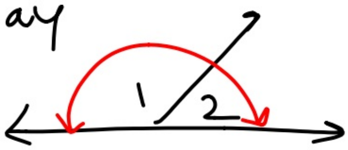
Geometry 4.2

Apply the triangle sum theorem
Apply the exterior angle theorem

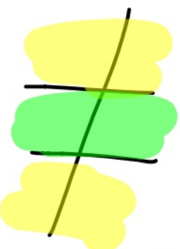
remote far away

straight angle 180°

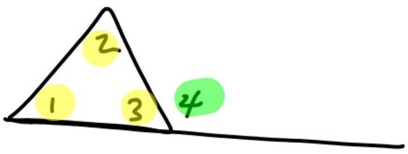


linear pair $m\angle 1 + m\angle 2 = 180$

auxiliary line line added following rules



exterior angle (of a triangle)



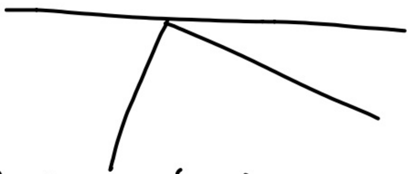
interior angle (of a triangle)

"flow proof" (meh) may substitute 2-col or paragraph

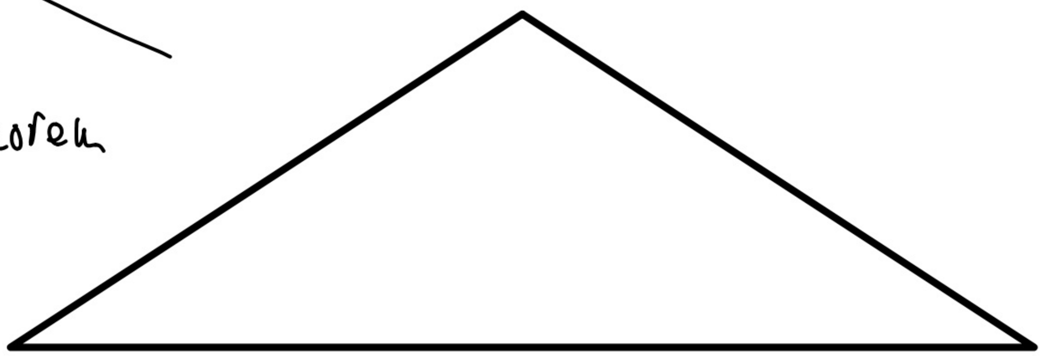
corollary closely related theorem

Does everybody have the same shape of triangle?
1. Shade each vertex of your triangle
2. Tear off the corners (vertices)
3. Piece together each corner (vertex-together)
What do you notice?

line = 180



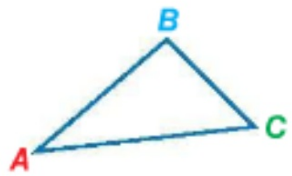
Δ sum theorem

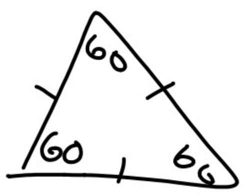


Theorem 4.1 Triangle Angle-Sum Theorem

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

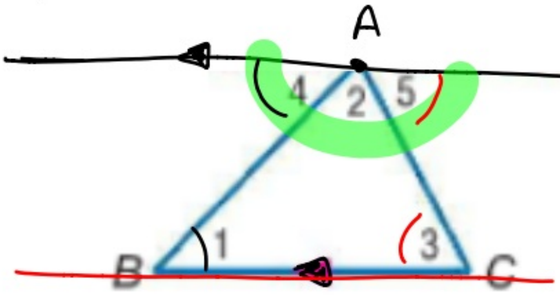
Example $m\angle A + m\angle B + m\angle C = 180$





Given $\triangle ABC$
aux. line $\parallel \overline{BC}$

Prove $\triangle$ sum th.



