

Section 2.3:

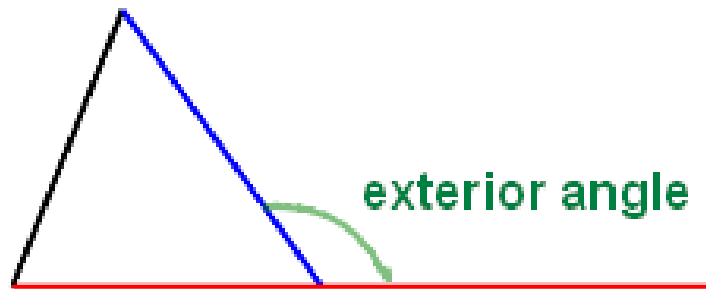
Angles Properties in Triangles

Learning Targets:

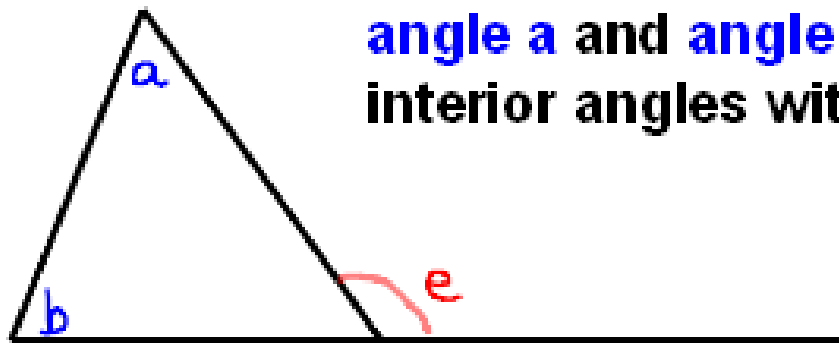
- 1) New terminology regarding angles in triangles:**
 - exterior angle**
 - non-adjacent interior angles**
- 2) Understand and apply two triangle properties.**

Key Terms

Exterior angle (of a triangle, or any other polygon): the angle that is formed by the **side of a triangle** (or any other polygon) and **the extension of an adjacent side**.



Non-adjacent interior angles (in a triangle): the two angles of a triangle that do not have the same vertex as an exterior angle.



angle a and **angle b** are the non-adjacent interior angles with respect to **angle e**

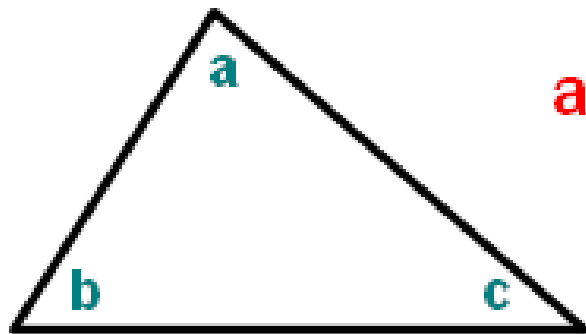
Triangle Properties

(add these to your reference sheet of angle pair classifications so you have all of the important properties and formulas in one place)

Triangle Property #1:

The sum of the measures of the interior angles in any triangle is 180° .

