

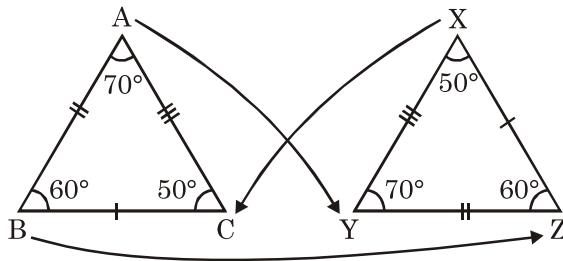
CHAPTER 7

CONGRUENCE OF TRIANGLES

Points to Remember :

If $\triangle ABC \cong \triangle PQR$, their corresponding parts are equal. Thus, $AB = PQ$, $BC = QR$, $CA = RP$, $\angle A = \angle P$, $\angle B = \angle Q$ and $\angle C = \angle R$.

Observe the correspondence of the vertices in the following figure :



Example : Correspondence of vertices :

$$A \longleftrightarrow X$$

$$B \longleftrightarrow Z$$

$$C \longleftrightarrow Y$$

$$\therefore \triangle ABC \cong \triangle XZY.$$

Correspondence of sides :

$$AB \longleftrightarrow XZ$$

$$BC \longleftrightarrow ZY$$

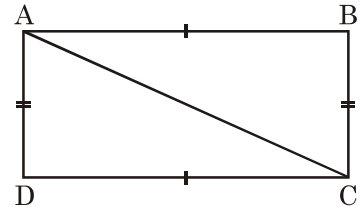
$$AC \longleftrightarrow XY$$

QUESTIONS

1. When are two geometric figures said to be congruent?
2. When are two line segments said to be congruent?
3. When are two angles said to be congruent?
4. When are two squares said to be congruent?
5. Two rectangles are congruent if _____.
6. Two circles are congruent if _____.

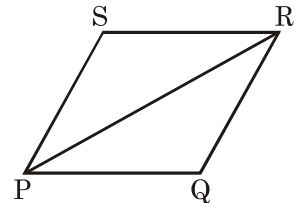
7. If $m\angle ABC = m\angle LMN$ then $\angle ABC$ _____ $\angle LMN$.
8. When are two triangles said to be congruent?
9. $\triangle ABC$ is an equilateral triangle. Is $\triangle ABC \cong \triangle ACB$? If yes, state the three criteria of congruence.

10. In the figure, $ABCD$ is a rectangle. AC is a diagonal



- (i) Is $\triangle ACD \cong \triangle CAB$. (ii) What congruence condition is used?

11. In the figure, $PQRS$ is a rhombus.

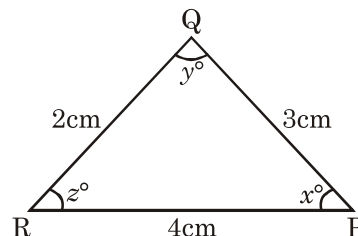
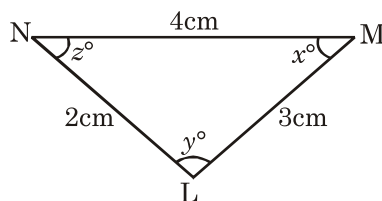


- (i) Is $\triangle PQR \cong \triangle RSP$? (ii) What congruence condition is used.

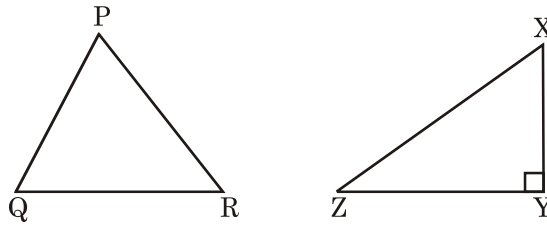
[Choose true or false and correct the wrong statements : (from Q. 12 to Q. 17).

12. Two triangles are congruent if three sides of one triangle are respectively equal to the three sides of the other triangle.
13. Congruent figures cover each other completely?
14. Congruent figures are same in shape.
15. Congruent figures are equal in size.
16. If two sides and the included angle of one triangle are respectively equal to any two sides and the included angle of the other then the two triangles are congruent.
17. In the figure measure of sides and angles of $\triangle PQR$ and $\triangle LMN$ are given. Which of the statements are true?

- (i) $\triangle LMN \cong \triangle PQR$ (ii) $\triangle LMN \cong \triangle QPR$ (iii) $\triangle LMN \cong \triangle QRP$

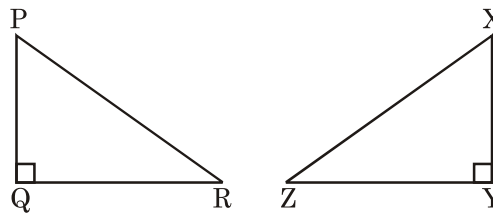


18. Are the given figures congruent? Give reasons.

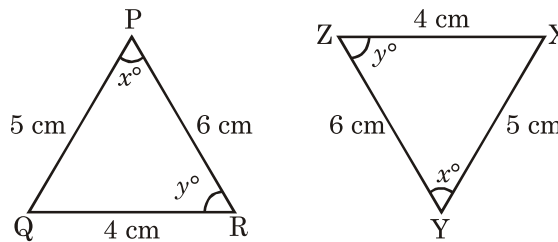


19. If $\triangle PQR \cong \triangle XYZ$ then

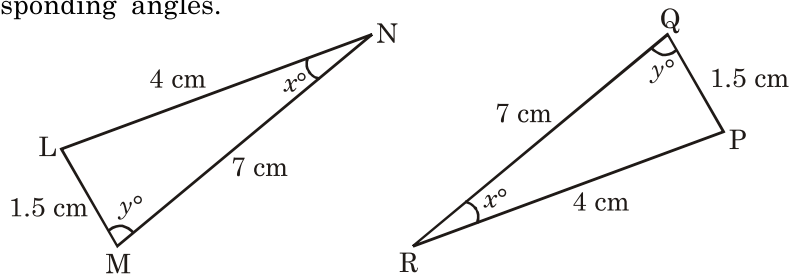
- (i) $\angle P = \underline{\hspace{2cm}}$ (ii) $\underline{\hspace{2cm}} = \angle Z$ (iii) $PQ = \underline{\hspace{2cm}}$ (iv) $\underline{\hspace{2cm}} = XZ$



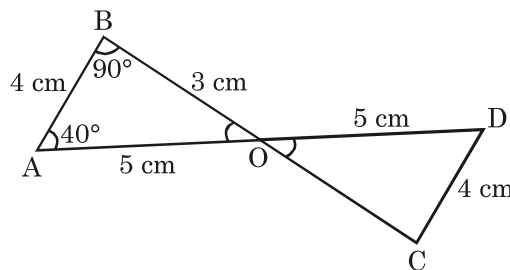
20. From the measure of following triangles, find the corresponding sides and corresponding angles.



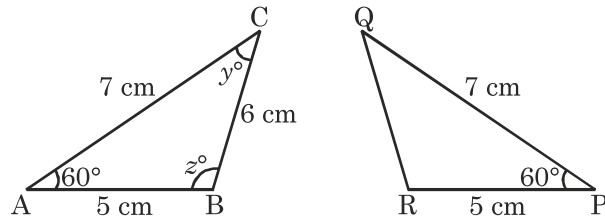
21. On the basis of the measurements of following triangles, find the corresponding sides and corresponding angles.



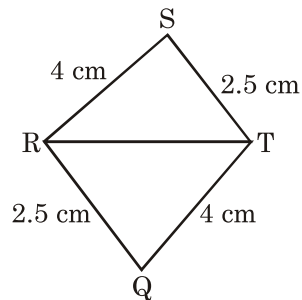
22. If $\triangle AOB \cong \triangle DOC$ then what is the measure of $\angle ODC$ and $\angle OCD$?



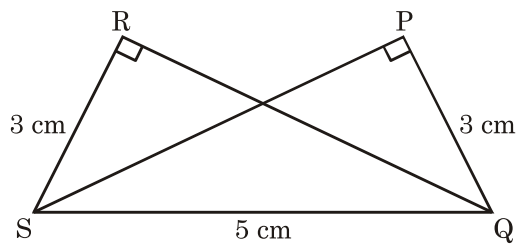
23. If $\triangle ABC \cong \triangle PRQ$ then from the appropriate correspondence find the side QR . Also find $\angle Q$ and $\angle R$.



