Math 9 – Plane Geometry

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Lesson #2: Triangles

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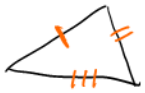
Did you know that the strongest shape is the triangle? Triangles are also amazing within Mathematics. In Grade 10 and beyond, you will begin to learn about Trigonometry, which is a study of the relations between the angles and sides of a triangle. Today, we will look at the properties of angles within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

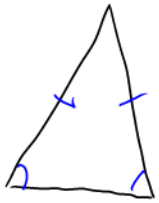
1. Scalene

- all sides not the same
- all angles different



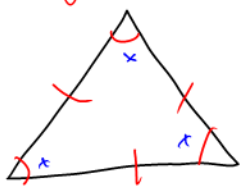
2. Isosceles

- 2 sides equal
- 2 base angles equal



3. Equilateral

- all sides equal
- all angles are equal

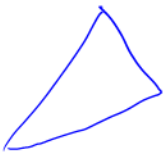


$3x = 180$

$x = 60°$

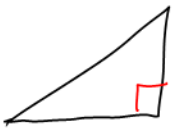
4. Acute

- all angles are acute angles



5. Right

- has a 90° right angle.

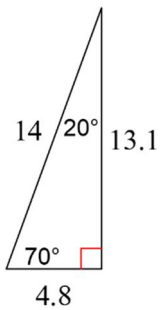


6. Obtuse

- one obtuse angle

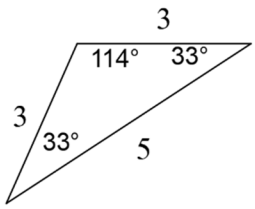
Example 1: Classify each triangle with its sides and angles.

a)



scalene right triangle

b)



obtuse isosceles triangle.

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)

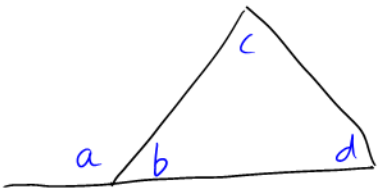
– the base angles of an isosceles triangle are equal

2. Angle Sum Triangle Theorem (ASTT)

– the angles added together equal 180°

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.

3. Exterior Angle Theorem (EAT)



"a" is the exterior, as it is outside the shape

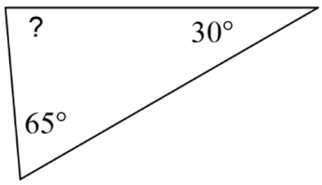
"b", "c", ad "d" are interior angles.

$a = c + d$

The exterior angle is equal to the opposite interior angles

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

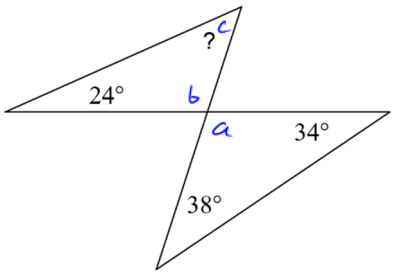
a)



$? = 180 - 65 - 30$ ASTT

$? = 85°$

b)



① $a = 180 - 38 - 89$ ASTT

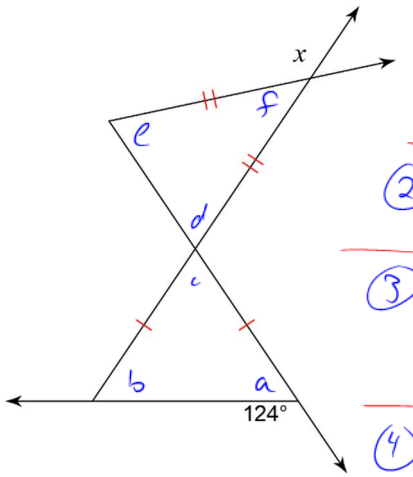
$a = 108°$

② $b = 108°$ EAT

③ $c = 180 - 24 - 108$ ASTT

$c = 48°$

c)



① $a = 180 - 124$

$a = 56^\circ$ SAT

② $b = 56^\circ$ ITT

③ $c = 180 - 56 - 56$

$c = 68^\circ$ ASTT

④ $d = 68^\circ$ OAT

⑤ $e = 68^\circ$ ITT

⑥ $x = e + d$

$x = 68 + 68$ EAT

$x = 136^\circ$

d) X U W V

$x + 85$, 70°, $2x + 95$, 110°

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

$3x + 360 = 360$ (−360 −360)

$3x = 0$

$x = 0$

e) V T Q U

86°, 118°, x, ?

$x + 86 = 118$ (−86 −86) EAT

$x = 32^\circ$

f) S A R T

$3x + 14$, $4x + 22$, 120°

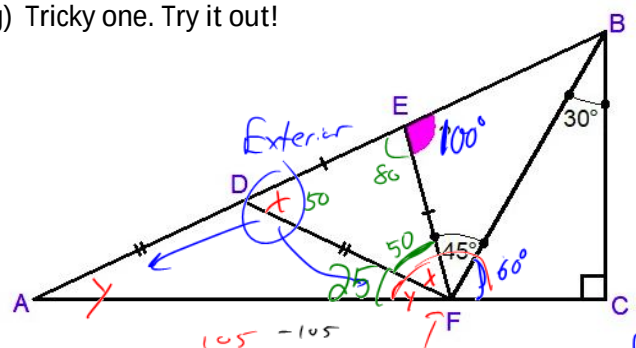
$120 = 3x + 14 + 4x + 22$ EAT

$120 = 7x + 36$ (−36 −36)

$\frac{84}{7} = \frac{7x}{7}$

$12 = x$

g) Tricky one. Try it out!



$x + y + 105 = 180$ (−105 −105)

EAT, $x = y + y$

$x = 2y$

$x + y = 75$

$2y + y = 75$

$\frac{3y}{3} = \frac{75}{3}$

$y = 25$