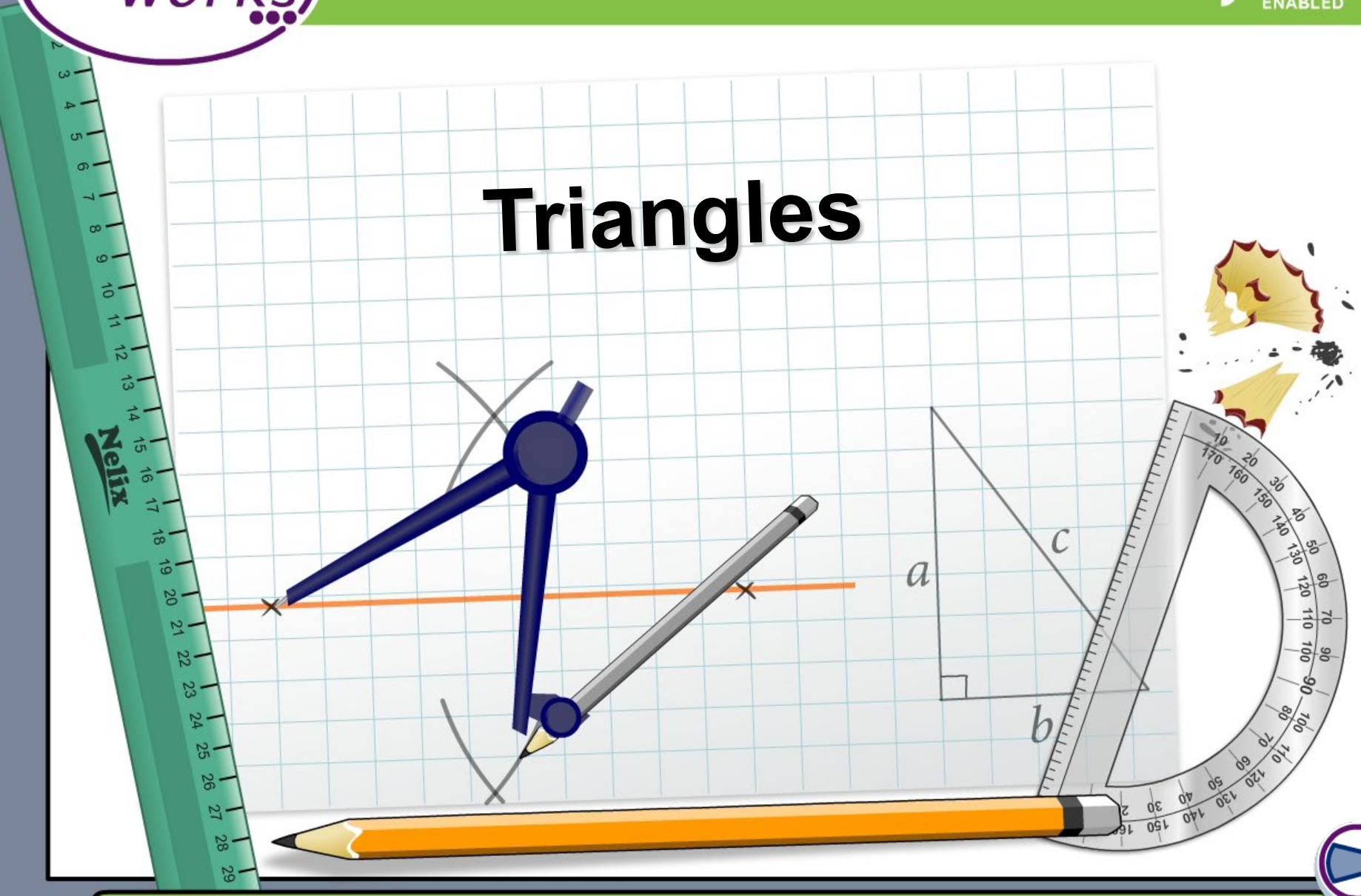
Triangles



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Information

Common core icons

This icon indicates a slide where the Standards for Mathematical Practice are being developed. Details of these are given in the Notes field.

Slides containing examples of mathematical modeling are marked with this stamp.

This icon indicates an opportunity for discussion or group work.

