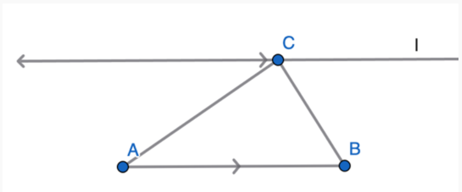
Triangle Angle Sum, Exterior Angles, and Polygon Sums

TRIANGLE ANGLE SUM THEOREM



Key idea: construct line l through C parallel to AB.

The three angles at C (α, γ, β) lie along line *l*

Triangle Angle Sum Theorem — Proof

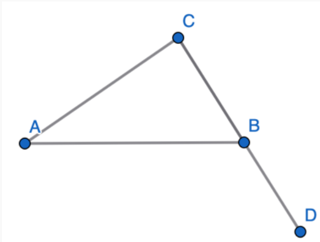
Conditional form: *If a polygon is a triangle, then the sum of its interior angles is 180°.*

This proof is conditional until Lesson 4.2 establishes the parallel line construction.

⚠ What this proof assumes

This proof assumes we can construct a line through any point parallel to any given line.

EXTERIOR ANGLE THEOREM



The exterior angle ∠ABD equals:

This follows from the triangle angle sum theorem because:

Exterior Angle Theorem — Proof

Conditional form: *If a side of a triangle is extended, then the exterior angle equals the sum of the two non-adjacent interior angles.*

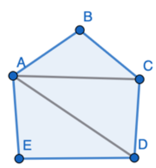
#	Statement	Justification

This proof uses only the triangle angle sum theorem and the linear pair theorem — no new assumptions needed.

POLYGON INTERIOR ANGLE SUM — *two methods, one answer*

Polygon Interior Angle Sum

Method 1 — Triangulate from one vertex

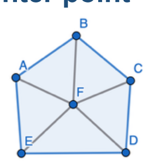


Draw all diagonals from one vertex. Count the triangles formed.

Number of triangles: ________

Interior angle sum =

Method 2 — Center point



Place a point inside the polygon. Connect to all vertices. Don't forget to subtract the angles at the center.

Number of triangles: ________

Interior angle sum =

Show algebraically that both formulas are the same: