MATHS

BOOKS - RS AGGARWAL MATHS (HINGLISH)

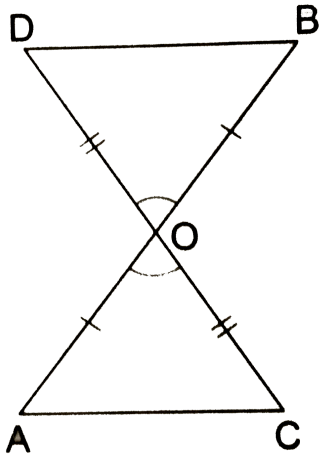
CONGRUENCE OF TRIANGLES AND INEQUALITIES IN A TRIANGLE

Solved Examples

1. In the given figure, Oa = OB and OC = OD.

Which is the criteria to prove

$\Delta AOC \cong \Delta BOD.$



A. SAS

B. ASA

C. SSS

D. NONE OF THESE

Answer: A

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2. AB is a line segment and line l is its perpendicular bisector. If a point P lies on l, show that P is equidistant from A and B.

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3. Prove that each angle of an equilateral triangle is 60^0

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4. In an Isoceless triangle altitude from the vertex bisects the base.

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5. If the altitude from one vertex of a triangle bisects the opposite side; then the triangle is isosceless.

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6. If the bisector of the vertical angle of a triangle bisects the base of the triangle;then the triangle is iscsceless.

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7. Prove that the perpendiculars drawn from the vertices of equal angles of an isosceles triangle to the opposite sides are equal.

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8. If the altitudes from two vertices of a triangle to the opposite sides are equal, prove that the triangle is isosceles.

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9. Prove that the medians of an equilateral triangle are equal.

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10. If D is the mid-point of the hypotenuse AC of a right triangle ABC, prove that $BD = \frac{1}{2}AC$

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11. If two isosceles triangles have a common base, prove that the line segment joining their vertices bisects the common base at right angles.

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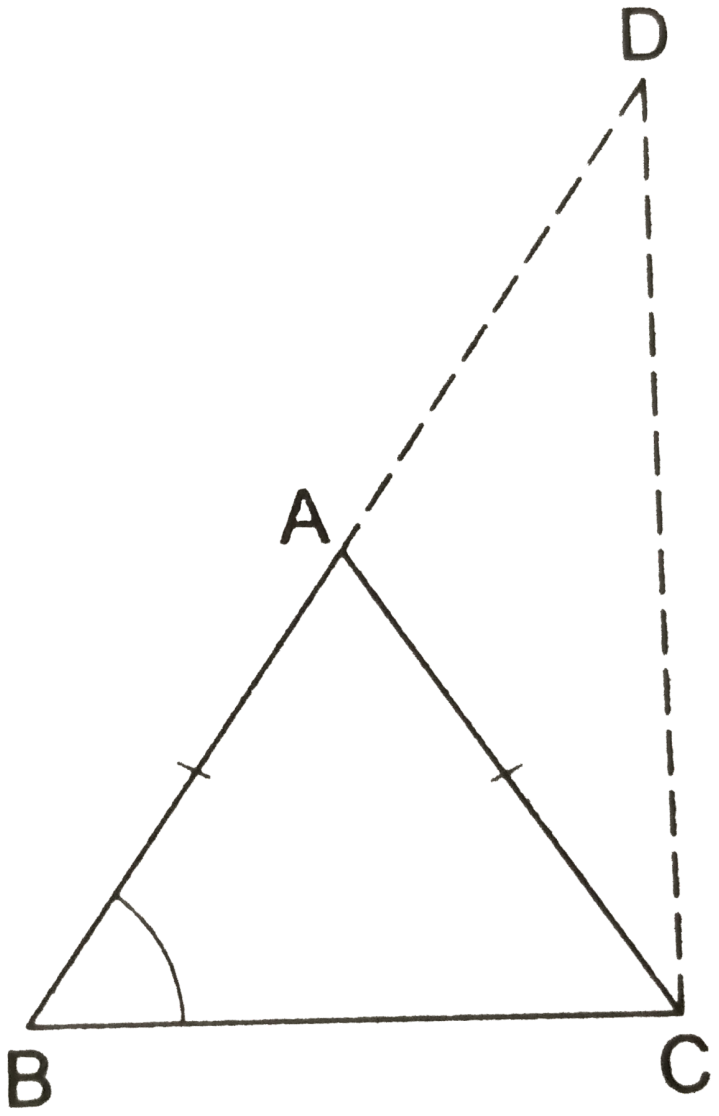
12. ΔABC is an isosceles triangle with AB = AC. Side BA is produced to D such that AB = AD.

Prove that $\angle BCD$ is a right angle.



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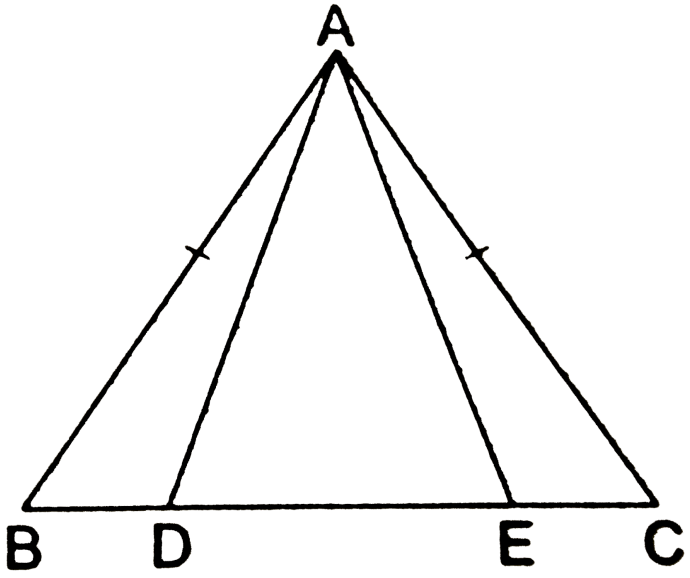
13. In an isosceles ΔABC with AB = AC, D and E are point on BC such that BE = CD. Show that AD = AE.



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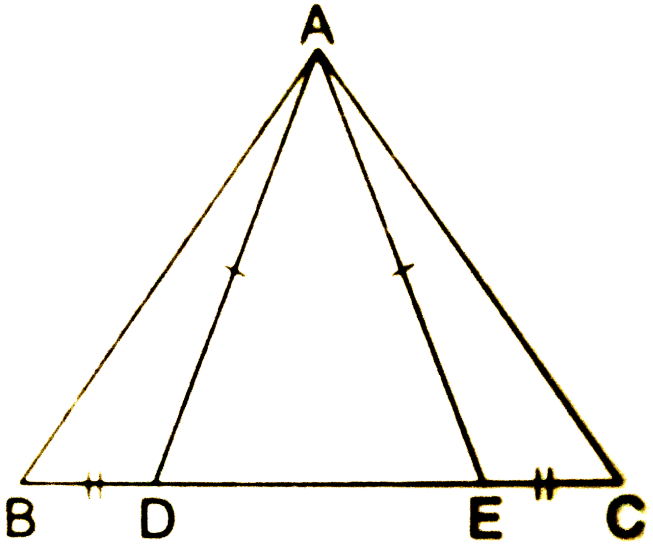
14. In the given figure, D and E are points on the side BC of a ΔABC such that BD = CE and AD = AE. Show that $\Delta ABD \cong \Delta ACE$.



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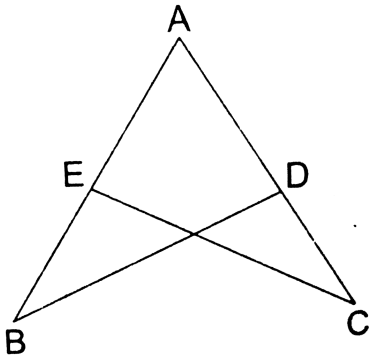
15. In the given figure, AB = AC and $\angle B = \angle C$.

Then $\Delta ABD \cong \Delta ACE$ by



A. SAS

B. ASA

C. SSS

D. NONE OF THESE

Answer: B

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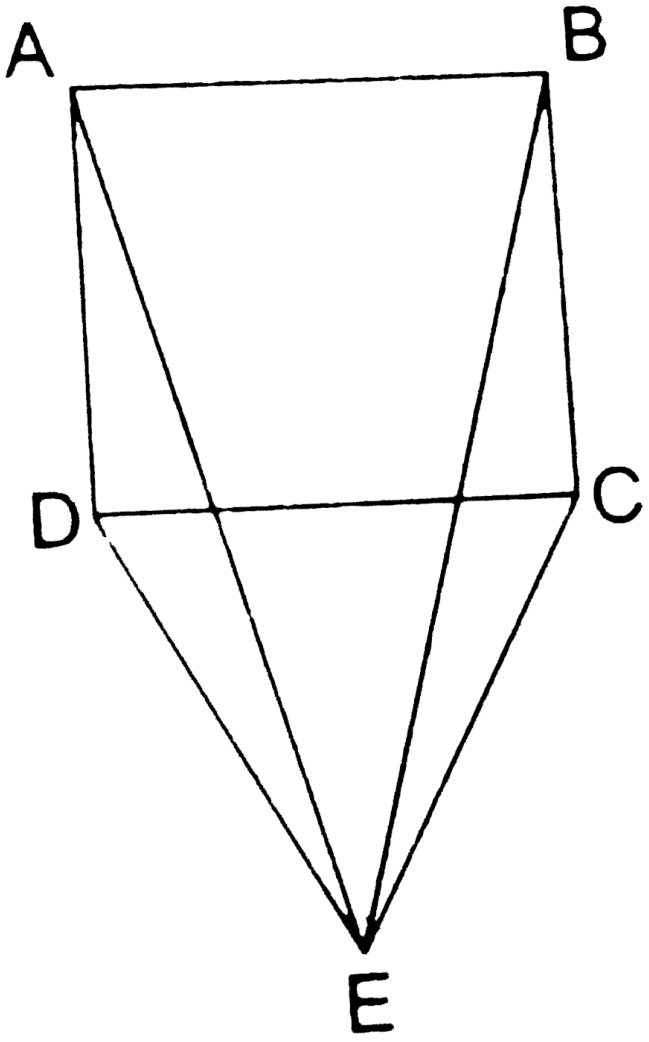
16. In the given figure, ΔCDE is an equilateral triangle on a side CD of a square ABCD. Show

that $\Delta ADE \cong \Delta BCE$.



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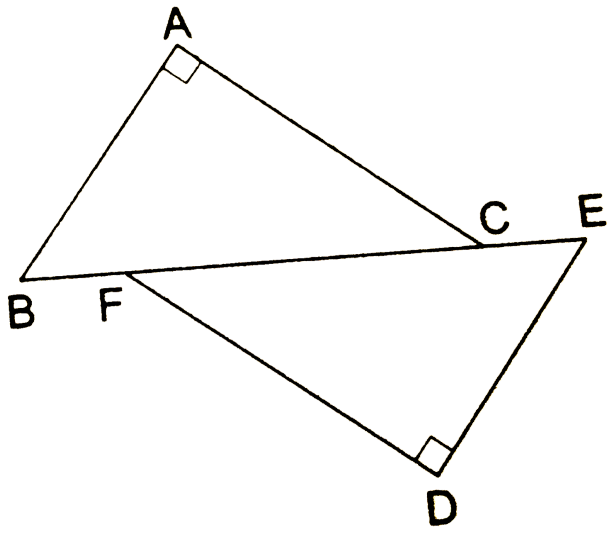
17. In the given figure, $BA \perp AC$ and $DE \perp DF$ such that AB = DE and BF = EC. Show that $\Delta ABC \cong \Delta DEF$.



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18. In the given figure, $AY \perp ZY$ and $BY \perp XY$ such that $AY = ZY$ and $BY = XY$. Prove that $AB = ZX$.

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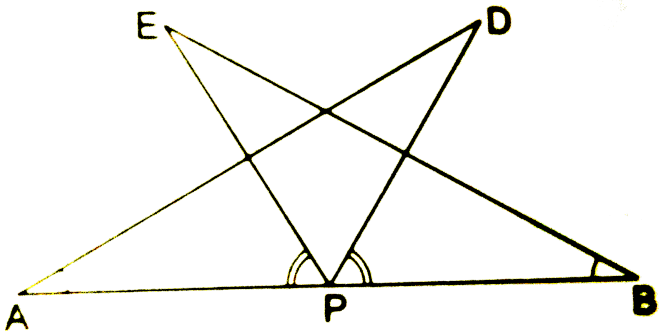
19. AB is a line segment and P is its midpoint. D and E are points on the same side of AD such that $\angle BAD = \angle ABE$ and $\angle EPA = \angle DPB$

.

Show that (i) $\Delta DAP \cong \Delta EBP$,

$(ii) AD = BE.$



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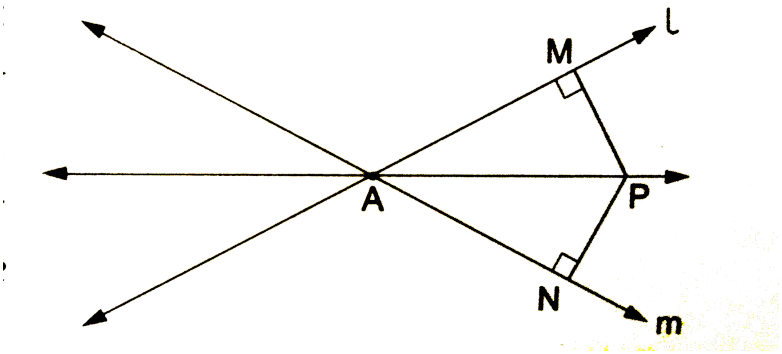
20. P is a point equidistant from two lines l and m intersecting at a point A, as shown in the given figure. Show that the line AP bisects tha

angle between them.



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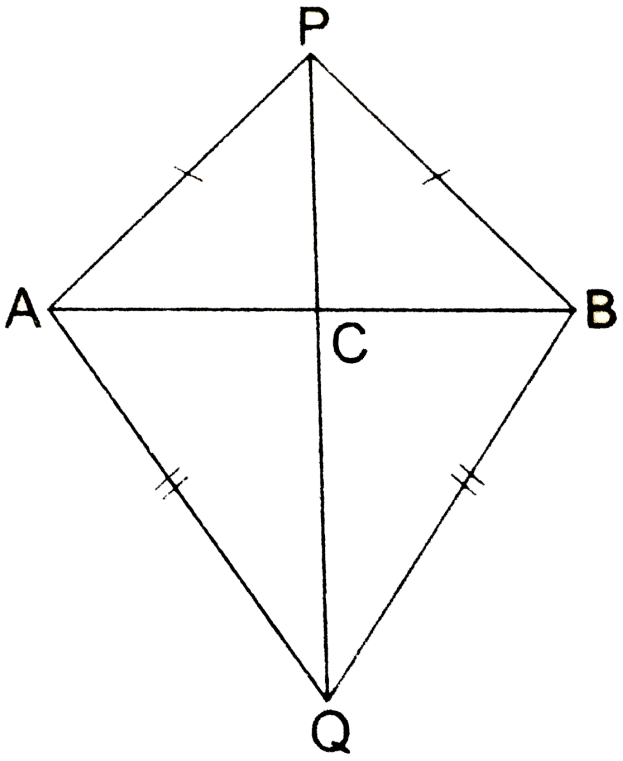
21. In the given figure, AB is a line segment. P and Q are points on opposite sides of AB such that each of them is equidistant from the points A and B. Show that the line PQ is the

perpendicular bisector of AB.



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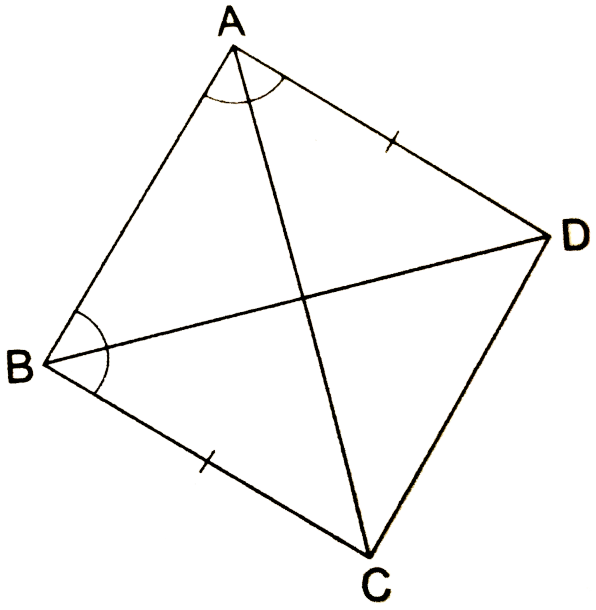
22. In the given figure, ABCD is a quadrilateral in which AD = BC and $\angle DAB = \angle CBA$.

Prove that (i) $\Delta ABD \cong \Delta BAC$,

(ii) BD = AC,

(iii) $\angle ABD = \angle BAC$.



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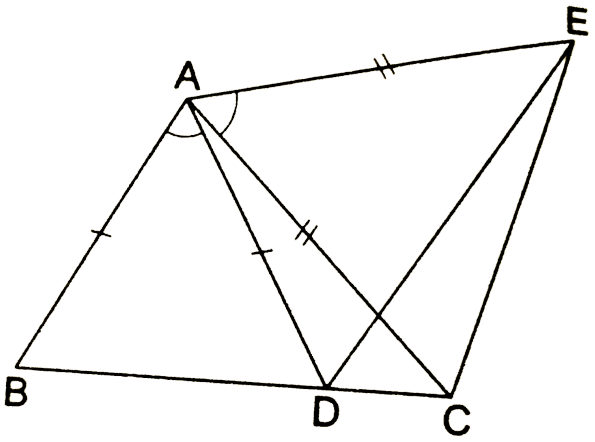
23. In the given figure, $AB = AD$ in ΔABD and $AC = AE$ in ΔACE and $\angle BAD = \angle EAC$. Show that $BC = DE$.



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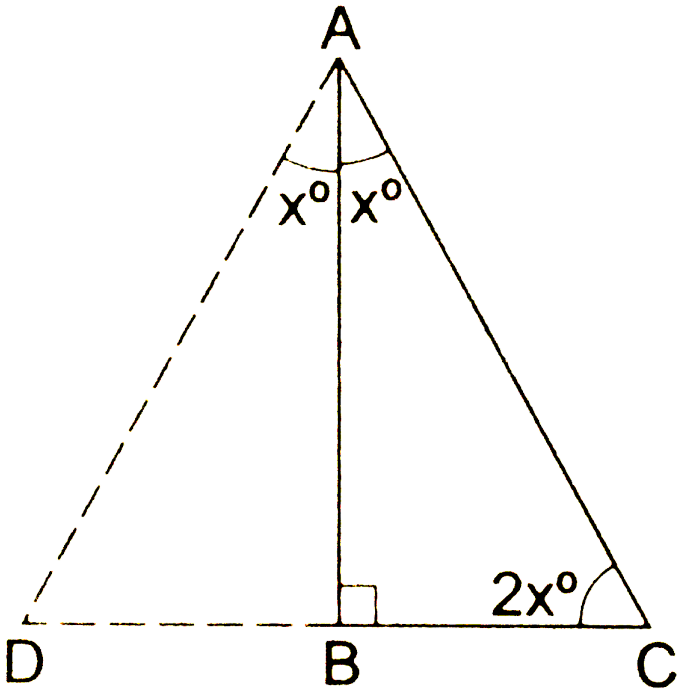
24. In the given figure, ΔABC is right angled at B such that $\angle BCA = 2\angle BAC$. Show that hypotenuse AC = 2BC.



