Reflect

3. **Analyze Relationships** How can you use the fact that $m\angle 4 + m\angle 1 + m\angle 5 = 180^\circ$ to show that $m\angle 2 + m\angle 1 + m\angle 3 = 180^\circ$?

_____

_____

_____

Finding Missing Angle Measures in Triangles

If you know the measures of two angles in a triangle, you can use the Triangle Sum Theorem to find the measure of the third angle.

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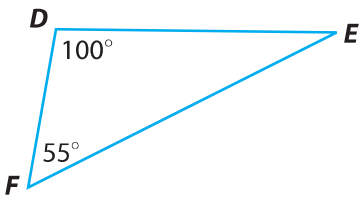
EXAMPLE 1

FL 8.EE.3.7

Find the missing angle measure.

STEP 1 Write the Triangle Sum Theorem for this triangle.

$m\angle D + m\angle E + m\angle F = 180^\circ$



STEP 2 Substitute the given angle measures.

$55^\circ + m\angle E + 100^\circ = 180^\circ$

STEP 3 Solve the equation for $m\angle E$.

$55^\circ + m\angle E + 100^\circ = 180^\circ$

$155^\circ + m\angle E = 180^\circ$

Simplify.

$-155^\circ \quad\quad -155^\circ$

Subtract 155° from both sides.

$m\angle E = 25^\circ$

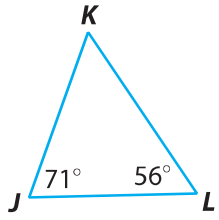
So, $m\angle E = 25^\circ$.

My Notes

YOUR TURN

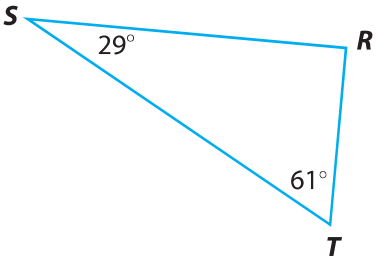
Find the missing angle measure.

4.



$m\angle K =$ _____

5.



$m\angle R =$ _____

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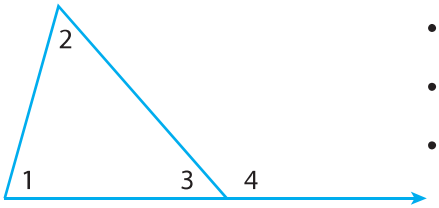
EXPLORE ACTIVITY 3 FL 8.G.1.5

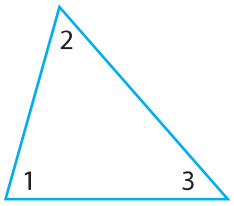
Exterior Angles and Remote Interior Angles

An **interior angle** of a triangle is formed by two sides of the triangle. An **exterior angle** is formed by one side of the triangle and the extension of an adjacent side. Each exterior angle has two remote interior angles. A **remote interior angle** is an interior angle that is not adjacent to the exterior angle.



- $\angle 1$, $\angle 2$, and $\angle 3$ are interior angles.
- $\angle 4$ is an exterior angle.
- $\angle 1$ and $\angle 2$ are remote interior angles to $\angle 4$.

There is a special relationship between the measure of an exterior angle and the measures of its remote interior angles.



A Extend the base of the triangle and label the exterior angle as $\angle 4$.

B The Triangle Sum Theorem states:

$m\angle 1 + m\angle 2 + m\angle 3 =$ _____.

C $\angle 3$ and $\angle 4$ form a _____,

so $m\angle 3 + m\angle 4 =$ _____.

D Use the equations in **B** and **C** to complete the following equation:

$m\angle 1 + m\angle 2 +$ _____ = _____ $+ m\angle 4$

E Use properties of equality to simplify the equation in **D**:

_____

The Exterior Angle Theorem states that the measure of an _____ angle is equal to the sum of its _____ angles.

Reflect

6. Sketch a triangle and draw all of its exterior angles. How many exterior angles does a triangle have at each vertex?

_____

7. How many total exterior angles does a triangle have?

_____

Using the Exterior Angle Theorem

You can use the Exterior Angle Theorem to find the measures of the interior angles of a triangle.

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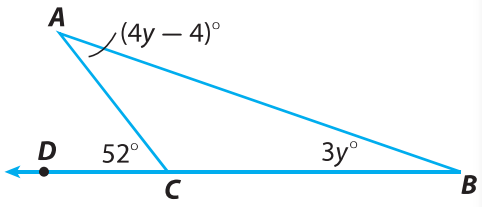
EXAMPLE 2

FL 8.EE.3.7b

Find $m\angle A$ and $m\angle B$.