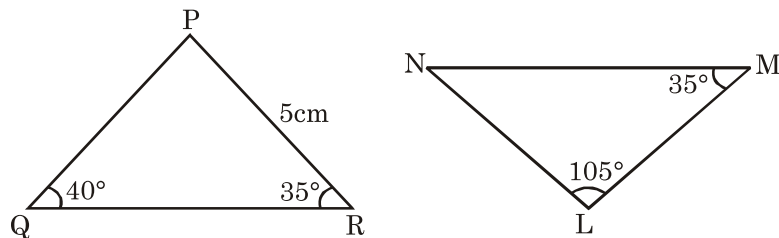
24. In the given figure which of the two triangles are congruent with appropriate correspondence.



25. In the given figure which of the two triangles are congruent with appropriate correspondence.

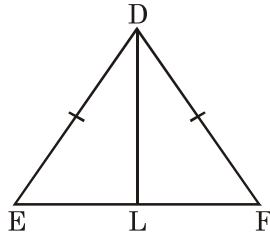


26. In the figure of Q. 25 which criterion is suitable to prove the congruence of the two triangles?
27. In Q. 26 in the congruence of triangles, which of the sides and angles are equal?
28. Are the following triangles congruent? If yes, then give the congruence criterion.

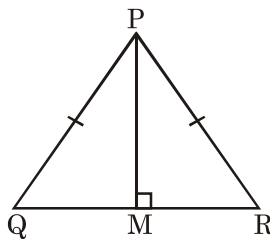


29. In Q. 28 if the triangles are congruent then name them according to the correspondence. Also name the pairs of corresponding angles.

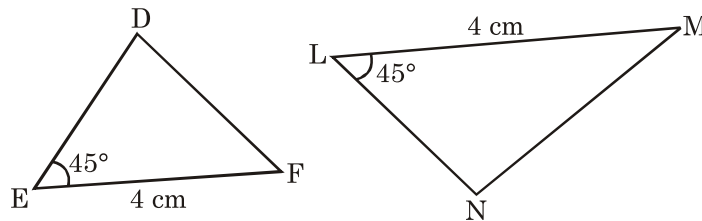
30. In the given figure, $\triangle DEF$ is an isosceles triangle in which $DE = DF$ and DL is the median of the triangle. Is $\triangle DEL \cong \triangle DFL$? Also give reasons.



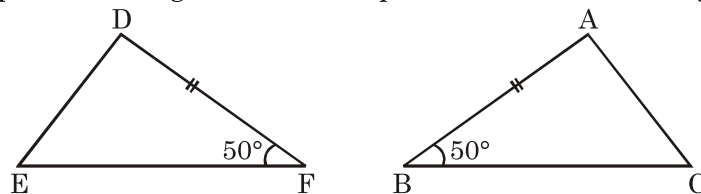
31. In the given figure, $\triangle PQR$ is an equilateral triangle and PM is the perpendicular on the side QR . Name the different criteria which are applicable to prove the congruence of $\triangle PQM$ and $\triangle PRM$? Why?



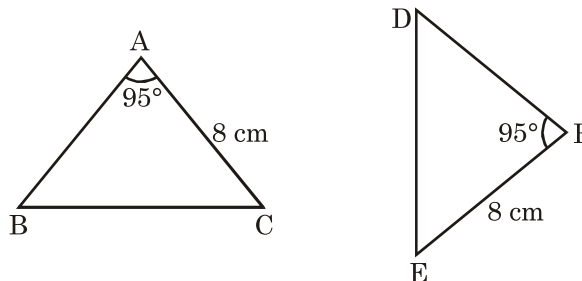
32. Which other pair of sides should be equal to make the given triangles congruent?



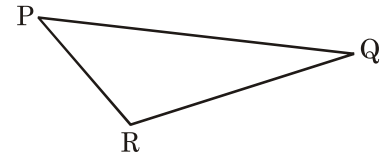
33. Which other pair of the angles should be equal to make the following triangles congruent?