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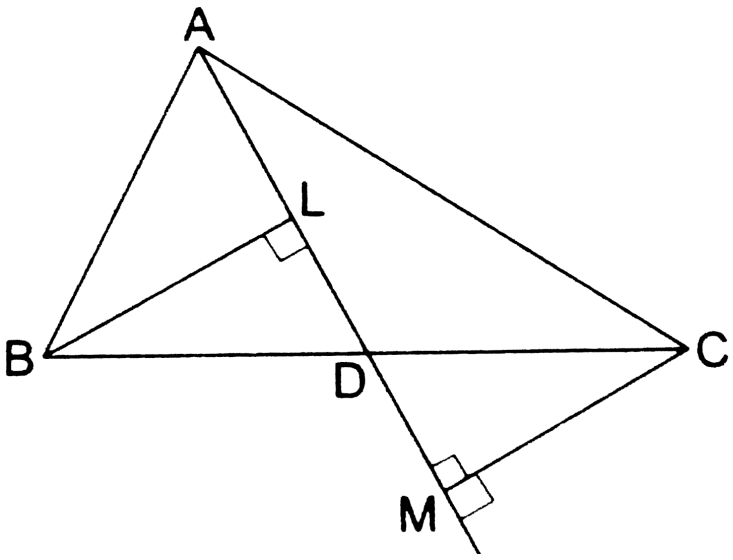
25. In the adjoining figure, AD is a median of ΔABC. If BL and CM are drawn perpendiculars on AD and AD produced, prove that BL = CM.



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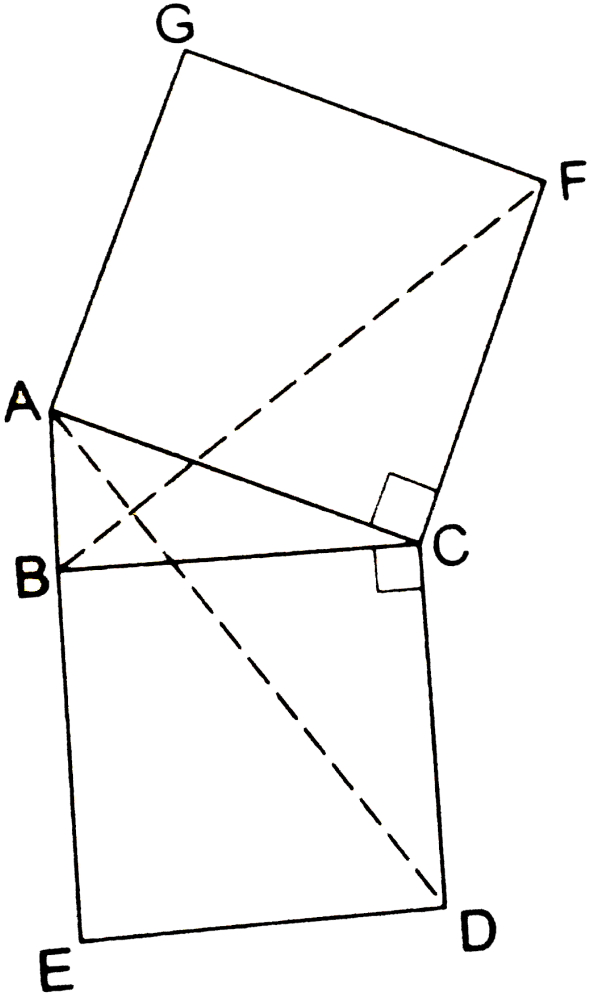
26. In the given figure, ABC is a triangle, right angled at B. If BCDE is a square on side BC and ACFG is a square on AC, prove that AD = FB.



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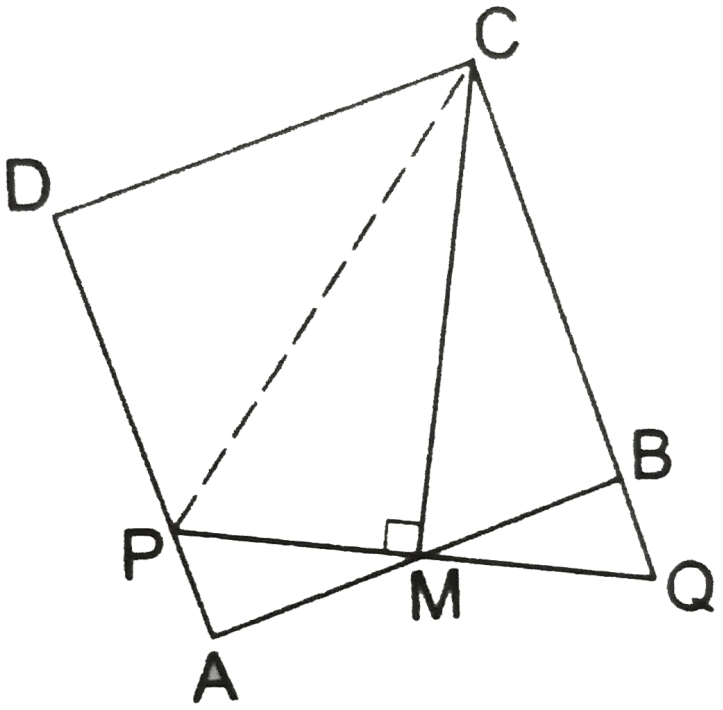
27. In the given figure, ABCD is a square, M is the midpoint of AB and $PQ \perp CM$ meets AD at P and CB produced at Q. Prove that (i) PA =

QB and (ii) $CP = AB + PA$.



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28. In the given figure, the two sides AB and BC, and the median AD of ΔABC are correspondingly equal to the two sides PQ and QR, and the medium PM of ΔPQR. Prove that $\Delta ABC \cong \Delta PQR$.

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29. In the given figure, the bisectors of $\angle B$ and $\angle C$ of ΔABC meet at I. If $IP \perp BC, IQ \perp CA$ and $IR \perp AB$, prove that (i) $IP = IQ = IR$, (ii) IA bisects $\angle A$.

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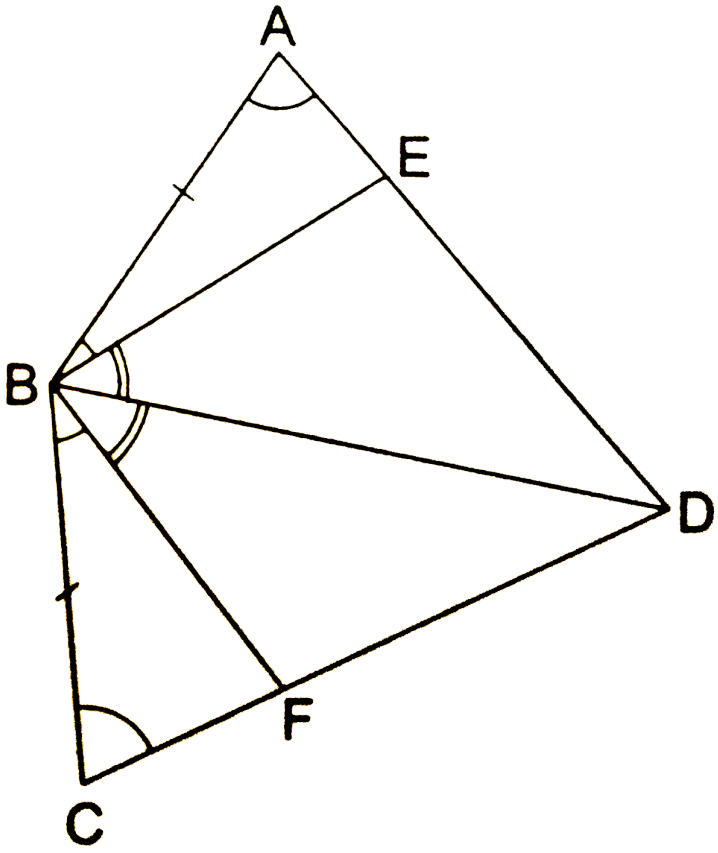
30. In the given figure, ABCD is a quadrilateral and E and F are points on AD and CD respectively such that AB = CB, $\angle ABE = \angle CBF$ and $\angle EBD = \angle FBD$.

Prove that $BE = BF$.



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31. In a ΔABC, if $\angle A = 40^\circ$ and $\angle B = 60^\circ$ then which side of the triangle is longest and which is shortest?

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32. Show that in a right angled triangle, the hypotenuse is the longest side.

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33. Show that the sum of the three altitudes of a triangle is less than the sum of three sides of the triangle.

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34. Prove that the perimeter of a triangle is greater than the sum of its three medians.

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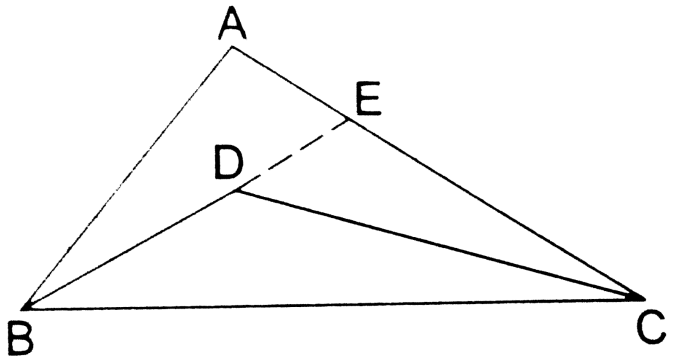
35. In the adjoining figure, ABC is a triangle and D is any point in its interior. Show that $(BD + DC) < (AB + AC)$.



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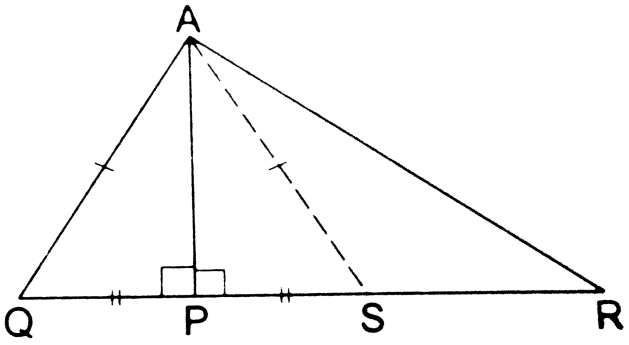
36. In the given figure, $AP \perp QR$, $PR > PQ$ and $PQ = PS$. Show

that $AR > AQ$.