Auxiliary lines

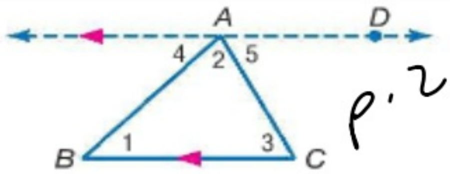
St.	Reas.
1. $\triangle ABC$ aux line $\parallel BC$	1. given
2. $m\angle 4 + m\angle 2 + m\angle 5 = 180$	2. form line
3. $\angle 4 \cong \angle 1$ $\angle 3 \cong \angle 5$	3. A I A
4. $m\angle 1 + m\angle 2 + m\angle 3 = 180$	4. subs.

Proof Triangle Angle-Sum Theoem

Given: $\triangle ABC$

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

Proof:



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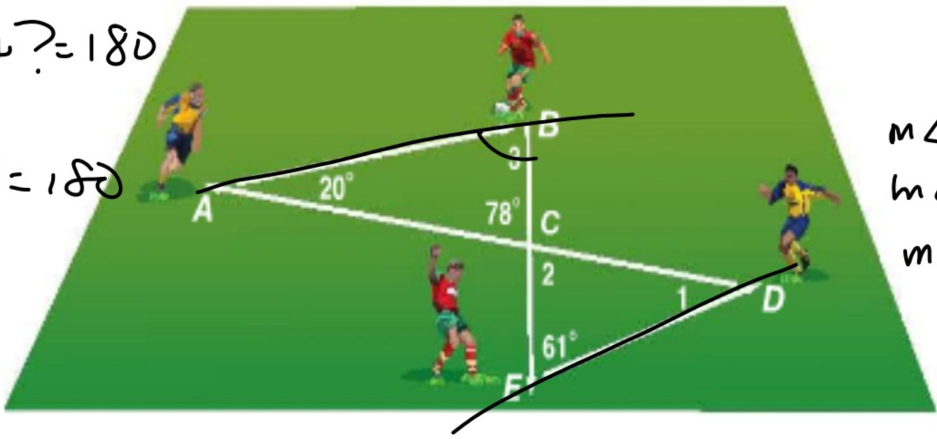
Statements	Reasons
1 $\triangle ABC$	1 Given

Real-World Example 1 Use the Triangle ~~Angl~~e-Sum Theorem

SOCCER The diagram shows the path of the ball in a passing drill created by four friends. Find the measure of each numbered angle.

$20 + 78 + ? = 180$

$78 + 61 + ? = 180$



$m\angle 1 = 41°$

$m\angle 2 = 78°$

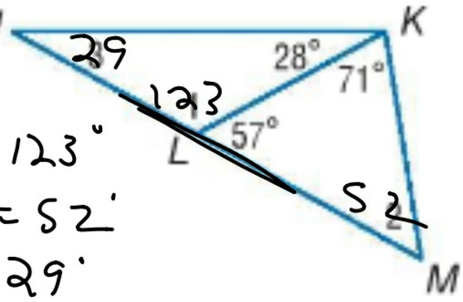
$m\angle 3 = 82°$

57+71+? = 180
123+28+? = 180

Guided Practice

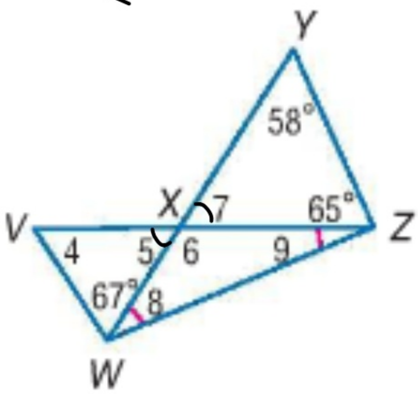
Find the measures of each numbered angle. angle chase

1A.



m<1 = 123°
m<2 = 52°
m<3 = 29°

1B.



