MATHEMATICS

Important Questions

Multiple Choice questions-

Question 1. A diagonal of a Rectangle is inclines to one side of the rectangle at an angle of 25°. The Acute Angle between the diagonals is:

(a) 115°

(b) 50°

(c) 40°

(d) 25°

Question 2. The diagonals of a rectangle PQRS intersects at O. If ∠QOR = 44°, ∠OPS =?

(a) 82°

(b) 52°

(c) 68°

(d) 75°

Question 3. If angles A, B, C and D of the quadrilateral ABCD, taken in order, are in the ratio 3:7:6:4, then ABCD is

(a) Rhombus

(b) Parallelogram

(c) Trapezium

(d) Kite

Question 4. All the angles of a convex quadrilateral are congruent. However, not all its sides are congruent. What type of quadrilateral is it?

(a) Parallelogram

(b) Square

(c) Rectangle

(d) Trapezium

Question 5. In a Quadrilateral ABCD, AB = BC and CD = DA, then the quadrilateral is a

(a) Triangle

(b) Kite

(c) Rhombus

(d) Rectangle

Question 6. The angles of a quadrilateral are (5x)°, (3x + 10)°, (6x – 20)° and (x + 25)°. Now, the measure of each angle of the quadrilateral will be

(a) 115°, 79°, 118°, 48°

(b) 100° 79°, 118°, 63°

(c) 110°, 84°, 106°, 60°

(d) 75°, 89°, 128°, 68°

Question 7. The diagonals of rhombus are 12 cm and 16 cm. The length of the side of rhombus is:

(a) 12cm

(b) 16cm

(c) 8cm

(d) 10cm

Question 8. In quadrilateral PQRS, if ∠P = 60° and ∠Q: ∠R : ∠S = 2 : 3 : 7, then ∠S =

(a) 175°

(b) 210°

(c) 150°

(d) 135°

Question 9. In parallelogram ABCD, if ∠A = 2x + 15°, ∠B = 3x – 25°, then value of x is:

(a) 91°

(b) 89°

(c) 34°

(d) 38°

Question 10. If ABCD is a trapezium in which AB || CD and AD = BC, then:

(a) ∠A = ∠B

(b) ∠A > ∠B

(c) ∠A < ∠B

(d) None of the above

Very Short:

1. If one angle of a parallelogram is twice of its adjacent angle, find the angles of the parallelogram.

2. If the diagonals of a quadrilateral bisect each other at right angles, then name the quadrilateral.

3. Three angles of a quadrilateral are equal, and the fourth angle is equal to 144o. Find each of the equal angles of the quadrilateral.

4. If ABCD is a parallelogram, then what is the measure of ∠A – ∠C?

5. PQRS is a parallelogram, in which PQ = 12 cm and its perimeter is 40 cm. Find the length of each side of the parallelogram.

6. Two consecutive angles of a parallelogram are (x + 60)° and (2x + 30)°. What special name can you give to this parallelogram?

7. ONKA is a square with ∠KON = 45°. Determine ∠KOA.

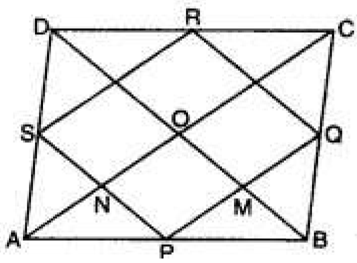
8. In quadrilateral PQRS, if ∠P = 60° and ∠Q : ∠R : ∠S = 2 : 3 : 7, then find the measure of ∠S.

