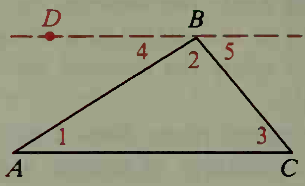
An **auxiliary line** is a line (or ray or segment) added to a diagram to help in a proof. An auxiliary line is used in the proof of the next theorem, one of the best-known theorems of geometry. The auxiliary line is shown as a dashed line in the diagram.

Theorem 3-11

The sum of the measures of the angles of a triangle is 180.

Given: $\triangle ABC$

Prove: $m\angle 1 + m\angle 2 + m\angle 3 = 180$



Proof:

Statements	Reasons
1. Through B draw $\overleftrightarrow{BD}$ parallel to $\overleftrightarrow{AC}$.	1. Through a point outside a line, there is exactly one line $\parallel$ to the given line.
2. $m\angle DBC + m\angle 5 = 180$; $m\angle DBC = m\angle 4 + m\angle 2$	2. Angle Addition Postulate
3. $m\angle 4 + m\angle 2 + m\angle 5 = 180$	3. Substitution Property
4. $\angle 4 \cong \angle 1$, or $m\angle 4 = m\angle 1$; $\angle 5 \cong \angle 3$, or $m\angle 5 = m\angle 3$	4. If two parallel lines are cut by a transversal, then alt. int. $\angle$s are $\cong$.
5. $m\angle 1 + m\angle 2 + m\angle 3 = 180$	5. Substitution Property

A statement that can be proved easily by applying a theorem is often called a **corollary** of the theorem. Corollaries, like theorems, can be used as reasons in proofs. Each of the four statements that are shown below is a corollary of Theorem 3-11.

Corollary 1

If two angles of one triangle are congruent to two angles of another triangle, then the third angles are congruent.

Corollary 2

Each angle of an equiangular triangle has measure 60.

Corollary 3

In a triangle, there can be at most one right angle or obtuse angle.

Corollary 4

The acute angles of a right triangle are complementary.