

Grade 8 - Angles in Triangles and Parallel Lines - Lesson

Common Core 8.G.A.5 · maths-pdf.fr/en/

The interior angles of a triangle add up to 180 degrees, and an exterior angle equals the sum of the two remote interior angles. When a transversal crosses parallel lines, corresponding angles and alternate interior angles are equal, and co-interior angles add to 180 degrees. Two triangles with two equal angles are similar.

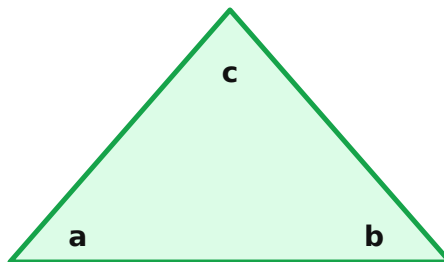
Grade 8 · Common Core State Standards: **8.G.A.5**

Key facts

- Angles of a triangle: $a + b + c = 180^\circ$.
- Exterior angle = sum of the two remote interior angles.
- Parallel lines: corresponding and alternate interior angles are equal.
- Co-interior angles add to 180° ; vertical angles are equal.
- Two equal angles are enough to show two triangles are similar (AA).

What is the angle sum of a triangle?

The three interior angles of any triangle add up to 180° . To see why, draw a line through one vertex parallel to the opposite side. The alternate interior angles are equal, and the three angles along the straight line add up to 180° .

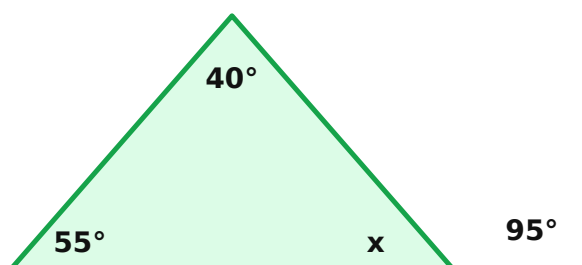


$a + b + c = 180^\circ$. Not drawn to scale.

Exterior angle theorem

An **exterior angle** of a triangle equals the sum of the two **remote interior angles**. It is

also supplementary to its adjacent interior angle.

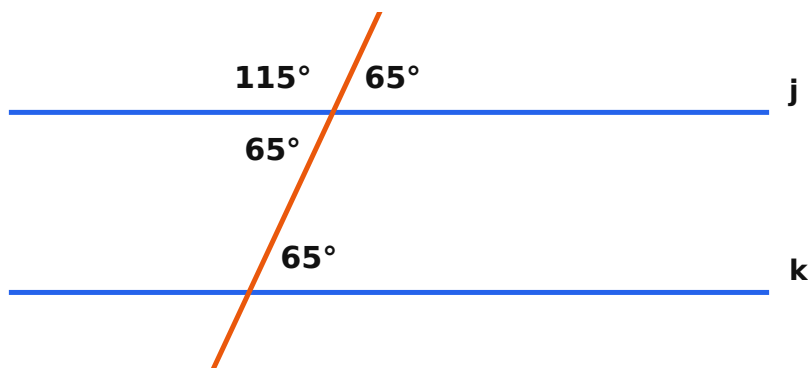


The exterior angle at B is $55^\circ + 40^\circ = 95^\circ$. Not drawn to scale.

Here the third angle is $180 - 55 - 40 = 85$, and the exterior angle is $180 - 85 = 95$, which matches $55 + 40$.

What happens when a transversal crosses parallel lines?

A transversal is a line that crosses two others. When the two lines are parallel, special pairs of angles are equal or supplementary.



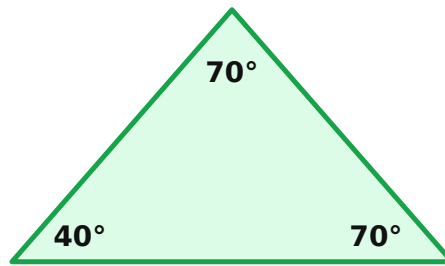
Corresponding angles are equal: 65° and 65° .

Angle pair	Relationship	Example
Corresponding	Equal	65° and 65°
Alternate interior	Equal	65° and 65°
Co-interior (same side)	Add to 180°	65° and 115°
Vertical	Equal	65° and 65°
Linear pair	Add to 180°	65° and 115°

How do angles show that triangles are similar?

If two angles of one triangle equal two angles of another triangle, the third angles are also equal, so the triangles are similar (the angle-angle criterion). Triangles with angles 40° , 70° ,

70° and 70° , 70° , 40° are similar. To solve for an unknown, write an equation, such as $(3x+10)+(2x+20)=180$ for co-interior angles, which gives $x=30$.



A triangle with angles 40, 70 and 70 degrees. Not drawn to scale.

Worked example. In a triangle, one angle is $2x$, another is $x+20$, and the third is $3x-20$. The angles add to 180, so $6x=180$ and $x=30$. The angles are 60, 50 and 70 degrees. Always check that your angles are positive and add to exactly 180. When an exterior angle is given, subtract it from 180 to find its interior neighbor, or subtract a remote interior angle from it to find the other one.

Questions about angles in triangles and parallel lines

Why do the angles of a triangle add up to 180 degrees?

Draw a line through one vertex parallel to the opposite side. Alternate interior angles are equal, so the three angles of the triangle fit together on a straight line, which measures 180 degrees.

What is an exterior angle?

It is the angle formed by extending one side of a triangle. It equals the sum of the two interior angles that are not next to it.

How can I tell alternate interior angles from corresponding angles?

Alternate interior angles lie between the parallel lines on opposite sides of the transversal. Corresponding angles are in the same position at each crossing.

Do these angle rules work if the lines are not parallel?

Vertical angles and linear pairs always work. The equal-angle rules for corresponding and alternate interior angles need parallel lines.

How many angles do I need to prove triangles similar?

Two. Once two angles match, the third must match because every triangle has a total of 180 degrees.