Short Questions:

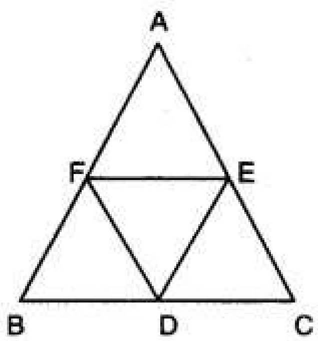
1. ABCD is a parallelogram in which ∠ADC = 75° and side AB is produced to point E as shown in the figure. Find x + y.
2. If the diagonals of a parallelogram are equal, then show that it is a rectangle.
3. In the figure, ABCD is a rhombus, whose diagonals meet at O. Find the values of x and y.
4. ABCD is a parallelogram and AP and CQ are perpendiculars from vertices A and C on diagonal BD (see fig.). Show that:

   (i) ΔAPB = ΔCQD

   (ii) AP = CQ
5. The diagonals of a quadrilateral ABCD are perpendicular to each other. Show that the quadrilateral formed by joining the mid-points of its sides is a rectangle.

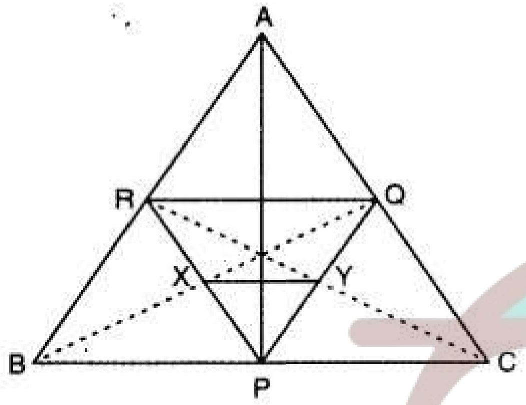


6. In the fig., D, E and F are, respectively the mid-points of sides BC, CA and AB of an equilateral triangle ABC. Prove that DEF is also an equilateral triangle.

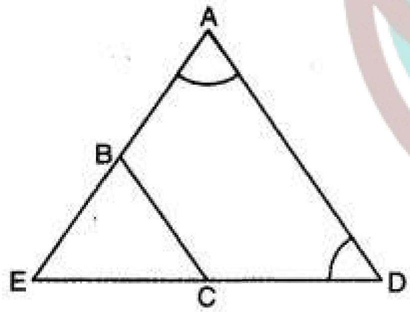


Long Questions:

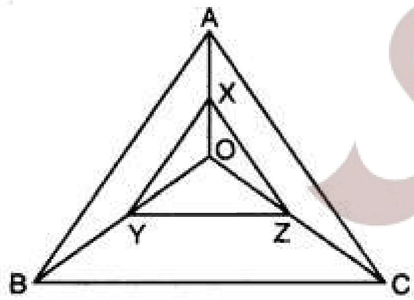
1. In the figure, P, Q and R are the mid-points of the sides BC, AC and AB of ΔABC. If BQ and PR intersect at X and CR and PQ intersect at Y, then show that $XY = \frac{1}{4}\,BC$



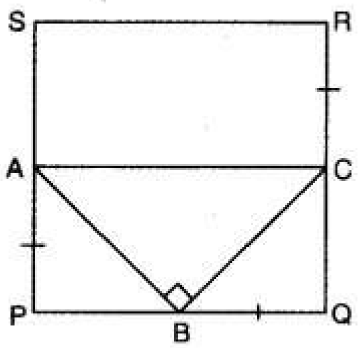
2. In the given figure, AE = DE and BC || AD. Prove that the points A, B, C and D are concyclic. Also, prove that the diagonals of the quadrilateral ABCD are equal.



3. In ΔABC, AB = 8cm, BC = 9 cm and AC = 10cm. X, Y and Z are mid-points of AO, BO and CO respectively as shown in the figure. Find the lengths of the sides of ΔXYZ.



4. PQRS is a square and ∠ABC = 90° as shown in the figure. If AP = BQ = CR, then prove that ∠BAC = 45°



5. ABCD is a parallelogram. If the bisectors DP and CP of angles D and C meet at P on side AB, then show that P is the mid-point of side AB.

Assertion and Reason Questions-

1. In these questions, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

c) Assertion is correct statement but reason is wrong statement.

d) Assertion is wrong statement but reason is correct statement.