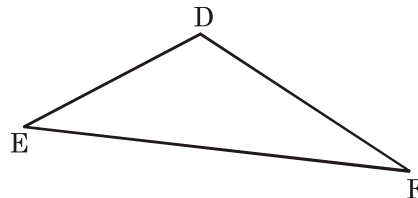
34. In the following pair of triangles which other pair sides is should be equal for the given triangles to be congruent according to the *SAS* congruence criterion?



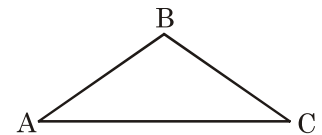
35. In $\triangle PQR$, which is the including angle of PQ and PR ?



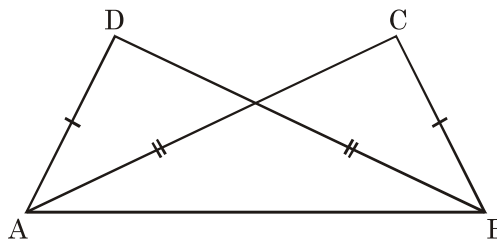
36. In $\triangle DEF$, which is the including side of $\angle EDF$ and $\angle DEF$?



37. In $\triangle ABC$ which is the including angle of side AB and BC ?



38. In the figure $\triangle ABC$ and $\triangle ABD$ are two triangles in which $AD = BC$ and $AC = BD$. Name the corresponding triangles.

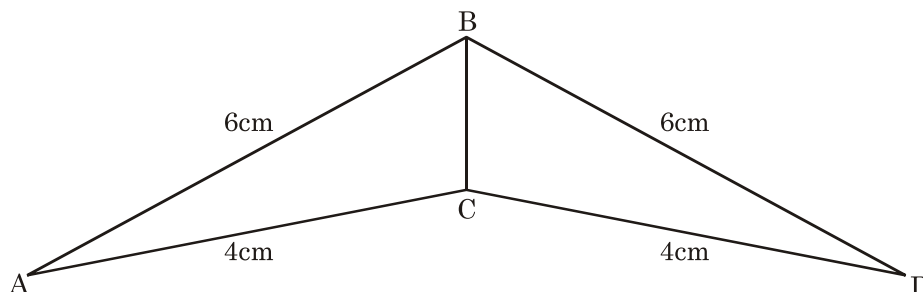


39. If $\triangle ABC \cong \triangle LMN$, name the corresponding sides and the corresponding angles.

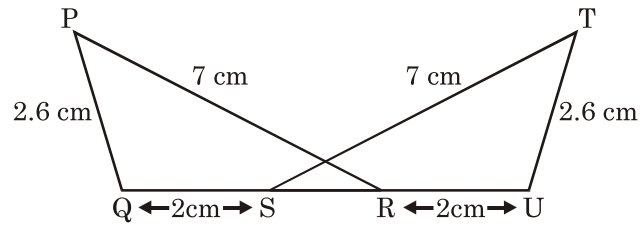
40. If $\triangle PQR \cong \triangle XYZ$, name the corresponding sides and the corresponding angles.

41. If $\triangle LMN \cong \triangle RST$, name the corresponding sides and the corresponding angles.

42. Which of the triangles are congruent and according to which congruence criterion? Name the corresponding sides.

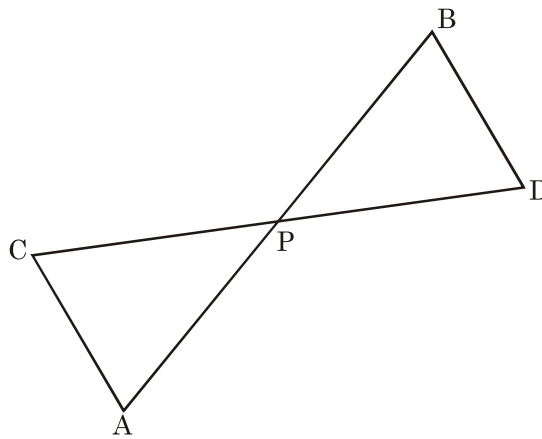


43. Name the congruent triangles (in the given figure) according to the side-side side (SSS) rule. Also name the corresponding equal sides.