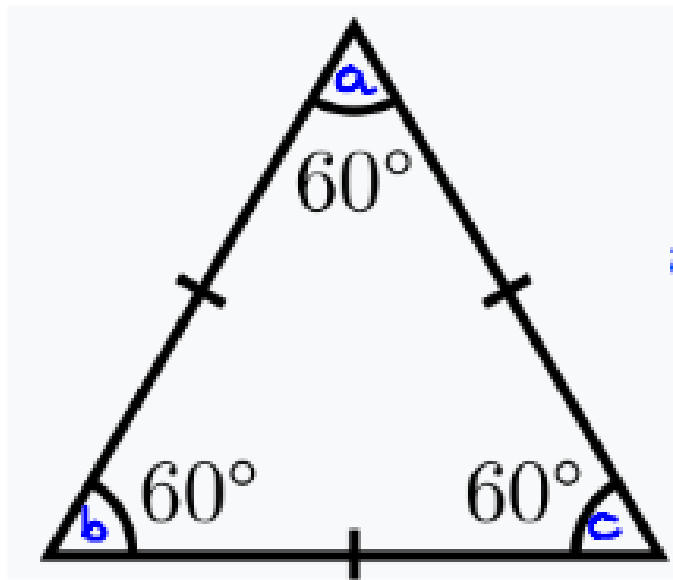
Abbreviation: **SMAT 180°**



$$a + b + c = 180^\circ$$

Special Case #1: Equilateral triangles

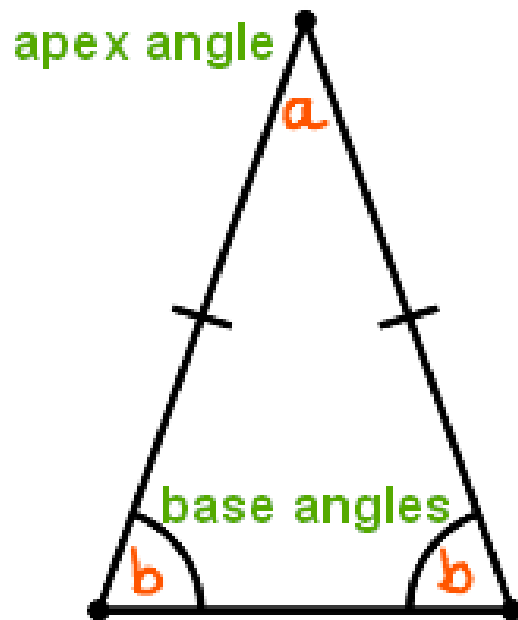
In an equilateral triangle, each of the interior angles will be 60° .



$$a = b = c = 60^\circ$$

Special Case #2: Isosceles triangles

An isosceles triangle has two equal base angles and one apex angle.



$$\text{apex angle} = 180^\circ - 2(\text{base})$$

$$a = 180^\circ - 2b$$

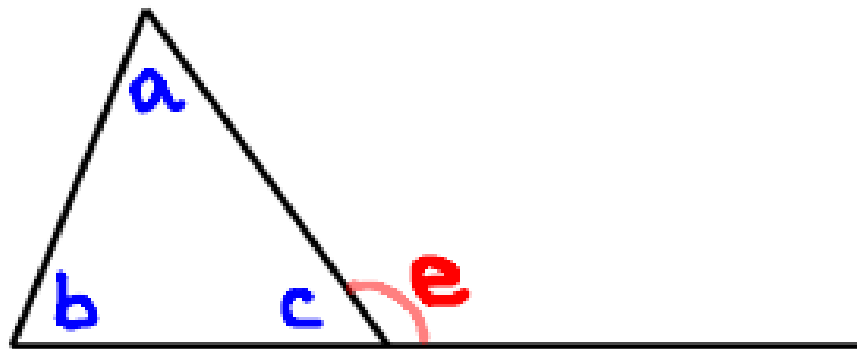
$$\text{base angle} = \frac{180^\circ - \text{apex}}{2}$$

$$b = \frac{180^\circ - a}{2}$$

Triangle Property #2:

