MATHEMATICS

Class-VII

Topic-06

CONGRUENCE OF TRIANGLES

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CHAPTER 06

CONGRUENCE OF TRIANGLES

TERMINOLOGIES

Congruent figures, Congruent Triangles, SAS, ASA, AAS, SSS, RHS, Similar Figures, AAA Similarity, SSS Similarity, SAS Similarity.

INTRODUCTION

Have you seen the two stamps of same denomination, shaving blades of same company, sheets of the same letter pad,etc,... Now if you place one stamp over the other.what do you observe? One stamp covers the other completely and exactly.This means that the two stamps are of the same shape and size, such objects are said to be congruent.
Two plane figures are congruent if each is a carbon copy of the other or if we put one object on other then they completely cover each other .This method of examining the congruence is called the method of superposition..

6.1 CONGRUENCE OF TRIANGLES

(a) Congruent figures

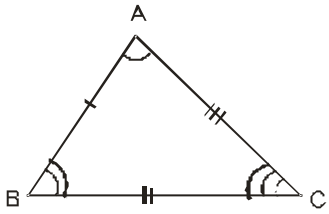
Fig.(i)

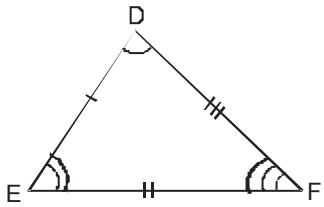
Fig.(ii)

In the above figures {fig.(i) and fig.(ii)} both are equal in length, width and height, so these are congruent figures.

(b) Congruent triangles

Two triangles are **congruent** if and only if one of them can be made to superimpose on the other, so as to cover it exactly.





If two triangles ΔABC and ΔDEF are congruent then there exist a one to one correspondence between their vertices and sides i.e. we get following six equalities

$\angle A = \angle D$, $\angle B = \angle E$, $\angle C = \angle F$

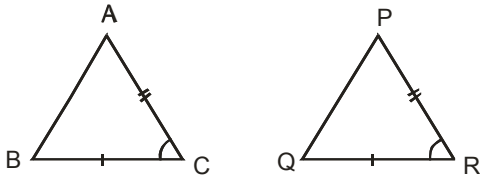
and AB = DE, BC = EF, AC = DF.

If two ΔABC & ΔDEF are congruent under $A \leftrightarrow D$, $B \leftrightarrow E$, $C \leftrightarrow F$ one to one correspondence then we write $\Delta ABC \cong \Delta DEF$ we can not write as $\Delta ABC \cong \Delta DFE$ or $\Delta ABC \cong \Delta EDF$ or in other forms because $\Delta ABC \cong \Delta DEF$ have following one-one correspondence $A \leftrightarrow D$, $B \leftrightarrow E$, $C \leftrightarrow F$.

Hence we can say that "two triangles are congruent if and only if there exists a one-one correspondence between their vertices such that the corresponding sides and the corresponding angles of the two triangles are equal.

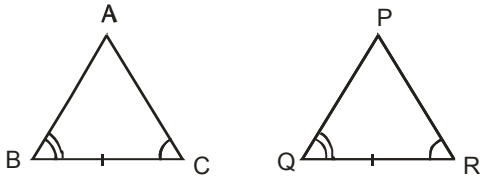
(c) Sufficient conditions for congruence of two triangles

(i) SAS Congruence Criterion



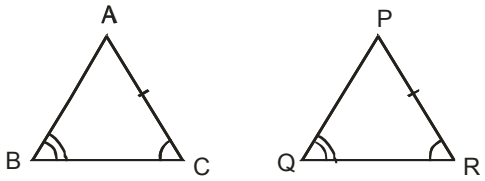
Two triangles are congruent if two sides and the included angle of one are equal to the corresponding sides and the included angle of the other triangle.

(ii) ASA Congruence Criterion:



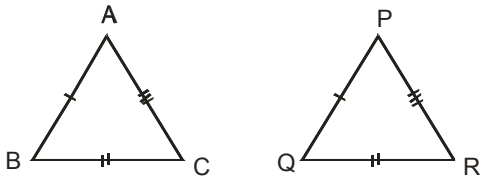
Two triangles are congruent if two angles and the included side of one triangle are equal to the corresponding two angles and the included side of the other triangle.

(iii) AAS Congruence Criterion:



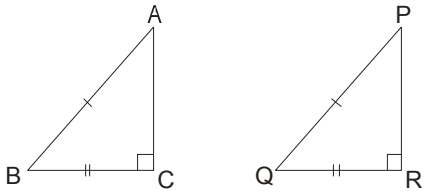
If any two angles and a non included side of one triangle are equal to the corresponding angles and side of another triangle, then the two triangles are congruent.

(iv) SSS Congruence Criterion:



Two triangles are congruent if the three sides of one triangle are equal to the corresponding three sides of the other triangle.

(v) RHS Congruence Criterion:



Two right triangles are congruent if the hypotenuse and one side of one triangle are respectively equal to the hypotenuse and one side of the other triangle.

(d) Congruence relation in the set of all triangles

By the definition of congruence of two triangles, we have following results.

(i) Every triangle is congruent to itself i.e. $\Delta ABC \cong \Delta ABC$.

(ii) If $\Delta ABC \cong \Delta DEF$ then $\Delta DEF \cong \Delta ABC$.

(iii) If $\Delta ABC \cong \Delta DEF$ and $\Delta DEF \cong \Delta PQR$ then $\Delta ABC \cong \Delta PQR$.

NOTE:

If two triangles are congruent then their corresponding sides and angles are also congruent by **cpct (corresponding parts of congruent triangles are also congruent).**

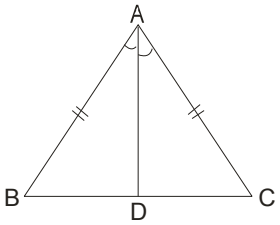
Illustration 6.1

Prove that : "Angles opposite to equal sides of an isosceles triangle are equal."

