

TITLE OF LESSON

Geometry Unit 1 Lesson 8 – Proofs, Part 3

Prove it! What's on the outside? What's on the inside? Of Geometry

TIME ESTIMATE FOR THIS LESSON

One class period

ALIGNMENT WITH STANDARDS

California – Geometry

1.0 Students demonstrate understanding by identifying and giving examples of undefined terms, axioms, theorems, and inductive and deductive reasoning.

2.0 Students write geometric proofs, including proofs by contradiction.

3.0 Students construct and judge the validity of a logical argument and give counterexamples to disprove a statement.

MATERIALS

Learning Styles – Student Page

Pens

Paper

Markers, colored pencils

Rulers

LESSON OBJECTIVES

- To further develop the idea of a proof
 - To further develop the process of formalizing the idea of a proof
 - To further develop an understanding of the idea of truth
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EXPLANATION OF LESSON

Day 3 of proofs: This lesson provides further development of the ideas presented in lessons 6 and 7.

Prepare strips of paper, one with each of the sentences from the activity (# 3 in Activities below). These should be large enough strips of paper that all members of a group can read and work together with all of them. You should have one full set of all 15 statements for each group you'll have in class.

Also, on a large, postable piece of paper, write the 7 learning styles.

FOCUS AND MOTIVATE STUDENTS

- 1) Homework Check – Stamp/initial complete homework assignment. Pass back graded work and have students place in the appropriate sections of their binders.
 - 2) **Agenda** – Have students copy the agenda.
 - 3) Present Homework – (7 minutes) Have students present their ideas for a demonstration of something that can be proved. Choose one of the better ones (one that requires some type of math to prove on the board) and actually go through the exercise with the class. Keep reinforcing the idea that we are presenting ways to prove something.
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ACTIVITIES – INDIVIDUAL AND GROUP

1. Discussion: Syllogisms and Negatives – (8 minutes) Lead a discussion on the following topic. What happens if we have a syllogism that has negatives in it?

What would be the conclusion if we had the major premise “no men can run faster than a horse” and a minor premise of “Bob is a man”? Answer: “Bob cannot run faster than a horse.”

What would be the conclusion if we had the major premise “no horses can drive cars” and a minor premise of “Secretariat is a Horse”? Answer: “Secretariat cannot drive a car”

What would be the conclusion if we had the major premise “all are a set of points containing at least two points” and the minor premise “Set A contains 1 point” Answer: “Set A is not a line”

What can we say about the syllogism in which the major premise is “All people from Oakland are smart” and a minor premise of “Sue is from San Francisco”? Can we make a conclusion from this set of statements?

(Answer: No) Why or why not? (Answer: We cannot conclude anything about the intelligence of Sue. We only know that all people from Oakland are smart. We know nothing about people from San Francisco.)

What about a syllogism that uses the word *some*? For instance, the major premise is “Some people from Oakland are women” and the minor premise is “Bill is from Oakland” Can we conclude anything from this? (Answer: Yes. Bill *might* be a woman, but does not *have* to be.)

2. Demonstration: Representation – (10 minutes) Draw 3 concentric circles on the board. In the inside circle write *Poodles*. In the middle circle write *Dogs* and in the outer circle write *Things with four legs*. Explain how we can represent our first syllogism with this construction. Repeat the syllogisms from the first day on proofs and ask for volunteers to draw the same type of circles on the board. Ask: “How would you draw the two statements, ‘All people who go to this school live in Oakland’, and ‘All the people in the school bus I saw this morning live in San Francisco.’” The idea is to draw two different non-intersecting circles. How would we represent the idea of *some* with circles? (Answer: Intersecting circles that don’t completely overlap). Show how these can be represented.
3. Group Work: Ordering Syllogisms – (5 minutes) Divide students into groups of three or four. Once they are in their groups, give them a set of strips of paper with each of the following statements written on one of the strips. In other words, each group should get 15 strips of paper. The first for each group should read, “Men are from Mars.” The second should read, “All beings from Venus have names that begin with P.” And so on. Without giving them group roles or giving them too much direction, ask them to take 3 minutes to put the strips into 5 different syllogisms with 3 parts each. These syllogisms don’t have to follow exactly the same format as others they’ve done, but all students in the group should agree on the syllogisms when they finish.
 - a. Men are from Mars
 - b. All beings from Venus have names that begin with P
 - c. Women are from Venus
 - d. Being number 2 is named Andrea
 - e. Cats are from Mercury
 - f. Being number 3 is named Deraxx
 - g. All beings from Mars have names with a K in them
 - h. Being number 4 is named Peter
 - i. All beings from Pluto have names which are four letters long
 - j. All beings from Mercury have names that end in a vowel
 - k. All beings from Neptune have names that have 2 X’s in them
 - l. Being number 1 is named Bert
 - m. Dogs are from Pluto
 - n. Elephants are from Neptune
 - o. Being number 5 is named Kathy
4. Process – (10 minutes) After 3 minutes or so, ask all students to take a couple of minutes to write down the process they went through to arrive at their answers. They should consider both what they did and how they were thinking and what their group did and how they reasoned together as a group.

5. Group Share – Have groups share their responses and check to see if they all came up with the same syllogisms. They can discuss in their groups and make changes if they'd like.
 6. Learning Styles Discussion – (10 minutes) Now, take as much time as you can to review how the students saw their processes. Ask each student to walk through the process—either by reading what she has written down or by explaining it to the class. As they're talking, you should be listening for indications of learning styles. Some students will talk specifically about trying to make sense out of what the statements say (linguistic learners), some may immediately match up the planets in at least two of the strips of paper in each set (mathematical/logical), others may not even read the strips but look at the shapes (“The *All beings from...* is longer, so it should probably go in the same position in each syllogism.”) (spatial learners), and so on. After students finish, post the **Learning Styles**. Using what students have said about how they went through the process, have each identify where she thinks her strongest learning style is. Also, pay attention to how students interacted and how they describe their interaction. Students who take the lead—because they were outgoing—may think of themselves as interpersonal even though they never listened to or heard anything any of their group members said. Shy students may say they're intrapersonal, but don't let them skirt the issue this way. Some shy students are interpersonal as their strongest learning style. Many have a clear learning style that the group may not have recognized yet because the student is shy. Talk through the process with each student and have them share their ideas too.
 7. Homework Review – Explain the homework assignment. Field questions.
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HOMEWORK

Each student should write out 10 syllogisms and put them in the standard order of major premise, minor premise and conclusion and then rewrite them as:

I assert that “conclusion”

Proof: “Major Premise”

“Minor Premise”

GROUP ROLES

None

DOCUMENTATION FOR PORTFOLIO

None

TARGET VOCABULARY

Proof – 1. Demonstration; a process that establishes (provides from evidence or complete JUSTIFICATION for) a truth or a fact. 2. In logic; the series of arguments based on the rules of INFERENCE based on the rules of the logic that derive the conclusion from the premises.

Justify* – To demonstrate or prove to be just, right, or valid.

Inference – Reasoning from factual knowledge or evidence; deriving logical conclusions from premises known or assumed to be true.

Truth – The quality of being true or correct according to some ground or test for establishing the reality of a statement (proposition, idea, thought, statement, assertion, theory or opinion).

Form of Proof:

Prove: Statement (assertion)

Given: Statement(s) (facts)

Proof: (argument)

Statement – Reason

Statement – Reason

Statement – Reason

Prove It
How do we create truth?

2:1:8:Proofs, Part 3

Form of a syllogism:
Major premise
Minor premise
Conclusion

* Definitions from The American Heritage Dictionary

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