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

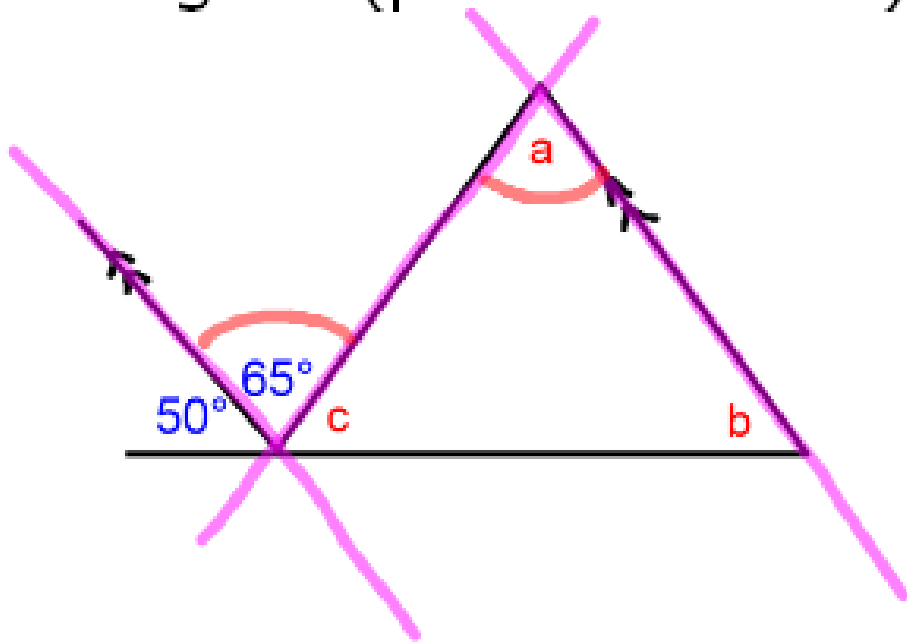
Abbreviation: ext angle property



$$e = a + b$$

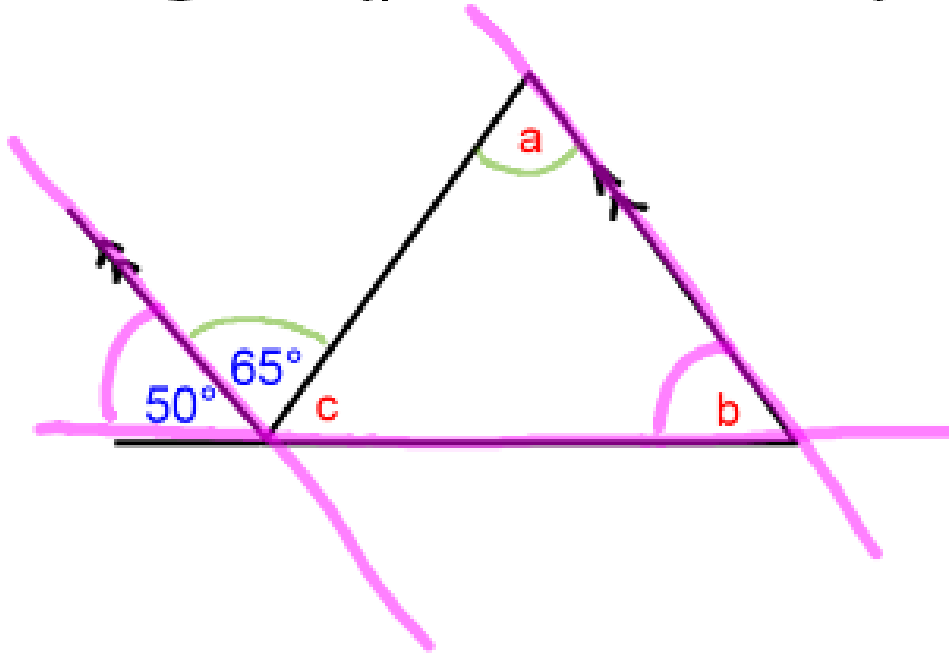
Example #1:

Determine the values of a , b and c in the following diagram (provide reasons).



Example #1:

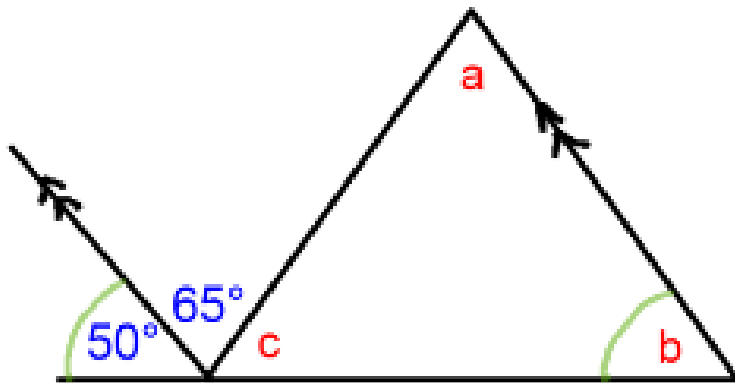
Determine the values of a , b and c in the following diagram (provide reasons).