STEP 1 Write the Exterior Angle Theorem as it applies to this triangle.

$m\angle A + m\angle B = m\angle ACD$

STEP 2 Substitute the given angle measures.

$(4y - 4)^\circ + 3y^\circ = 52^\circ$

STEP 3 Solve the equation for y.

$(4y - 4)^\circ + 3y^\circ = 52^\circ$

$4y^\circ - 4^\circ + 3y^\circ = 52^\circ$ Remove parentheses.

$7y^\circ - 4^\circ = 52^\circ$ Simplify.

$+4^\circ \quad +4^\circ$ Add 4° to both sides.

$7y^\circ = 56^\circ$ Simplify.

$\frac{7y^\circ}{7} = \frac{56^\circ}{7}$ Divide both sides by 7.

$y = 8$ Simplify.

STEP 4 Use the value of y to find $m\angle A$ and $m\angle B$.

$m\angle A = 4y - 4$
$= 4(8) - 4$
$= 32 - 4$
$= 28$

$m\angle B = 3y$
$= 3(8)$
$= 24$

So, $m\angle A = 28^\circ$ and $m\angle B = 24^\circ$.

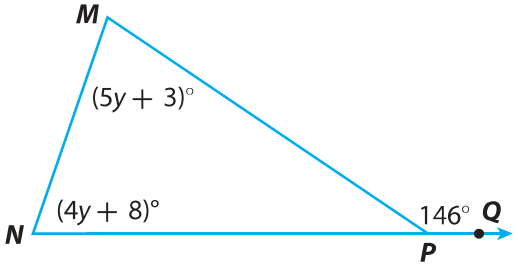
Math Talk
Mathematical Practices
Describe two ways to find $m\angle ACB$.

YOUR TURN

8. Find $m\angle M$ and $m\angle N$.

$m\angle M =$ _____

$m\angle N =$ _____



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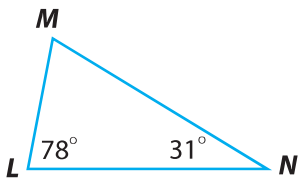
Guided Practice

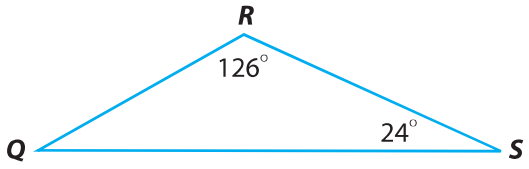
Find each missing angle measure. (Explore Activity 1 and Example 1)

1.



$m\angle M =$ _____

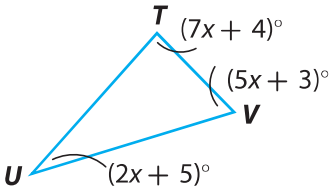
2.



$m\angle Q =$ _____

Use the Triangle Sum Theorem to find the measure of each angle in degrees. (Explore Activity 2 and Example 1)

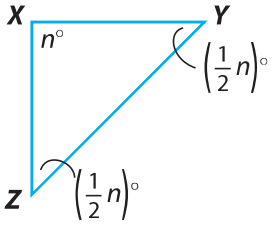
3.



$m\angle T =$ _____, $m\angle U =$ _____,

$m\angle V =$ _____

4.

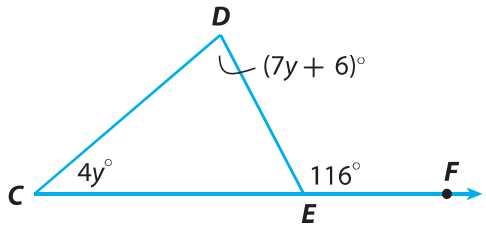


$m\angle X =$ _____, $m\angle Y =$ _____,

$m\angle Z =$ _____

Use the Exterior Angle Theorem to find the measure of each angle in degrees. (Explore Activity 3 and Example 2)

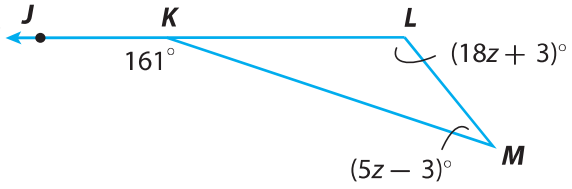
5.



$m\angle C =$ _____, $m\angle D =$ _____,

$m\angle DEC =$ _____

6.



$m\angle L =$ _____, $m\angle M =$ _____,

$m\angle LKM =$ _____

ESSENTIAL QUESTION CHECK-IN

7. Describe the relationships among the measures of the angles of a triangle.

_____

_____

_____