Assertion: ABCD is a square. AC and BD intersect at O. The measure of +AOB = 90°.

Reason: Diagonals of a square bisect each other at right angles.

2. In these questions, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

c) Assertion is correct statement but reason is wrong statement.

d) Assertion is wrong statement but reason is correct statement.

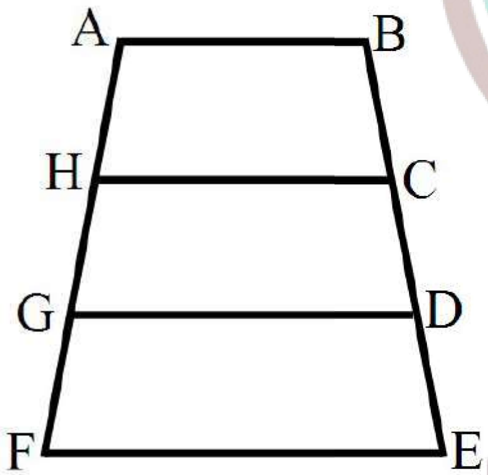
Assertion: The consecutive sides of a quadrilateral have one common point.

Reason: The opposite sides of a quadrilateral have two common point.

Case Study Questions-

1. Read the Source/ Text given below and answer these questions:

Sohan wants to show gratitude towards his teacher by giving her a card made by him. He has three pieces of trapezium pasted one above the other as shown in fig. These pieces are arranged in a way that AB || HC || GD || FE. Also BC = CD = DE and AH = HG = GF = 6cm. He wants to decorate the card by putting up a colored tape on the nonparallel sides of the trapezium.



i. Find the total length of colored tape required if DE = 4cm.
   a. 20cm
   b. 30cm
   c. 40cm
   d. 50cm

ii. ABHC is a trapezium in which AB || HC and ∠A=∠B=45ₒ. Find angles C and H of the trapezium.
   a. 135, 130
   b. 130, 135
   c. 135, 135

d. 130, 130

iii. What is the difference between trapezium and parallelogram?

a. Trapezium has 2 sides, and parallelogram has 4 sides.

b. Trapezium has 4 sides, and parallelogram has 2 sides.

c. Trapezium has 1 pair of parallel sides, and parallelogram has 2 pairs of parallel sides.

d. Trapezium has 2 pairs of parallel sides, and parallelogram has 1 pair of parallel sides.

iv. Diagonals in isosceles trapezoid are ________.

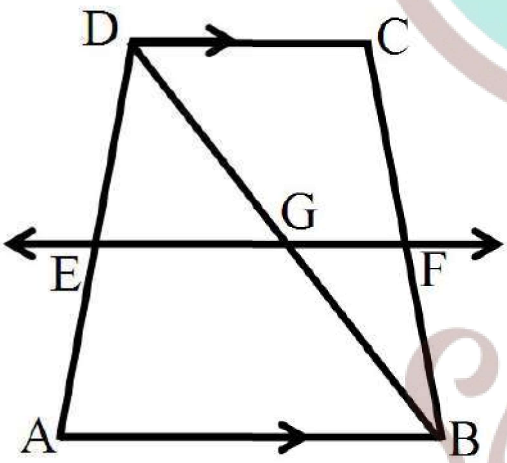
a. parallel.

b. opposite.

c. vertical.

d. equal.

v. ABCD is a trapezium where AB || DC, BD is the diagonal and E is the midpoint of AD. A line is drawn through E parallel to AB intersecting BC at F. Which of these is true?



