3.1 - Investigating Angle Relationships

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Unit 2: Angles and Triangles

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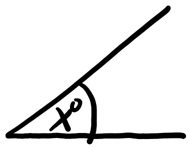
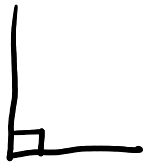
Review of Angles and Triangles

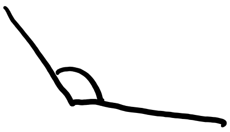
Acute Angle:
Angle “x” measures: $0° \leq x < 90°$



Right Angle:
Angle “x” measures: $x = 90°$

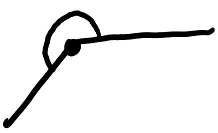


Obtuse Angle:
Angle “x” measures: $90° < x < 180°$



Straight Angle:
Angle “x” measures: $x = 180°$

Reflex Angle:
Angle “x” measures: $180° < x < 360°$

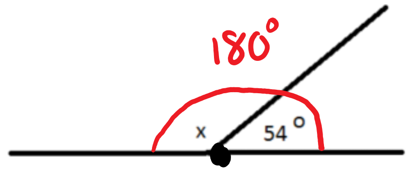


Complete Rotation:
Angle “x” measures: $x = 360°$

Angles on One Side of a Straight Line

Because we know that a straight line measures 180°, we know all angles on a straight line will add to 180°.

Example. Calculate the following indicated angles:

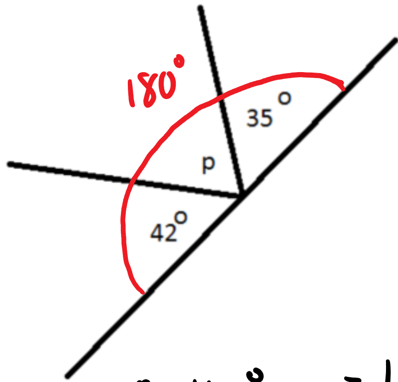


$54° + x = 180°$

$-54° \quad -54°$

$x = 180° - 54°$

$x = 126°$

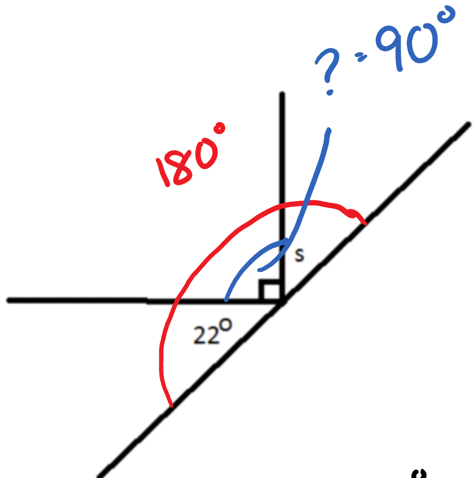


$35° + 42° + p = 180°$

$77° + p = 180°$

$-77° \quad -77°$

$p = 180° - 77° = 103°$



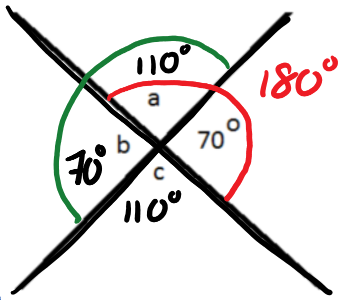
$22° + 90° + s = 180°$

$112° + s = 180°$

$-112° \quad -112°$

$s = 180° - 112°$

$= 68°$



$70° + a = 180°$

$-70° \quad -70°$

$a = 110°$

$a + b = 180°$

$(110°) + b = 180°$

$-110° \quad -110°$

$b = 70°$

$b + c = 180°$

$(70°) + c = 180°$

$-70° \quad -70°$

$c = 110°$

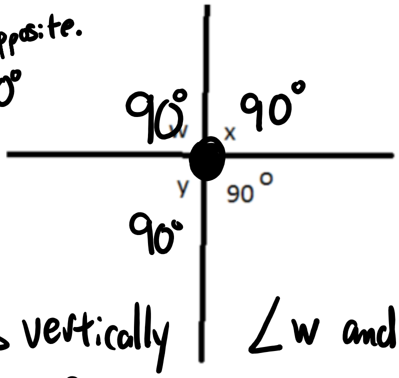
Angles which form a straight line are called **supplementary angles.**

Notice from the last example that the opposite angles are equal.

When straight lines cross and form an "X" shape, the point where they cross is called the "**vertex**", and the angles that are across from each other are called "**vertically opposite angles**", and are equal in measure.