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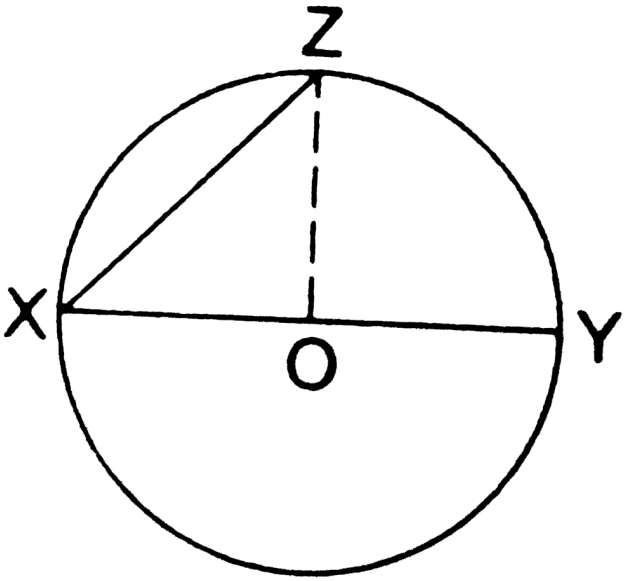
37. In the given figure, O is the centre of the circle and XOY is a diameter. If XZ is any other

chord, show that XY gt XZ.



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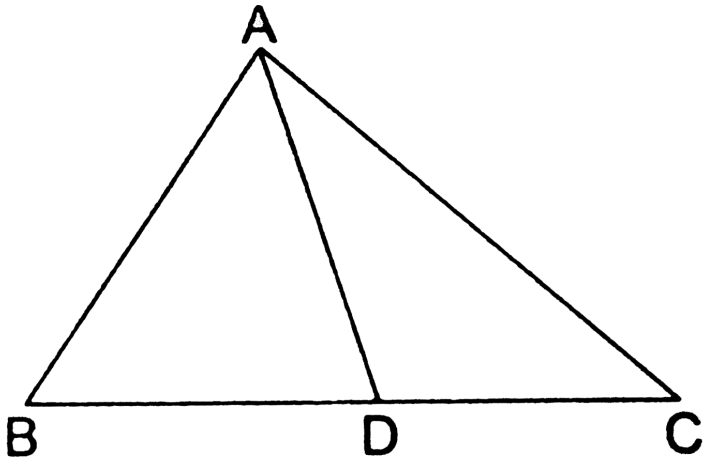
38. In ΔABC, if D is any point on the side BC, show that $(AB + BC + AC) > 2AD$.



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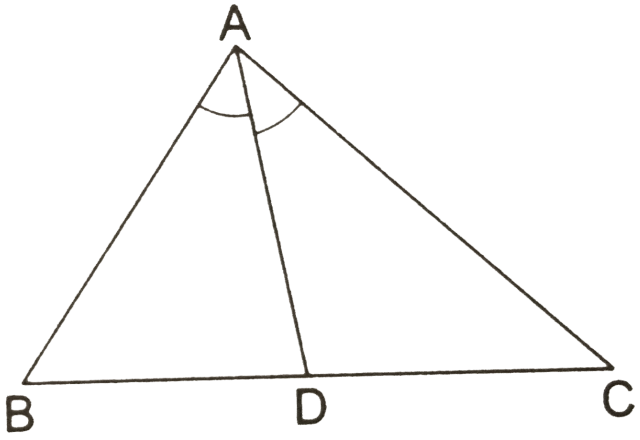

39.

In ΔABC, if AD is the bisector of $\angle A$, show that $AB > BD$ and $AC > DC$.

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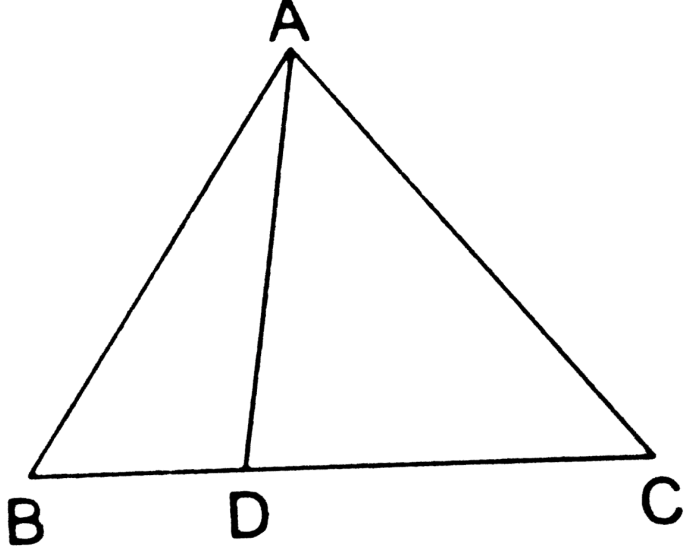
40. In the given figure, $AB > AC$. If D is any point on BC, show that $AB > AD$.



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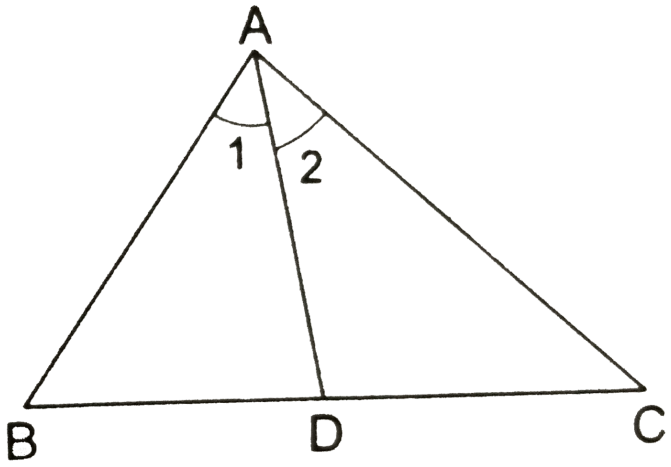
41. In the given figure, $AC > AB$ and AD is the bisector of $\angle A$. show that $\angle ADC > \angle ADB$.



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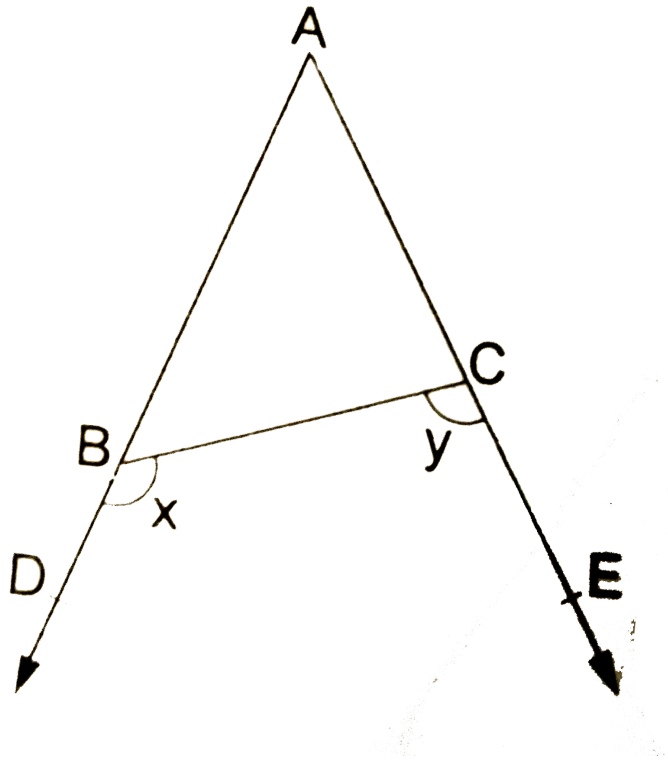
42. In the given figure, the sides AB and AC of ΔABC have been extended to D and E

respectively. If $x > y$, show that $AB > AC$.



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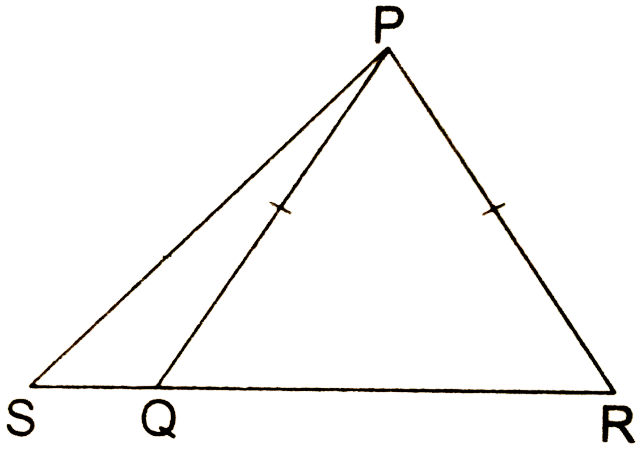
43. In the given figure, Q is a point on the side SR of ΔPSR such that PQ = PR. Prove that $PS > PQ$.



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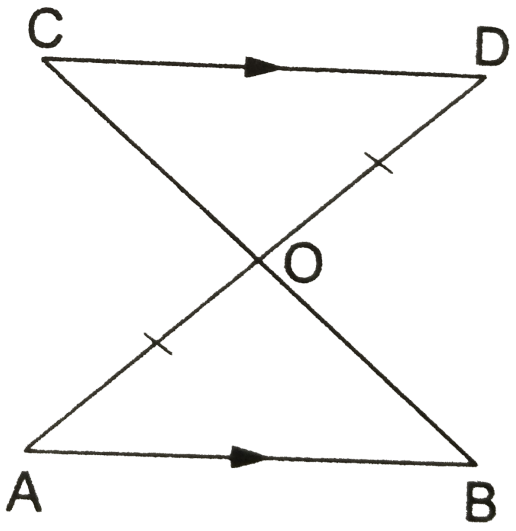
Exercise 9 A

1. In the given figure, $AB||CD$ and O is the midpoint of AD.

Show that (i) $\Delta AOB \cong \Delta DOC$.

(ii) O is the midpoint of BC.



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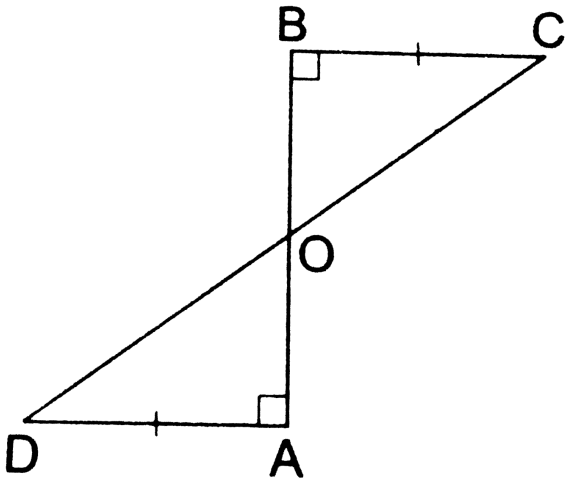
2. In the given figure, AD and BC are equal perpendicualrs to a line segment AB.

