MATHS

BOOKS - MTG IIT JEE FOUNDATION

QUADRILATERALS

Illustrations

1. In a parallelogram $ABCD$, prove that sum of any two consecutive angles is 180^0.

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2. $ABCD$ is a parallelogram. $L\,and\,M$ are points on $AB\,and\,DC$ respectively and $AL = CM$. Prove that $LM\,and\,BD$ bisect each other.

3. If $ABCD$ is a quadrilateral in which $ABCD$ and $AD = BC,$ prove that $\angle A$ =$\angle B$.

**4.** $ABCD$ is a parallelogram. AB is produced to E so that $BE = AB$. Prove that ED bisects $BC.$

5. In Figure, 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.

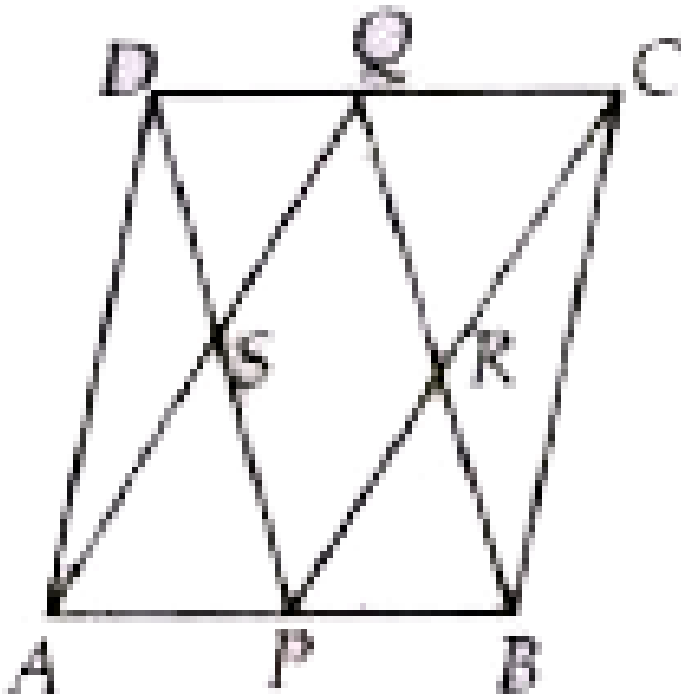**6.** Let ABC be a triangle, right-angled at B and D be the midpoint of AC. Show that DA = DB = DC.

7. ABCD is a parallelogram in which P and Q are midpoints of opposite sides AB and CD respectively (see figure). If AQ intersects DP at S and BQ intersects CP at R, show that:
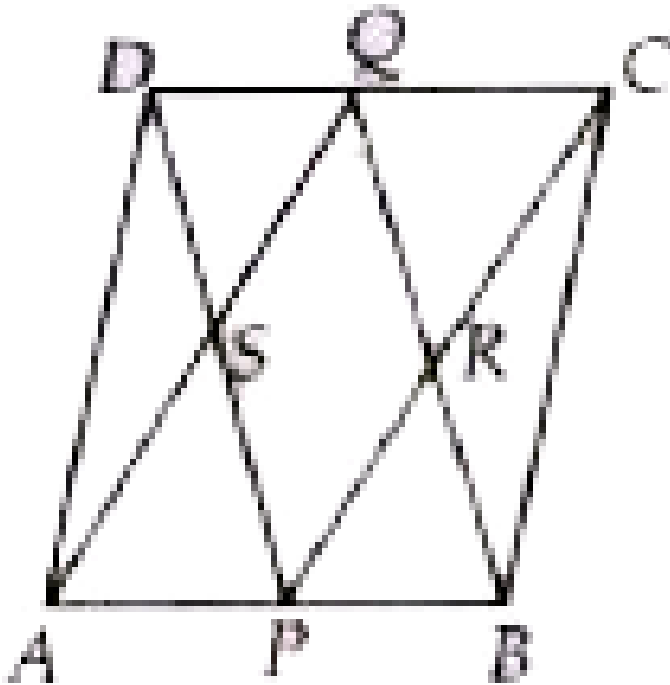
(i) APCQ is a parallelogram.

