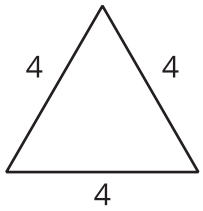
Big Angles, Long Sides. Small Angles, Short Sides.

Let's make some more observations about the angles in a triangle.

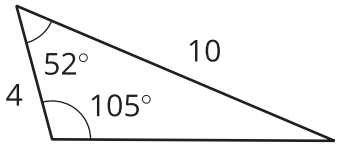
4.1 Which Three Go Together: Tri-"angles"

Which three go together? Why do they go together?

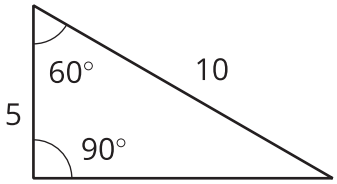
A



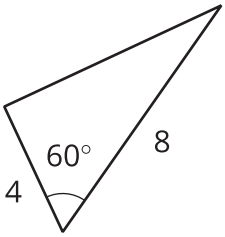
B



C



D



4.2 Let's Include Angles

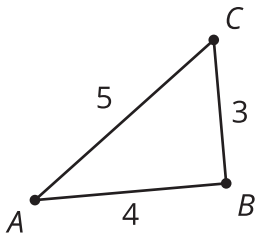
1. Complete the table for 5 different triangles in which AC and BC are fixed lengths. Include triangles in which angle C (the angle between sides AC and BC) is acute, obtuse, and right.

length AC	length BC	length AB	angle C (the angle between sides AC and BC)

2. What do you notice about the relationship between the length of AB and the measure of angle C?

4.3 A Few More Triangles

1. Is this triangle a right triangle? Explain or show your reasoning.



2. Triangle DEF is constructed so that $DE = 4$, $EF = 3$, and $DF = 6$. What do you notice about the relationship between the sides and angles in triangle DEF? Explain or show your reasoning.

3. Triangle LMN is constructed so that $LM = 4$, $MN = 3$, and $LN = 2$. What do you notice about the relationship between the sides and angles in triangle LMN? Explain or show your reasoning.

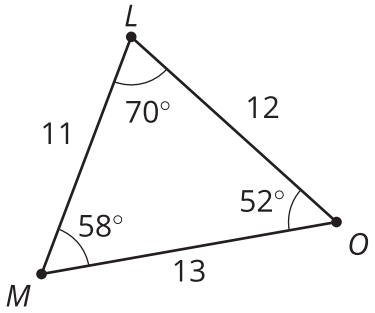
Are you ready for more?

Given a triangle with sides of length a, b, and c, what can you conclude about the angle across from the side of length c if the following relationships hold between the side lengths?

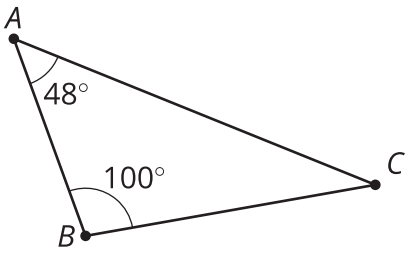
1. $c^2 = a^2 + b^2$
2. $c^2 < a^2 + b^2$
3. $c^2 > a^2 + b^2$

Lesson 4 Summary

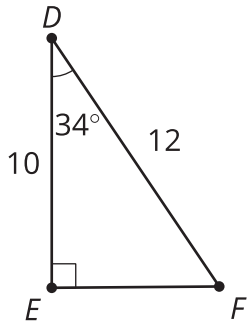
In a triangle, larger angles are always opposite, or across from, longer sides. In triangle LMO, the largest angle is L and it is opposite the longest side MO. Similarly, the smallest angle, O, is opposite the shortest side, LM. The converse is also true—longer sides are opposite larger angles. Since angle L is the largest angle, we know side MO is the longest.



In triangle ABC, which side is the shortest? Using the Triangle Angle Sum Theorem, we find angle C is 32 degrees, so side AB must be the shortest side in the triangle.



In right triangles, we have additional methods to help us figure out information about the angles and sides. You may have learned in an earlier grade that the hypotenuse of a right triangle is always the longest side. Now we can say that the hypotenuse is the longest side in a right triangle because it is opposite the right angle, which is always the biggest angle in a right triangle.



In triangle DEF, which side is shorter: DE or EF?

Method 1

Using Pythagorean Theorem, we can solve for EF.

$$\begin{aligned} 10^2 + EF^2 &= 12^2 \\ EF^2 &= 12^2 - 10^2 \\ EF^2 &= 44 \\ EF &= \sqrt{44} \approx 6.6 \end{aligned}$$

This method is helpful if you need to know the length of EF and you have a right triangle.

Method 2

Using the Triangle Angle Sum Theorem, we know the measure of angle F is 56 degrees.

Since angle D is the smallest angle, the shortest side must be EF.

This method doesn't give us the length of EF, but it does answer the question of which side in the triangle is shortest.