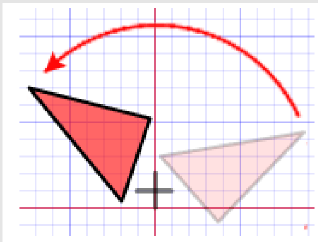
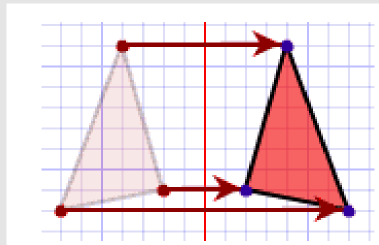
CONGRUENT TRIANGLES

If one shape can become another using Turns, Flips and/or Slides, then the shapes are **Congruent.** In other words, two geometric figures are ***congruent*** when they have exactly the same size and shape.

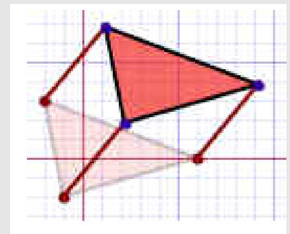
ROTATION / TURN



REFLECTION / FLIP



TRANSLATION/SLIDE

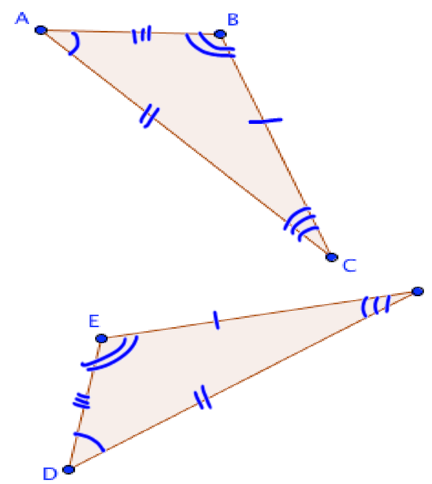


After any of those transformation (turn, flip or slide), the shape still has the **same size**, **area, angles, and line lengths.**

The symbol used for congruence is '≅'.

For example, the sentence '$\Delta ABC \cong \Delta DEF$' is read as 'triangle ABC is congruent to triangle DEF '

How to Find if Triangles are Congruent



CPCTC: When reporting congruences, you must do so in a way that 'matches up' corresponding parts.

For example, when you report that $\Delta ABC \cong \Delta DEF$, then all of the following are true:

angle A corresponds to angle D (∠D)

- ∠A=∠D
- ∠B=∠E
- ∠C=∠F
- AB=DE (recall that AB represents the distance from A to B)
- AC=DF
- BC=EF

corresponding angles

This property will be referred to as 'CPCTC':

Corresponding **P**arts of **C**ongruent **T**riangles are **C**ongruent.

In this congruence $\Delta ABC \cong \Delta DEF$:
vertex A corresponds to vertex D.
Vertex B corresponds to vertex E.
Vertex C corresponds to vertex F.

The congruence can be reported in any way that preserves this correspondence between the vertices. For example, here are two other correct ways that the congruence could be reported:
$\Delta BAC \cong \Delta EDC$ or $\Delta CBA \cong \Delta FED$.

However, $\Delta BAC \cong \Delta DEF$ is ***not*** a correct way to report the congruence indicated above.

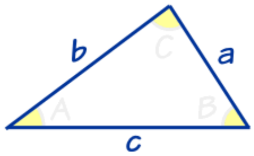
For more information check http://www.onemathematicalcat.org/Math/Geometry_obj/triangle_congruence.htm

METHODS TO FIND OUT CONGRUENCY

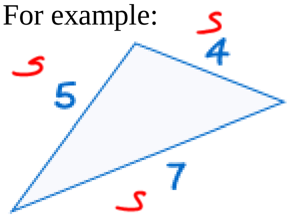
1. SSS *(side, side, side)*

SSsH SASSY AAS HLY ASAP

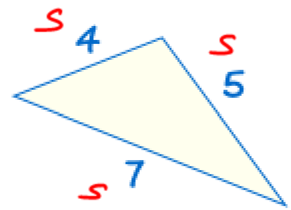
SSS stands for "side, side, side" and means that we have two triangles with all three sides equal.