Sol. **Given :** ΔABC in which AB = AC.

To Prove : $\angle B = \angle C$.

Construction : We draw the bisector AD of $\angle A$ which meets BC in D.



Proof : In ΔABD and ΔACD we have

AB = AC	[Given]	
$\angle BAD = \angle CAD$	[AD is bisector of $\angle A$]	
And, AD = AD	[Common side]	
By SAS criterion of congruence, we have		
$\Delta ABD \cong \Delta ACD$		
$\Rightarrow$ $\angle B = \angle C$	[By CPCT]	**Hence Proved.**

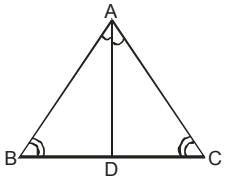
Illustration 6.2

Prove that : "If two angles of a triangle are equal, then sides opposite to them are also equal."

Sol. **Given :** ΔABC in which $\angle B = \angle C$.

To Prove : AB = AC.

Construction : We draw the bisector of $\angle A$ which meets BC in D.



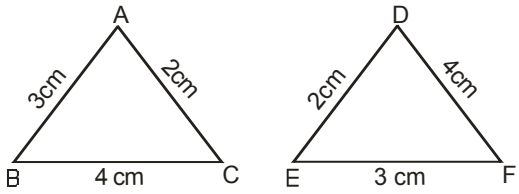
Proof : In ΔABD and ΔACD we have

$\angle B = \angle C$	[Given]	
$\angle BAD = \angle CAD$	[AD is bisector of $\angle A$]	
AD = AD	[Common side]	
By AAS criterion of congruence, we get		
$\Delta ABD \cong \Delta ACD$		
$\Rightarrow$ AB = AC	[By CPCT]	**Hence Proved.**

Illustration 6.3

In ΔABC, AB = 3 cm, BC = 4 cm and CA = 2 cm and in ΔDEF, DE = 2 cm, EF = 3 cm and FD = 4 cm. Is the above given triangle are congruent. If they are congruent write out the pairs of equal angles.

Sol.



In triangles ABC and DEF, we have
AB = EF = 3 cm, BC = FD = 4 cm and CA = DE = 2 cm
So, by SSS condition of congruence, we have
$\Delta ABC \cong \Delta EFD$
Since, AB = EF, therefore angles opposite to these sides are equal.
$\Rightarrow \quad \angle C = \angle D$
Similarly, BC = FD $\Rightarrow$ $\angle A = \angle E$ and CA = DE $\Rightarrow$ $\angle B = \angle F$.

Illustration 6.4

Which of the following pairs of triangles are congruent ?

(i) ΔABC, AB = 2 cm, AC = 4 cm, $\angle A = 40^\circ$;
ΔXYZ , XZ = 2 cm, YZ = 4 cm, $\angle Z = 40^\circ$.

(ii) ΔPQR, PQ = 5 cm, PR = 6 cm, $\angle P = 55^\circ$;
ΔDEF, DE = 6 cm, EF = 5 cm, $\angle D = 55^\circ$.

Sol. **(i)** In ΔABC and ΔXYZ, we have
AB = XZ = 2 cm, AC = YZ = 4 cm and $\angle A = \angle Z = 40^\circ$
Thus, in ΔABC and ΔXYZ, the two sides and the included angle of one triangle are equal to two sides and the corresponding included angle of the other.
So by SAS congruence condition, we have $\Delta ABC \cong \Delta ZXY$

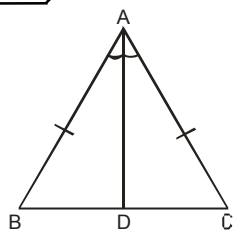
(ii) In ΔPQR, the included angle between PQ and PR is $\angle P$.
In ΔDEF, the included angle between DE and EF is $\angle E$.
We have,
PQ = EF = 5 cm and PR = DE = 6 cm but $\angle P \neq \angle E$
So, the given triangles are not congruent.

Illustration 6.5

Show that the bisector of vertical angle of an isosceles triangle bisects the base at right angles.

Sol. Let ΔABC be an isosceles triangle such that AB = AC.
Let AD be the bisector of vertical angle $\angle A$ meeting BC in D.
Now, in Δs ABD and ACD, we have

	AB = AC	[Given]
	$\angle BAD = \angle CAD$	[$\because$ AD is the bisector of $\angle A$]
and	AD = AD	[Common side]



Therefore, By SAS congruence condition, we have

$\Delta ABD \cong \Delta ACD$

$\Rightarrow$ BD = CD and $\angle ADB = \angle ADC$

But, $\angle ADB + \angle ADC = 180^\circ$ [Linear pair property]

$\therefore$ $\angle ADB = \angle ADC = 90^\circ$

Hence, AD bisects BC at right angles.

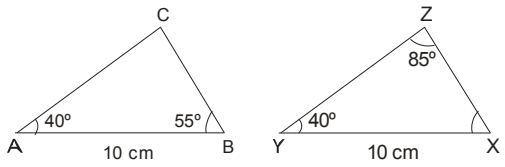
Illustration 6.6

Which of the following pairs of triangles are congruent ?