a. BF = FC

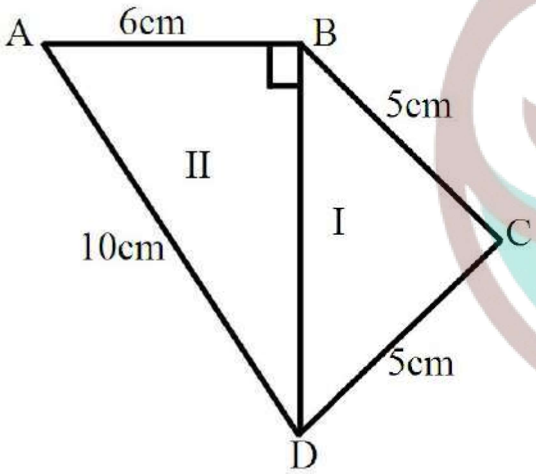
b. EA = FB

c. CF = DE

d. None of these

2. Read the Source/ Text given below and answer any four questions:

Chocolate is in the form of a quadrilateral with sides 6cm and 10cm, 5cm and 5cm(as shown in the figure) is cut into two parts on one of its diagonal by a lady. Part-I is given to her maid and part II is equally divided among a driver and gardener.



i. Length of BD:
   a. 9cm
   b. 8cm
   c. 7cm
   d. 6cm
ii. Area of △ABC:
   a. $24cm^2$
   b. $12cm^2$
   c. $42cm^2$
   d. $21cm^2$
iii. The sum of all the angles of a quadrilateral is equal to:
   a. 180°
   b. 270°

c. 360°
d. 90°

iv. A diagonal of a parallelogram divides it into two congruent:
a. Square.
b. Parallelogram.
c. Triangles.
d. Rectangle.

v. Each angle of the rectangle is:
a. More than 90°
b. Less than 90°
c. Equal to 90°
d. Equal to 45°

Answer Key:

MCQ:

1. (b) 50°
2. (c) 68°
3. (c) Trapezium
4. (c) Rectangle
5. (b) Kite
6. (a) 115°, 79°, 118°, 48°
7. (d) 10cm
8. (a) 175°
9. (d) 38°
10. (a) ∠A = ∠B

Very Short Answer:

1. Let the two adjacent angles be x and 2x.

In a parallelogram, sum of the adjacent angles are 180°

∴ x + 2x = 180°

⇒ 3x = 180°

⇒ x = 60°

Thus, the two adjacent angles are 120° and 60°. Hence, the angles of the parallelogram are 120°, 60°, 120° and 60°.

2. Rhombus.

3. Let each equal angle of given quadrilateral be x.

We know that sum of all interior angles of a quadrilateral is 360°

$\therefore x + x + x + 144° = 360°$

$3x = 360° - 144°$

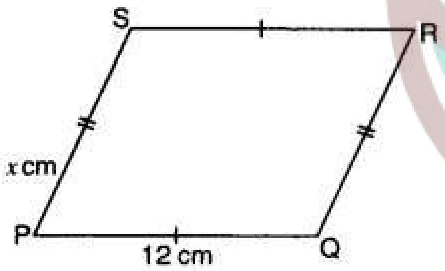
$3x = 216°$

$x = 72°$

Hence, each equal angle of the quadrilateral is of 72o measures.

4. ∠A – ∠C = 0° (opposite angles of parallelogram are equal]

5.



Here, PQ = SR = 12 cm

Let PS = x and PS = QR

$\therefore x + 12 + x + 12 =$ Perimeter

$2x + 24 = 40$

$2x = 16$

$x= 8$

Hence, length of each side of the parallelogram is 12cm, 8 cm, 12cm and 8cm.

6. We know that consecutive interior angles of a parallelogram are supplementary.

$\therefore (x + 60° + (2x + 30)° = 180°$

$\Rightarrow 3x° + 90° = 180°$

$\Rightarrow 3x° = 90°$

$\Rightarrow x° = 30°$

Thus, two consecutive angles are (30 + 60)°, 12 x 30 + 30)”. i.e., 90° and 90°.

Hence, the special name of the given parallelogram is rectangle.