angle chase

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

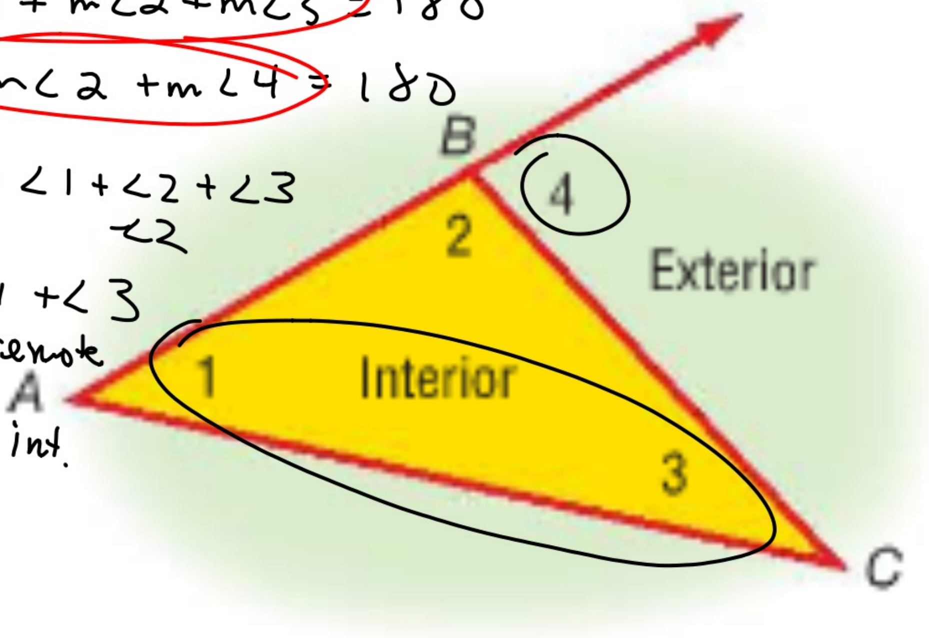
$m\angle 2 + m\angle 4 = 180$

$\angle 2 + \angle 4 = \angle 1 + \angle 2 + \angle 3$

$-\angle 2 \qquad\qquad -\angle 2$

$\angle 4 = \angle 1 + \angle 3$

ext remote int.

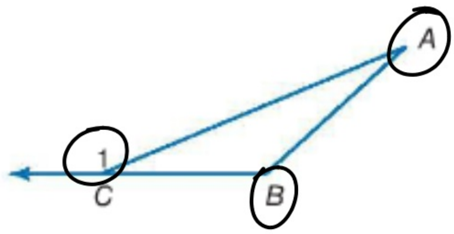


What do you call it...?

Theorem 4.2 **Exterior Angle Theorem**

The measure of an exterior angle of a triangle is equal to the sum of the measures of the two remote interior angles.

Example $m\angle A + m\angle B = m\angle 1$



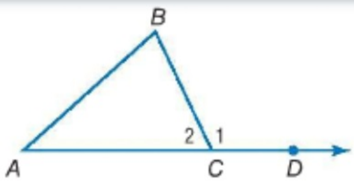
:/ meh

A **flow proof** uses statements written in boxes and arrows to show the logical progression of an argument. The reason justifying each statement is written below the box. You can use a flow proof to prove the Exterior Angle Theorem.

Proof Exterior Angle Theorem

Given: $\triangle ABC$

Prove: $m\angle A + m\angle B = m\angle 1$



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Flow Proof:

