Math 9 – Plane Geometry Name: _____

Lesson #2: Triangles Date: _____

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 3 sides & All 3 angles are different.

2. Isosceles

- 2 sides are equal
- 2 angles are equal

3. Equilateral

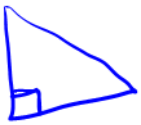
All sides & all angles are equal.

4. Acute

All angles are acute.

(1° - 89°)

5. Right



one angle = 90°

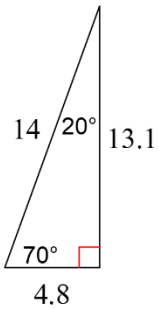
6. Obtuse

one angle is obtuse

(91° - 179°)

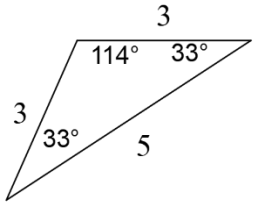
Example 1: Classify each triangle with its sides and angles.

a)



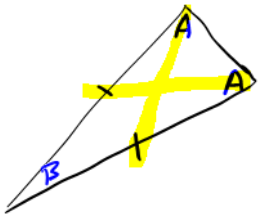
Scalene Right Triangle

b)



Obtuse isoceles 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)

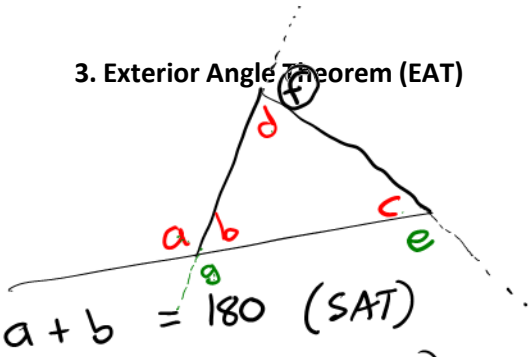
In an isosceles △, the base angles are equal.

2. Angle Sum Triangle Theorem (ASTT)

Angles in a △, add up to 180°. Always

In fact, the angles in a quadrilateral (4 sided) 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)



$a + b = 180$ (SAT)

$b + c + d = 180$ (ASTT)

Exterior means "outside" (a)

Interior means "inside" (b, c, d)

$a + b = b + c + d$

$-b \quad -b$

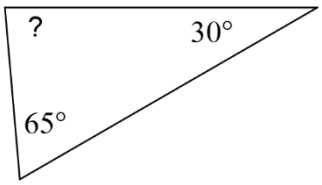
$a = c + d$

An exterior angle is equal to the two opposite interior angles. $e = b + d$

$f = b + c$

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

a)

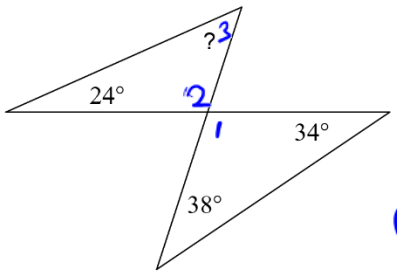


ASTT

$? = 180 - 30 - 65$

$? = 85°$

b)



① ASTT

① $= 180 - 34 - 38$

① $= 108°$

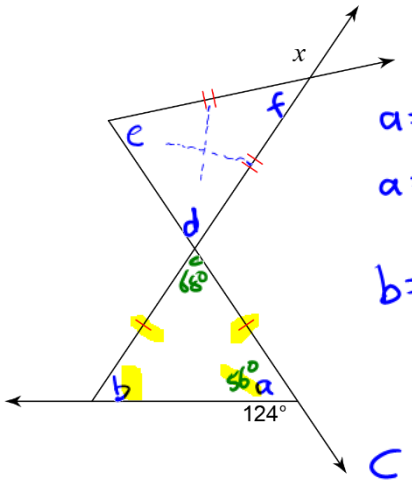
② $= ①$ (OAT)

② $= 108°$

③ $= 180 - 24 - 108$ (ASTT)

③ $= 48°$

c)



SAT

$a = 180 - 124$

$a = 56°$

$b = 56°$ (ITT

(ASTT)

$c = 180 - 56 - 56$

$c = 68°$

$d = 68°$ OAT

$e = 68°$ ITT

$f = 180 - 68 - 68$ ASTT

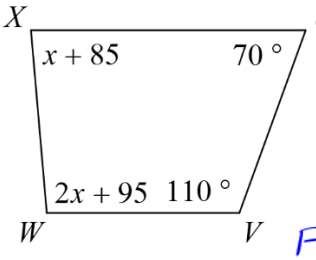
$= 44°$

SAT

$\therefore x = 180 - 44$

$x = 136°$

d)



Quadrilateral, angles add up to 360°

Find x, not angle.

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

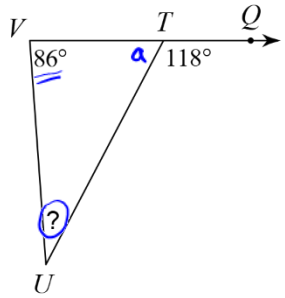
$3x + 360 = 360$

$-360 \quad -360$

$\frac{3x}{3} = \frac{0}{3}$

$x = 0$

e)



Use EAT

$86 + ? = 118$

$-86 \quad -86$

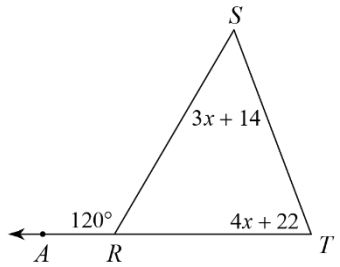
$? = 32°$

Alternative

Use SAT for a

Use ASTT

f)



EAT

$120 = (3x+14) + (4x+22)$

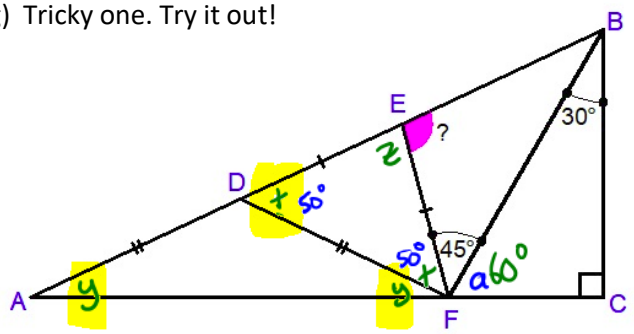
$120 = 7x + 36$

$-36 \quad -36$

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

$12 = x$

g) Tricky one. Try it out!



$a = 180 - 90 - 36$

$a = 60^\circ$ ASTT

Also: $x + y + 45 + 60 = 180^\circ$

$x + y = 75^\circ$

EATrule says $x = y + y$

$x = 2y$

Replace "x" with "2y"

$(2y) + y = 75^\circ$

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

$y = 25^\circ$

$\therefore x = 2y = 2(25) = 50^\circ$

$x = 50^\circ$

option 1: EAT

$? = 50 + 50$

$? = 100^\circ$

option 2

$z = 180 - 50 - 50$ (ASTT)

$z = 80^\circ$

$\therefore ? = 180 - 80^\circ$

$= 100^\circ$ (SAT)

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)