Mathematics
Congruence of Triangles

NCERT Exercises (Questions-Solutions)

Exercise 7.1

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1. Complete the following statements :
(a) Two line segments are congruent if...... .
(b) Among two congruent angles, one has a measure of 70°; the measure of the other angle is ....
(c) When we write $\angle A = \angle B,$ we actually mean ....

Sol. (a) Two line segments are congruent if they have the same length.
(b) Among two congruent angles, one has a measure of 70^o the measure of the other angle is also 70^o.
(c) When we write $\angle A = \angle B,$ we actually mean $\angle A \cong \angle B,$

2. Give any two real-life examples for congruent shapes.

Sol. Please give yourself.

3. If $\Delta ABC \cong \Delta FED$ under the correspondence $ABC \leftrightarrow FED,$ write all the corresponding congruent parts of the triangles.

Sol. Corresponding vertices: A and F; B and E; C and D.
Corresponding sides: $\overline{AB}$ and $\overline{FE}$; $\overline{BC}$ and $\overline{ED}$; $\overline{CA}$ and $\overline{DF}$.
Corresponding angles: $\angle A$ and $\angle F; \angle B$ and $\angle E; \angle C$ and $\angle D$

4. If $\Delta DEF \cong \Delta BCA$, write the part(s) of ΔBCA that correspond to

(i) $\angle E$ **(ii)** $\overline{EF}$
(iii) $\angle F$ **(iv)** $\overline{DF}$

Sol. (i) $\angle C$ (ii) $\overline{CA}$
(iii) $\angle A$ (iv) $\overline{BA}$

Exercise 7.2

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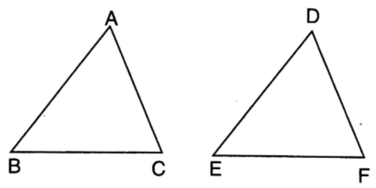
1. Which congruence criterion do you use in the following?

(a)

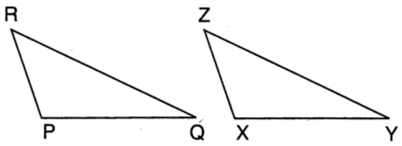


Given: $AC = DF$
$AB = DE$

$BC = EF$

So, $\Delta ABC \cong \Delta DEF$

(b)



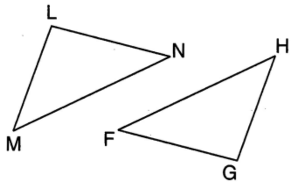
Given: ZX = RP

RQ = ZY

$\angle PRQ = \angle XZY$

So, $\Delta PQR \cong \Delta XYZ$

(c)



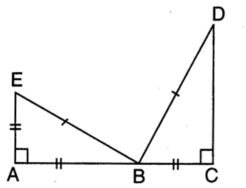
Given: ZMLN=ZFGH

$\angle NML = \angle GFH$

$ML = GF$

So, $\Delta LMN \cong \Delta GFH$

(d)



Given: $EB = DB$

$AE = BC$

$\angle A = \angle C = 90^\circ$

So, $\Delta ABE \cong \Delta CDB$

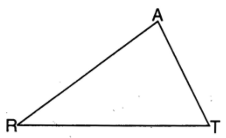
Sol. (a) SSS congruence criterion

(b) SAS congruence criterion

(c) SAS congruence criterion

(d) RHS congruence criterion.

2. You want to show that $\Delta ART \cong \Delta PEN$,



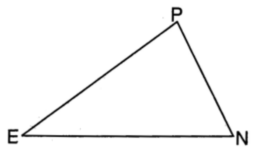
(a) If you have to use SSS criterion, then you need to show

(i) AR = (ii) RT = (iii) AT=

(b) If it is given that $\angle T = \angle N$ **and you are to use SAS criterion, you need to have**

(i) RT = and (ii) PN =

(c) If it is given that $AT = PN$ **and you are to use ASA criterion, you need to have**



(i) ? **(ii) ?**

Sol. (a) (i) $AR = \underline{PE}$ (ii) $RT = \underline{EN}$

(iii) $AT = \underline{PN}$

(b) (i) $RT = \underline{EN}$ and (ii) $PN = \underline{AT}$

(c) (i) $\underline{\angle ATR = \angle PNE}$ and

(ii) $\underline{\angle TAR = \angle NPE}$

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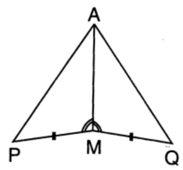
3. **You have to show that $\Delta AMP \cong \Delta AMQ$.**

In the following proof, supply the missing reasons.



