Assignments in Mathematics Class IX (Term 2)
8. QUADRILATERALS

IMPORTANT TERMS, DEFINITIONS AND RESULTS

- Sum of the angles of a quadrilateral is 360°.

- A diagonal of a parallelogram divides it into two congruent triangles.

- In a parallelogram,
  - (i) opposite sides are equal
  - (ii) opposite angles are equal
  - (iii) diagonals bisect each other

- A quadrilateral is a parallelogram, if
  - (i) opposite sides are equal or
  - (ii) opposite angles are equal or
  - (iii) diagonals bisect each other or
  - (iv) a pair of opposite sides is equal and parallel

- Diagonals of a rectangle bisect each other and are equal and vice-versa.

- Diagonals of a rhombus bisect each other at right angles and vice-versa.

- Diagonals of a square bisect each other at right angles and are equal, and vice-versa.

- The line segment joining the mid-points of any two sides of a triangle is parallel to the third side and is half of it.

- A line through the mid-point of a side of a triangle parallel to another side bisects the third side.

- The quadrilateral formed by joining the mid-points of the sides of a quadrilateral, in order, is a parallelogram.


## SUMMATIVE ASSESSMENT

MULTIPLE CHOICE QUESTIONS [1 Mark]

A. Important Questions

1. Two consecutive angles of a parallelogram are in the ratio 1 : 3. Then the smaller angle is :
   (*a*) 50°   (*b*) 90°   (*c*) 60°   (*d*) 45°

2. A quadrilateral is a parallelograms if :
   (*a*) both pairs of opposite sides are equal
   (*b*) both pairs of opposite angles are equal
   (*c*) the diagonals bisect each other
   (*d*) all of these

3. ABCD is a rhombus. Diagonal AC is equal to one of its sides. Then ∆ABC must be :
   (*a*) a right angled triangle
   (*b*) an equilateral triangle
   (*c*) an isosceles triangle
   (*d*) none of these

4. In the figure, ABCD is a parallelogram. The values of *x* and *y* are respectively :
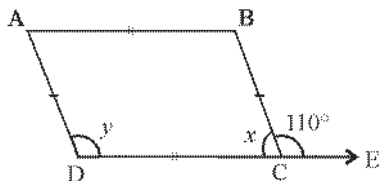
   (*a*) 70°, 110°   (*b*) 70°, 70°
   (*c*) 110°, 70°   (*d*) 70°, 40°

5. In the given figure, ABCD is a rhombus. If ∠A = 80°, then ∠CDB is equal to :
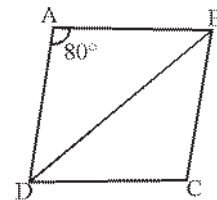
   (*a*) 80°   (*b*) 90°   (*c*) 50°   (*d*) 100°

6. The sum of three angles of a quadrilateral is 3 right angles. Then the fourth angle is a/an :
   (*a*) right angle   (*b*) obtuse angle
   (**c**) acute angle   (*d*) reflex angle
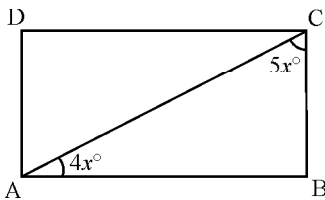
7. In the given figure, the measure of ∠DOC is equal to :
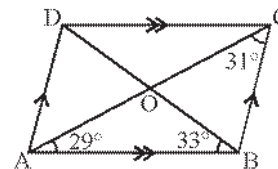
   (*a*) 90°   (*b*) 180°   (*c*) 118°   (*d*) 62°

8. Two adjacent angles of a parallelogram are $2x + 30°$ and $3x – 30°$. Then the value of *x* is :
   (*a*) 30°   (*b*) 60°   (*c*) 0°   (*d*) 36°

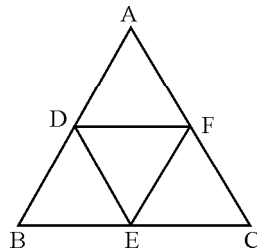9. In the figure, AB ‖ DC, then the measure of ∠D is equal to :

1
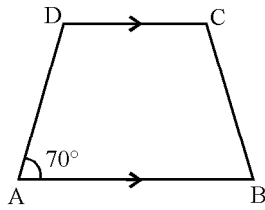
(*a*) 70°   (*b*) 140°   (*c*) 180°   (*d*) 110°

10. In the rectangle ABCD, ∠BAC = $4x°$, if ∠BCA = $5x°$, then measures of ∠ACD and ∠CAD are respectively :

(*a*) 50°, 40°   (*b*) 40°, 50°
(*c*) 80°, 100°   (*d*) none of these

11. In the figure, D, E and F are the mid-points of the sides AB, BC and CA respectively. If AC = 8.2 cm, then value of DE is :

(*a*) 8.2 cm   (*b*) 4.1 cm
(*c*) 2.05 cm   (*d*) none of these

12. In a rectangle ABCD, diagonals AC and BD intersect at O. If AO = 3 cm, then the length of the diagonal BD is equal to :
(*a*) 3 cm   (*b*) 9 cm   (*c*) 6 cm   (*d*) 12 cm

13. Three angles of a quadrilateral are 75°, 90° and 75°.The fourth angle is :
(*a*) 90°   (*b*) 95°   (*c*) 105°   (*d*) 120°

14. Diagonals of a parallelogram ABCD intersect at O. If ∠BOC = 90° and ∠BDC = 50°, then ∠OAB is :
(*a*) 90°   (*b*) 50°   (*c*) 40°   (*d*) 10°

15. If APB and CQD are two parallel lines, then the bisectors of the angles APQ, BPQ, CQP and PQD form :
(*a*) a square   (*b*) a rhombus
(*c*) a rectangle   (*d*) any other parallelogram

**16.** The figure obtained by joining the mid-points of the sides of a rhombus, taken in order, is :
(*a*) a rhombus   (*b*) a rectangle
(*c*) a square   (*d*) any parallelogram

17. The sides BA and DC of a quadrilateral ABCD are produced as shown in the figure. Then which of the following relations is true?
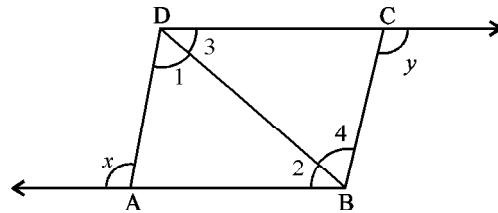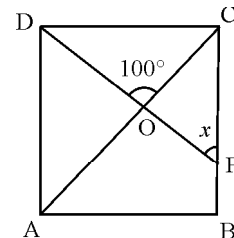

