Lesson 11: Conditions on Measurements that Determine a Triangle

Classwork

Exploratory Challenge 1

1. Can any three side lengths form a triangle? Why or why not?
2. Draw a triangle according to these instructions:

* Draw segment of length cm in your notebook.
* Draw segment of length cm on one piece of patty paper.
* Draw segment of length cm on the other piece of patty paper.
* Line up the appropriate endpoint on each piece of patty paper with the matching endpoint on .
* Use your pencil point to hold each patty paper in place, and adjust the paper to form .

1. What do you notice?
2. What must be true about the sum of the lengths of and if the two segments were to just meet? Use your patty paper to verify your answer.
3. Based on your conclusion for part (c), what if cm as you originally had, but cm in length. Could you form ?
4. What must be true about the sum of the lengths of and if the two segments were to meet and form a triangle?

Exercise 1

Two sides of have lengths of cm and cm. What are all the possible whole-number lengths for the remaining side?

Exploratory Challenge 2

1. Which of the following conditions determine a triangle? Follow the instructions to try and draw . Segment has been drawn for you as a starting point in each case.
2. Choose measurements of and for so that the sum of measurements is greater than . Label your diagram.

Your chosen angle measurements:

Were you able to form a triangle? Why or why not?



1. Choose measurements of and for so that the measurement of is supplementary to the measurement of . Label your diagram.

Your chosen angle measurements:

Were you able to form a triangle? Why or why not?



1. Choose measurements of and for so that the sum of measurements is less than . Label your diagram.

Your chosen angle measurements:

Were you able to form a triangle? Why or why not?



1. Which condition must be true regarding angle measurements in order to determine a triangle?
2. Measure and label the formed triangle in part (b) with all three side lengths and the angle measurement for . Now, use a protractor, ruler, and compass to draw with the same angle measurements, but side lengths that are half as long.
3. Do the three angle measurements of a triangle determine a unique triangle? Why or why not?

Exercise 2

Which of the following sets of angle measurements determines a triangle?

1. ,
2. ,
3. ,
4. ,

1. ,

Choose one example from above that does determine a triangle and one that does not. For each, explain why it does or does not determine a triangle using words and a diagram.

Problem Set

1. Decide whether each set of three given lengths determines a triangle. For any set of lengths that does determine a triangle, use a ruler and compass to draw the triangle. Label all side lengths. For sets of lengths that do not determine a triangle, write “Does not determine a triangle,” and justify your response.
2. cm, cm, cm
3. cm, cm, cm
4. cm, cm, cm
5. cm, cm, cm
6. cm, cm, cm
7. cm, cm, cm
8. For each angle measurement below, provide one angle measurement that will determine a triangle and one that will not determine a triangle. Provide a brief justification for the angle measurements that will not form a triangle. Assume that the angles are being drawn to a horizontal segment ; describe the position of the non-horizontal rays of angles and .

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| --- | --- | --- | --- |
|  | : A Measurement that Determines a Triangle | : A Measurement that Doesn’t Determine a Triangle | Justification for No Triangle |
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1. For the given side lengths, provide the minimum and maximum whole-number side lengths that determine a triangle.

|  |  |  |
| --- | --- | --- |
| Given Side Lengths | Minimum Whole Number Third Side Length | Maximum Whole Number Third Side Length |
| cm, cm |  |  |
| cm, cm |  |  |
| cm, cm |  |  |
| cm, cm |  |  |