Show that CD bisects AB.



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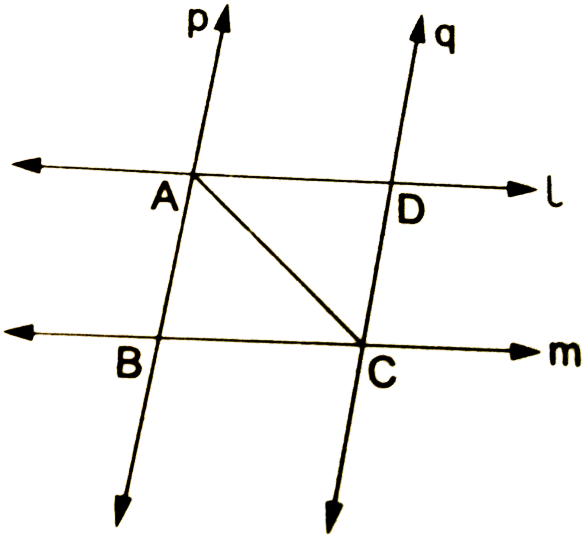
3. In thg given figure, two parallel lines l and m are intersected by two parallel lines p and q. Show that $\Delta ABC \cong \Delta CDA$.



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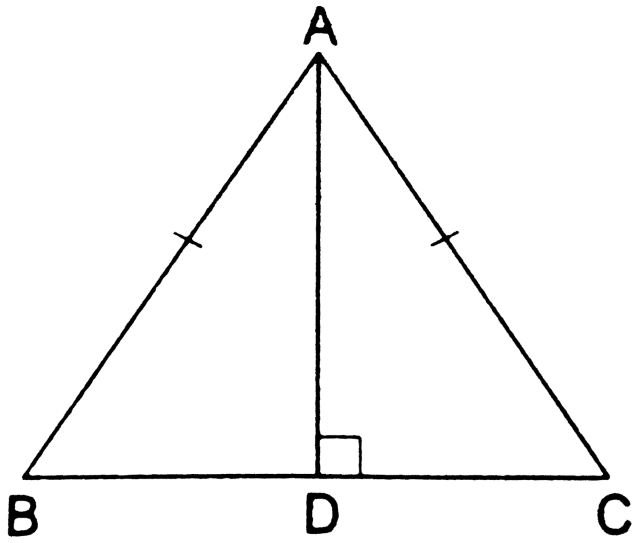
4. AD is an altitude of an isosceles ΔABC in which AB = AC.

Show that (i) AD bisects BC,

(ii) AD bisects $\angle A$.



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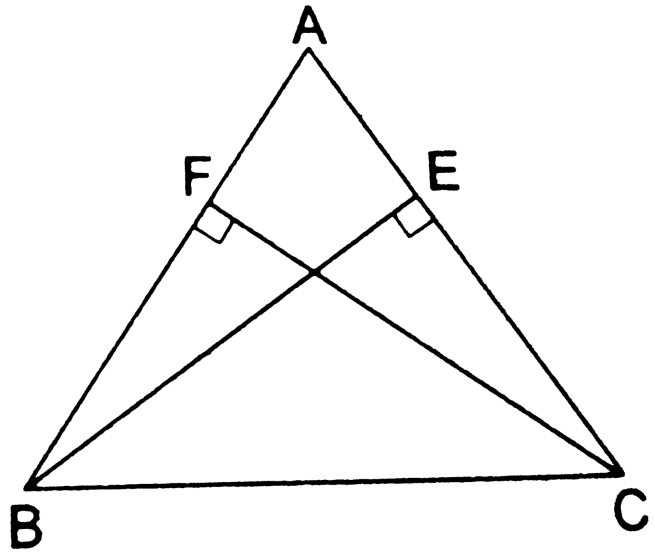
5. In the given figure, BE and CF are two equal altitudes of ΔABC.

Show that (i) $\Delta ABE \cong \Delta ACF$,

(ii)AB = AC.



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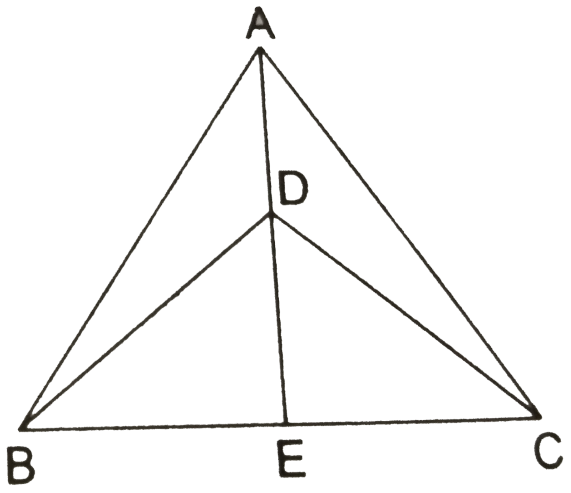
6. ΔABC and ΔDBC are two isosceles triangles on the same base BC and vertices A and D are on the same side of BC. If AD is extended to intersect BC at E, show that

(i) $\Delta ABD \cong \Delta ACD$

(ii) $\Delta ABE \cong \Delta ACE$

(iii) AE bisects $\angle A$ as well as $\angle D$

(iv) AE is the perpendicualr bisector of BC.



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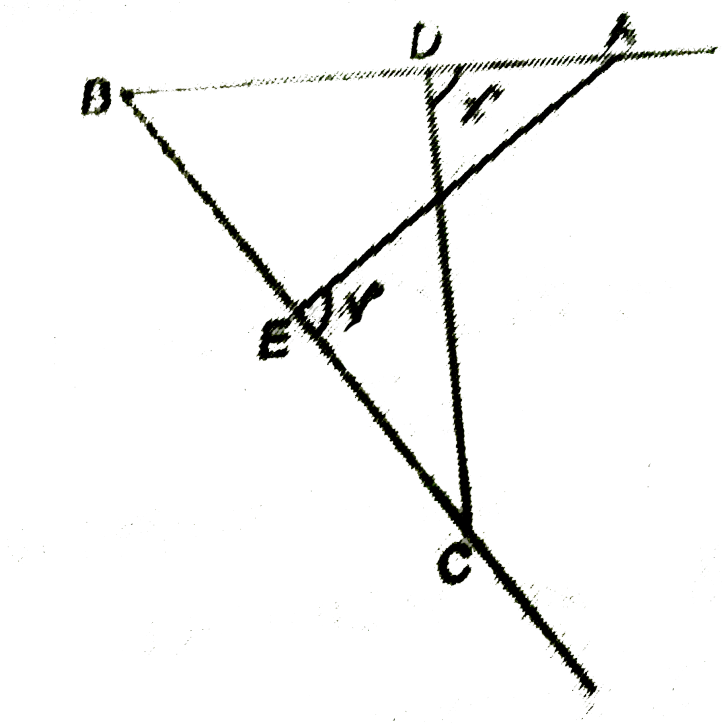
7. In the given figure, if $x = y$ and $AB = CB$, then prove that $AE = CD$.



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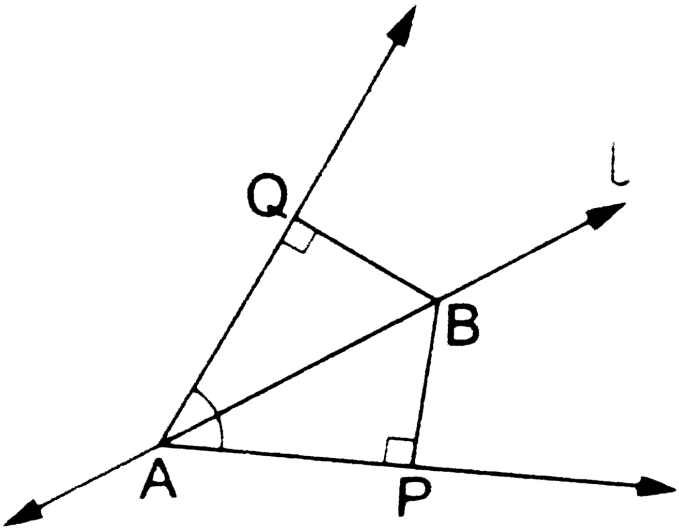
8. In the given figure, line l is the bisector of an angle $\angle A$ and B is any point on l. If BP and BQ are perpendiculars from B to the arms of $\angle A$, show that

(i) $\Delta APB \cong \Delta AQB$

(ii) BP = BQ, i.e., B is equidistant from the arms

of $\angle A$.



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9. In Figure, diagonal AC of a quadrilateral $ABCD$ bisects the angles A and C . Prove that $AB = AD$ and $CB = c$··

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10. ΔABC is a right triangle right angled at A such that $AB = AC$ and bisector of $\angle C$ intersects the side AB at D. Prove that $AC + AD = BC$.

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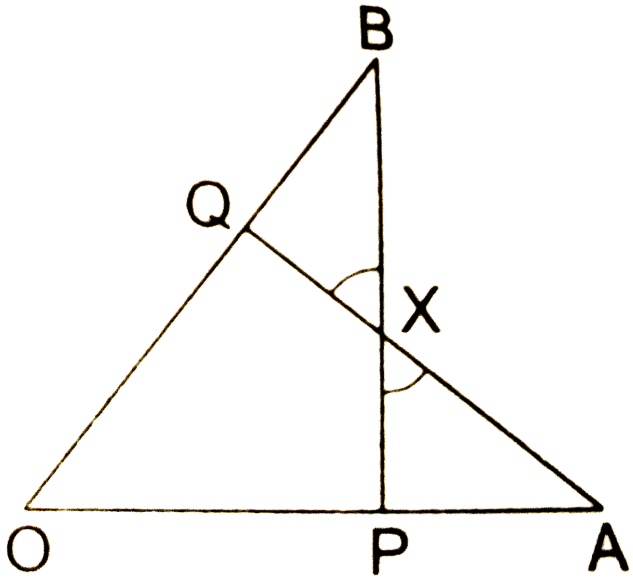
11. In the givne figure, OA = OB and OP = OQ.