8. ABCD is a parallelogram in which P and Q are midpoints of opposite sides AB and CD respectively (see figure). If AQ intersects DP at S and BQ intersects CP at R, show that:

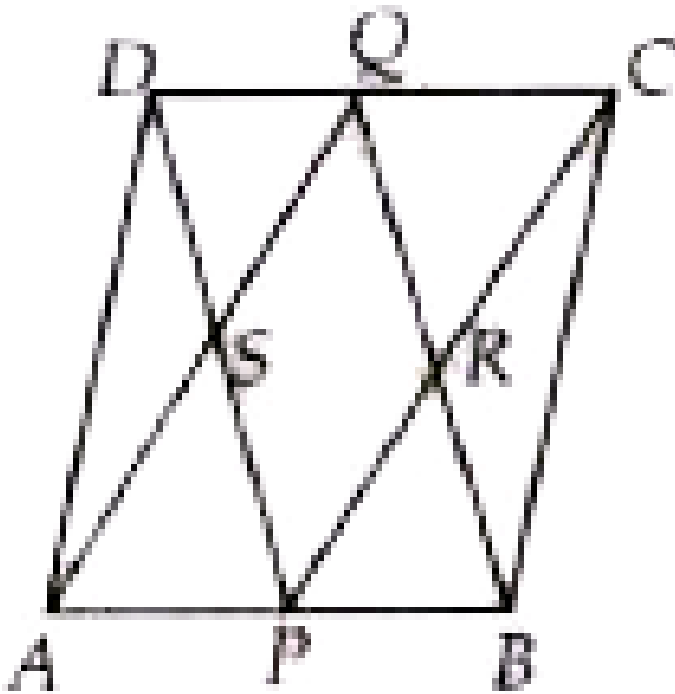

DPBQ is a parallelogram

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9. ABCD is a parallelogram in which P and Q are midpoints of opposite sides AB and CD respectively (see figure). If AQ intersects DP at S and BQ intersects CP at R, show that:

PSQR is a parallelogram.

Solved Examples

1. In Figure, bisectors of $\angle B \text{ and } \angle D$ of quadrilateral $ABCD$ meet $CD \text{ and } AB$ produced at $P \text{ and } Q$ respectively. Prove that $\angle P + \angle Q = \dfrac{1}{2}(\angle ABC + \angle ADC).$

2. In Figure, $PQRS$ is a parallelogram, PO and QO are, respectively, the angle bisectors of $\angle P$ and $\angle Q.$ Line

LOM is drawn parallel to $PQ.$ Prove that : $PL = QM$

(ii) $LO = OM$

3. In Figure, $PQRS$ is a parallelogram, PO and QO are, respectively, the angle bisectors of $\angle P$ and $\angle Q.$ Line LOM is drawn parallel to $PQ.$ Prove that : $PL = QM$

(ii) $LO = OM$

4. Given $\triangle ABC$, lines are drawn through A, B and C parallel respectively to thesides BC, CA and AB,

forming $\triangle PQR$ (Fig. 13.27). Show that $BC = \dfrac{1}{2}QR.$

5. In Figure, $ABCD$ is a parallelogram and $\angle DAB = 60^0.$ If the bisectors AP and BP of angles A and B respectively, meet at P on $CD,$ prove that P is the mid-point of $CD.$ Figure

6. The diagonals of a parallelogram $ABCD$ intersect at $O\dot{A}$ line through O intersects AB at X and DC at $Y.$ Prove that $OX = OY.$

7. The diagonals of a quadrilateral $ABCD$ are perpendicular. Show that the quadrilateral, formed by joining the mid-points of its sides, is a rectangle.

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8. Show that the quadrilateral, formed by joining the mid-points of the sides of a square is also a square.

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9. In Figure, $ABCD$ isa trapezium in which side AB is a parallel to side DC and E is the mid-point of side AD. If F is a point on the side BC such that the segment EF is parallel to side DC . Prove that F is the mid point of BC and $EF = \dfrac{1}{2}(AB + DC)$.

10. Prove that the line segment joining the mid-points of the diagonals of a trapezium is parallel to each of the parallel sides and is equal to half the difference of these sides.

11. $ABCD$ is a rhombus, $EABF$ is a straight line such that $EA = AB = BF$. Prove that ED and FC when produced meet at right angles.

12. The diagonals of a rectangle PQRS intersect at O. if $\angle ROQ = 60°$ then find $\angle OSP$.

Ncert Section Exercise 8 1

1. The angles of a quadrilateral are in the ratio $3:5:9:13.$ Find all the angles of the quadrilateral.

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2. If the diagonals of a parallelogram are equal, then it is a

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3. Show that if the diagonals of a quadrilateral bisect each other at right angles, then it is a rhombus.

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4. Show that the diagonals of a square are equal and bisect each other at right angles.