For example:

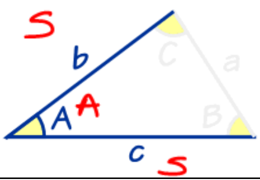


is congruent to:

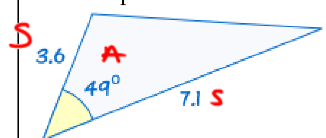


2. SAS *(side, angle, side)*

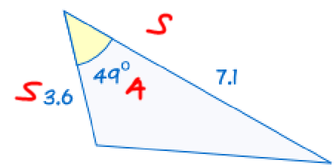
SAS stands for "side, angle, side" and means that we have two triangles where we know two sides and the included angle are equal.



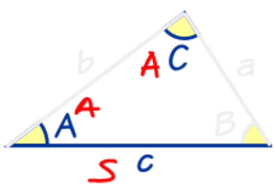
For example:



is congruent to:

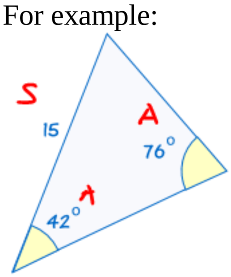


3. AAS *(angle, angle, side)*

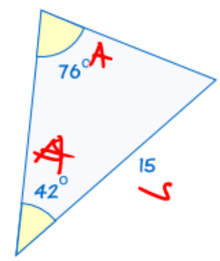


AAS stands for "angle, angle, side" and means that we have two triangles where we know two angles and the non-included side are equal.

For example:

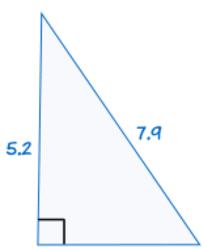


is congruent to:

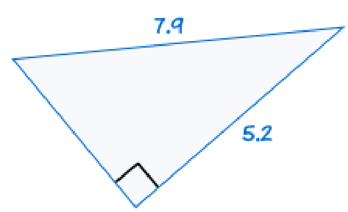


4. HL *(hypotenuse, leg)*

HL stands for "Hypotenuse, Leg. This one applies only to [right angled-triangles]!

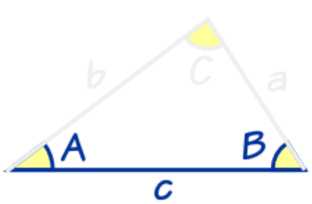


is congruent to

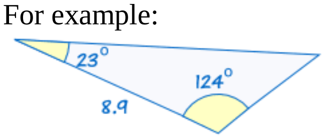


5. ASA *(angle, side, angle)*

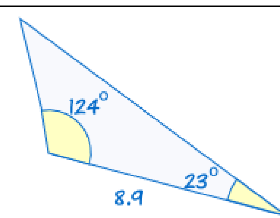
ASA stands for "angle, side, angle" and means that we have two triangles where we know two angles and the included side are equal.



For example:

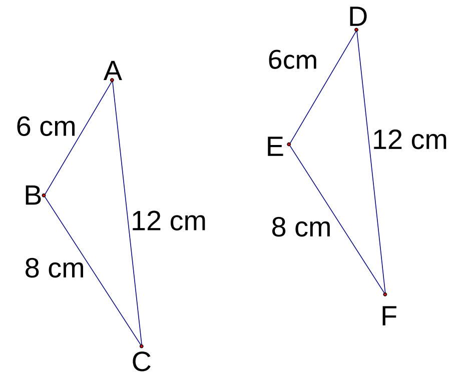


is congruent to:



EXAMPLE #1:

Are these triangles congruent? Which congruence sufficiency condition applies?



a) State the congruency statement.
i.e. Δ A B C $\cong \Delta$ D E F

SSS (side, side and side)

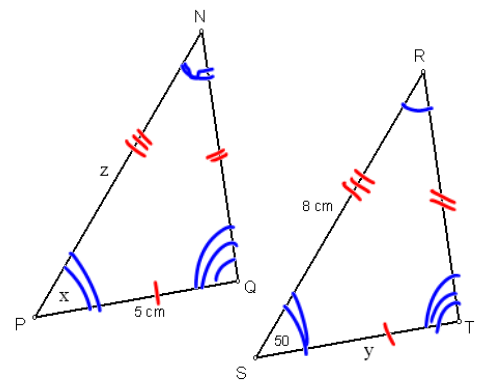
EXAMPLE #2:

$\Delta NPQ \cong \Delta RST$. State the values of x, y, and z.