Prove that (i) PX = QX, (ii) AX = BX.



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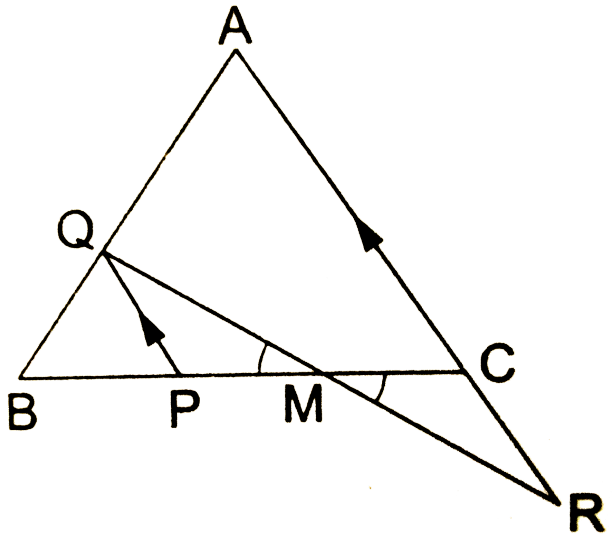
12. In the givne figure, ABC is an equilateral triangle, $PQ||AC$ and AC is produced to R such

that CR = BP. Prove that QR bisects PC.



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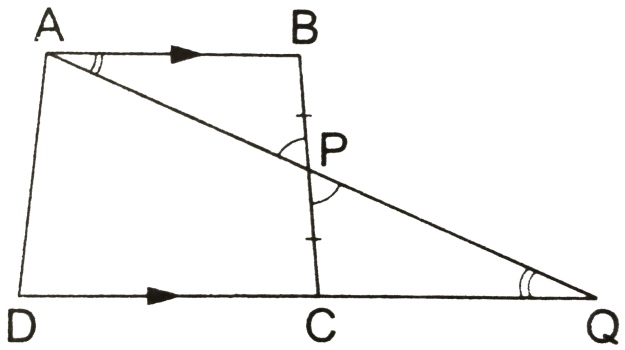
13. In the given figure ABCD is a quadrilateral in which $AB||DC$ and P is the midpoint of BC. On producing, AP and DC meet at Q. Prove that

$(i) AB = CQ, (ii) DQ = DC + AB.$



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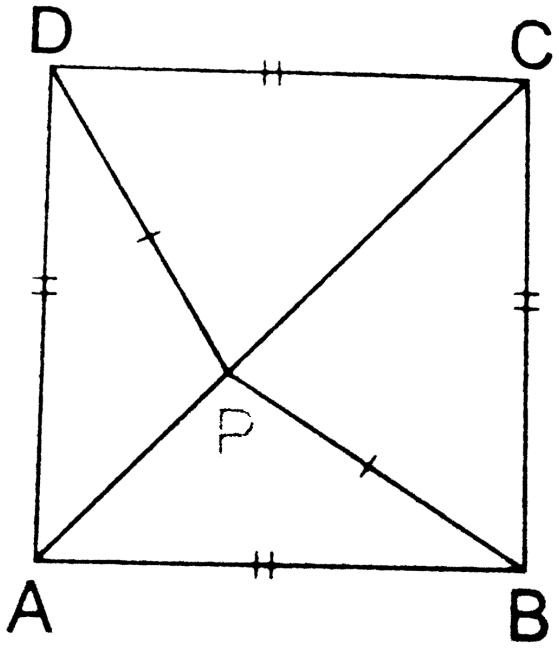
14. In the given figure, ABCD is a square and P is a point inside it such PB = Pd. Prove that CPA is

a straight line.



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15. In the given figure, O is a point in the interior of square ABCD such that ΔOAB is an

equilateral triangle.

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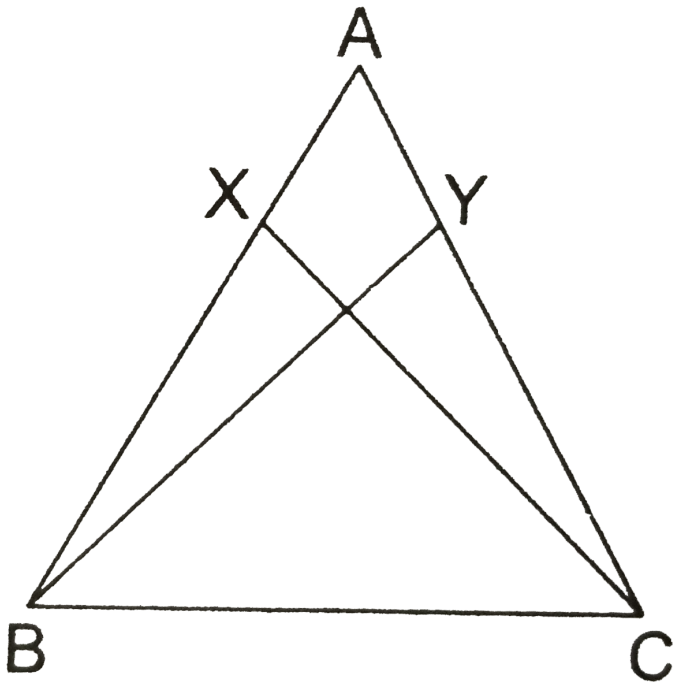
16. In the adjoining figure, X and Y are respectively two points on equal sides AB and AC of ΔABC such that AX = AY. Prove that CX =

BY.



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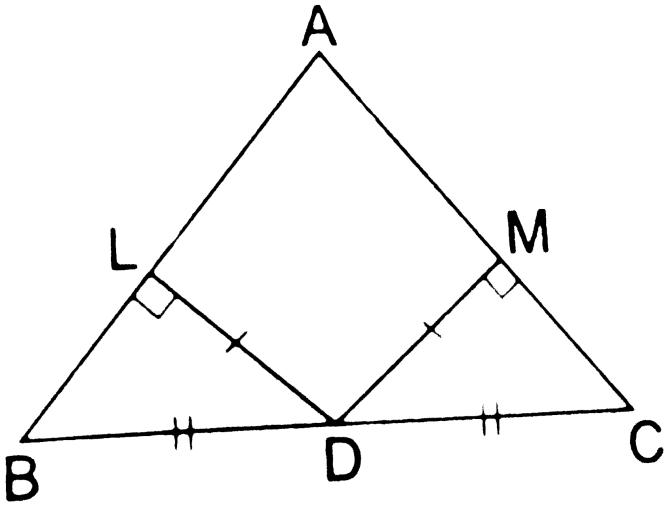
17. In $\Delta ABC, D$ is the midpoint of BC. If $DL \perp AB$ and $DM \perp AC$ such that DL = DM,

prove that AB = AC.



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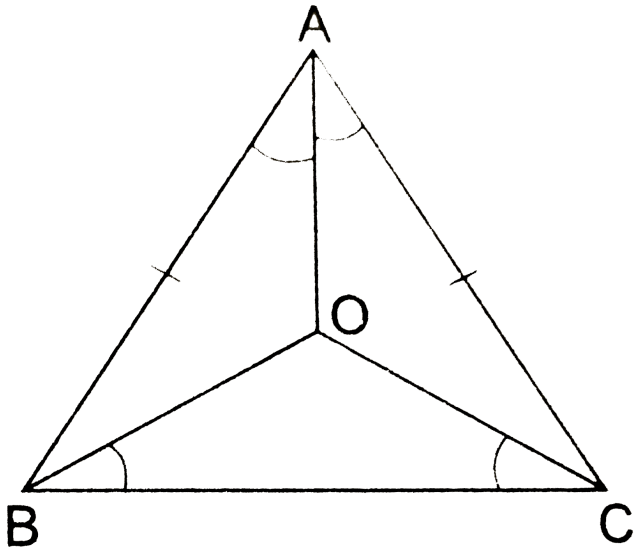
18. In ΔABC, $AB = AC$ and the bisectors of $\angle B$ and $\angle C$ meet at a point O. Prove that BO =

CO and the ray AO is the bisector of $\angle A$.



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19. The line segments joining the midpoints M and N of parallel sides AB and DC respectively

of a trapezium ABCD is perpendicular to both the sides AB and DC. Prove that AD=BC

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20. The bisectors of $\angle B$ and $\angle C$ of an isosceles triangle with $AB = AC$ intersect each other at a point O. BO is produced to meet AC at a point M. Prove that $\angle MOC = \angle ABC$.

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21. The bisectors of $\angle B$ and $\angle C$ of an isosceles ΔABC with $AB = AC$ intersect each other at point O. Show that the exterior angle adjacent to $\angle ABC$ is equal to $\angle BOC$.

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22. P is a point on the bisector of an angle $\angle ABC$. If the line through P parallel to AB meets BC at Q , prove that triangle BPQ is isosceles.

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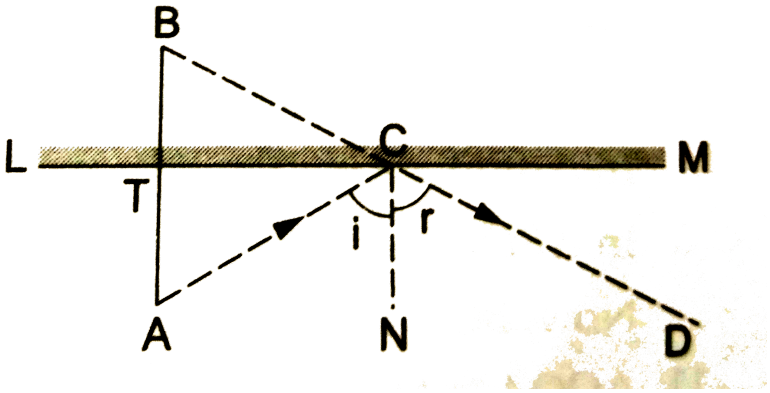
23. The image of an object placed at a point A before a plane mirror LM is seen at the point B by an observer at D, as shown in the figure. Prove that the image is as far behind the mirror as the object is in front of the mirror.