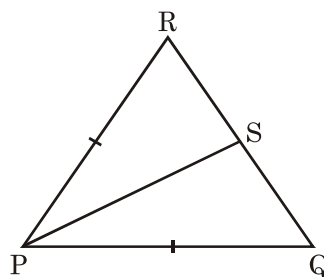
44. In the following figure, P bisects the two line segments AB and CD .

- (i) Is $\triangle APC \cong \triangle BPD$? (ii) Is $AC \parallel BD$?

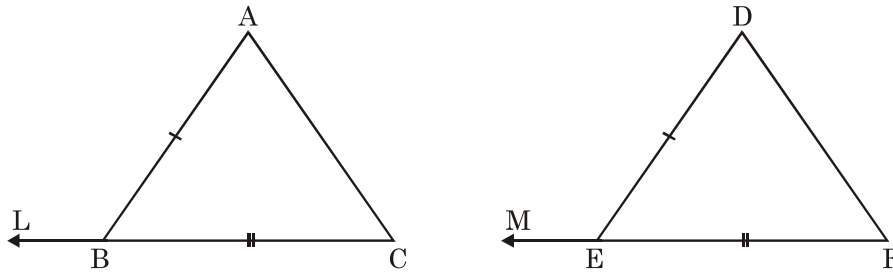


45. If $\triangle PQR \cong \triangle MNL$

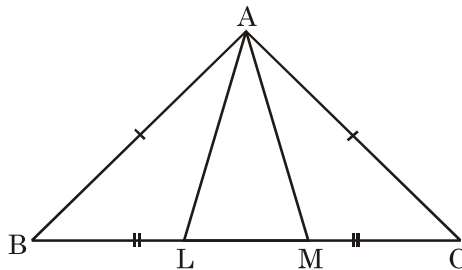
- (i) Which side of $\triangle PQR$ is equal to the side of LM of $\triangle MNL$?
- (ii) Which angle of $\triangle MNR$ is equal to $\angle R$ in the $\triangle PQR$.
46. In the following figure, if S is the mid point of the side QR , then is $\triangle PQS \cong \triangle PRS$? Also give reasons.



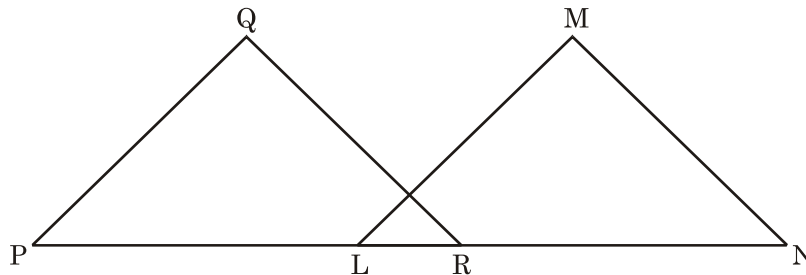
47. In the figure given below $\triangle ABC$ and $\triangle DEF$ are such that $AB = DE$, $BC = EF$, Extend CB and FE to L and M such that $\angle ABL = \angle DEM$. Is $\triangle ABC \cong \triangle DEF$? Give reasons.



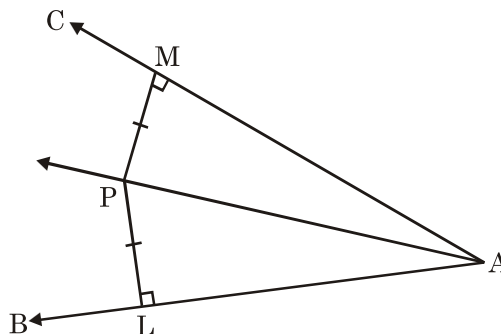
48. In the following figure, $AB = AC$ and $BL = CM$. Is $AL = AM$? Also give reasons.



49. In the following figure, $PQ = LM$, $PL = RN$ and $\angle QPR = \angle MLN$. Is $\triangle PQR \cong \triangle LMN$? Give reasons.



50. In the following figure, $PL \perp AB$ and $PM \perp AC$, $PL = PM$. Does AP bisect $\angle BAC$? Give answer with reasons.