The **Standards for Mathematical Practice** outlined in the Common Core State Standards for Mathematics describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

These are:

1) Make sense of problems and persevere in solving them.

2) Reason abstractly and quantitatively.

3) Construct viable arguments and critique the reasoning of others.

4) Model with mathematics.

5) Use appropriate tools strategically.

6) Attend to precision.

7) Look for and make use of structure.

8) Look for and express regularity in repeated reasoning.

This icon indicates that the slide contains activities created in Flash. These activities are not editable.

This icon indicates teacher's notes in the Notes field.

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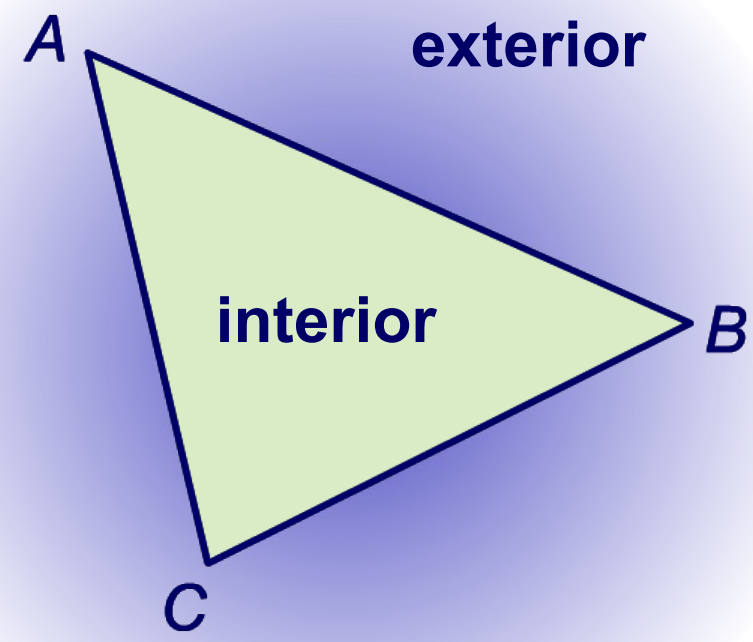
Triangles

A **triangle** is a polygon made up of three connected line segments that form a closed figure.



Triangles are named using the triangle symbol, $\triangle$, and its **vertices**, e.g., $\triangle ABC$.

$\overline{AB}$, $\overline{BC}$ and $\overline{AC}$ are the line segments that make up the triangle.

The interior is the set of points inside the triangle.

The exterior is the set of points outside the triangle.

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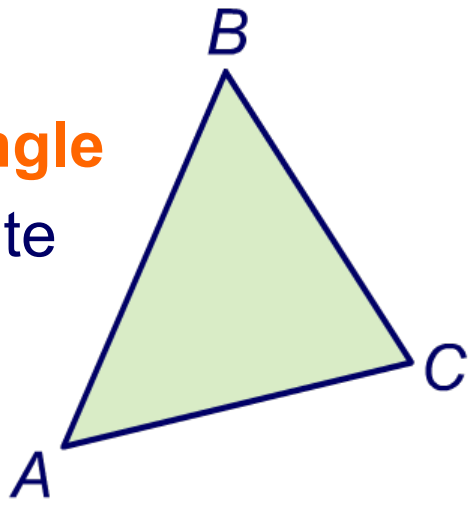
Classifying triangles by angle

What is special about the angles in each of the triangles?