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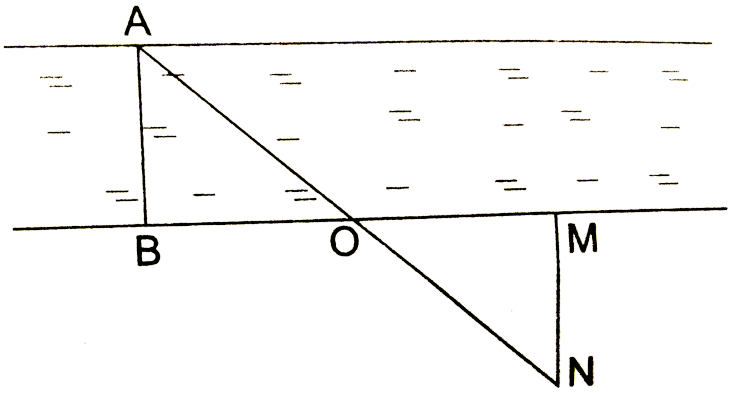
24. In the adjoining figure, explain how one can find the breadth of the river without crossing it.



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25. In a ΔABC, D is the mid point of side AC such that BD $= \frac{1}{2}$ AC .Show that $\angle ABC$ is a right anlge.

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26. If two sides and an angle of one triangle are equal to two sides and an angle of another triangle , then the two triangles must be congruent'. Is the statement true? Why?

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27. "If two angles and a side of one triangle are equal to two angles and a side of another triangle then the two triangle must be

congruent."

Is the statement true ? Why?

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Exercise 9 B

1. Is it possible to construct a triangle with lengths of its sides as given below? Give reason for your answer. ltbtgt (i) 5cm, 4cm, 9cm

(ii) 8cm, 7 cm, 4cm

(iii) 10 cm, 5 cm, 6cm

(iv) 2.5 cm, 5cm, 7 cm

(v) 3 cm, 4 cm, 8 cm

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2. In $\Delta ABC, \angle A = 50^\circ$ and $\angle B = 60^\circ$. Determine the longest and shortest sides of the triangle.

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3. (i) In $\Delta ABC, \angle A = 90^\circ$. Which is its longest side?

(ii) In $\Delta ABC, \angle A = \angle B = 45^\circ$. Which is its longest side?

(iii) In $\Delta ABC, \angle A = 100^\circ$ and $\angle C = 50^\circ$. Which is its shortest side?

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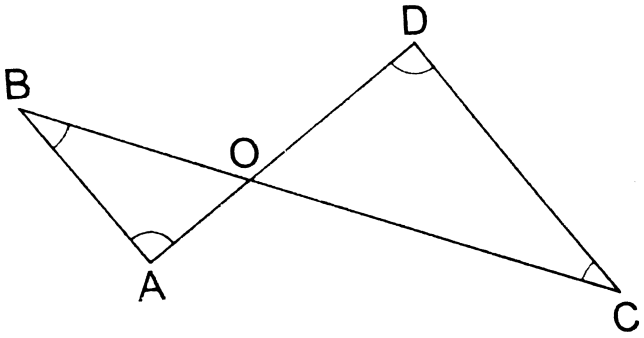
4. In the given figre, $\angle B < \angle A$ and $\angle C < \angle D$. Show that $AD < BC$.



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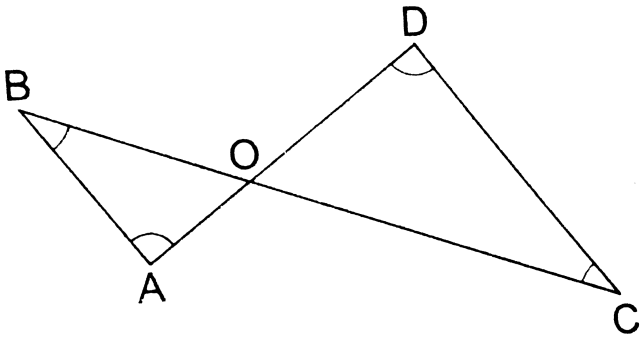
5. In the given figre, $\angle B < \angle A$ and $\angle C < \angle D$. Show that $AD < BC$.



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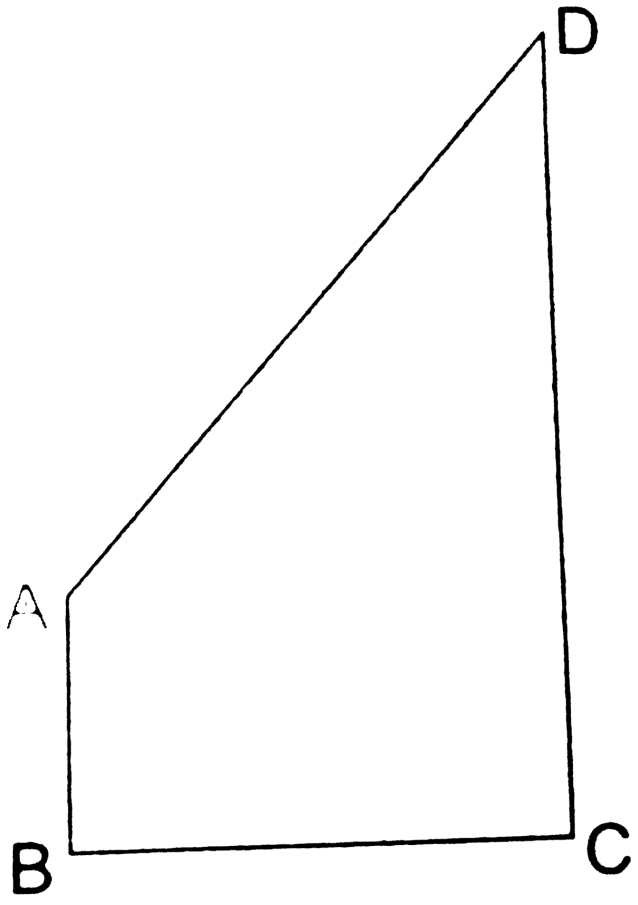
6. AB and CD are respectively the smallest and largest sides of a quadrilateral ABCD. Show that

$\angle A > \angle C$ and $\angle B > \angle C$.



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7. In a quadrilateral ABCD, show that

$(AB + BC + CD + DA) > (AC + BD)$.

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8. In a quadrilateral ABCD, show that

$(AB + BC + CD + DA) < 2(BD + AC)$.

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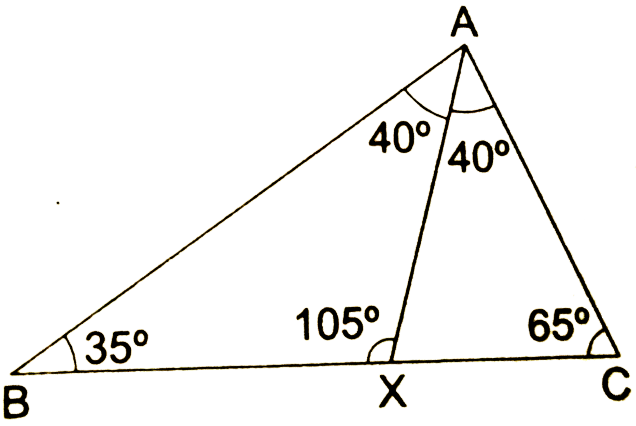
9. In $\Delta ABC, \angle B = 35^\circ, \angle C = 65^\circ$ and the bisector of $\angle BAC$ meets BC in X. Arrange AX, BX and CX in descending order.



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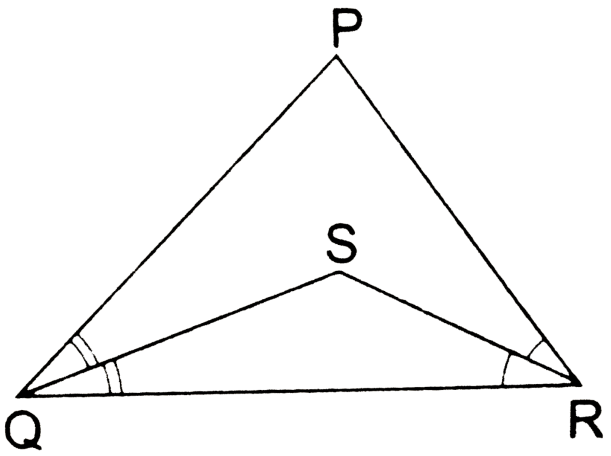
10. In the given figure, $PQ > PR$ and QS and RS are the bisectors of $\angle Q$ and $\angle R$ respectively. Show that $SQ > SR$.



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11. D is any point on side AC of a ΔABC with AB= AC .Show that $CD < BD$.

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12. Prove that in a triangle, other then an an eguilateral triangle, angle opposite the longest side is greater than $\frac{2}{3}$ of a right angle

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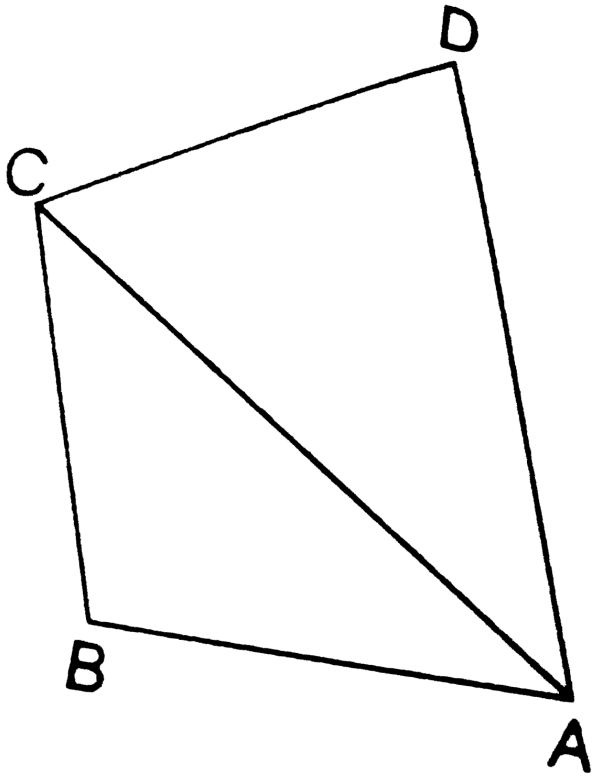
13. In the given figure, prove that

(i) $CD + DA + AB > BC$

(ii) $CD + DA + AB + BC > 2AC.$



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14. O is any point in the interior of ABC. Prove that $AB + AC > OB + OC$

$AB + BC + CA > OA + OB + OC$

$OA + OB + OC > \frac{1}{2}(AB + BC + CA)$

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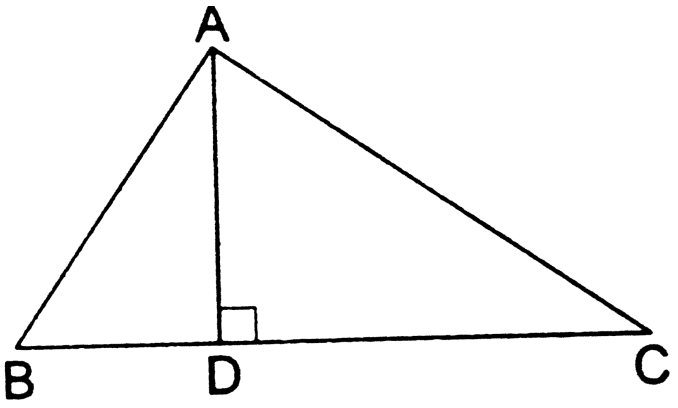
15. In the given figure, $AD \perp BC$ and $CD > BD$. Show that

$AC > AB$.