(*a*) $x + y = ∠1 + ∠2 + ∠3 + ∠4$
(*b*) $x − y = ∠1 + ∠2 + ∠3 + ∠4$
(*c*) $x + y = 2 (∠1 + ∠2 + ∠3 + ∠4)$
(*d*) none of these

18. In the figure, P and Q are mid-points of sides AB and AC respectively of ΔABC. If PQ = 3.5 cm and AB = AC = 9 cm, then the perimeter of ΔABC is :
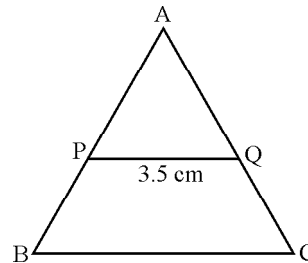
(*a*) 20 cm   (*b*) 23 cm   (*c*) 25 cm   (*d*) 27 cm

19. In the figure, if ABCD is a square, then value of *x* is :

(*a*) 50°   (*b*) 55°   (*c*) 80°   (*d*) 60°

20. In a parallelogram ABCD, bisectors of two adjacent angles A and B meet at O. The measure of the angle AOB is equal to :
(*a*) 90°   (*b*) 180°   (*c*) 60°   (*d*) 360°

21. Lengths of two adjacent sides of a parallelogram are in the ratio 2 : 7. If its perimeter is 180 cm, then the adjacent sides of the parallelogram are :
(*a*) 10 cm, 20 cm   (*b*) 20 cm, 70 cm
(*c*) 41 cm, 140 cm   (*d*) none of these

22. If *a, b, c* and *d* are four angles of a quadrilateral such that $a = 2b$, $b = 2c$ and $c = 2d$, then the value of *d* is :
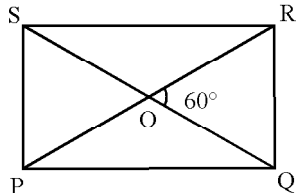(*a*) 36°   (*b*) 24°   (*c*) 30°   (*d*) none of these

23. The triangle formed by joining the mid points of the sides of a right angled triangle is :
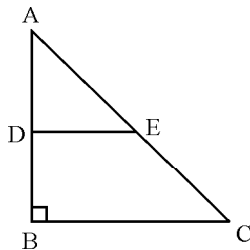(*a*) an acute angled triangle
(*b*) an obtuse angled triangle

(c) a right angled triangle

(d) none of these

24. The diagonals of a rectangle PQRS intersect at O. If ∠ROQ = 60°, then ∠OSP is equal to :


(a) 90°   (b) 120° (c) 60°   (d) none of these

25. In the ΔABC, ∠B is a right angle, D and E are the mid-points of the sides AB and AC respectively. If AB = 6 cm and AC = 10 cm, then the length of DE is :

(a) 3 cm   (b) 5 cm   (c) 4 cm   (d) 6 cm

26. In a ΔABC, D, E and F are respectively the mid-points of BC, CA and AB as shown in the figure. The perimeter of ΔDEF is :
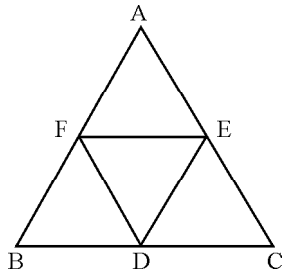
(a) $\frac{1}{2}$(AB + BC + CA) (b) AB + BC + CA

(c) 2 (AB + BC + CA) (d) none of these

27. In a parallelogram ABCD, ∠A = (3x + 15°) and ∠B = (5x – 35°).The measure of ∠D is :

(a) 125°   (b) 90°

(c) 180°   (d) cannot be determined

28. In the given figure, if ABCD is a parallelogram, then the value of 2∠ABC – ∠ADC is :
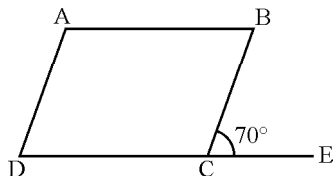

(a) 40°   (b) 220°   (c) 70°   (d) 75°

29. If one angle of a parallelogram is 56° more than three times of its adjacent angle, then measures of all the angles are :

(a) 31°, 149°, 31°, 149°

(b) 59°, 121°, 59°, 121°

(c) 37°, 143°, 37°, 143°

(d) none of these

30. In a trapezium ABCD, AB ∥ CD, ∠A = (2x – 35°), ∠B = y°, ∠C = 85° and ∠D = (3x + 65°). The values of x and y are respectively :

(a) 30°, 60°   (b) 45°, 75°

(c) 75°, 115°   (d) 30°, 95°

31. In the ΔABC, E and F are the mid-points of AB and AC respectively. The altitude AP intersects EF at Q. The correct relation between AQ and QP is :
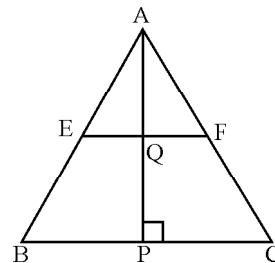
(a) AQ > QP   (b) AQ = QP

(c) AQ < QP   (d) none of these

32. The quadrilateral formed by joining the mid-points of the sides of a quadrilateral PQRS, taken in order, is a rectangle, if :

(a) PQRS is a rectangle

(b) PQRS is a parallelogram

(c) diagonals of PQRS are perpendicular

(d) diagonals of PQRS are equal

33. The quadrilateral formed by joining the mid-points of the sides of a quadrilateral PQRS, taken in order, is a rhombus, if :

(a) PQRS is a rhombus

(b) PQRS is a parallelogram

(c) diagonals of PQRS are perpendicular

(d) diagonals of PQRS are equal

34. D and E are the mid-points of the sides AB and AC respectively of ΔABC. DE is produced to F. To prove that CF is equal and parallel to DA, we need an additional information which is :

(a) ∠DAE = ∠EFC   (b) AE = EF

(c) DE = EF   (d) ∠ADE = ∠ECF

35. D and E are the mid-points of the sides AB and AC of ΔABC and O is any point on side BC. O is joined to A. If P and Q are the mid-points of OB and OC respectively, then DEQP is :

(a) a square   (b) a rectangle
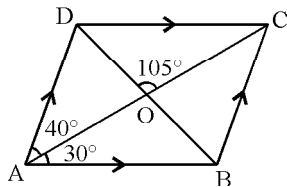
(c) a rhombus   (d) a parallelogram

36. The figure formed by joining mid-points of the sides of a quadrilateral ABCD, taken in order, is a square only if :

(*a*) ABCD is a rhombus

(*b*) diagonals of ABCD are equal

(*c*) diagonals of ABCD are equal and perpendicular

(*d*) diagonals of ABCD are perpendicular.