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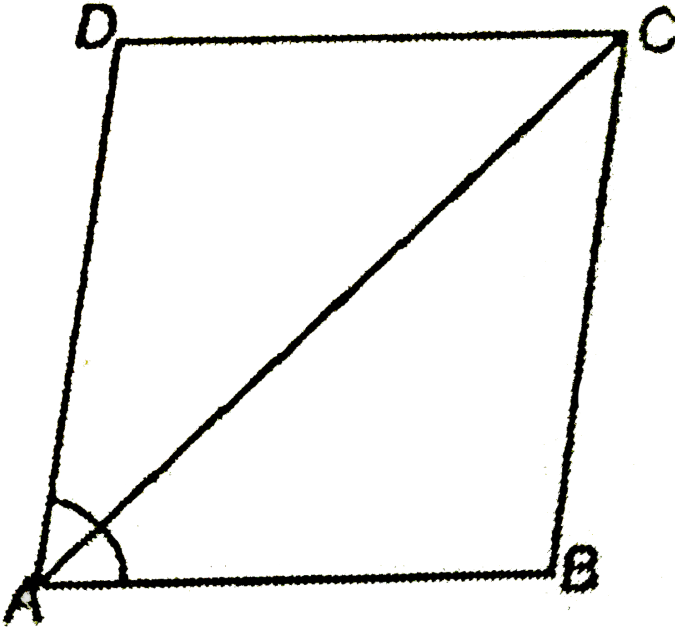**5.** Show that if the diagonals of a quadrilateral are equal and bisect each other at right angle, then it is a square.

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6. Diagonal AC of a paraleligram ABCD bisects $\angle A$ (sec figure). Show that:
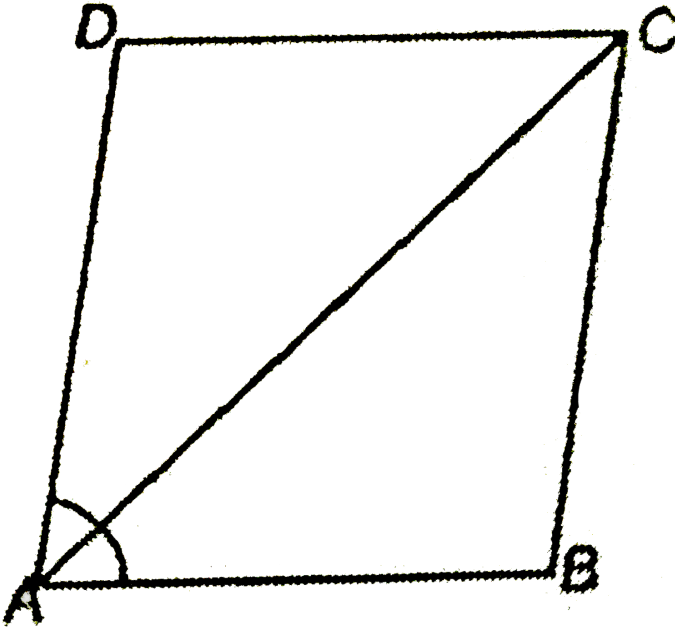
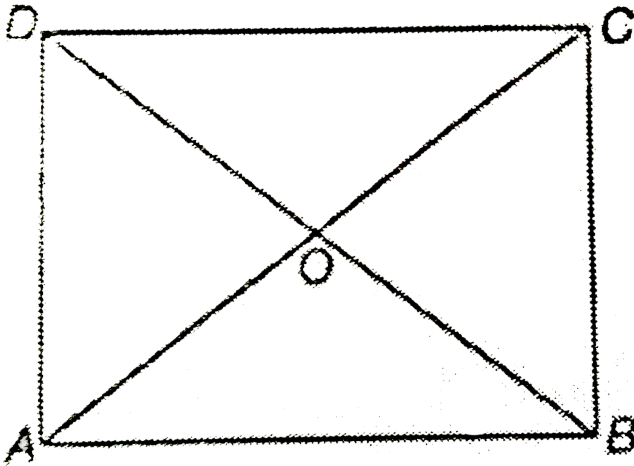(i) it bisects $\angle C$ also (ii) ABCD is a rhombus.

7. Diagonal AC of a paraleligram ABCD bisects $\angle A$ (sec figure). Show that:

(i) it bisects $\angle C$ also (ii) ABCD is a rhombus.

8. ABCD is a rhombus. Show that diagonal AC bisects $\angle A$ as well as $\angle C$ and diagonal BD bisects $\angle B$ as well as $\angle D.$
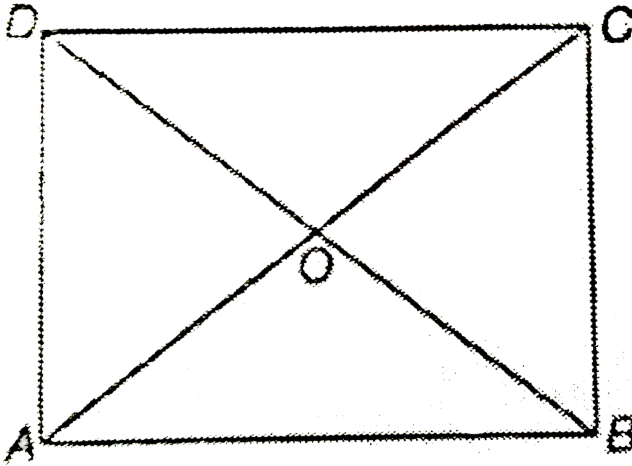
9. ABCD is a reactangle in which diagonal AC bisects $\angle A$ as well as $\angle C$. Show that (i) ABCD is a square (ii) diagonal BD bisects $\angle B$