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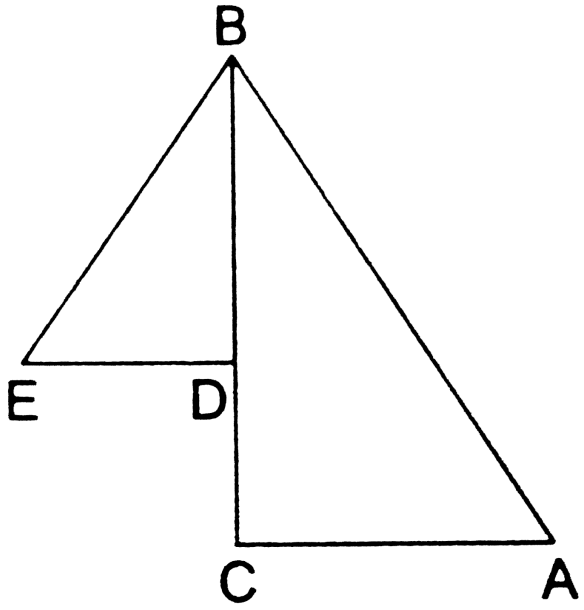
16. In the given figure, D is a point on side BC of a ΔABC and E is a point such that CD = DE.

Prove that $AB + AC > BE$.



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Multiple Choice Questions Mcq

1. Which of the following is not a criterion for congruence of triangles?

A. SSA

B. SAS

C. ASA

D. SSS

Answer: A

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2. If $AB = QR, BC = PR$ and $CA = PQ,$ then

A. $\Delta ABC \cong \Delta PQR$

B. $\Delta CBA \cong \Delta PQR$

C. $\Delta CAB \cong \Delta PQR$

D. $\Delta BCA \cong \Delta PQR$

Answer: C

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3. If $\Delta ABC \cong \Delta PQR$ then which of the following is not true?

A. BC = PQ

B. AC = PR

C. BC = QR

D. AB = PQ

Answer: A

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4. In $\Delta ABC, AB = AC$ and $\angle B = 50^\circ$.

Then, $\angle A = ?$

A. 40°

B. 50°

C. 80°

D. 130°

Answer: C

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5. In $\Delta ABC, BC = AB$ and $\angle B = 80^\circ$.

Then, $\angle A = ?$

A. 50°

B. 40°

C. 100°

D. 80°

Answer: A

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6. In $\Delta ABC, \angle C = \angle A, BC = 4cm$ and $AC = 5cm.$

Then, AB = ?

A. 4 cm

B. 5 cm

C. 5 cm

D. 2.5 cm

Answer: A

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7. Two sides of a triangle are of length 4 cm and 2.5 cm. The length of the third side of the triangle cannot be

A. 6 cm

B. 6.5 cm

C. 5.5 cm

D. 6.3 cm

Answer: B

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8. In ΔABC, if $\angle C > \angle B$, then

A. $BC > AC$

B. $AB > AC$

C. $AB < AC$

D. $BC < AC$

Answer: B

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9. It is given that $\Delta ABC \cong \Delta FDE$ in which

$AB = 5cm,$

$\angle B = 40^\circ, \angle A = 80^\circ$ and $FD = 5cm.$

Then, which of the following is true?

A. $\angle D = 60^\circ$

B. $\angle E = 60^\circ$

C. $\angle F = 60^\circ$

D. $\angle D = 80^\circ$

Answer: B

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10. In $\Delta ABC, \angle A = 40^\circ$ and $\angle B = 60^\circ$.

Then, the longest side of ΔABC is

A. BC

B. AC

C. AB

D. cannot be determined

Answer: C

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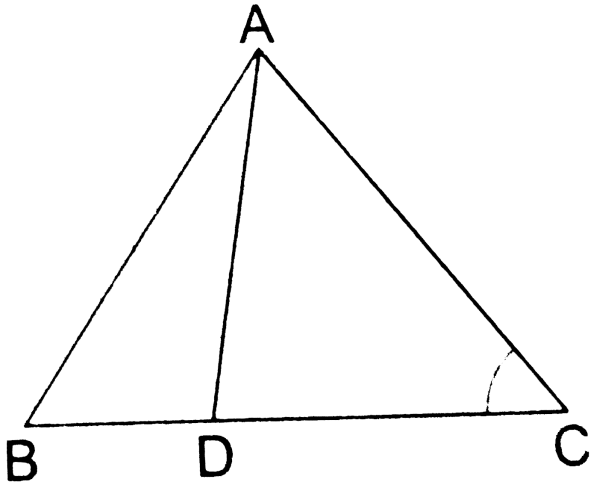
11. It the given figure, $AB > AC$. Then, which of the following is true?



A. $AB < AD$

B. $AB = AD$

C. $AB > AD$

D. cannot be determined

Answer: C

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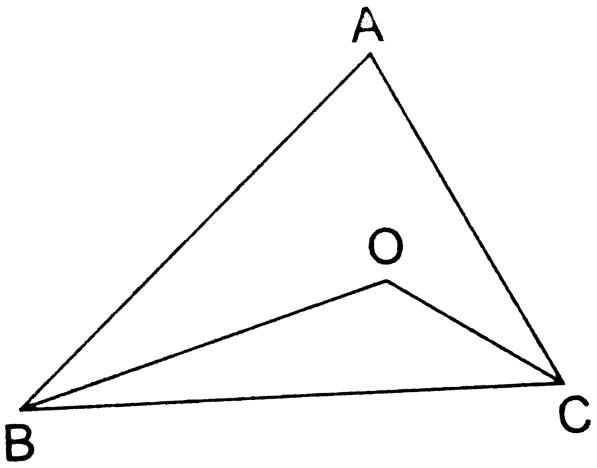
12. In the given figure, $AB > AC$. If BO and CO are the bisectors of $\angle B$ and $\angle C$ respectively

then



A. $OB = OC$

B. $OB > OC$

C. $OB < OC$

D. cannot be determined

Answer: B

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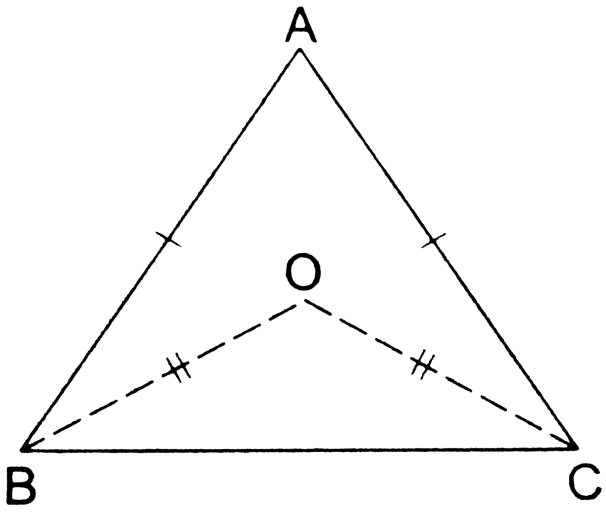
13. In the given figre, AB = AC and OB = OC. Then,

$\angle ABO : \angle ACO = ?$



A. $1:1$

B. $2:1$

C. $1:2$

D. none of these

Answer: A

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14. If the altitudes from two vertices of a triangle to the opposite sides are equal, prove that the triangle is isosceles.

A. equilateral

B. isosceles

C. scalene

D. right angled

Answer: B

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15. In ΔABC and ΔDEF, it is given that AB = DE and BC = EF. In order that $\Delta ABC \cong \Delta DEF$, we must have

A. $\angle A = \angle D$

B. $\angle B = \angle E$

C. $\angle C = \angle F$

D. none of these

Answer: B

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16. In ΔABC and ΔDEF, it is given that $\angle B = \angle E$ and $\angle C = \angle F$, In order that $\Delta ABC \cong \Delta DEF$, we must have

A. AB = DF

B. AC = DE

C. BC = EF

D. $\angle A = \angle D$

Answer: C

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17. In ΔABC and ΔPQR, If AB=AC, $\angle C = \angle P$ and $\angle B = \angle Q$, then the two triangles are

A. isosceles but not congruent

B. isosceles and congruent

C. congruent but not isosceles

D. neither congruent nor isosceles

Answer: A

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18. which is true?

A. A triangle can have two right angles.

B. A triangle can have two obtuse angles.

C. A triangle can have two acute angles.

D. An exterior angle of a triangle is less than either of the interior opposite angles.

Answer: C

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19. Fill in the blanks with lt or gt

(a) (Sum of any two sides of a triangle)..... (the third side).

(b) (Difference of any two sides of a triangle).... (the third side).

(c) (Sum of three altitudes of a triangle)....(sum of its three sides).

(d) (Sum of any two sides of a triangle).....(twice the median to the 3rd side).

(e) (Perimeter of a triangle)....(sum of its three medians).

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20. Fill in the blanks . (a) Each angle of an equilateral triangle measures ..... (b)

Medians of an equilateral triangle are ..... (c) In a right triangle, the hypotenuse is the ..... Side.

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