$\angle N = \angle R$
$\angle P = \angle S$ $\boxed{x = 50°}$
$\angle Q = \angle T$

$PQ = ST$ $\boxed{5 = y}$
$NQ = RT$
$NP = RS$ $\boxed{z = 8\text{ cm}}$

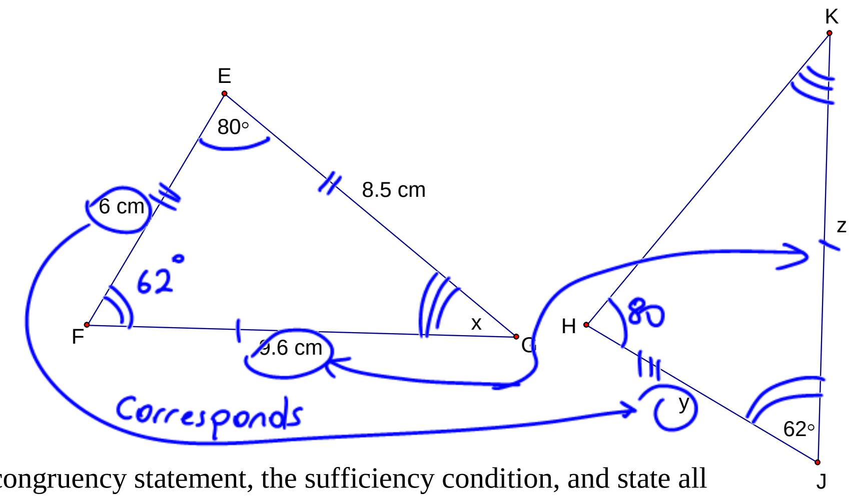
$\therefore$ $x = 50°$
$y = 5\text{cm}$
$z = 8\text{cm}$



EXAMPLE #3:

$\Delta EFG \cong \Delta HJK$. State the values of x, y, and z.

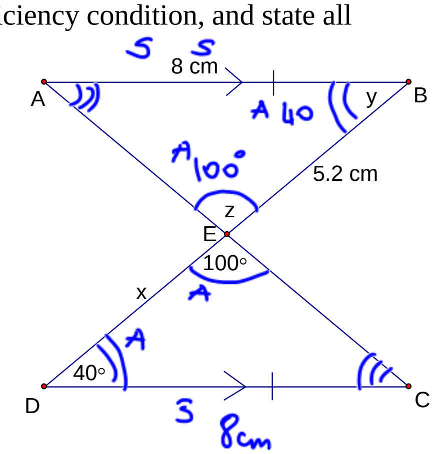
$\angle E = \angle H$ $80 = \angle H$
$\angle F = \angle J$ $\angle F = 62°$
$\angle G = \angle K$ $80 + 62 + x = 180$
$\boxed{x = 38°}$
$\boxed{y = 6\text{ cm}}$
$\boxed{z = 9.6\text{ cm}}$



EXAMPLE #4:

a) Show that these triangles are congruent. State the congruency statement, the sufficiency condition, and state all evidence.

$\angle z = 100°$ (vertically opp. angles)
$\angle y = 40°$ (alternate angles on parallel lines)



b) Determine the values of x, y, and z.

AAS condition applies
$\Delta ABE \cong \Delta CDE$

$BE = DE$
$\boxed{3.2 = x}$

$\therefore$ $x = 5.2\text{cm}$
$y = 40°$
$z = 100°$

PRACTICE → http://bit.ly/trianglescongruent2
http://bit.ly/trianglescongruent