(i) ΔABC : AB = 10 cm, $\angle A = 40^\circ$, $\angle B = 55^\circ$;
ΔXYZ : XY = 10 cm, $\angle Y = 40^\circ$, $\angle Z = 85^\circ$

(ii) ΔPQR : PR = 5 cm, $\angle P = 37^\circ$, $\angle R = 64^\circ$;
ΔDEF : DE = 5 cm, $\angle D = 37^\circ$, $\angle F = 64^\circ$

Sol. **(i)** In ΔXYZ, we have



$\angle Y = 40^\circ$ and $\angle Z = 85^\circ$

$\therefore$ $\angle X = 180^\circ - (\angle Y + \angle Z) = 180^\circ - (40^\circ + 85^\circ) = 55^\circ$

Thus, in Δs ABC and XYZ, we have

AB = XY = 10 cm and $\angle A = \angle Y = 40^\circ$ and, $\angle B = \angle X = 55^\circ$

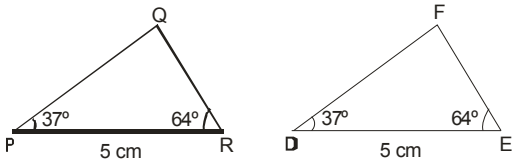
$\therefore$ By ASA congruence condition, we have $\Delta ABC \cong \Delta YXZ$.

(ii) In Δ's PQR and DEF, we have

PR = DE = 5 cm and $\angle P = \angle D = 37^\circ$ and, $\angle R = \angle E = 64^\circ$

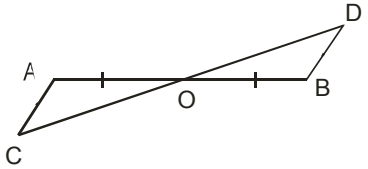
$\therefore$ By ASA congruence condition, we have

$\Delta PQR \cong \Delta DFE$ or $\Delta PRQ \cong \Delta DEF$



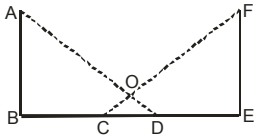
Ask yourself

1. In the given figure, O is the mid-point of AB and AC || BD. Show that $\Delta AOC \cong \Delta BOD$.

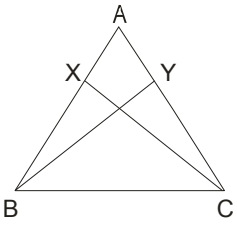


2. P is any point in the ∠ABC such that the perpendicular drawn from P on AB and BC are equal. Prove that BP bisects ∠ABC.

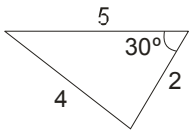
3. It is given that AB = EF, BC = DE, AB ⊥ BD and EF⊥ CE.Prove that ΔABD ≅ Δ FEC.

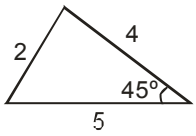


4. In the adjoining figure, X and Y are respectively two points on equal sides AB and AC of ΔABC such that AX = AY. Prove that CX = BY.



5. Which Criteria can be used to prove congruence of 2 triangles ?





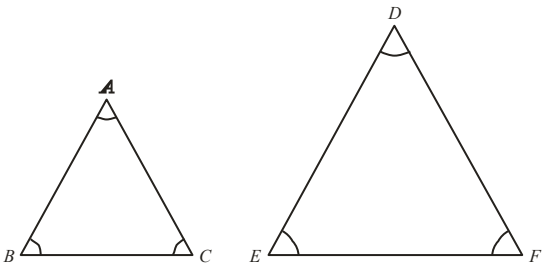
Add your knowledge

Two geometric figures having the same shape and size are known as **congruent figures**. Geometric figures having the same shape but different sizes are known as **similar figures**. Two triangles **ABC** and **DEF** are said to be similar if their

(i) Corresponding angles are equal.

i.e. ∠A = ∠D, ∠B = ∠E, ∠C = ∠F

And,



(ii) Corresponding sides are proportional.

i.e. $\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DE}$.

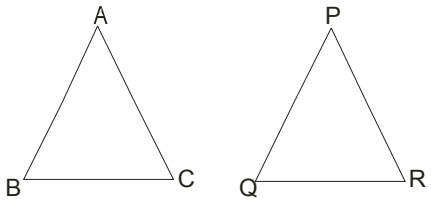
(a) Characteristic Properties of Similar Triangles :

(i) **(AAA Similarity)** If two triangles are equiangular, then they are similar.

(ii) **(SSS Similarity)** If the corresponding sides of two triangles are proportional, then they are similar.

(iii) **(SAS Similarity)** If in two triangles, one pair of corresponding sides are proportional and the included angles are equal then the two triangles are similar. Lets understand this topic more clearly with the help of an example

Example : ΔABC and ΔPQR are similar triangles such that $\angle A = 32^\circ$ and $\angle R = 65^\circ$, then $\angle B$ is :



Sol.

$\Delta ABC \sim \Delta PQR$

$\angle A = \angle P$, $\angle B = \angle Q$ and $\angle C = \angle R$

$\therefore \angle P = 32^\circ$, $\angle C = 65^\circ$

In ΔABC

$\Rightarrow \quad \angle A + \angle B + \angle C = 180^\circ$

$\Rightarrow \quad 32^\circ + \angle B + 65^\circ = 180^\circ$

$\Rightarrow \quad \angle B = 180^\circ - 32^\circ - 65^\circ.$

$\Rightarrow \quad \angle B = 180^\circ - 97^\circ = 83^\circ.$

Example : Two triangles ABC and PQR are similar, if BC : CA : AB = 3 : 6 : 5, find the value of $\frac{QR}{PR}$.