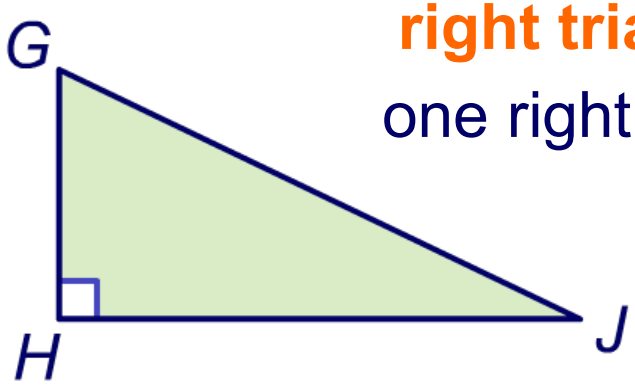
acute triangle

three acute angles



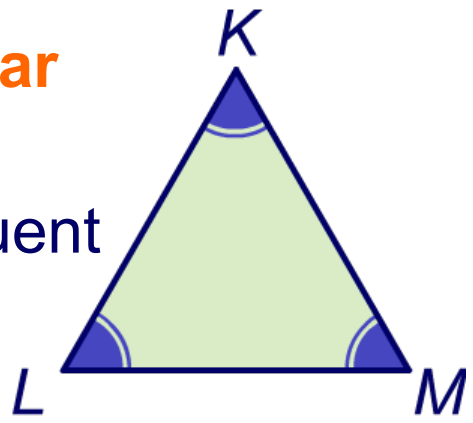
right triangle

one right angle



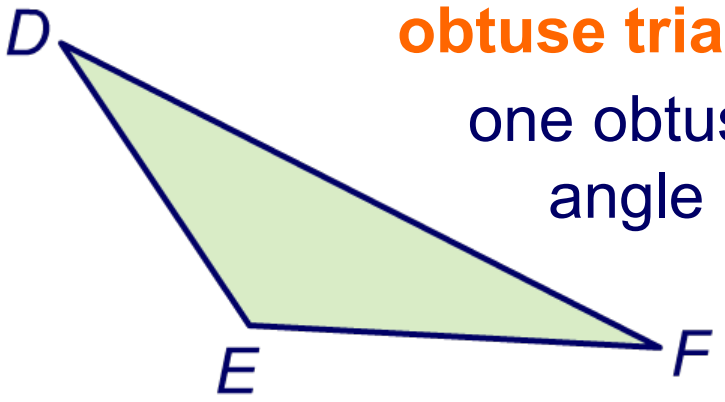
equiangular triangle

three congruent angles



obtuse triangle

one obtuse angle



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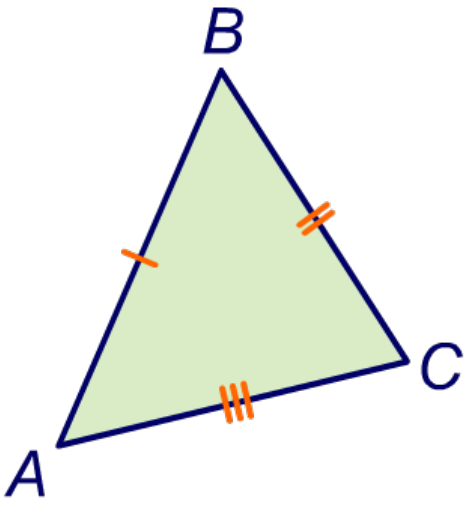
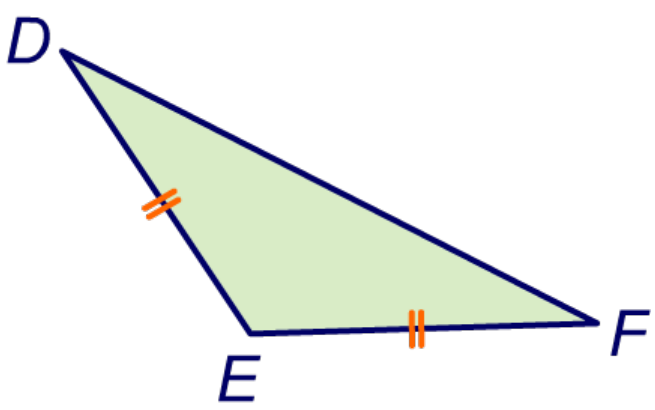
Classifying triangles by side length

What is special about the sides of each triangle?