7. Since ONKA is a square

∴ ∠AON = 90°

We know that diagonal of a square bisects its ∠s

⇒ ∠AOK = ∠KON = 45°

Hence, ∠KOA = 45°

Now, ∠A + ∠B + ∠C = 180°

⇒ ∠A + 70° + 70° = 180°

[∵ ∠B = 70°]

⇒ ∠A = 180° – 70° – 70° = 40°

8. Let ∠Q = 2x, ∠R = 3x and ∠S = 7x

Now, ∠P + ∠Q + ∠R + ∠S = 360°

⇒ 60° + 2x + 3x + 7x = 360°

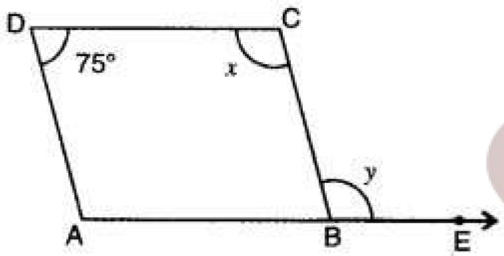
⇒ 12x = 300°

$X = \frac{300°}{12} = 25°$

∠S = 7x = 7 x 25° = 175°

Short Answer:

Ans: 1.



Here, ∠C and ∠D are adjacent angles of the parallelogram.

∴ ∠C + ∠D = 180°

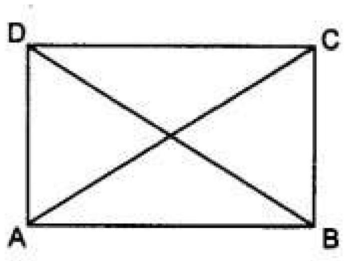
⇒ x + 75° = 180°

⇒ x = 105°

Also, y = x = 105° [alt. int. angles]

Thus, x + y = 105° + 105° = 210°

Ans: 2.



Given: A parallelogram ABCD, in which AC = BD.

To Prove: ΔBCD is a rectangle.

Proof: In ΔABC and ΔBAD

AB = AB (common]

AC = BD (given]

BC = AD (opp. sides of a ||gm]

⇒ ΔABC ≅ ΔBAD

[by SSS congruence axiom]

⇒ ∠ABC = ∠BAD (c.p.c.t.)

Also, ∠ABC + ∠BAD = 180° (co-interior angles)

∠ABC + ∠ABC = 180° [∵ ∠ABC = ∠BAD]

2∠ABC = 180°

∠ABC = 1/2 x 180° = 90°

Hence, parallelogram ABCD is a rectangle.

Ans: 3. Since diagonals of a rhombus bisect each other at right angle.

In ∴ ΔAOB, we have

∠OAB + ∠x + 90° = 180°

∠x = 180° – 90° – 35°

= 55°

Also,

∠DAO = ∠BAO = 35°

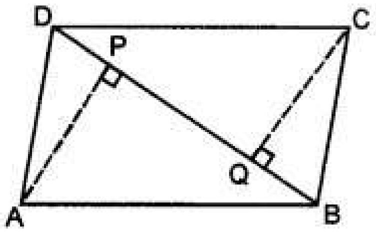
∠y + ∠DAO + ∠BAO + ∠x = 180°

⇒ ∠y + 35° + 35° + 55° = 180°

⇒ ∠y = 180° – 125o = 55°

Hence, the values of x and y are x = 55°, y = 55

Ans: 4.



Given: In ||gm ABCD, AP and CQ are perpendiculars from the vertices A and C on the diagonal BD.

To Prove: (i) ΔAPB ≅ ΔCQD

(ii) AP = CQ

Proof: (i) In ΔAPB and ΔCQD

AB = DC (opp. sides of a ||gm ABCD]

∠APB = ∠DQC (each = 90°)

∠ABP = ∠CDQ (alt. int. ∠s]

⇒ ΔAPB ≅ ΔCQD [by AAS congruence axiom]

(ii) ⇒ AP = CQ [c.p.c.t.]

Ans: 5. Given: A quadrilateral ABCD whose diagonals AC and BD are perpendicular to each other at O. P, Q, R and S are mid-points of side AB, BC, CD and DA respectively are joined are formed quadrilateral PQRS.