Sol. $\Delta ABC \sim \Delta PQR$

$$\frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR}$$

So, $$\frac{BC}{QR} = \frac{AC}{PR}$$

$$\Rightarrow \quad \frac{QR}{PR} = \frac{BC}{AC}$$

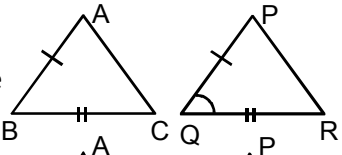
$$\Rightarrow \quad \frac{QR}{PR} = \frac{3}{6} = \frac{1}{2}$$

Concept Map

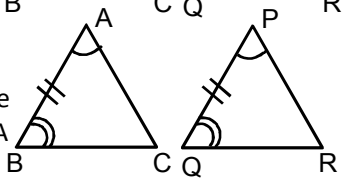
CONGURENCE OF TRIANGLE

Criteria

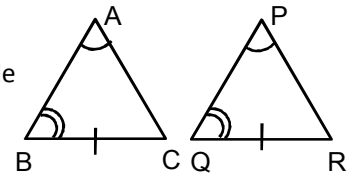
(Side Angle Side) SAS



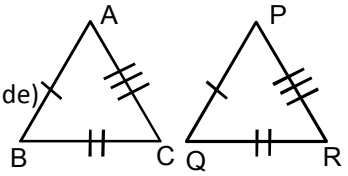
(Angle Side Angle) ASA



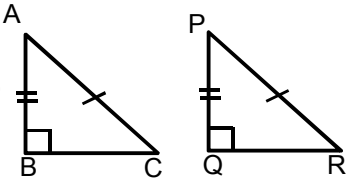
(Angle Angle Side) AAS



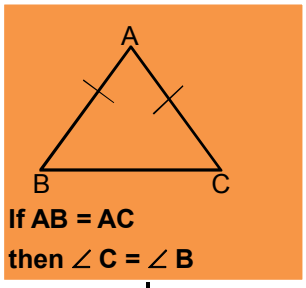
(Side Side Side) SSS



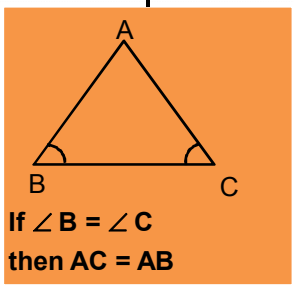
(Right Hypotenuse Side) RHS



$\Delta ABC \cong \Delta PQR$
means
$\angle A = \angle P$ AB = PQ
$\angle B = \angle Q$ BC = QR
$\angle C = \angle R$ AC = PR



If AB = AC
then $\angle C = \angle B$



If $\angle B = \angle C$
then AC = AB

Summary

1. Two figures are called **congruent** if they have same shape and same size. In other words, two figures are called congruent if they are having equal length, width and height.

2. Two triangles are **congruent** if and only if one of them can be made to superimposed on the other, so as to cover it exactly.

3. If two triangles ΔABC and ΔDEF are congruent then there exist a one to one correspondence between their vertices and sides i.e. we get following six equalities
$\angle A = \angle D$, $\angle B = \angle E$, $\angle C = \angle F$ and $AB = DE$, $BC = EF$, $AC = DF$.

4. Two triangles are congruent if two sides and the included angle of one are equal to the corresponding sides and the included angle of the other triangle (SAS)

5. Two triangles are congruent if two angles and the included side of one triangle are equal to the corresponding two angles and the included side of the other triangle.(ASA)

6. If any two angles and a non included side of one triangle are equal to the corresponding angles and side of another triangle, then the two triangles are congruent.(AAS)

7. Two triangles are congruent if the three sides of one triangle are equal to the corresponding three sides of the other triangle.(SSS)

8. Two right triangles are congruent if the hypotenuse and one side of one triangle are respectively equal to the hypotenuse and one side of the other triangle. (R.H.S)

9. Two congruent figures are equal in area but two figures having same area need not be congruent.

10. Angles opposite to equal sides of an isosceles triangle are equal.

11. If two angles of a triangle are equal, then sides opposite to them are also equal.

12. The bisector of the vertical angle of an isosceles triangle bisects the base at right angles.

EXERCISE 01

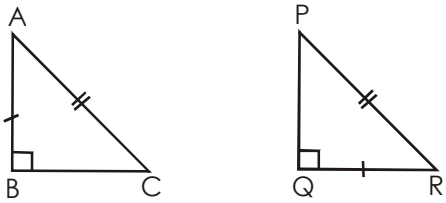
SECTION -A (FIXED RESPONSE TYPE)

MULTIPLE CHOICE QUESTIONS

1. If $\Delta ABC \cong \Delta QRP$, then which of the following statement is correct.

(A) $\angle A = \angle P$ (B) $\angle B = \angle R$ (C) $\angle A = \angle R$ (D) $\angle C = \angle Q$

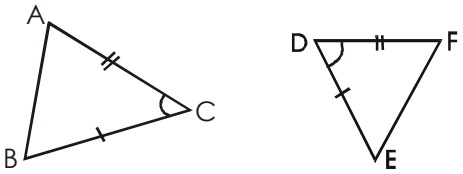
2.



By which criteria the given triangle are congruent.

(A) ASA (B) SAS (C) RHS (D) SSS

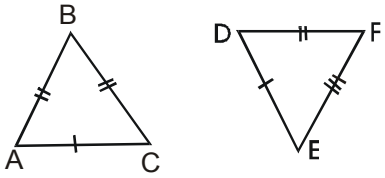
3. For given figure, which one is correct :



(A) Δ ABC $\cong$ Δ DEF (B) Δ ABC $\cong$ ΔDFE

(C) Δ ABC $\cong$ Δ EFD (D) Δ ABC $\cong$ Δ FED

4. For given figure, which one is correct



(A) Δ ABC $\cong$ Δ DEF (B) Δ ABC $\cong$ ΔFED

(C) Δ ABC $\cong$ Δ DFE (D) Δ ABC $\cong$ Δ EDF

5. Which of the following figure are not congruent.

(A) Two squares of same perimeter

(B) Two equilateral triangle of same perimeter

(C) Two Regular hexagon of same perimeter

(D) Square and an equilateral triangle of same perimeter

6. Which of the following is not the criteria for the congruency of triangle.

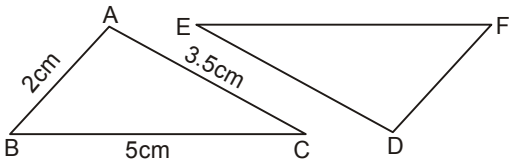
(A) ASA (B) AAS (C) SSS (D) SSA

7. $\Delta PQR \cong \Delta SRQ$ by SAS axiom. Which of the following is not a matching part ?