B. Questions From CBSE Examination Papers

1. ABCD is a rhombus such that $\angle ACB = 40°$, then $\angle ADC$ is : **[T-II (2011)]**
(*a*) 40°　(*b*) 45°　(*c*) 100°　(*d*) 60°

2. If the angles of a quadrilateral ABCD, taken in order, are in the ratio 3 : 7 : 6 : 4, then ABCD is a : **[T-II (2011)]**
(*a*) rhombus　　　　(*b*) kite
(*c*) parallelogram　　(*d*) trapezium

3. Two adjacent angles of a rhombus are $3x - 40°$ and $2x + 20°$. The measurement of the greater angle is : **[T-II (2011)]**
(*a*) 160°　(*b*) 100°　(*c*) 80°　(*d*) 120°

4.

ABCD is a parallelogram in which $\angle DAC = 40°$; $\angle BAC = 30°$; $\angle DOC = 105°$ then $\angle CDO$ equals : **[T-II (2011)]**
(*a*) 75°　(*b*) 70°　(*c*) 45°　(*d*) 85°

5. Angles of a quadrilateral are in the ratio 3 : 6 : 8 : 13. The largest angle is : **[T-II (2011)]**
(*a*) 178°　(*b*) 90°　(*c*) 156°　(*d*) 36°

6. ABCD is a rhombus such that one of its diagonals is equal to its side. Then the angles of rhombus ABCD are : **[T-II (2011)]**
(*a*) 45°, 135°, 45°, 135° (*b*) 100°, 80°, 100°, 80°
(*c*) 120°, 60°, 120°, 60° (*d*) 60°, 60°, 60°, 60°

7. D, E, F are midpoints of sides BC, CA and AB of ΔABC. If perimeter of ΔABC is 12.8 cm, then perimeter of ΔDEF is : **[T-II (2011)]**
(*a*) 17 cm (*b*) 38.4 cm (*c*) 25.6 cm (*d*) 6.4 cm

8. In a quadrilateral three angles are in the ratio 3 : 3 : 1 and one of the angles is 80°, then other angles are : **[T-II (2011)]**
(*a*) 120°, 120°, 40°　(*b*) 100°, 100°, 80°
(*c*) 110°, 110°, 60°　(*d*) 90°, 90°, 30°

9. Two adjacent angles of a parallelogram are $(2x + 30)°$ and $(3x + 30)°$. The value of x is : **[T-II (2011)]**
(*a*) 30°　(*b*) 60°　(*c*) 24°　(*d*) 36°

10. In a quadrilateral ABCD, AB = BC and CD = DA, then the quadrilateral is a : **[T-II (2011)]**
(*a*) parallelogram　　(*b*) rhombus
(*c*) kite　　　　　　(*d*) trapezium

11. In a parallelogram ABCD, $\angle A = 60°$, then $\angle D$ is equal to : **[T-II (2011)]**
(*a*) 110°　(*b*) 140°　(*c*) 120°　(*d*) 130°

12. In the figure, ABCD is a parallelogram. If $\angle DAB = 60°$ and $\angle DBC = 80°$, then $\angle CDB$ is : **[T-II (2011)]**
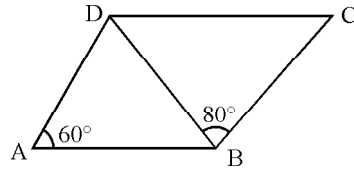

(*a*) 40°　(*b*) 80°　(*c*) 60°　(*d*) 20°

13. In the figure, ABCD is a parallelogram. If $\angle B = 100°$, then $(\angle A + \angle C)$ is equal to : **[T-II (2011)]**
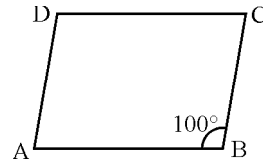
(*a*) 360°　(*b*) 200°　(*c*) 180°　(*d*) 160°

14. All the angles of a convex quadrilateral are congruent. However, not all its sides are congruent. What type of quadrilateral is it? **[T-II (2011)]**
(*a*) parallelogram　　(*b*) square
(*c*) rectangle　　　　(*d*) trapezium

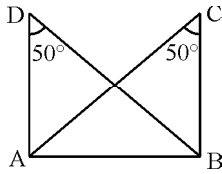**15.** ABCD is a quadrilateral and AP and DP are bisectors of $\angle A$ and $\angle D$. The value of x is : **[T-II (2011)]**
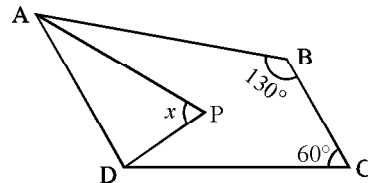
(*a*) 60°　(*b*) 85°　(*c*) 95°　(*d*) 100°

16. In a ΔPQR, right angled at Q, PQ = 24 cm and QR = 7 cm. S is the mid point of PR. Then RS is : **[T-II (2011)]**
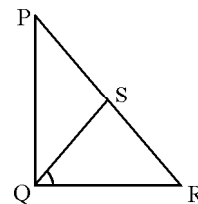
(*a*) 3.5 cm　(*b*) 12 cm (*c*) 25 cm　(*d*) 12.5 cm

17. If ∠C = ∠D = 50°, then four points A, B, C, D :
    [T-II (2011)]

    (*a*) are concyclic
    (*b*) do not lie on same circle
    (*c*) are collinear
    (*d*) A, B, D and A, B, C lie on different circles

18. In parallelogram ABCD, if ∠A = 2*x* + 15°, ∠B = 3*x* − 25°, then value of *x* is : **[T-II (2011)]**
    (*a*) 91°   (*b*) 89°   (*c*) 34°   (*d*) 38°

19. Three angles of a quadrilateral are 70°, 120° and 65°. The fourth angle of the quadrilateral is :
    [T-II (2011)]
    (*a*) 95°   (*b*) 75°   (*c*) 105°   (*d*) 90°

20. If PQRS is a parallelogram, then ∠Q − ∠S is equal to : **[T-II (2011)]**
    (*a*) 90°   (*b*) 120°   (*c*) 180°   (*d*) 0°

21. Which of the following is not true for a parallelogram? **[T-II (2011)]**
    (*a*) opposite sides are equal
    (*b*) opposite angles are equal
    (*c*) opposite angles are bisected by diagonals
    (*d*) diagonals bisect each other

