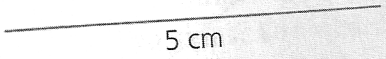
Guided Instruction

Understand: Drawing a triangle when given two angle measures and the length of one side

Can Selina draw a triangle with a 30° angle, a 110° angle, and a 5 cm side that is between the two angles? Can she draw *more than one triangle*?

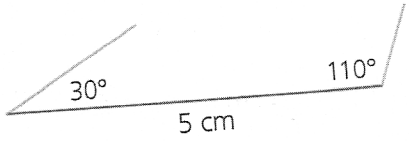
Step 1

Selena draws the 5 cm segment.



Step 2

She draws a 30° angle at one end of the segment and a 110° angle at the other end.

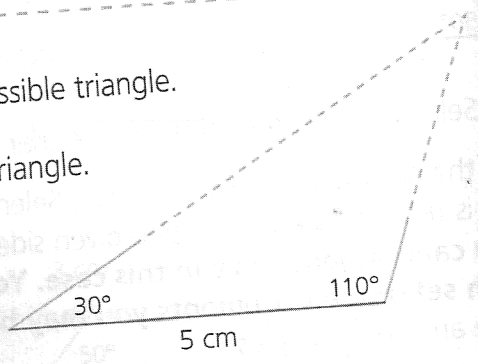


Step 3

Selena extends the sides of each angle to make the only possible triangle.

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

This is the only triangle that Selena can draw.

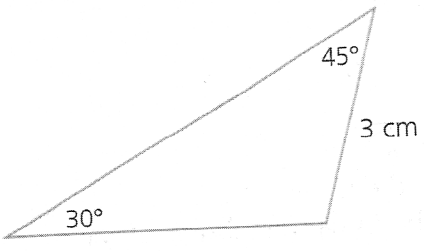


Property of Triangles: Any time you are given 2 angle measures (sum less than 180°) and the measure of the side between them, you can draw *exactly one triangle*.

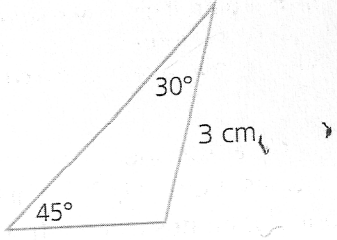
Can Selina draw a triangle with a 30° angle, a 45° angle and a 3 cm side that is *not* between the two given angles? Can she draw *more than one triangle*?

Selena uses a ruler and a protractor to explore different options and she finds that she can draw two different triangles.

She can draw *exactly one triangle* that has the 3 cm side opposite the 30° angle.



She can draw *exactly one triangle* that has the 3 cm side opposite the 45° angle.



Selena can draw *more than one triangle*: *exactly one triangle* with the given side opposite the 30° angle and *exactly one triangle* with the given side opposite the 45° angle.

Property of Triangles: If the two given angle measures are different (sum less than 180°), you can always draw two different triangles. If the two given angles have the same measure (sum less than 180°), you can only draw one triangle.

Connect: Constructing triangles when given two side lengths and one angle measure or two angle measures and one side length

When given two side lengths and one angle measure or two angle measures and one side length, how can you predict whether *exactly one triangle*, *more than one triangle*, or *no triangle* can be constructed?

Under certain conditions, you can make general statements about constructing triangles.

The examples on pages 220 and 221 illustrate these four **Properties of Triangles:**

Given two side lengths and one angle measure (less than 180°):

1. If the two given sides make up the given angle, *exactly one triangle* can be constructed.
2. If the two given sides do not make up the given angle, *sometimes exactly one triangle*, *sometimes more than one triangle, and sometimes no triangle* can be constructed.

Given two angle measures (sum less than 180°) and one side length:

3. If the side given is between the two given angles, *exactly one triangle* can be constructed.
4. If the side given is not between the two angles there will be exactly two triangles: *exactly one triangle* in which the given side is opposite the larger angle and *exactly one triangle* in which the given side is opposite the smaller angle. (If the given angles have the same measure, there will be exactly one triangle.)

Use a ruler and a protractor, or technology software. Draw a triangle with sides 3 cm and 6 cm and a 120° angle that is not between the given sides. Predict whether all of your classmates will draw the same triangle. Check your prediction.