(A) PQ = SR (B) $\angle PQR = \angle SRQ$

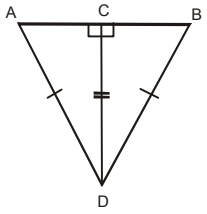
(C) PQ = SQ (D) QR = RQ

8. If $\Delta ABC \cong \Delta DEF$, then the value of DF will be :



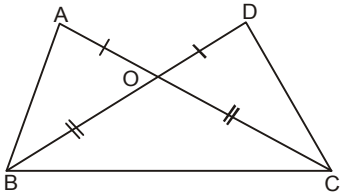
(A) 13 cm (B) 2 cm (C) 3.5 cm (D) 5 cm

9. In the given figure, if $AC \perp CD$, $BC \perp CD$ and AD = BD, than CA is equal to :



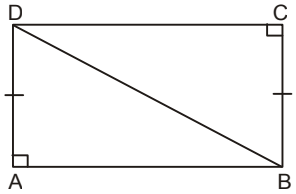
(A) AD (B) CD (C) BD (D) BC

10. BC is the common base of ΔABC and ΔDCB. Also AO = OD and BO = CO. Then which of the following statement is true by side -angle- side congruence property.



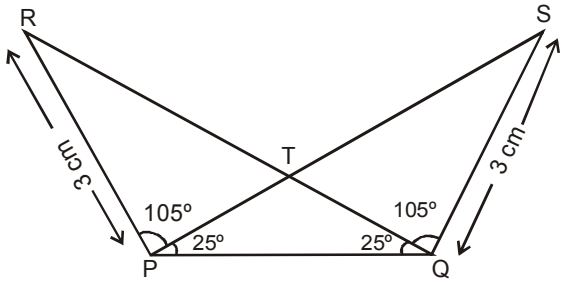
(A) $\Delta AOB \cong \Delta DOC$ (B) $\Delta AOB \cong \Delta DCO$ (C) $\Delta AOB \cong \Delta COD$ (D) $\Delta AOB \cong \Delta CDO$

11. Which of the following statement is true for the given fig.



(A) $\Delta ABD \cong \Delta BCD$ (B) $\Delta ABD \cong \Delta CDB$
(C) $\Delta ABD \cong \Delta DBC$ (D) $\Delta ABD \cong \Delta CBD$

12. For the given figure, which one is correct.



(A) $\Delta PQR \cong \Delta PQS$ (B) $\Delta PQR \cong \Delta PSQ$ (C) $\Delta PQR \cong \Delta SQP$ (D) $\Delta PQR \cong \Delta QPS$

13. ΔABC and ΔPQR are congurent if
(A) AB = BC = AC and PQ = QR = PR (B) $\angle A = \angle P$, $\angle B = \angle Q$, $\angle C = \angle R$
(C) AB = PQ, BC = QR, AC = PR (D) None of these

14. Which of the following are Criteria for congruence of triangles.
(A) RHS (B) SSS (C) AAS (D) All of these

FILL IN THE BLANKS

1. Two figures having same shape and size are known as _____

2. C.P.C.T means_____

3. If each angle of a triangle is equal, than measure of each angle is _____

4. Two circles are congruent if they have same _____

5. In a right angle triangle ____ is the longest side.

TRUE / FALSE

1. Triangles with AAA condition are not congruent.

2. All squares are congruent .

3. If two squares have equal areas, they are congruent.

4. If two triangles are congruent then their corresponding sides and their corresponding angles are equal.

5. If the hypotenuse of one right triangle is equal to the hypotenuse of another right triangle, then the triangle are congruent.

MATCH THE COLUMN

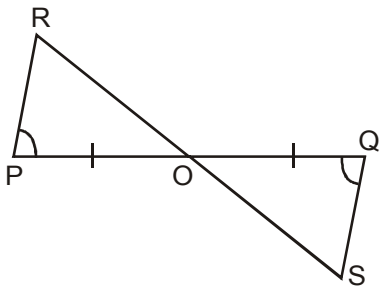
Column – I		**Column – II**	
(A)	If $\Delta ABC \cong \Delta PQR$ then	(p)	SSA
(B)	In RHS, H stands for	(q)	SSS
(C)	Congruency condition does not hold true for	(r)	BC = QR
(D)	If 3 sides of one triangle are equal to corresponding 3 sides of other triangle, then Δ's are congruent by	(s)	Hypotenuse
(E)	Sum of all angles of Δ	(t)	180°
(F)	Intersection point of medians	(u)	Orthocenter
(G)	Intersection points of altitudes	(v)	Centroid
(H)	Intersection points of angle bisectors	(w)	Incenter

SECTION -B (FREE RESPONSE TYPE)

VERY SHORT ANSWER TYPE

1. How many congruency criterias are there ?

2.

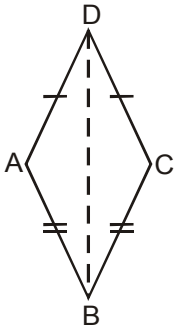


In adjoining figure, PO = QO; $\angle P = \angle Q$

(i) Is $\angle POR = \angle QOS$? Give reasons. **(ii)** Is $\Delta POR \cong \Delta QOS$? Give reasons.

(iii) Is $\angle PRO = \angle QSO$?

