## EXERCISE 7.4

1. Find all the angles of an equilateral triangle.

2. 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 Fig. 7.12. Prove that the image is as far behind the mirror as the object is in front of the mirror.

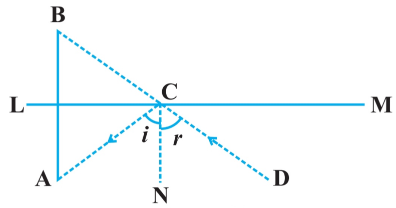

Fig. 7.12

[Hint: CN is normal to the mirror. Also, angle of incidence = angle of reflection].

3. ABC is an isosceles triangle with AB = AC and D is a point on BC such that AD ⊥ BC (Fig. 7.13). To prove that ∠ BAD = ∠ CAD, a student proceeded as follows:

In △ ABD and △ ACD,
AB = AC (Given)
∠ B = ∠C (because AB = AC)
and ∠ ADB = ∠ ADC
Therefore, △ ABD ≅ △ ACD (AAS)
So, ∠ BAD = ∠ CAD (CPCT)
What is the defect in the above arguments?
[Hint: Recall how ∠ B = ∠ C is proved whenAB = AC]

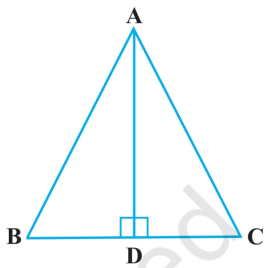

Fig. 7.13

4. P is a point on the bisector of ∠ ABC. If the line through P, parallel to BA meet BC at Q, prove that BPQ is an isosceles triangle.

5. ABCD is a quadrilateral in which AB = BC and AD = CD. Show that BD bisects both the angles ABC and ADC.

6. ABC is a right triangle with AB = AC. Bisector of ∠ A meets BC at D. Prove that BC = 2 AD

7. O is a point in the interior of a square ABCD suchthat OAB is an equilateral triangle. Show that △ OCD is an isosceles triangle.

8. ABC and DBC are two triangles on the same base BC such that A and D lie on the opposite sides of BC, AB = AC and DB = DC. Show that AD is the perpendicular bisector of BC.

9. ABC is an isosceles triangle in which AC = BC. AD and BE are respectively two altitudes to sides BC and AC. Prove that AE = BD.

10. Prove that sum of any two sides of a triangle is greater than twice the median with respect to the third side.

11. Show that in a quadrilateral ABCD, AB + BC + CD + DA < 2 (BD + AC)

12. Show that in a quadrilateral ABCD,

    AB + BC + CD + DA > AC + BD

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

14. In a right triangle, prove that the line-segment joining the mid-point of the hypotenuse to the opposite vertex is half the hypotenuse.

15. Two lines l and m intersect at the point O and P is a point on a line n passing through the point O such that P is equidistant from l and m. Prove that n is the bisector of the angle formed by l and m.

16. Line segment joining the mid-points 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.

17. ABCD is a quadrilateral such that diagonal AC bisects the angles A and C. Prove that AB = AD and CB = CD.

18. ABC is a right triangle such that AB = AC and bisector of angle C intersects the side AB at D. Prove that AC + AD = BC.

19. AB and CD are the smallest and largest sides of a quadrilateral ABCD. Out of $\angle$ B and $\angle$ D decide which is greater.

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

21. ABCD is quadrilateral such that AB = AD and CB = CD. Prove that AC is the perpendicular bisector of BD.