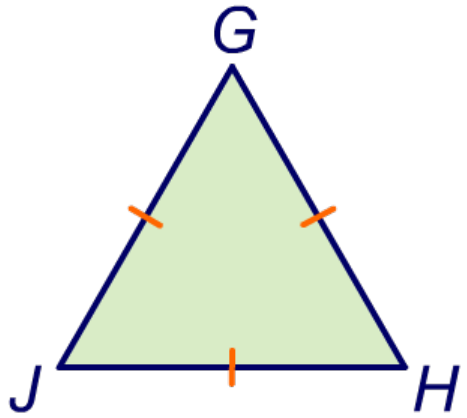
scalene triangle

no congruent sides



isosceles triangle

two congruent sides



equilateral triangle

three congruent sides

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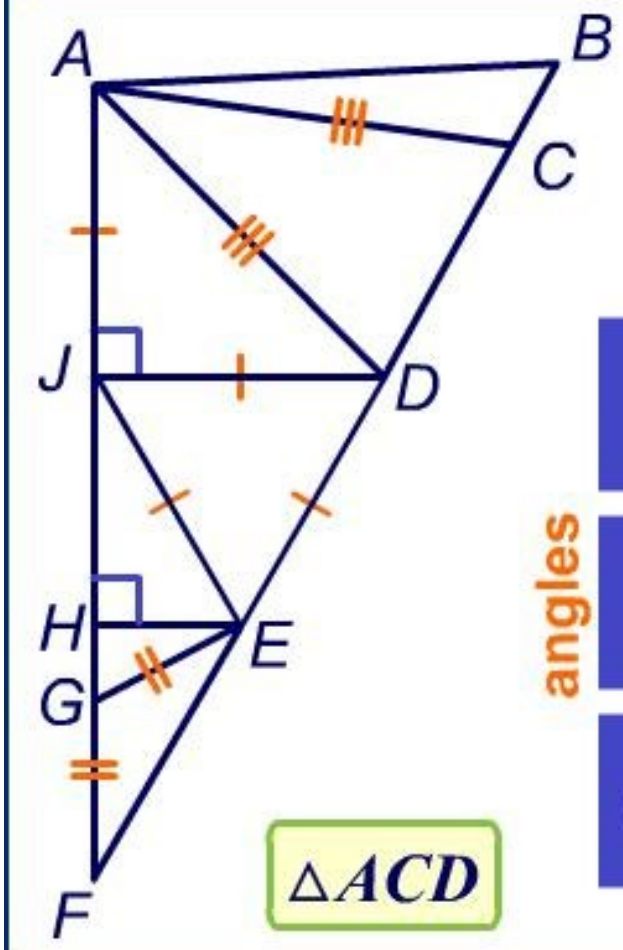
Classifying triangles



Classify the triangles in the figure

angles \ sides	scalene	isosceles	equilateral
acute			
right			
obtuse			

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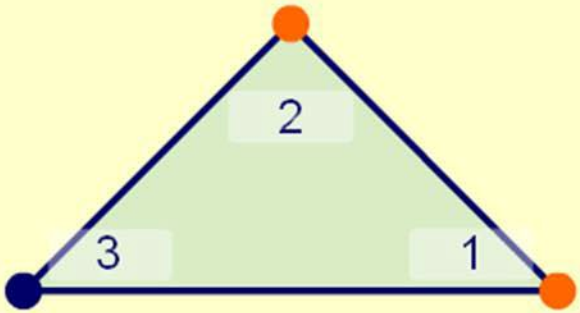
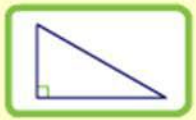
Angle relationships in triangles

How are the angles in a triangle related?





Drag the vertices of the triangle to explore the relationship between angles.

show measures

show relation

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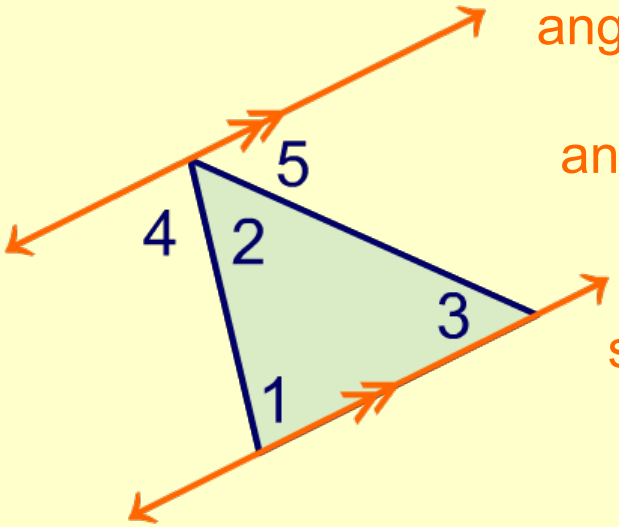
Triangle sum theorem