3. In figure, AD = CD and AB = CB.



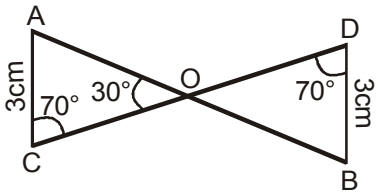
(i) State the three pairs of equal parts in ΔABD and ΔCBD.

(ii) Is $\Delta ABD \cong \Delta CBD$? Why or why not ?

(iii) Does BD bisect $\angle ABC$? Give reasons.

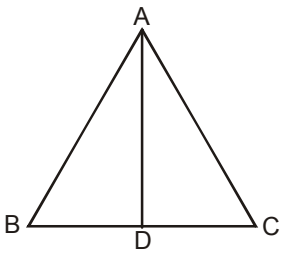
4. In quadrilateral PQRS, PQ = PS and PR is the bisector of $\angle P$. Show that $\Delta PQR \equiv \Delta PSR$. Is QR = SR ?

5.



In figure, can you use ASA congruence rule and conclude that $\Delta AOC \cong \Delta BOD$?

6. In figure AD is the bisector of $\angle BAC$, Prove that triangles ABD and ADC are congurent if AB = AC,



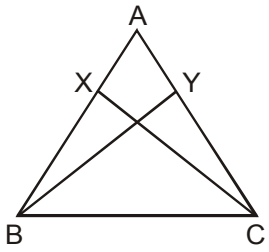
SHORT ANSWER TYPE

7. Which of the following pairs of triangles are congruent? If they are congruent, write out the pairs of equal angles.

(i) ΔABC: AB = 3 cm, BC = 4 cm, CA = 2 cm
ΔDEF: DE = 2 cm, EF= 3 cm and FD = 4 cm

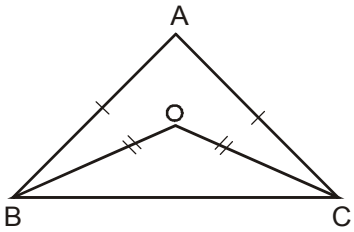
(ii) ΔPQR: PQ = 17 cm, QR = 15 cm, PR = 18 cm
ΔDEF : DE = 18 cm, EF = 17 cm, DF = 15 cm.

8. In the adjoining figure, X and Y are respectively two points on equal sides AB and AC of ΔABC such that AX = AY. Prove that CX = BY.

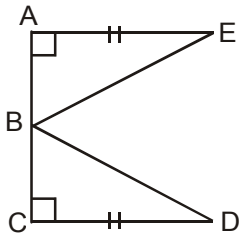


9. Prove that measure of each angle of an equilateral triangle is 60°.

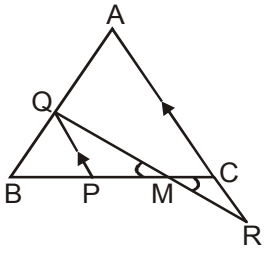
10. In the given figure, AB = AC and OB = OC. Prove that $\angle ABO = \angle ACO$.



11. In figure AE || CD, AB = BC, AE = CD. If AC $\perp$ CD & $\angle AEB = 35°$. Find $\angle DBE$.

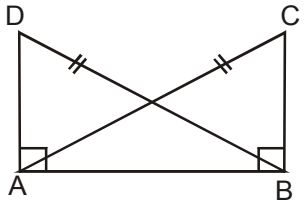


12. In the given figure, ABC is an equilateral triangle; PQ || AC and AC is produced to R such that CR = BP. Prove that QR bisects PC.



LONG ANSWER TYPE

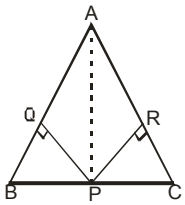
13. In figure, DA ⊥ AB, CB ⊥ AB and AC = BD. State the three pairs of equal parts in ΔABC and ΔDAB. Which of the following statements is meaningful ?



(i) ΔABC ≅ ΔBAD **(ii)** ΔABC ≅ ΔABD

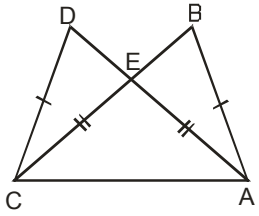
14. If ΔABC is an isosceles triangle such that AB = AC, then show that altitude AD from A on BC bisects BC.

15. In the given figure P is the mid point of BC. Also PQ = PR and, PQ ⊥ AB and PR ⊥ AC. Then, prove that :



(i) ΔBPQ ≅ ΔCPR **(ii)** AB = AC

16. In figure, it is given that AB = CD and AD = BC. Prove that ΔADC ≅ ΔCBA.



EXERCISE 02

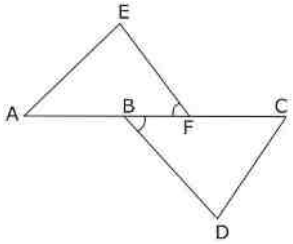
SECTION -A (COMPETITIVE EXAMINATION QUESTION)

MULTIPLE CHOICE QUESTIONS

1. In ΔABC ∠A = 100 , AD bisects ∠A and AD BC .Then ∠B is equal to

(A) 80 (B) 20 (C) 40 (D) 30

2. In the given figure it is given that AB = CF, EF = BD and ∠AFE = ∠DBC . Then congruence of ΔAFE and ΔCBD by



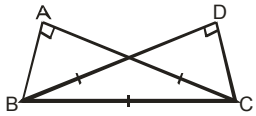
(A) AAA congruence criterion. (B) SSS congruence criterion.

(C) ASA congruence criterion. (D) SAS congruence criterion.

3. $\Delta ABC \cong \Delta EFG$, AB = 15 cm, BC = 20 cm, AC = 25 cm and FG = 3x - 7, then value of x is given by

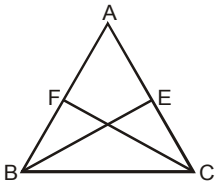
(A) 7.3 cm. (B) 9 cm. (C) 10.6 cm. (D) 20 cm.