To Prove: PQRS is a rectangle.

Proof: In ΔABC, P and Q are mid-points of AB and BC respectively.

∴ PQ || AC and PQ = $\frac{1}{2}$ AC ... (i) (mid-point theorem]

Further, in SACD, R and S are mid-points of CD and DA respectively.

SR || AC and SR = $\frac{1}{2}$ AC ... (ii) (mid-point theorem]

From (i) and (ii), we have PQ || SR and PQ = SR

Thus, one pair of opposite sides of quadrilateral PQRS are parallel and equal.

∴ PQRS is a parallelogram.

Since PQ|| AC PM || NO

In ΔABD, P and S are mid-points of AB and AD respectively.

PS || BD (mid-point theorem]

⇒ PN || MO

∴ Opposite sides of quadrilateral PMON are parallel.

∴ PMON is a parallelogram.

∠ MPN = ∠ MON (opposite angles of ||gm are equal]

But ∠MON = 90° [given]

∴ ∠MPN = 90° ⇒ ∠QPS = 90°

Thus, PQRS is a parallelogram whose one angle is 90°

∴ PQRS is a rectangle.

Ans: 6. Since line segment joining the mid-points of two sides of a triangle is half of the third side.

Therefore, D and E are mid-points of BC and AC respectively.

⇒ DE = $\frac{1}{2}$AB ...(i)

E and F are the mid-points of AC and AB respectively.

∴ EF = $\frac{1}{2}$BC ... (ii)

F and D are the mid-points of AB and BC respectively.

∴ FD = $\frac{1}{2}$ AC ... (iii)

Now, SABC is an equilateral triangle.

⇒ AB = BC = CA

⇒ $\frac{1}{2}AB = \frac{1}{2}BC = \frac{1}{2}CA$

⇒ DE = EF = FD (using (i), (ii) and (iii)]

Hence, DEF is an equilateral triangle

Long Answer:

Ans: 1. Here, in ΔABC, R and Q are the mid-points of AB and AC respectively.

∴ By using mid-point theorem, we have

RQ || BC and RQ = $\frac{1}{2}$ BC

∴ RQ = BP = PC [∵ P is the mid-point of BC]

∴ RQ || BP and RQ || PC

In quadrilateral BPQR

RQ || BP, RQ = BP (proved above]

∴ BPQR is a parallelogram. [∵ one pair of opp. sides is parallel as well as equal]

∴ X is the mid-point of PR. [∵ diagonals of a ||gm bisect each other]

Now, in quadrilateral PCQR

RQ || PC and RQ = PC [proved above)

∴ PCQR is a parallelogram [∵ one pair of opp. sides is parallel as well as equal]

∴ Y is the mid-point of PQ [∵ diagonals of a ||gm bisect each other]

In ΔPQR

∴ X and Y are mid-points of PR and PQ respectively.

∴ $XY \parallel RQ$ and $XY = \frac{1}{2}RQ$ [by using mid-point theorem]

$XY = \frac{1}{2}\left(\frac{1}{2}BC\right)$ [∵ $RQ = \frac{1}{2}BC$]

⇒ $XY = \frac{1}{4}BC$

Ans: 2. Since AE = DE

∠D = ∠A .... (i) [∵ ∠s opp. to equal sides of a Δ]

Again, BC || AD

∠EBC = ∠A .... (ii) (corresponding ∠s]

From (i) and (ii), we have

∠D = ∠EBC .... (iii)

But ∠EBC + ∠ABC = 180° (a linear pair]

∠D + ∠ABC = 180° (using (iii)]

Now, a pair of opposite angles of quadrilateral ABCD is supplementary

Thus, ABCD is a cyclic quadrilateral i.e., A, B, C and D'are concyclic. In ΔABD and ΔDCA

∠ABD = ∠ACD [∠s in the same segment for cyclic quad. ABCD]

∠BAD = ∠CDA [using (i)]

AD = AD (common]

So, by using AAS congruence axiom, we have

ΔABD ≅ ΔDCA

Hence, BD = CA [c.p.c.t.]

