Math 9 – Plane Geometry

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Lesson #2: Triangles

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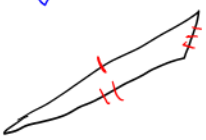
Learning Goal: We are learning to identify 6 types of triangles and 3 triangle theorems. We are learning to use those theorems to find missing information in triangles.

Did you know that the strongest shape is the triangle? Triangles are also amazing within Mathematics. In Grade 10 and beyond, you will begin to learn about Trigonometry, which is a study of the relations between the angles and sides of a triangle. Today, we will look at the properties of angles within a triangle. First, let's review the six types of triangles:

1. Scalene

All sides different length

All angles are different.



2. Isosceles

2 sides equal

2 base angles equal

3. Equilateral

3 sides are equal

All angles are 60°

4. Acute

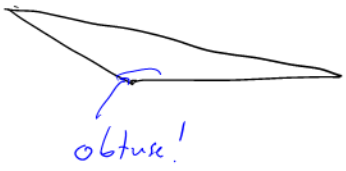
All angles are acute $< 90°$

5. Right

One angle is 90°

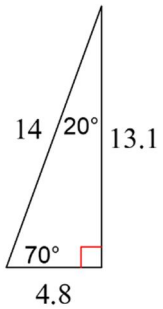
6. Obtuse

One angle is obtuse $> 90°$



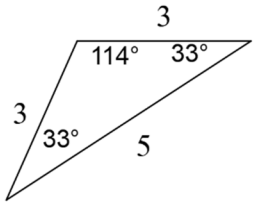
Example 1: Classify each triangle with its sides and angles.

a)



Scalene right

b)



Obtuse Isosceles

Triangle Theorems: Just like last lesson, triangles have properties which are truths, and therefore we can call them theorems which help us to solve for missing information.

1. Isosceles Triangle Theorem (ITT)

in an isosceles triangle, the base angles are equal.

3 = 180°

4 = 360°

2. Angle Sum Triangle Theorem (ASTT)

The sum of the angles in a triangle add up to 180°

5 = 540°

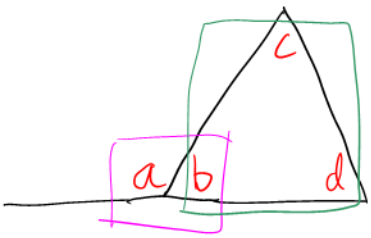
6 = 720°

In fact, the angles in a quadrilateral add up to 360. In a 5-sided figure, the angles add up to 540. When you add a side, you add 180° to the sum of the angles.

Exterior Angle → outside a shape

Interior Angle → inside a shape

3. Exterior Angle Theorem (EAT)



$a + b = 180$

$180 = b + c + d$

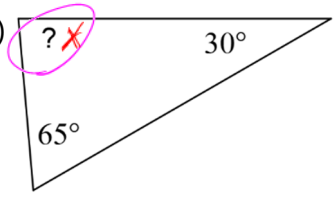
$a + b = b + c + d$

$a = c + d$

An exterior angle is equal to the two opposite interior angles.

Example 2: Find the missing angle (?) or the value of x. State the theorems you are using on each step.

a)

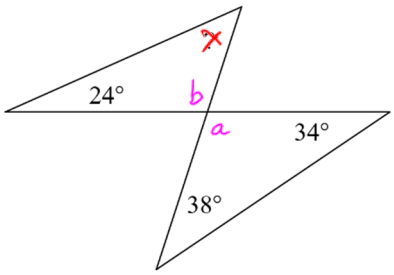


$x + 30 + 65 = 180$, ASTT

$x = 180 - 95$

$x = 85°$

b)



$a + 34 + 38 = 180$, ASTT

$a = 180 - 72$

$a = 108°$

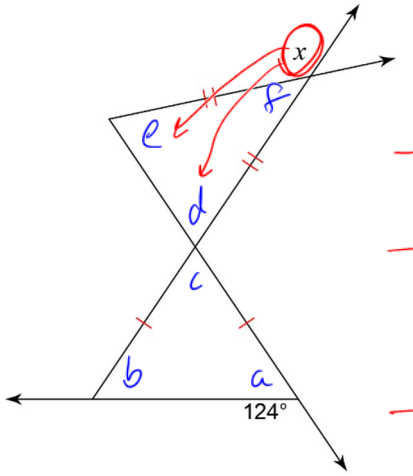
$b = 108°$, OAT

$x + 24 + 108 = 180$, ASTT

$x = 180 - 132$

$x = 48°$

c)



$a = 180 - 124$, SAT

$a = 56°$

$b = 56°$, ITT

$c + 56 + 56 = 180$, ASTT

$c = 68°$

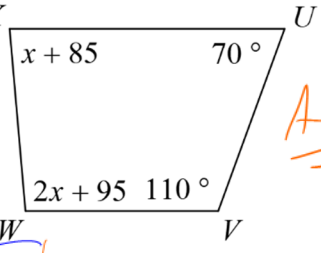
$d = 68°$, OAT

$e = 68°$, ITT

$x = 68 + 68$, EAT

$x = 136°$

d)



AST

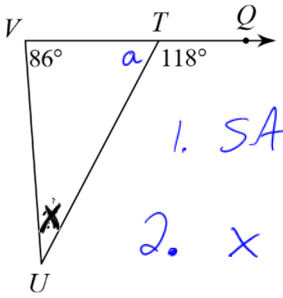
$x + 85 + 2x + 95 + 110 + 70 = 360$

$3x + 360 = 360$

$3x = 0$

$x = 0$

e)



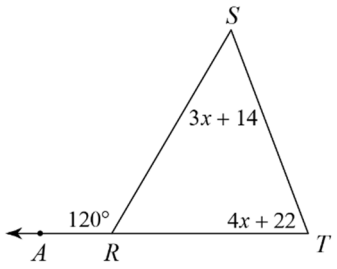
1. SAT then ASTT

2. $x + 86 = 118$, EAT

$x = 118 - 86$

$x = 32°$

f)



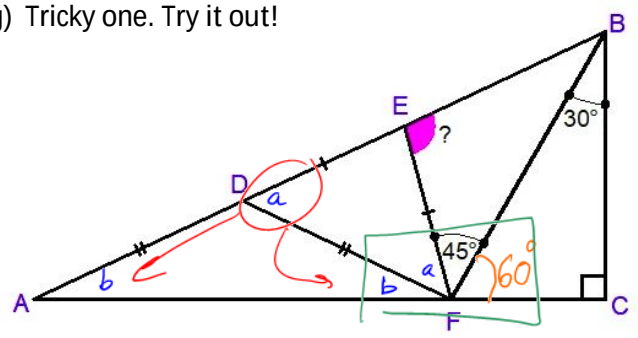
$120 = 3x + 14 + 4x + 22$, EAT

$120 = 7x + 36$

$84 = 7x$

$12 = x$.

g) Tricky one. Try it out!



SAT $a + b + 45 + 60 = 180$

$a + b = 75$

EAT $a = b + b$

$a = 2b$

$2b + b = 75$

$3b = 75$

$b = 25$.

and therefore $? = 100^\circ$

Success Criteria:

- I can identify scalene, isosceles, equilateral, acute, right, and obtuse triangles
- I can identify the ITT, ASTT, and EAT triangle theorems
- I can use the 3 triangle theorems and the 3 angle theorems from yesterday to find missing information in a triangle (or group of triangles)