms *vertex*, *edge*, and *face*?

Step 6: Read the article. What did you learn from reading the article?

- Do Steps 1–4 for the term *cylinder*.