ANSWERS

1. Two geometric figures are said to be congruent if they have the same shape and size.
2. Two line segments are congruent if they have the same length.
3. Two angles are said to be congruent if they have the same measure and shape.
4. Two squares are said to be congruent if they have the same side length.
5. They have the same length and breadth.
6. They have the same radii.
7. $\angle ABC \cong \angle LMN$.
8. Two triangles are congruent if and only if one of them can be made to superimpose on the other, so as to cover the other exactly.
9. Yes, S.A.S., S.S.S., A.S.A. or A.A.S.
10. Yes, SSS congruence condition.
11. Yes, SSS congruence condition.
12. True
13. True
14. False, congruent figures are equal in shape and size.
15. False, congruent figures are equal in shape and size.
16. True.
17. (i) $\triangle LMN \cong \triangle QPR$.
18. No, the given figures are not congruent because they are not equal in shape and size.
19. Yes, $\triangle PQR \cong \triangle XYZ$.
 - (i) $\angle P = \angle X$
 - (ii) $\angle R = \angle Z$
 - (iii) $PQ = XY$
 - (iv) $PR = XZ$
20. $\angle P = \angle Y, \angle Q = \angle X$
 $\angle R = \angle Z$
 $PQ = YX$
 $PR = YZ$
 $RQ = ZX$
21. $\angle N = \angle R$
 $\angle M = \angle Q, \angle L = \angle P$

- $NM = RQ$
 $NL = RP$
 $LM = PQ$
22. $\angle ODC = 40^\circ$; $\angle OCD = 90^\circ$.
 23. $QR = 6$ cm
 $\angle Q = y^\circ$; $\angle R = z^\circ$
 24. $\triangle SRT \cong \triangle QTR$ (SSS rule)
 25. $\triangle RSQ \cong \triangle PQS$, RHS
 26. RHS
 27. $\angle R = \angle P = 90^\circ$
 $RS = PQ$ $SQ = QS$
 28. Yes, angle-side-angle (ASA)
 29. $\triangle PRQ \cong \triangle LMN$, $\angle P = 105^\circ = \angle L$, $\angle R = \angle M = 35^\circ$
 30. Yes, $\triangle DEL \cong \triangle DFL$, S.S.S. congruence criterion $DE = DF$, $EL = LF$, $DL = DL$.
 31. S.S.S., A.S.A., S.A.S., R.H.S. because in an equilateral triangle perpendicular bisectors, median, angle bisector coincides.
 32. $DE = NL$
 33. $\angle A = \angle D$
 34. $AB = FD$
 35. $\angle P$
 36. DE
 37. $\angle B$
 38. $\triangle ADB \cong \triangle BCA$
 39. $AB = LM$, $BC = MN$, $AC = LN$, $\angle A = \angle L$, $\angle B = \angle M$, $\angle C = \angle N$.
 40. $PQ = XY$, $QR = YQ$, $PR = XZ$, $\angle P = \angle X$, $\angle Q = \angle Y$, $\angle R = \angle Z$.
 41. $LM = RS$, $MN = ST$, $LN = RT$, $\angle L = \angle R$, $\angle M = \angle S$, $\angle N = \angle T$.
 42. $\triangle BCA \cong \triangle BCD$ S.S.S.; $AB = DB$, $AC = DC$, $BC = BC$.
 43. $\triangle PQR \cong \triangle TUS$; $PQ = TU$, $PR = TS$, $QR = US$
 44. (i) Yes, S.A.S. congruence criterion; $PC = PD$, $PB = PA$, $\angle APC = \angle BPD$ (Vertically opposite angles).

- (ii) Yes; $\angle CAP = \angle DBP$ (Corresponding angles of congruent triangle but they are also alternate angle).
- $\therefore AC \parallel BD$.
45. (i) RP (ii) $\angle L$
46. Yes; $PQ = PR, PS = PS, RS = QS \Rightarrow$ S.S.S. Congruency criterion.
47. Yes; S.A.S.; $AB = DE, BC = EF, \angle ABC = \angle DEF$
48. Yes, $\triangle ABL \cong \triangle ACM$ (SAS)
- $\therefore AL = AM$ (cpct)
49. Yes; S.A.S; $QP = ML, \angle QPR = \angle MLN, PR = LN$.
50. Yes; $\triangle AMP \cong \triangle ALP$ [R.H.S. congruence]
- $\angle MAP = \angle LAP$ (Corresponding parts of congruent triangles).
- $\therefore AP$ divides $\angle BAC$.