$a = 65^\circ$ (ALT INT)

Example #1:

Determine the values of a , b and c in the following diagram (provide reasons).

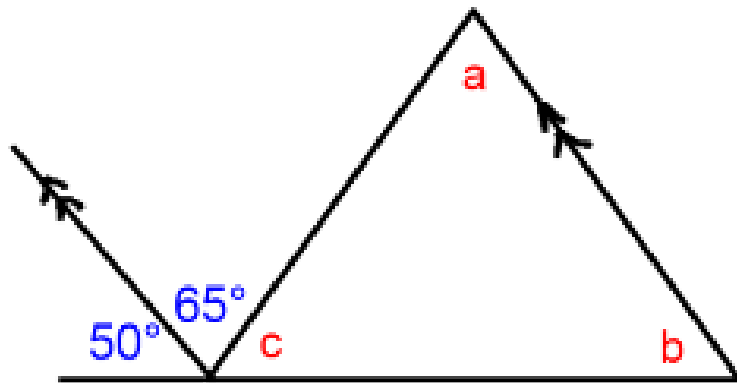


$$a = 65^\circ \text{ (ALT INT)}$$

$$b = 50^\circ \text{ (CORR)}$$

Example #1:

Determine the values of a , b and c in the following diagram (provide reasons).



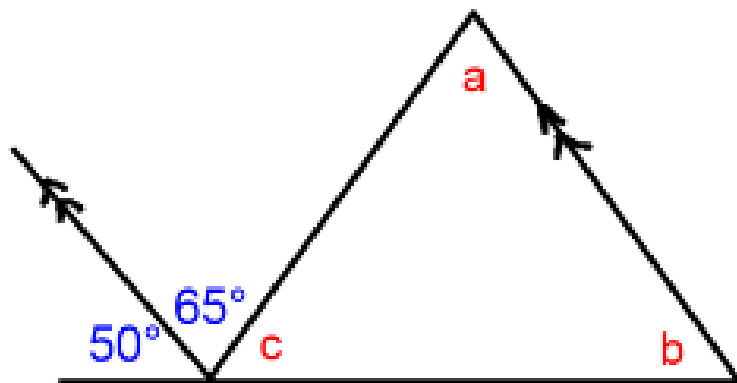
$$a = 65^\circ \text{ (ALT INT)}$$

$$b = 50^\circ \text{ (CORR)}$$

$$a + b + c = 180^\circ \text{ (SMAT } 180^\circ)$$

Example #1:

Determine the values of a , b and c in the following diagram (provide reasons).



$$a = 65^\circ \text{ (ALT INT)}$$

$$b = 50^\circ \text{ (CORR)}$$

$$a + b + c = 180^\circ \text{ (SMAT } 180^\circ)$$

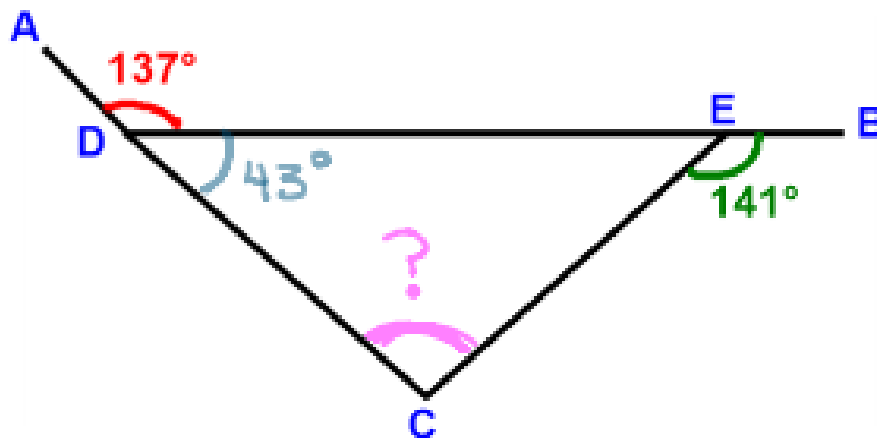
$$c = 180^\circ - a - b$$

$$c = 180^\circ - 65^\circ - 50^\circ$$

$$c = 65^\circ$$

Example #2:

Determine the measure of angle DCE in the following diagram (provide reasons):



$$\angle EDC = 180^\circ - 137^\circ \text{ (LPA)}$$

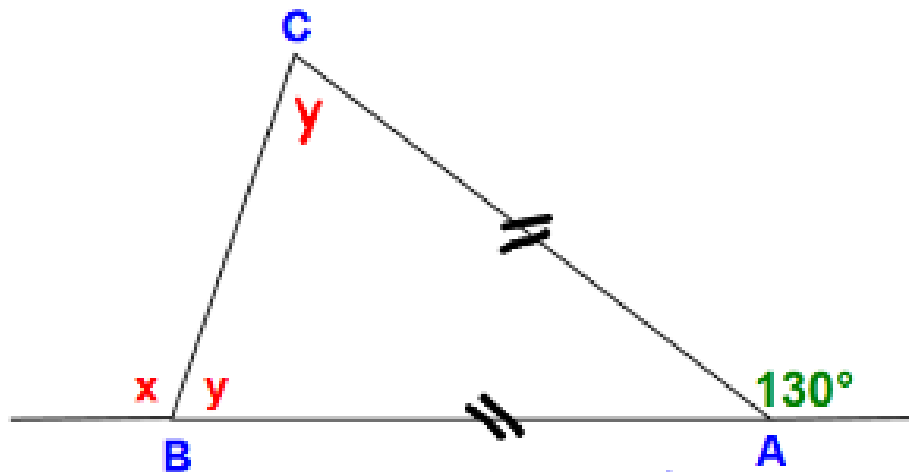
$$\angle EDC = 43^\circ$$

$$141^\circ = 43^\circ + \angle DCE \text{ (ext } \angle \text{ prop)}$$

$$98^\circ = \angle DCE$$

Example #3:

Triangle ABC is isosceles with $AB = AC$. Determine the measures of angles x and y (provide reasons):



$$x + y = 180^\circ \text{ (LPA)}$$

$$x = 180^\circ - 65^\circ = 115^\circ$$

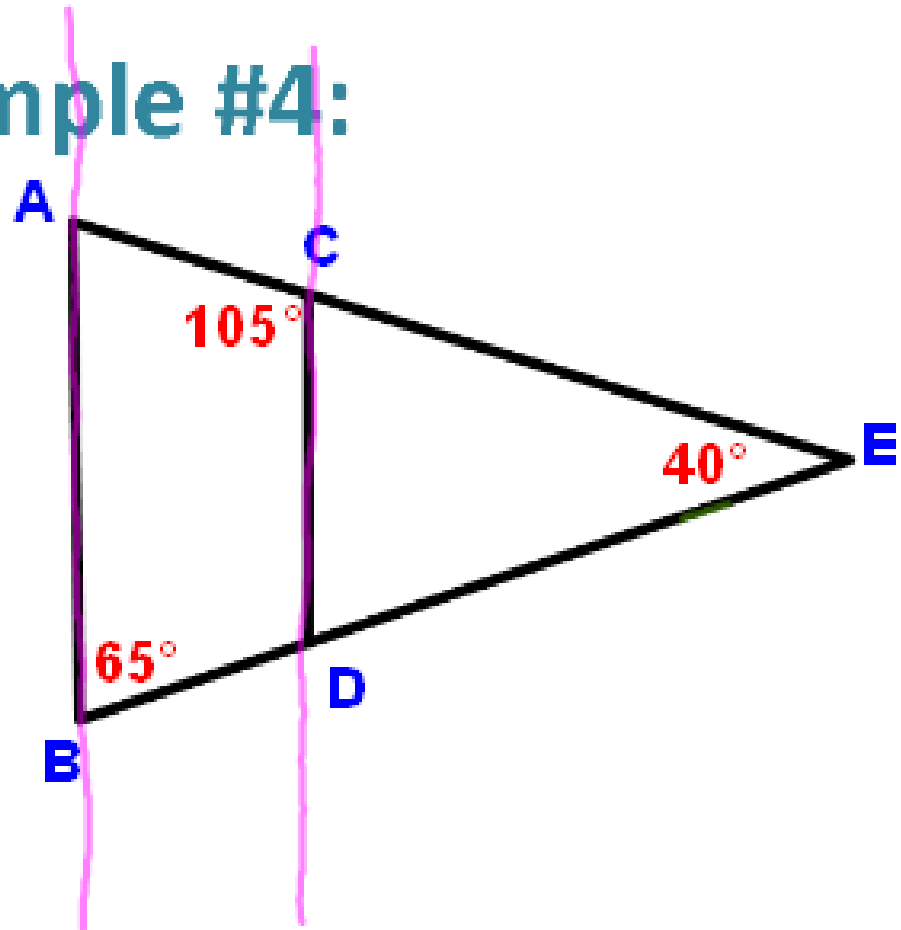
$$y + y = 130^\circ \text{ (ext } \angle \text{ prop)}$$