22. If APB and CQD are parallel lines and a transversal PQ cut them at P and Q, then the bisectors of angles APQ, BPQ, CQP and PQD form a **[T-II (2011)]**
    (*a*) rectangle   (*b*) rhombus
    (*c*) square   (*d*) any other parallelogram

23. ABCD is a rhombus such that ∠ACB = 40°, then ∠ADB is : **[T-II (2011)]**
    (*a*) 40°   (*b*) 45°   (*c*) 50°   (*d*) 60°

24. The figure obtained by joining mid-points of adjacent sides of a rectangle of sides 8 cm and 6 cm is : **[T-II (2011)]**
    (*a*) a rectangle of area 24 cm^2
    (*b*) a square of area 25 cm^2
    (*c*) a trapezium of area 24 cm^2
    (*d*) a rhombus of area 24 cm^2

25. If the diagonals AC and BD of a quadrilateral ABCD bisect each other, then ABCD is a :
    [T-II (2011)]
    (*a*) parallelogram   (*b*) rectangle
    (*c*) rhombus   (*d*) trapezium

26. The diagonals of a parallelogram PQRS intersect at O. If ∠QOR = 90° and ∠QSR = 50°, then ∠ORS is : **[T-II (2011)]**
    (*a*) 90°   (*b*) 40°   (*c*) 70°   (*d*) 50°

27. If in a quadrilateral ABCD, ∠A = 90° and AB = BC = CD = DA, then ABCD is a
    [T-II (2011)]
    (*a*) a parallelogram   (*b*) rectangle
    (*c*) square   (*d*) rhombus

28. In qudrilateral PQRS, if ∠P = 60° and ∠Q : ∠R : ∠S = 2 : 3 : 7, then ∠S is : **[T-II (2011)]**
    (*a*) 175°   (*b*) 135°   (*c*) 150°   (*d*) 210°
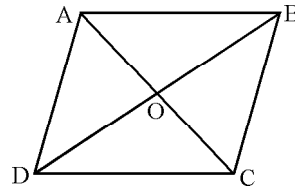
29. A quadrilateral whose diagonals are equal and bisect each other at right angles is a :
    [T-II (2011)]
    (*a*) rhombus   (*b*) square
    (*c*) trapezium   (*d*) rectangle

30. In a parallelogram ABCD, if ∠A = 75°, then ∠B is :
    [T-II (2011)]
    (*a*) 75°   (*b*) 105°   (*c*) 15°   (*d*) 95°

31. In the given figure, ABCD is a rhombus in which diagonals AC and BD intersect at O. Then ∠AOB is : **[T-II (2011)]**

    (*a*) 60°   (*b*) 80°   (*c*) 90°   (*d*) 45°

32. The diagonals AC and BD of a parallelogram ABCD inntersect each other at the point O. If ∠DAC = 32°, ∠AOB = 70°, then ∠DBC is equal to : **[T-II (2011)]**
    (*a*) 24°   (*b*) 88°   (*c*) 38°   (*d*) 32°

33. Which of the following is not a parallelogram?
    [T-II (2011)]
    (*a*) rhombus   (*b*) rectangle
    (*c*) trapezium   (*d*) square

34. Two angles of a quadrilateral are 50° and 80° and other two angles are in the ratio 8 : 15, then the remaining two angles are : **[T-II (2011)]**
    (*a*) 140°, 90°   (*b*) 100°, 130°
    (*c*) 80°, 150°   (*d*) 70°, 160°

35. In a quadrilateral ABCD, if ∠A = 80°, ∠B = 70°, ∠C = 130°, then ∠D is : **[T-II (2011)]**
   (*a*) 80°   (*b*) 70°   (*c*) 130°   (*d*) 150°

36. In an equilateral triangle ABC, D and E are the mid points of sides AB and AC respectively. Then length of DE is : **[T-II (2011)]**
    (*a*) not possible to find

    (*b*) 3 cm   (*c*) $\frac{1}{2}$BC   (*d*) $\frac{3}{2}$BC

37. In a quadrilateral ABCD, diagonals bisect each other at right angles. Also, AB = BC = AD = 6 cm, then length of CD is : **[T-II (2011)]**

(*a*) 3 cm   (*b*) 6 cm   (*c*) $6\sqrt{2}$ cm (*d*) 12 cm

38. In the figure, PQRS is a parallelogram in which ∠PSR = 125°, ∠RQT is equal to : **[T-II (2011)]**
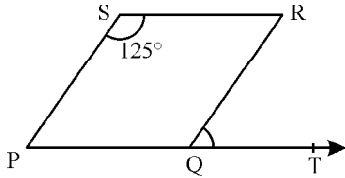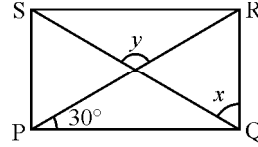

(*a*) 75°   (*b*) 65°   (*c*) 55°   (*d*) 125°

39. Two consecutive angles of a parallelogram are in the ratio 1 : 3, then the smaller angle is : **[T-II (2011)]**

(*a*) 50°   (*b*) 90°   (*c*) 60°   (*d*) 45°

40. In the figure, PQRS is a rectangle. If ∠RPQ = 30°, then the value of ($x + y$) is : **[T-II (2011)]**

(*a*) 90°   (*b*) 120°   (*c*) 150°   (*d*) 180°

41. The diagonals of a rhombus are 12 cm and 16 cm. The length of the side of the rhombus is : **[T-II (2011)]**

(*a*) 10 cm   (*b*) 12 cm   (*c*) 16 cm   (*d*) 8 cm

SHORT ANSWER TYPE QUESTIONS   [2 Marks]

A. Important Questions

1. Can 95°, 70°, 110° and 80° be the angles of a quadrilateral ? Why or why not ?

2. Three angles of a quadrilateral are equal. Is it a parallelogram?

3. Diagonals of a parallelogram are perpendicular to each other. Is this statement true ? Give reason for your answer.

4. Diagonals of a quadrilateral PQRS bisect each other. If ∠P = 35°, find ∠Q.

5. The angles of a quadrilateral are in the ratio 2 : 4 : 5 : 7. Find the angles.

**6.** The lengths of the diagonals of a rhombus are 24 cm and 18 cm. Find the length of each side of the rhombus.

7. Diagonals AC and BD of a parallelogram ABCD intersect each other at O. If OA = 3 cm and OD = 2 cm, find the lengths of AC and BD.