Triangle sum theorem: all three angle measures in a triangle add up to 180°.

$$m\angle 1 + m\angle 2 + m\angle 3 = 180°$$

Prove the triangle sum theorem.



alternate interior angle theorem: $m\angle 1 = m\angle 4$ and $m\angle 3 = m\angle 5$

angle addition postulate: $m\angle 4 + m\angle 2 + m\angle 5 = 180°$ angles along a line sum to 180°

substituting: since $m\angle 1 = m\angle 4$ and $m\angle 3 = m\angle 5$

$m\angle 1 + m\angle 2 + m\angle 3 = \mathbf{180°}$ ✓

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Using the triangle sum theorem

What are the angle measures in an equiangular triangle?

The measures of the angles in a triangle add up to 180°.
An equiangular triangle has three congruent angles.

equiangular triangle: $x° = m\angle A = m\angle B = m\angle C$

triangle sum theorem: $m\angle A + m\angle B + m\angle C = 180°$

substituting: $x° + x° + x° = 3x° = 180°$

solving: $x° = 180° \div 3 = \mathbf{60°}$

What is the sum of the measures on the non-right angles in a right triangle?

triangle sum theorem: $m\angle A + m\angle B + m\angle C = 180°$

substituting: $m\angle A + m\angle B + 90° = 180°$

solving: $m\angle A + m\angle B = 180° - 90° = \mathbf{90°}$

They are **complementary angles**.

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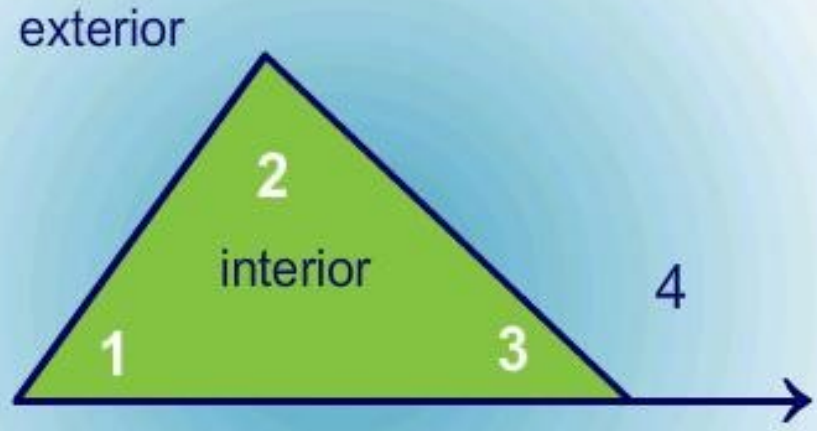
Exterior angle theorem

The exterior angle theorem



interior angle

exterior angle

remote interior angles

exterior angle theorem

Press on the terms above to learn their definitons, then press on the ***exterior angle theorem*** to learn more.

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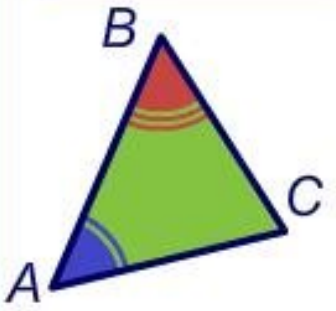
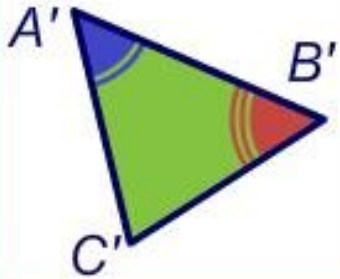
Third angles theorem

Complete the paragraph proof of the third angles theorem

Third angles theorem: If two angles of a triangles are congruent to two angles of a different triangle, then the third pair of angles is congruent.





It is given that two angle pairs are congruent. $\angle A$ is congruent to $\angle A'$ and $\angle B$ is congruent to angle $\angle B'$.

By the definition of congruence:

$m\angle A = m\angle A'$ and $m\angle B = m\angle B'$

By the triangle sum theorem:

$m\angle A + m\angle B + m\angle C = 180°$ and

$m\angle A' + m\angle B' + m\angle C' = 180°$.

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