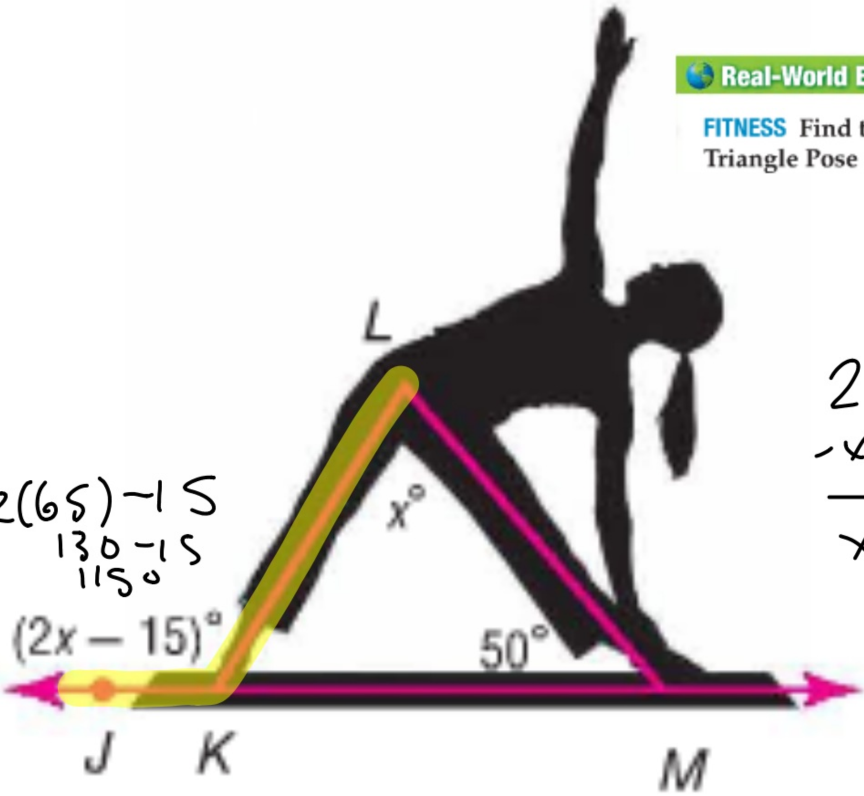
ΔABC given

$\angle 1 + \angle 2 = 180$ LP

$\angle A + \angle B + \angle 2 = 180$ Δ sum

Real-World Example 2 Use the Exterior Angle Theorem

FITNESS Find the measure of $\angle JKL$ in the Triangle Pose shown.

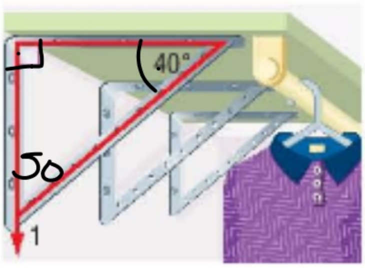


2(65)−15
130−15
115°

$$2x - 15 = x + 50$$
$$-x \quad +15 \quad -x \quad +15$$
$$x = 65$$

GuidedPractice

2. CLOSET ORGANIZING Tanya mounts the shelving bracket shown to the wall of her closet. What is the measure of ∠1, the angle that the bracket makes with the wall?



130°

90 + 40

50 + ? = 180

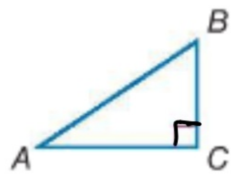
A corollary is a theorem with a proof that follows as a direct result of another theorem. As with a theorem, a corollary can be used as a reason in a proof. The corollaries below follow directly from the Triangle Angle-Sum Theorem.

Corollaries Triangle Angle-Sum Corollaries

4.1 The acute angles of a right triangle are complementary.

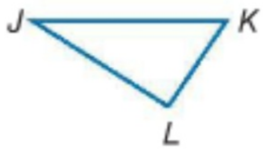
Abbreviation: *Acute ∠s of a rt. △ are comp.*

Example: If $\angle C$ is a right angle, then $\angle A$ and $\angle B$ are complementary.



4.2 There can be at most one right or obtuse angle in a triangle.

Example: If $\angle L$ is a right or an obtuse angle, then $\angle J$ and $\angle K$ must be acute angles.



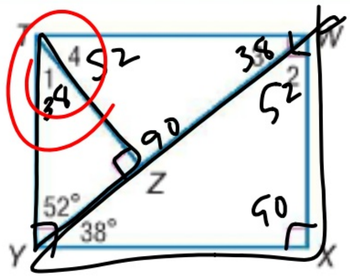
Example 3 Find Angle Measures in Right Triangles

Find the measures of each numbered angle.

$m\angle 1 + m\angle TYZ = 90$ Acute ∠s of a rt. △ are comp.

$m\angle 1 + 52 = 90$ Substitution

$m\angle 1 = 38$ Subtract 52 from each side.



GuidedPractice

3A. $\angle 2$ 52°

3B. $\angle 3$ 38°

3C. $\angle 4$ 52°

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9-37 odd