Ans: 3. Here, in ΔABC, AB = 8cm, BC = 9cm, AC = 10cm.

In ΔAOB, X and Y are the mid-points of AO and BO.

∴ By using mid-point theorem, we have

$XY = \frac{1}{2}\ AB = \frac{1}{2} \times 8cm = 4cm$

Similarly, in $\Delta\tau BOC$, Y and Z are the mid-points of BO and CO.

∴ By using mid-point theorem, we have

YZ = $\frac{1}{2}$ BC = $\frac{1}{2}$ x 9cm = 4.5cm

And, in ΔτCOA, Z and X are the mid-points of CO and AO.

∴ ZX = $\frac{1}{2}$AC = $\frac{1}{2}$ x 10cm = 5cm

Hence, the lengths of the sides of ΔXYZ are XY = 4cm, YZ = 4.5 cm and ZX = 5cm.

Ans: 4. Since PQRS is a square.

∴ PQ = QR … (I) [∵ sides of a square are equal]

Also, BQ = CR … (ii) [given]

Subtracting (ii) from (i), we obtain

PQ – BQ = QR – CR

⇒ PB = QC … (iii)

In ΔτAPB and ΔτBQC

AP = BQ

[given ∠APB = ∠BQC = 90°](each angle of a square is 90°)

PB = QC (using (iii)]

So, by using SAS congruence axiom, we have

ΔAPB ≅ ΔBQC

∴ AB = BC [c.p.c.t.]

Now, in ΔABC

AB = BC [proved above]

∴ ∠ACB = ∠BAC = x° (say) [∠s opp. to equal sides]

Also, ∠B + ∠ACB + ∠BAC = 180°

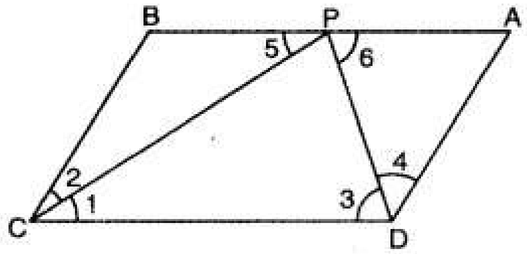
⇒ 90° + x + x = 180°

⇒ 2x° = 90°

x° = 45°

Hence, ∠BAC = 45°

Ans: 5.



Since DP and CP are angle bisectors of ∠D and ∠C respectively.

: ∠1 = ∠2 and ∠3 = ∠4

Now, AB | | DC and CP is a transversal

∴ ∠5 = ∠1 [alt. int. ∠s]

But ∠1 = ∠2 [given]

∴ ∠5 = ∠2

Now, in ABCP, ∠5 = ∠2

⇒ BC = BP ... (I) [sides opp. to equal ∠s of a A]

Again, AB | | DC and DP is a transversal.

∴ ∠6= ∠3 (alt. int. Δs]

But ∠4 = ∠3 [given]

∴ ∠6 = ∠4

Now, in ΔADP, ∠6 = ∠4

⇒ DA = AP .... (ii) (sides opp. to equal ∠s of a A]

Also, BC = DA... (iii) (opp. sides of parallelogram)

From (i), (ii) and (iii), we have

BP = AP

Hence, P is the mid-point of side AB.

Assertion and Reason Answers-

1. a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

2. c) Assertion is correct statement but reason is wrong statement.

Case Study Answers-

1.

(i)	(b)	30cm

(ii)	(c)	135, 135
(iii)	(c)	Trapezium has 1 pair of parallel sides, and parallelogram has 2 pairs of parallel sides.
(iv)	(d)	equal.
(v)	(a)	BF = FC

2.

(i)	(b)	8cm
(ii)	(a)	$24cm^2$
(iii)	(c)	360°
(iv)	(c)	Triangles.
(v)	(c)	Equal to 90°