Example: Calculate the indicated angles:

x & y are vertically opposite. $\therefore \angle y = 90^\circ$



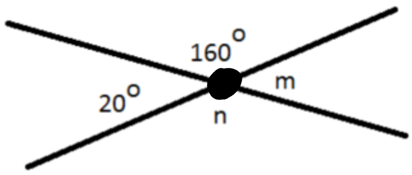
90° is vertically opposite from angle w, $\therefore w = 90^\circ$

$\angle w$ and $\angle x$ are supplementary, so $w + x = 180^\circ$

$(90^\circ) + x = 180^\circ$

$-90^\circ \quad -90^\circ$

$x = 90^\circ$



20° is vertically opposite to m, $\therefore m = 20^\circ$,

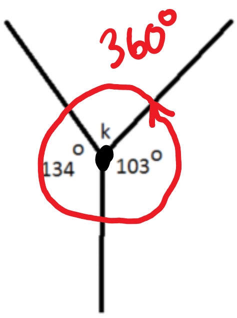
160° is vertically opposite to $\angle n$, $\therefore \angle n = 160^\circ$

What do you notice about the sum of all angles in an "X" shape?

They all add to 360°.

Around any vertex or point, all angles will add to 360º, a complete rotation (a complete circle).

Example: Determine the indicated angle:

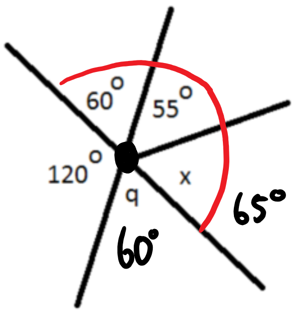


$k + \underbrace{134^\circ + 103^\circ} = 360^\circ$

$k + 237^\circ = 360^\circ$

$-237^\circ \quad -237^\circ$

$k = 360^\circ - 237^\circ = 123^\circ$



$\angle q$ is vertically opposite $60°$, $\therefore \angle q = 60°$

$60°$ and $55°$ and $\angle x$ are all supplementary, $\therefore 60° + 55° + x = 180°$

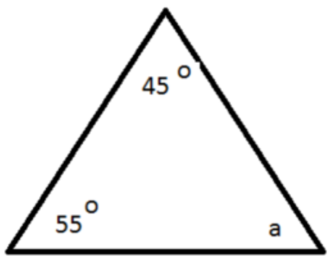
$\cancel{115°} + x = 180°$
$-115° \quad -115°$

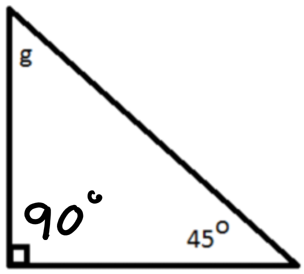
$x = 65°$

Angles Involving Triangles

The **interior angles** (inside angles) of a triangle add to 180°:

Example: Determine the indicated angles:

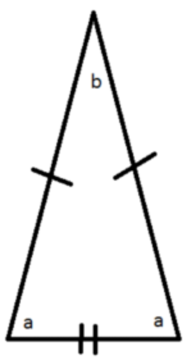




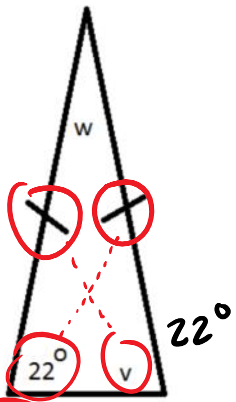
$45° + 55° + a = 180°$
$100° + a = 180°$
$a = 80°$

$90° + 45° + g = 180°$
$135° + g = 180°$
$g = 45°$

An **isosceles** triangle has 2 equal sides and 2 equal angles:



Example: Determine the indicated angle:

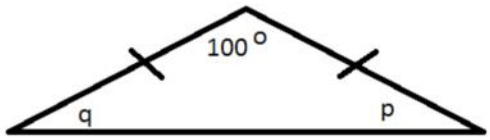


$\angle v = 22°$ ∵ the measure of angle opposite an equal side length is 22°.

$22° + 22° + w = 180°$

$44° + w = 180°$

$w = 136°$



$\angle q = \angle p$

$q + p + 100° = 180°$

$q + q + 100° = 180°$

$2q + \cancel{100°} = 180°$

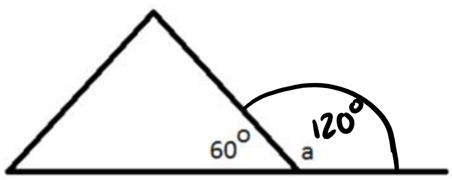
$\cancel{-100°} \quad -100°$

$\frac{\cancel{2}q}{\cancel{2}} = \frac{80°}{2}$ ∵ $q = p$,

$q = 40° \qquad p = 40°$

We can use properties of straight lines to find **exterior angles** of triangles:

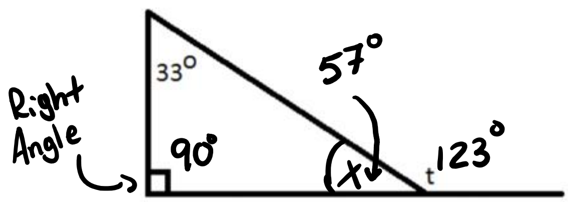
Example: Determine the indicated angle:



$\cancel{60°} + a = 180°$

$\cancel{-60°} \quad -60°$

$a = 120°$



$33° + 90° + x = 180°$

$\cancel{123°} + x = 180°$

$\cancel{-123°} \quad -123°$

$x = 57°$

$\cancel{57°} + t = 180°$

$\cancel{-57°} \quad -57$

$t = 123°$