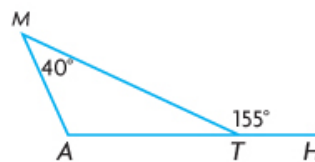## APPLY the Math

EXAMPLE **1**	Using angle sums to determine angle measures

In the diagram, $\angle MTH$ is an **exterior angle** of $\triangle MAT$. Determine the measures of the unknown angles in $\triangle MAT$.

Serge's Solution

$\angle MTA + \angle MTH = 180°$ ------------- $\angle MTA$ and $\angle MTH$ are supplementary since they form a straight line.
$\quad \angle MTA + (155°) = 180°$
$\qquad\qquad \angle MTA = 25°$

$\angle MAT + \angle AMT + \angle MTA = 180°$ --- The sum of the measures of the interior angles of any triangle is 180°.
$\quad \angle MAT + (40°) + (25°) = 180°$
$\qquad\qquad\qquad \angle MAT = 115°$

The measures of the unknown angles are:
$\angle MTA = 25°$; $\angle MAT = 115°$.

| EXAMPLE **2** | Using reasoning to determine the relationship between the exterior and interior angles of a triangle |

Determine the relationship between an exterior angle of a triangle and its **non-adjacent interior angles** .

non-adjacent interior angles
The two angles of a triangle that do not have the same vertex as an exterior angle.

$\angle A$ and $\angle B$ are non-adjacent interior angles to exterior $\angle ACD$.

Joanna's Solution

I drew a diagram of a triangle with one exterior angle. I labelled the angle measures a, b, c, and d.

$\angle d + \angle c = 180°$
$\angle d = 180° - \angle c$

$\angle d$ and $\angle c$ are supplementary. I rearranged these angles to isolate $\angle d$.

$\angle a + \angle b + \angle c = 180°$
$\angle a + \angle b = 180° - \angle c$
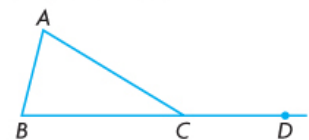
The sum of the measures of the angles in any triangle is 180°.

$\angle d = \angle a + \angle b$

Since $\angle d$ and $(\angle a + \angle b)$ are both equal to $180° - \angle c$, by the transitive property, they must be equal to each other.

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

EXAMPLE **2**

Using reasoning to determine the relationship between the exterior and interior angles of a triangle

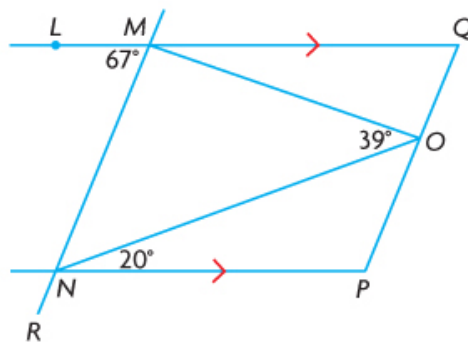Determine the relationship between an exterior angle of a triangle and its non-adjacent interior angles .

Your Turn

Prove: $\angle e = \angle a + \angle b$
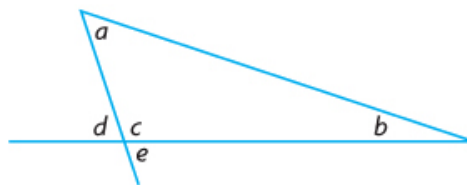
Answer
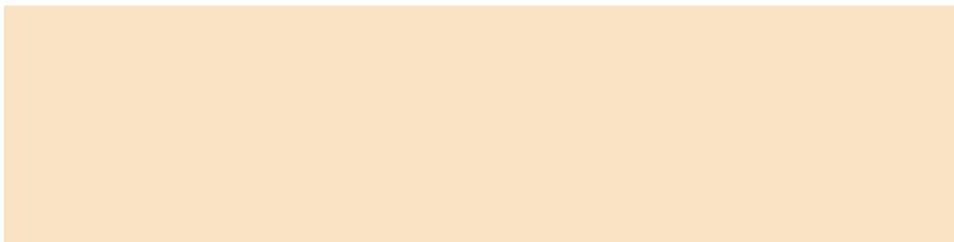
EXAMPLE **3** | Using reasoning to solve problems

Determine the measures of
∠*NMO*, ∠*MNO*, and ∠*QMO*.

Tyler's Solution

MN is a transversal of parallel lines *LQ* and *NP*. ┄┄┄ (MN intersects parallel lines *LQ* and *NP*.)

∠*MNO* + 20° = 67° ┄┄┄┄┄┄┄┄┄┄┄┄ (Since ∠*LMN* and ∠*MNP* are alternate interior
∠*MNO* = 47° angles between parallel lines, they are equal.)

∠*NMO* + ∠*MNO* + 39° = 180° ┄┄┄┄ (The measures of the angles in a triangle add
∠*NMO* + (47°) + 39° = 180° to 180°.)
∠*NMO* + 86° = 180°
∠*NMO* = 94°

∠*NMO* + ∠*QMO* + 67° = 180° ┄┄┄┄ (∠*LMN*, ∠*NMO*, and ∠*QMO* form a straight line, so
(94°) + ∠*QMO* + 67° = 180° their measures must add to 180°.)
161° + ∠*QMO* = 180°
∠*QMO* = 19°

The measures of the angles are:
∠*MNO* = 47°; ∠*NMO* = 94°; ∠*QMO* = 19°.

SUMMARY

- **In any triangle, the sum of the measure of the interior angles is proven to be 180^0.**

- **The measure of any exterior angle of a triangle is proven to be equal to the sum of the measures of the two non-adjacent interior angles.**

Attachments

PM11-2s3-2.gsp

2s3e2 finalt.mp4