4. In the given figure, triangles ABC and DCB are right angled at A and D respectively and AC = DB, then $\Delta ABC \cong \Delta DCB$ of from



(A) AAA (B) SAS (C) ASS (D) None of these

5. In the given figure, ABC is an isosceles triangle in which AB = AC. If E and F be the midpoints of AC and AB respectively, then BE is equal to _____.



(A) CF (B) AB (C) CE (D) BF

6. Which of the following statements is true ?

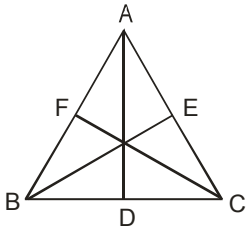
(A) In an isosceles triangle, the angles opposite to equal sides are equal

(B) The bisector of the vertical angle of an isosceles triangle bisects the base at right angles.

(C) If the hypotenuse and an acute angle of one right angled triangle is equal to the hypotenuse and the corresponding acute angle of another triangle, then the triangles are congruent.

(D) All of the above.

7. If AD, BE and CF, the altitude of ΔABC are equal. Then the ΔABC is :



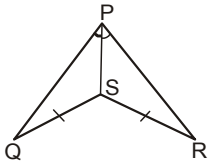
(A) Equilateral triangle (B) Right angle triangle

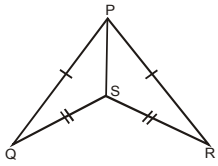
(C) Isosceles triangle (D) None of these

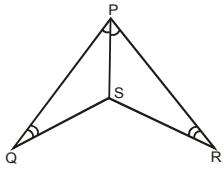
8. If ΔABC is an isosceles triangle such that AB = AC and the altitude AD from A on BC, then :

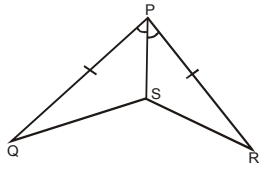
(A) AB = DC (B) BD = AC (C) BD = DC (D) None of these

9. In the following which two triangles are congruent by side-side -side congruence property.

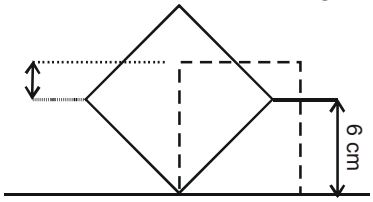
(A) 

(B) 

(C) 

(D) 

10. A square board side 10 centimeters, standing vertically, is tilted to the left so that the bottom-right corner is raised 6 centimeters from the ground.



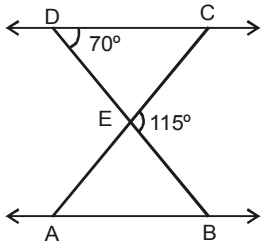
By what distance is the top-left corner lowered from its original position ?
(A) 1 cm (B) 2 cm (C) 3 cm (D) 0.5 cm

11. In a right angled triangle ABC, P is mid point of AC. Which one is true ?
(A) PA = $\frac{AC}{2}$ (B) PB = $\frac{AC}{2}$ (C) PA = PB (D) All of these

SECTION -B (TECHIE STUFF)

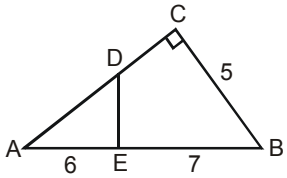
12. In ΔLMN, $\angle L = 50^\circ$ and $\angle N = 60^\circ$. If $\Delta LMN \sim \Delta PQR$, then find $\angle Q$.
(A)50° (B) 60° (C) 70° (D) none of these

13. In figure if $\Delta EDC \sim \Delta EBA$, $\angle EDC = 70^\circ$ & $\angle BEC = 115^\circ$. Find $\angle EAB$.



(A) 45° (B) 60° (C) 30° (D) 20°

14. In the figure C is a right angle, DE ⊥ AB, AE = 6, EB = 7 and BC = 5. The area (in sq unit) of the quadrilateral EBCD is

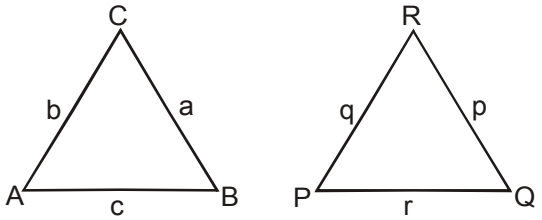


(A) 22.5 (B) 25 (C) 27.5 (D) 30

EXERCISE 03

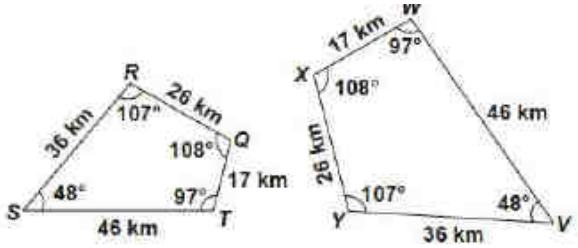
(PREVIOUS YEAR EXAMINATION QUESTIONS)

1. For the congruence of ΔABC and ΔPQR, which one of the following sets of conditions is not sufficient ? **[NSTSE 2010]**



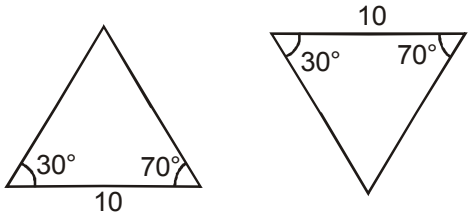
(A) $\angle ABC = \angle PQR$, a = p , c = r (B) $\angle CAB = \angle RPQ$, $\angle ABC = \angle PQR$, c = r
(C) b = q, $\angle CAB = \angle RPQ$, a = p (D) b = q, c = r, $\angle CAB = \angle RPQ$