Steps	Reasons
(i) $PM = QM$	
(ii) $\angle PMA = \angle QMA$	
(iii) $AM = AM$	
(iv) $\Delta AMP \cong \Delta AMQ$	

Sol.

(i) $PM = QM$	(i) Given
(ii) $\angle PMA = \angle QMA$	(ii) Given
(iii) $AM = AM$	(iii) Common in both
(iv) $\Delta AMP \cong \Delta AMQ$	(iv) By SAS congruence criterion

4. **In $\Delta ABC, \angle A = 30^o, \angle B = 40^o$ and $\angle C = 110^o$**

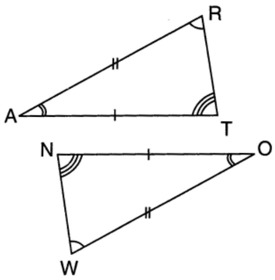
In $\Delta PQR, \angle P = 30^o, \angle Q = 40^o$ and $\angle R = 110^o$

A student says that $\Delta ABC \cong \Delta PQR$ by AAA congruence criterion. Is he justified? Why or why not?

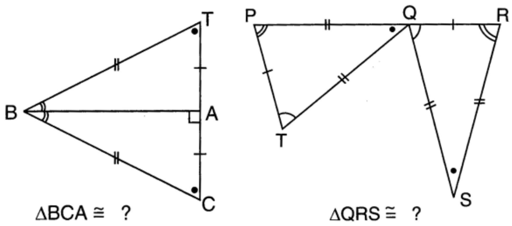
Sol. No! he is not justified because AAA is not a criterion for congruence of triangles.

5. **In the figure, the two triangles are congruent. The corresponding parts are marked. We can write $\Delta RAT \cong ?$**

Sol. $\Delta RAT \cong \underline{\Delta WON}$



6. Complete the congruence statement:

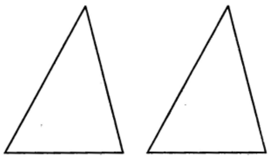


Sol. $\Delta BCA \cong \underline{\Delta BTA}$

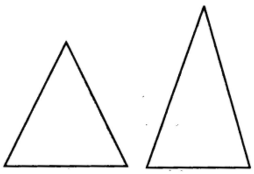
$\Delta QRS \cong \underline{\Delta TPQ}$

7. In a squared sheet, draw two triangles of equal areas such that
(i) the triangles are congruent.
(ii) the triangles are not congruent.
What can you say about their perimeters?

Sol. (i)



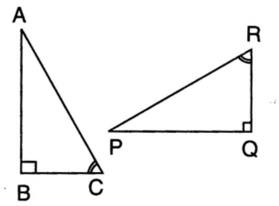
(ii)



(i) There can be two congruent triangles whose perimeters are equal. [Actually, two congruent triangles are exact copies of each other.]

(ii) The two triangles are not congruent but their perimeters are equal.

8. If ΔABC and ΔPQR are to be congruent, name one additional pair of corresponding parts. What criterion did you use?



Sol. BC = RQ by ASA congruence rule.

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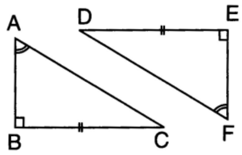
9. Explain why

$\Delta ABC \cong \Delta FED$



Sol. $\Delta ABC \cong \Delta FED\ (= 90^o)$

$BC = ED$

$\angle ACB = \angle FDE$

$\because$ The sum of the measures of three angles of atriangle is 180^o

$\therefore$ $\Delta ABC \cong \Delta FED$ | By SAS congruence criterion

Enrichment Activity. We saw that superposition is a useful method to test congruence of plane figures. We discussed conditions for congruence of line segments, angles and triangles. You can now try to extend this idea to other plane figures as well.

1. Consider cut-outs of different sizes of squares. Use the method of superposition to find out the condition for congruence of squares. How does the idea of' corresponding parts' under congruence apply? Are there corresponding sides? Are there corresponding diagonals?

2. What happens if you take circles? What is the condition for congruence of two circles? Again, you can use the method of superposition. Investigate.

3. Try to extend this idea to other plane figures like regular hexagons, etc.

Take two congruent copies of a triangle. By paper folding, investigate if they have equal attitudes. Do they have equal medians? What can you say about their perimeters and areas.

Sol.

1. The condition for congruence of squares is that their sides must be the same.

2. The condition for congruence of two circles is that their radii must be the same,

3. The condition for congruence of two plane figures like regular hexagons, etc. is that their sides must be the same.

4. Two congruent triangles have equal altitudes, equal medians, equal altitudes, equal medians, equal perimeters and equal areas.