8. Can all the angles of a quadrilateral be acute ? Give reason for your answer.

9. In ΔABC, P, Q and R are mid-points of sides BC, CA and AB respectively. If AC = 21 cm, BC = 29 cm and AB = 30 cm, find the perimeter of the quadrilateral ARPQ.

10. Diagonals of a quadrilateral ABCD bisect each other. If ∠A = 35°, then ∠B = 145°. Is it true ? Justify your answer.

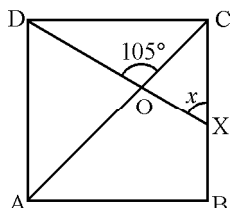### B. Questions From CBSE Examination Papers

1. The sides BA and DC of quadrilateral ABCD are produced as shown in the figure.

Prove that $x + y = a + b$.   **[T-II (2011)]**
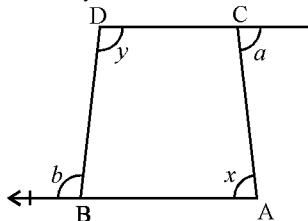
2. In the figure, ABCD is a square. A line segment DX cuts the side BC at X and the diagonal AC at O such that ∠COD = 105°. Find the value of *x*. **[T-II (2011)]**


3. In ΔABC, D and E are mid points of AB and AC. If AD = 3.5 cm; AE = 4 cm ; DE = 2.5 cm, find the perimeter of ΔABC. **[T-II (2011)]**

4. ABCD is a rhombus in which AC = 16 cm ; BC = 10 cm. Find the length of the diagonal BD. **[T-II (2011)]**

5. In ΔABC, AB = 12 cm, BC = 15 cm and AC = 7 cm. Find the perimeter of the triangle formed by joining the mid points of the sides of the triangle. **[T-II (2011)]**

**6.** ABCD is a rhombus. AO = 5 cm. Area of the rhombus is 25 sq cm. Find the length of BD. **[T-II (2011)]**
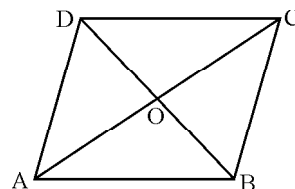
7. ABCD is a parallelogram. L and M are points on AB and DC respectively such that AL = MC. Prove that LM and BD bisect each other. **[T-II (2011)]**
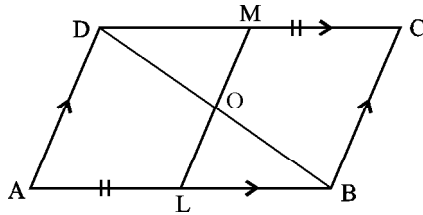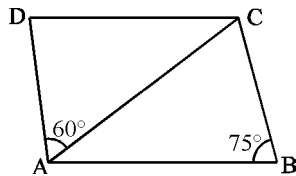

8. *l, m* and *n* are three parallel lines intersected by transversal *p* and *q* such that *l, m* and *n* cut equal intercepts AB and BC on *p*. Show that *l, m, n* cut off equal intercepts DE and EF on *q* also.
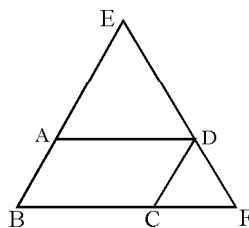
[T-II (2011)]
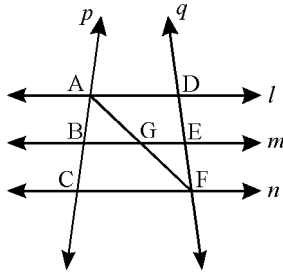
9. In the figure, ABCD is a parallelogram. Find the measure of the angles *x, y*. **[T-II (2011)]**
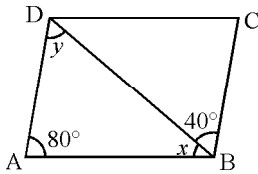
10. In the figure, ABCD is a parallelogram. Compute ∠DCA, ∠ACB and ∠ADC, given ∠DAC = 60° and ∠ABC = 75°. **[T-II (2011)]**

11. Prove that if the diagonals of a quadrilateral bisect each other, then it is a parallelogram. **[T-II (2011)]**

12. In the figure, ABCD is a parallelogram. BA is produced to E such that AE = AD. ED is produced to meet BC produced at F. Show that CD = CF. **[T-II (2011)]**


13. In ΔABC, ∠B = 90°, D and E are the mid-points of the sides AB and AC respectively. If AB = 6 cm and AC = 10 cm, then find the length of DE. **[T-II (2011)]**

14. Angles of a quadrilateral are in the ratio 3 : 4 : 5 : 6. Find the angles of the quadrilateral. **[T-II (2011)]**

15. In ΔABC, AD is the median. A line through D and parallel to AB, meets AC at E. Prove that BE is the median of triangle ABC. **[T-II (2011)]**

16. ABCD is parallelogram. The angle bisectors of ∠A and ∠D intersect at O. Find the measures of ∠AOD. **[T-II (2011)]**

17. In the given figure, PQRS is a parallelogram and line segments PA and RB bisect the angles P and R respectively. Show that PA||RB. **[T-II (2011)]**
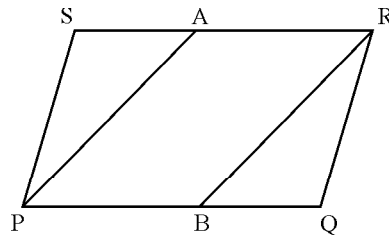

18. In ΔABC, D, E and F are mid points of sides AB, BC and CA. Show that ΔABC is divided into four congruent triangles by joining D, E and F.

[T-II (2011)]

19. ABCD is a parallelogram and AP and CQ are perpendiculars from vertices A and C on diagonal BD. Show that : **[T-II (2011)]**
   (*i*) ΔAPB ≅ ΔCQD   (*ii*) AP = CQ
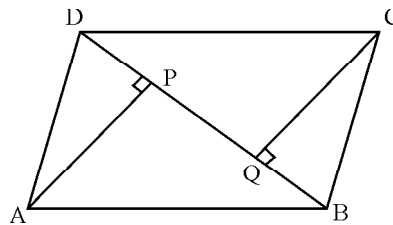
20. If angles of a quadrilateral are in the ratio 1 : 2 : 3 : 4, find measures of all the angles of the quadrilateral. **[T-II (2011)]**

21. Two opposite angles of a parallelogram are $(3x - 2)°$ and $(63 - 2x)°$. Find all the angles of the parallelogram. **[T-II (2011)]**

