

Lesson 25

Construct Triangles Using Both Side Lengths and Angle Measures

Essential Question: Given two side lengths and one angle measure, or two angle measures and one side length, can you construct *exactly one triangle, more than one triangle, or no triangle?*

7.G.2

Guided Instruction

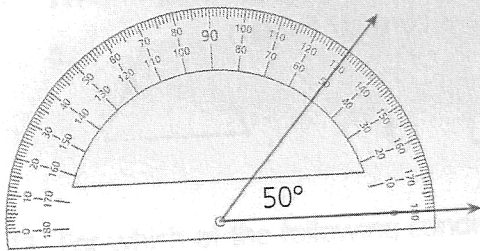
In this lesson, you will learn how to tell if two side lengths and one angle measure, or two angle measures and one side length, can be used to draw *exactly one triangle, more than one triangle, or no triangle.*

Understand: Drawing a triangle when given two side lengths and the measure of the angle between them

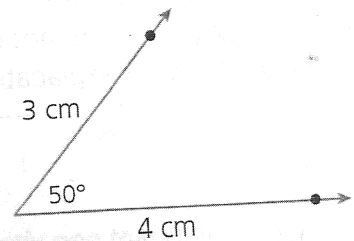
Can Selina draw a triangle with a 4 cm side, a 3 cm side, and a 50° angle between those two sides? Can she draw *more than one triangle*?

Selena follows these steps to draw a triangle.

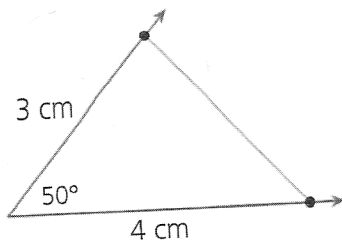
Selena uses a protractor to draw a 50° angle.



She uses a ruler to mark end points of the two sides so that one side is 4 cm long and the other side is 3 cm long.



Selena connects the two endpoints to draw the third side of the triangle.



This is the only triangle that Selena can draw. If she draws a triangle that looks different, she can turn it and/or flip it so that it exactly fits onto this triangle.

Property of Triangles: Any time you are given 2 side lengths and the measure of the angle (less than 180°) between them, you can draw *exactly one triangle.*

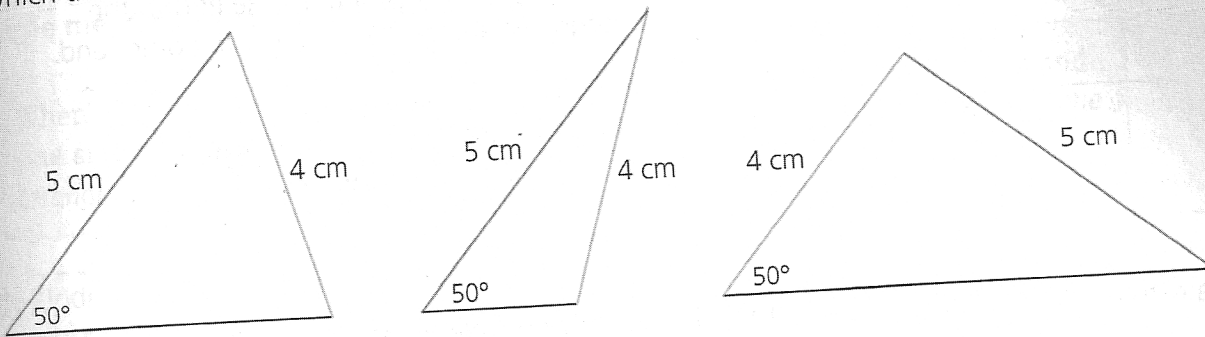
➡ Selena can draw exactly one triangle, not more than one triangle.

➡ Use a protractor and a ruler. Draw a triangle that has sides 3 cm and 4 cm and a 50° angle between them. Did you or anyone in your class draw a triangle that is different from Selena's?

Understand: Drawing a triangle when given two side lengths and the measure of an angle not between them

Can Selina draw a triangle with a 4 cm side, a 5 cm side, and a 50° angle that is *not* between those two sides? Can she draw more than one triangle?

Selena draws a 50° angle. She finds that she can draw three different triangles in which the 50° angle is not between the 4 cm side and the 5 cm side.

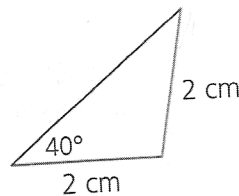


► Selena can draw more than one triangle.

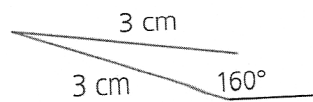
For the particular conditions above, Selena can draw more than one triangle. However, this is *not* the case for any two given side lengths and an angle not between them. **You cannot generalize in this case. You have to try different options for each set of measurements you may be given.**

Here are two examples:

For side lengths 2 cm, 2 cm, and a 40° angle not between them, exactly one triangle can be drawn.



For side lengths 3 cm, 3 cm, and a 160° angle not between them, no triangle can be drawn.



Property of Triangles: If given two sides that do not make up the given angle, *sometimes no triangle, sometimes exactly one triangle, and sometimes more than one triangle* can be constructed.

► Use a protractor and a ruler or technology software to draw a triangle that has two sides 4 cm and 5 cm and a 50° angle *not* between them. Did you or any of your classmates draw a triangle that is different from the three triangles Selena drew?