$$\frac{2y}{2} = \frac{130^\circ}{2}$$

$$y = 65^\circ$$

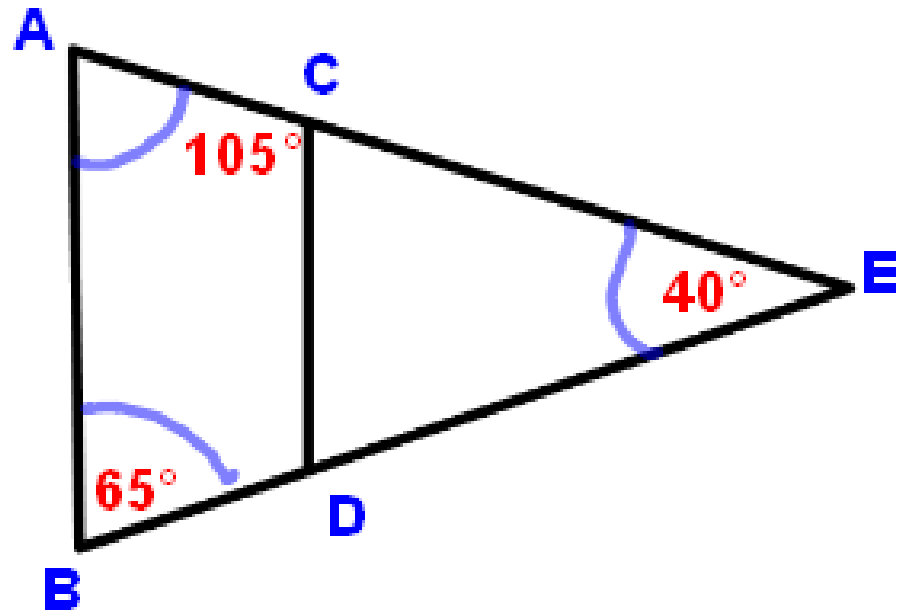
Example #4:

Prove that AB is parallel to CD:



Example #4:

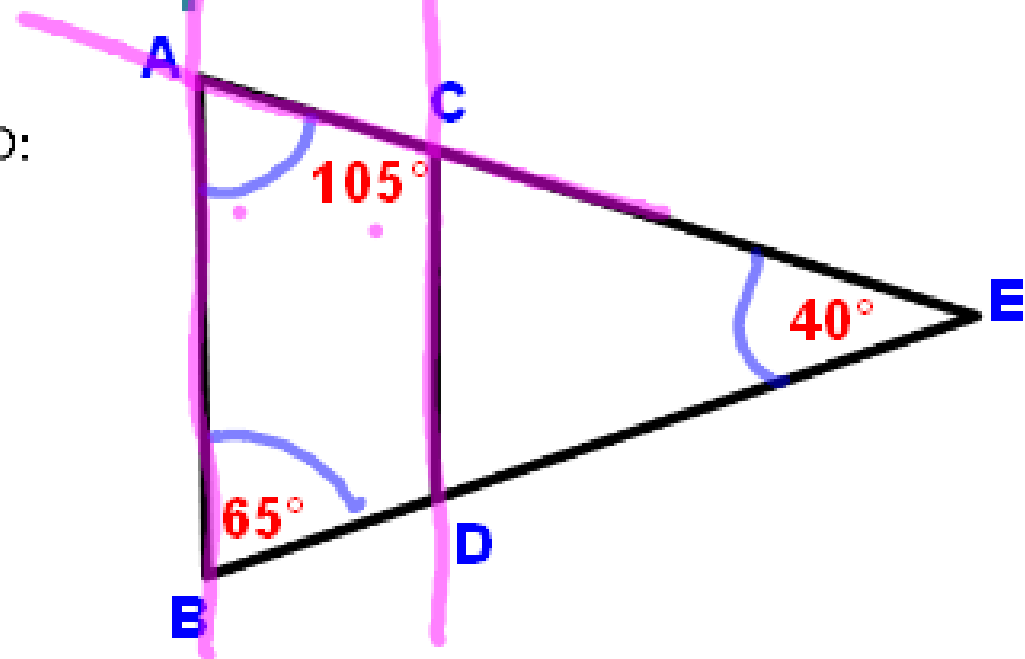
Prove that AB is parallel to CD:



$$\text{angle A} = 180^\circ - 40^\circ - 65^\circ = 75^\circ \quad (\text{SMAT } 180^\circ)$$

Example #4:

Prove that AB is parallel to CD:

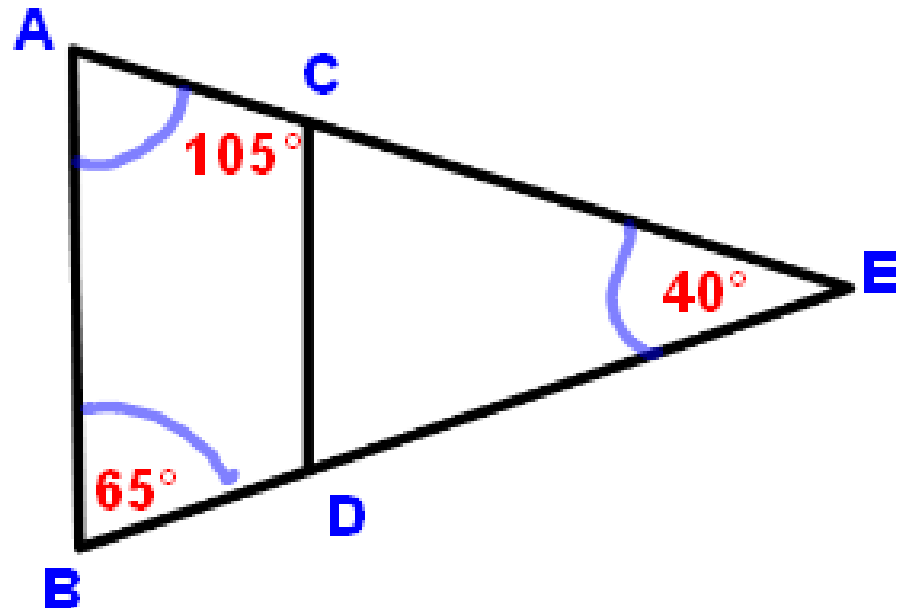


$$\text{angle A} = 180^\circ - 40^\circ - 65^\circ = 75^\circ \quad (\text{SMAT } 180^\circ)$$

$$\text{angle A} + \text{angle ACD} = 75^\circ + 105^\circ = 180^\circ$$

Example #4:

Prove that AB is parallel to CD:



$$\text{angle A} = 180^\circ - 40^\circ - 65^\circ = 75^\circ \quad (\text{SMAT } 180^\circ)$$

$$\text{angle A} + \text{angle ACD} = 75^\circ + 105^\circ = 180^\circ$$

Therefore, AB is parallel to CD because angle A and angle ACD are a pair of **SSIA** that are **supplementary**.

Check your understanding:

Textbook pg. 90 - 93

#1, 2, 3, 4, 6, 7, 9, 11, 13, 14, 15, 16