22. Prove that diagonal of a parallelogram divides it into two congruent triangles. **[T-II (2011)]**

23. ABCD is a quadrilateral in which P, Q, R and S are mid points of AB, BC, CD and DA respectively. Show that PQRS is a parallelogram. **[T-II (2011)]**
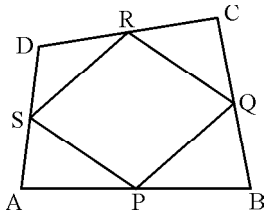
24. If PQRS is a rhombus with ∠PQR = 55°, find ∠PRS. **[T-II (2011)]**

25. D and E are the mid-points of sides AB and AC respectively of triangle ABC. If the perimeter of ∆ABC = 35 cm, find the perimeter of ∆ADE. **[T-II (2011)]**

26. The vertices of a parallelogram lie on a circle. Prove that its diagonals are equal. **[T-II (2011)]**

27. The angles of a quadrilateral are in the ratio 3 : 5 : 7 : 9. Find the angles of the quadrilateral. **[T-II (2011)]**

28. In the figure, it is given that BDEF and FDCE are parallelograms. Show that BD = CD. **[T-II (2011)]**
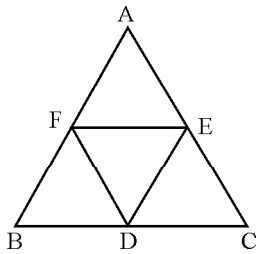
29. In a cyclic quadrilateral PQRS, if ∠P – ∠R = 50°, then find the measure of ∠P and ∠R. **[T-II (2011)]**

30. In ∆ABC, AD is the median and DE ∥ AB. Prove that BE is another median. **[T-II (2011)]**
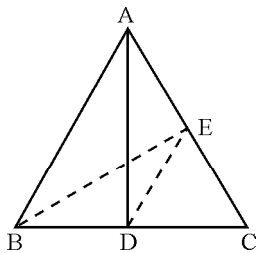

31. Show that diagonals of a square are equal and bisect each other at right angles. **[T-II (2011)]**

32. ABC is a triangle right angled at C. A line through the mid point M of hypotenuse AB and parallel to BC intersects AC at D. Show that **[T-II (2011)]**
(*i*) D is the mid point of AC
(*ii*) MD ⊥ AC

33. The two opposite angles of a parallelogram are $(3x – 10)°$ and $(2x + 35)°$. Find the measure of all the four angles of the parallelogram. **[T-II (2011)]**

34. In ∆ABC, AB = 5 cm, BC = 8 cm and AC = 7 cm. If D and E are respectively mid-points of AB and BC, determine the length of DE. Give reasons. **[T-II (2011)]**

35. In the figure, it is given that BDEF and FDCE are parallelograms. If BD = 4 cm, determine CD. **[T-II (2011)]**
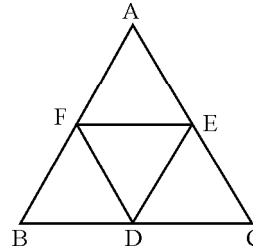
36. In a parallelogram PQRS, if ∠P = $(3x – 5)°$, ∠Q = $(2x + 15)°$, find the value of *x*. **[T-II (2011)]**

37. In the figure, PQRS is a parallelogram. Find the values of *x* and *y*. **[T-II (2011)]**
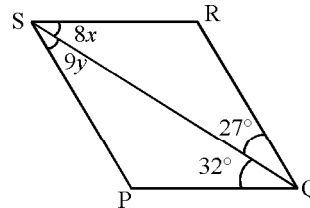
38. In the figure, ∠AOB = 90°, AC = BC, OA = 12 cm and OC = 6.5 cm. Find the measure of OB. **[T-II (2011)]**
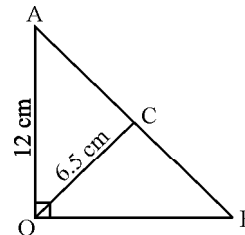
39. The angles of a quadrilateral are in the ratio 3 : 5 : 9 : 13. Find all the angles of the quadrilateral. **[T-II (2011)]**

40. The angle between the two altitudes of a parallelogram through the vertex of an obtuse angle is 50°. Find the angles of the parallelogram. **[T-II (2011)]**

41. In a parallelogram, show that the angle bisectors of two adjacent angles intersect at right angle. **[T-II (2011)]**

42. Find the measure of each angle of a parallelogram, if one of its angles is 30° less than twice the smaller angle. **[T-II (2011)]**

**43.** ABCD is a rhombus with ∠ABC = 58°. Find ∠ACD. **[T-II (2011)]**

8

## SHORT ANSWER TYPE QUESTIONS [3 Marks]

A. Important Questions

1. ABCD is a rhombus in which altitude from D on side AB bisects AB. Find the angles of the rhombus.

2. In a parallelogram show that the angle bisectors of two adjacent angles intersect at right angles.

3. One angle of a quadrilateral is 108° and the remaining three angles are equal. Find each of the three equal angles.

4. E and F are points on diagonal AC of a parallelogram ABCD such that AE = CF. Show that BFDE is a parallelogram.

5. D, E and F are the mid-points of the sides BC, CA and AB respectively of an equilateral ΔABC.

   Show that ΔDEF is also an equilateral triangle.

6. In a triangle ABC, median AD is produced to X such that AD = DX. Prove that ABXC is a parallelogram.

7. In the figure, through A, B and C lines RQ, PQ and PR have been drawn respectively parallel to sides BC, CA and AB of a ΔABC. Show that

   BC = $\frac{1}{2}$ QR.
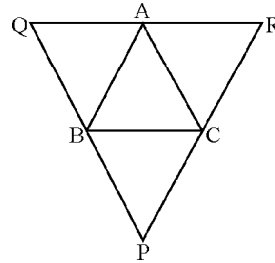
8. Show that the quadrilateral formed by joining the mid-points of sides of a square is also a square.

9. E is the mid-point of the side AD of trapezium ABCD with AB ∥ DC. A line through E drawn parallel to AB intersects BC at F. Show that F is the mid-point of BC.