2. Which of the following are corresponding part of the two given congruent figures? **[IMO-2010]**



(A) $\overline{TQ} \cong \overline{XY}$ (B) $\overline{ST} \cong \overline{XY}$ (C) $\overline{TQ} \cong \overline{WX}$ (D) $\angle Q \equiv \angle Y$

3. The method use to prove the two triangles are congruent is : **[NSTSE 2011]**



(A) SSS (B) SAS (C) ASA (D) AAS

4. $\Delta PQR \cong \Delta SRQ$ by SAS axiom. Which of the following is not a matching part ? **[NSTSE 2012]**

(A) PQ = SR (B) $\angle PQR = \angle SRQ$ (C) PQ = SQ (D) QR = RQ

5. Harika wants to prove that $\Delta TUV \cong \Delta XYZ$ using RHS. She knows that TU = XY and TV = XZ. What additional information does she need ? **[NSTSE 2012]**

(A) $\angle U = \angle Y = 90°$ (B) $\angle T = \angle X = 90°$

(C) $\angle T = \angle U = 90°$ (D) $\angle X = \angle Z = 90°$

6. Which of the following statements is CORRECT? **[IMO-2012]**

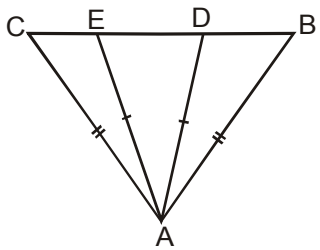
(A) All squares are congruent.

(B) All right angles are congruent.

(C) Two obtuse angles are always congruent.

(D) None of these

7. In the figure, AB = AC and AD = AE **[NSTSE 2013]**

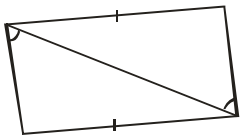


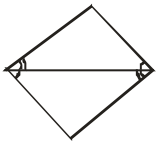
Which of the following statement is not true ?

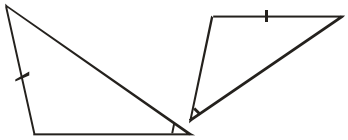
(A) $\angle CAE = \angle DAB$ (B) $\Delta ACE \cong \Delta ABD$

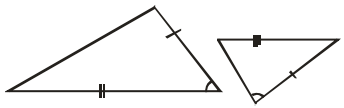
(C) $\Delta AEC \cong \Delta ABD$ (D) BE = DC

8. Identify the pair of triangles that are congruent **[NSTSE 2013]**

(A) 

(B) 

(C) 

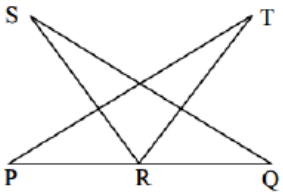
(D) 

9. The triangle ABC and PQR may not be congruent when **[IMO-2013]**

(A) AB = PQ,AC = PR,$\angle A = \angle P$ (B) AB = PQ, AC = PR, BC = QR

(C) AB = PQ, AC = PR,$\angle B = \angle Q$ (D) $\angle A = \angle P$, $\angle B = \angle Q$, AB = PQ

10. In the given figure if PR = QR, $\angle SRP = \angle TRQ$ and $\angle SQP = \angle TPQ$, then **[IMO-2013]**

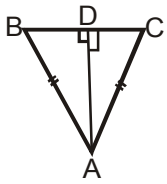


[IMO-2013]

(A) $\Delta SQR \cong \Delta PTR$ & SR = TR (B) $\Delta SQR \cong \Delta TPR$ & SR = TR

(C) $\Delta RQS \cong \Delta TPR$ & SR = TR (D) $\Delta QRS \cong \Delta PRT$ & SR = TR

11. ΔABC is isosceles with AB = AC and AD $\perp$ BC. **[NSTSE 2014]**



Which of the following is correct

(A) $\Delta ADC \cong \Delta ADB$ (B) $\Delta ADC \ncong \Delta ADB$

(C) $\Delta ADB \cong \Delta ABC$ (D) $\Delta ABC \cong \Delta ADC$

ANSWER KEY

EXERCISE 01

SECTION -A (FIXED RESPONSE TYPE)

MULTIPLE CHOICE QUESTIONS

Ques.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Ans.	B	C	D	C	D	D	C	C	D	A	B	D	C	D

FILL IN THE BLANKS

1. Congruent **2.** Corresponding parts of congruent triangles **3.** 60°

4. Radius **5 .** Hypotenuse

TRUE / FALSE

1. True **2.** False **3.** True **4.** True **5.** False

MATCH THE COLUMN

1. (A) → r, (B) → s, (C) → p, (D) → q, (E) → t, (F) → v, (G) → u, (H) → w

SECTION -B (FREE RESPONSE TYPE)

VERY SHORT ANSWER TYPE

1. 5

2. **(i)** vertically opposite angle **(ii)** Yes by ASA **(iii)** Yes by cpct

3. **(i)** AB = CB, AD = CD, BD = BD **(ii)** $\Delta ABD \cong \Delta CBD$
(iii) Yes

4. Yes **5.** Yes

SHORT ANSWER TYPE

11. 70°

EXERCISE 02

SECTION -A (COMPETITIVE EXAMINATION QUESTION)

MULTIPLE CHOICE QUESTIONS

Ques.	1	2	3	4	5	6	7	8	9	10	11
Ans.	C	D	B	D	A	D	A	C	B	B	D

SECTION -B (TECHIE STUFF)

Ques.	12	13	14
Ans.	C	A	A

EXERCISE 03

(PREVIOUS YEAR EXAMINATION QUESTIONS)

Ques.	1	2	3	4	5	6	7	8	9	10	11
Ans.	C	C	C	C	A	B	C	B	C	B	A