10. If one angle of a parallelogram is a right angle, it is a rectangle. Prove.

11. In the figure, P is the mid-point of side BC of a parallelogram ABCD such that ∠BAP = ∠DAP. Prove that AD = 2CD.
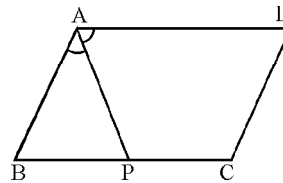

B. Questions From CBSE Examination Papers

1. Show that bisectors of the angles of a parallelogram form a rectangle. **[T-II (2011)]**

2. Prove that a parallelogram is a rhombus if its diagonals bisect at right angles. **[T-II (2011)]**

3. Two parallel lines *l* and *m* are intersected by a transversal *p*. Show that the quadrilateral formed by the bisectors of interior angles is a rectangle. **[T-II (2011)]**
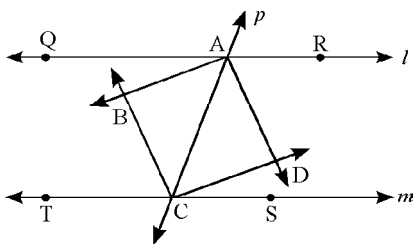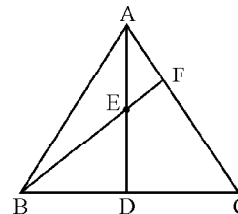

4. In a parallelogram ABCD, bisector of ∠A, also bisects BC at X. Prove that AD = 2 AB. **[T-II (2011)]**
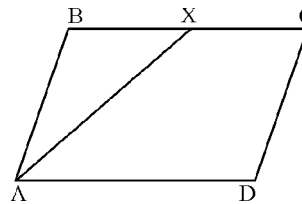
5. AD is the median of ΔABC. E is the midpoint of AD. BE produced meets AC at F. Show that

   AF = $\frac{1}{3}$ AC. **[T-II (2011)]**

6. Prove that line segments joining the mid points of opposite sides of any quadrilateral bisect each other. **[T-II (2011)]**

7. Prove that the diagonals of a rectangle are equal. **[T-II (2011)]**

8. Show that if the diagonals of a quadrilateral bisect each other at right angles, then it is a rhombus. **[T-II (2011)]**

9. In a quadrilateral ABCD, AO and BO are the bisectors of ∠A and ∠B respectively. Prove that

$$\angle AOB = \frac{1}{2}(\angle C + \angle D)$$ **[T-II (2011)]**

10. In the figure, ABCD is a square, if ∠PQR = 90° and PB = QC = DR, prove that QB = RC, PQ = QR, ∠QPR = 45°. **[T-II (2011)]**
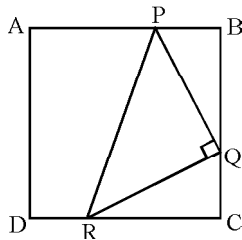
11. In the figure, points A and B are on the same side of a line *m*, AD ⊥ *m* and BE ⊥ *m* and meet *m* at D and E respectively. If C is the mid point of AB, prove that CD = CE. **[T-II (2011)]**
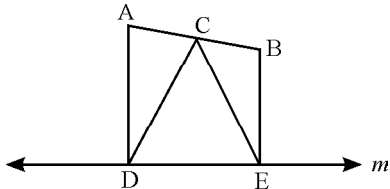
12. ABCD is a parallelogram in which X and Y are the mid-points of AB and CD. AY and DX are joined which intersect each other at P. BY and CX are also joined which intersect each other at Q. Show that PXQY is a parallelogram. **[T-II (2011)]**

13. ABCD is a rectangle in which diagonal AC bisects ∠A as well as ∠C. Show that **[T-II (2011)]**
  (*i*) ABCD is a square
  (*ii*) Diagonal BD bisects ∠B as well as ∠D

14. Diagonal AC of a parallelogram bisects ∠A. Show that (i) it bisects ∠C also (ii) ABCD is a rhombus **[T-II (2011)]**

15. Show that the diagonals of a rhombus are perpendicular to each other. **[T-II (2011)]**

16. Show that a diagonal of a parallelogram divides it into two congruent triangles and hence prove that the opposite sides of a parallelogram are equal. **[T-II (2011)]**

17. ABCD is parallelogram. On diagonal BD are points P and Q such that DP = BQ. Show that APCQ is a parallelogram. **[T-II (2011)]**
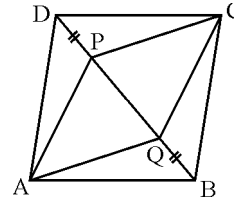
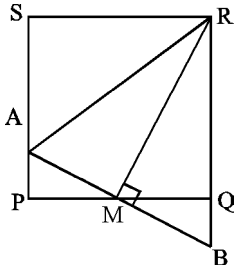**18.** In the figure, diagonal BD of parallelogram ABCD bisects ∠B. Show that it bisects ∠D also. **[T-II (2011)]**
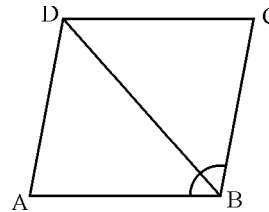
19. PQRS is a parallelogram and ∠SPQ = 60°. If the bisectors of ∠P and ∠Q meet at point A on RS, prove that A is mid-point of RS. **[T-II (2011)]**

20. Prove that quadrilateral formed by bisectors of the angles of a parallelogram is a rectangle. **[T-II (2011)]**
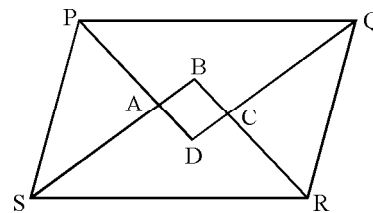
21. Show that the line segments joining the mid-points of opposite sides of quadrilateral bisect each other. **[T-II (2011)]**

22. In the figure, PS and RT are medians of ΔPQR and SM ∥ RT. Prove that $QM = \frac{1}{4}PQ$. **[T-II (2011)]**
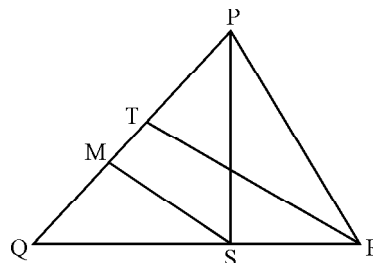
**23.** In a parallelogram PQRS, the bisectors of adjacent angles R and S intersect each other at the point O. Prove that ∠ROS = 90°. **[T-II (2011)]**

**24.** In the figure, PQRS is a square. M is the midpoint of PQ and AB ⊥ RM. Prove that RA = RB. **[T-II (2011)]**

25. ABCD is a rhombus. Show that diagonal AC bisects ∠A as well as ∠C and diagonal BD bisects ∠B as well as ∠D. **[T-II (2011)]**

26. Prove that the bisectors of any two consecutive angles of a parallelogram intersect at right angles. **[T-II (2011)]**

27. In the figure, ABCD is a trapezium in which AB ∥ DC. E is the mid point of AD and F is a point of BC such that EF ∥ DC. Prove that F is the mid point of BC. **[T-II (2011)]**
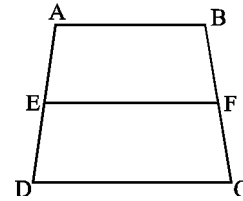
28. In the figure, DE and BF are perpendiculars to the diagonal AC of a parallelogram ABCD. Prove that DE = BF. **[T-II (2011)]**
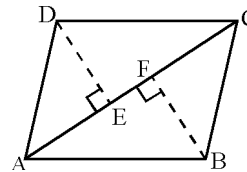
29. In the figure, PQRS is a parallelogram in which PQ is produced to T such that QT = PQ. Prove that ST bisects RQ. **[T-II (2011)]**
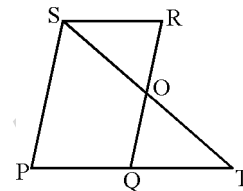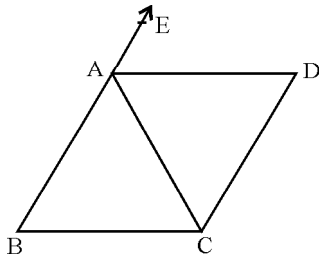
LONG ANSWER TYPE QUESTIONS [4 Marks]

A. Important Questions

1. In the figure, ABC is an isosceles triangle in which AB = AC, CD ∥ AB and AD is bisectors of exterior ∠CAE of ΔABC. Prove that ∠CAD = ∠BCA and ABCD is a parallelogram.

2. PQ and RS are two equal and parallel line segments. Any point M not lying on PQ or RS is joined to Q and S and lines through P parallel to QM and through R parallel to SM meet at N. Prove that line segments MN and PQ are equal and parallel to each other.

3. A diagonal of a parallelogram bisects one of its angles. Prove that it will bisect its opposite angle also.

4. Prove that the line joining the mid-points of the diagonals of a trapezium is parallel to the parallel sides of the trapezium.

5. ABCD is a rectangle in which diagonal BD bisects ∠B. Show that ABCD is a square.

6. If ABCD is a trapezium in which AB ∥ CD and AD = BC, prove that ∠A = ∠B.

7. P, Q, R, and S are respectively the mid-points of the sides AB, BC, CD and DA of a quadrilateral ABCD in which AD = BC. Prove that PQRS is a rhombus.

B. Questions From CBSE Examination Papers

1. In a parallelogram ABCD, E and F are the mid-points of sides AB and CD respectively. Show that the line segment AF and EC trisects the diagonal BD. **[T-II (2011)]**
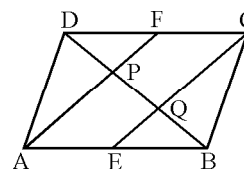
2. ABC is a triangle right angled at C. A line through the mid-point M of hypotenuse AB and parallel to BC intersects AC at D. Show that **[T-II (2011)]**

   (*i*) MD ⊥ AC

   (*ii*) D is mid-point of AC

   (iii) MC = MA = $\frac{1}{2}$ AB

3. Prove that a line segment joining the mid-points of any two sides of a triangle is parallel and half of its third side. **[T-II (2011)]**

4. Prove that a line passing through mid-point of one non parallel side of a trapezium parallel to parallel sides bisect the other non parallel side.

   [T-II (2011)]

5. In the figure, ABCD is a parallelogram. E is the mid-point of BC. DE and AB when produced meet at F. Prove that AF = 2AB. **[T-II (2011)]**
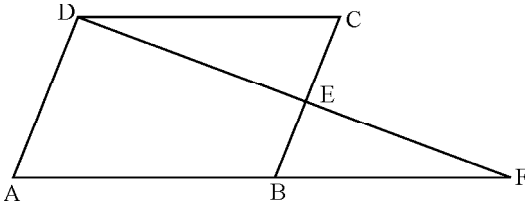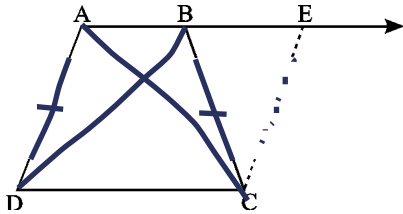

6. If X, Y and Z are the mid-points of sides BC, CA and AB of ΔABC respectively, prove that AZXY is a parallelogram. **[T-II (2011)]**

7. ABCD is a trapezium in which AB ∥ CD and AD = BC. Show that **[T-II (2011)]**

   (*i*) ∠A = ∠B   (*ii*) ∠C = ∠D

   (*iii*) ΔABC ≅ ΔBAD

   (*iv*) Diagonal AC = diagonal BD

8. ABCD is a parallelogram in which ∠A = 60°. If

bisectors of ∠A and ∠B meet at P, prove that AD = DP, PC = BC, DC = 2AD.   **[T-II (2011)]**
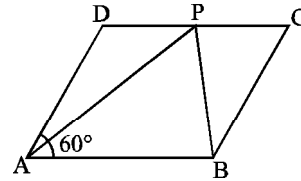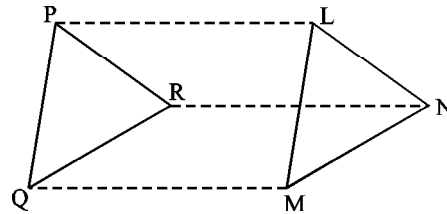

9. Show that the quadrilateral formed by joining the mid-points of the sides of a rectangle is a rhombus.

   [T-II (2011)]

10. Prove that in a triangle, the line segment joining the mid-points of any two sides is parallel to third side and is half of it.

    Using the above, if P, Q, R are the mid-points of sides BC, AC and AB of ΔABC respectively and if PQ = 2.5 cm, QR = 3 cm, RP = 3.5 cm, find the lengths of AB, BC and CA. **[T-II (2011)]**

11. If ΔPQR and ΔLMN be two triangles given in such a way that PQ ∥ LM, PQ = LM, QR = MN and QR ∥ MN, then show that PR ∥ LN and PR = LN. **[T-II (2011)]**

12. ABCD is a square and on the side DC, an equilateral triangle is constructed. Prove that **[T-II (2011)]**

    (*i*) AE = BE and   (*ii*) ∠DAE = 15°
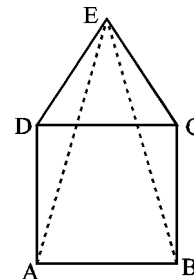
13. The diagonals of a quadrilateral ABCD are perpendicular, show that quadrilateral formed by joining the mid-points of its sides, is rectangle.

    [T-II (2011)]