10. ABCD is a reactangle in which diagonal AC bisects $\angle A$ as well as $\angle C$. Show that (i) ABCD is a square (ii)

diagonal BD bisects $\angle B$

11. In parallelogram ABCD two points P and Q are taken on diagonal BD such that DP = BQ (set figure). Show that:

$(i) \triangle APD \cong CQB$ $(ii) AP = CQ$
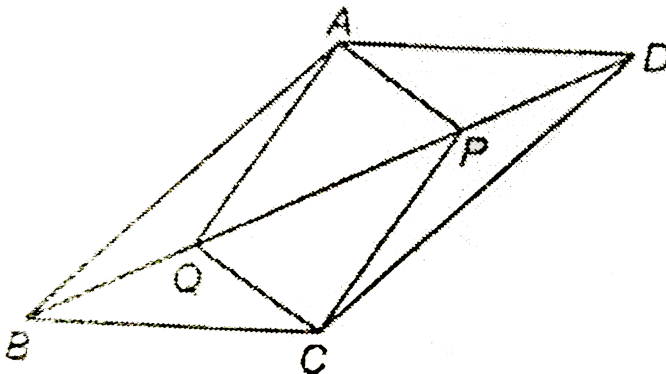
$(iii) \triangle AQB \cong \triangle CPD$ $(iv) AQ = CP$ ltbegt

$(v) APCQ$ is a parallelogram.

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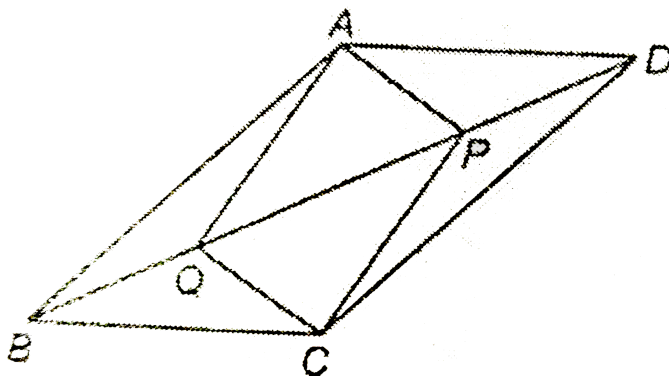**12.** In parallelogram ABCD two points P and Q are taken on diagonal BD such that DP = BQ (set figure). Show that:

$(i) \Delta APD \cong CQB$ $(ii) AP = CQ$

$(iii) \Delta AQB \cong \Delta CPD$ $(iv) AQ = CP$ ltbegt

$(v) APCQ$ is a parallelogram.

13. In parallelogram ABCD two points P and Q are taken on diagonal BD such that DP = BQ (set figure). Show that:

$(i) \Delta APD \cong CQB$ $(ii) AP = CQ$

$(iii) \Delta AQB \cong \Delta CPD$ $(iv) AQ = CP$ ltbegt

$(v) APCQ$ is a parallelogram.

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14. In parallelogram ABCD two points P and Q are taken on diagonal BD such that DP = BQ (set figure). Show that:
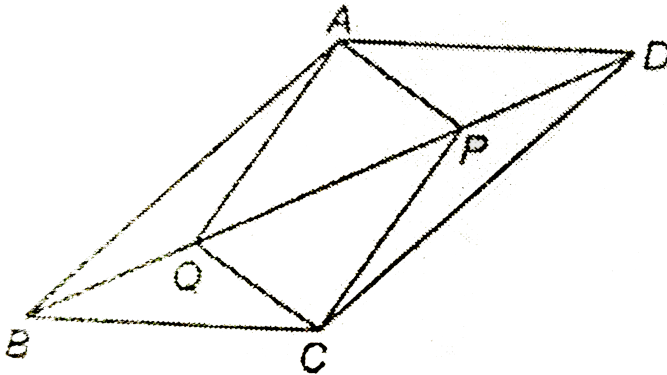
$(i) \Delta APD \cong CQB$ $(ii) AP = CQ$

$(iii) \Delta AQB \cong \Delta CPD$ $(iv) AQ = CP$ ltbegt

$(v) APCQ$ is a parallelogram.

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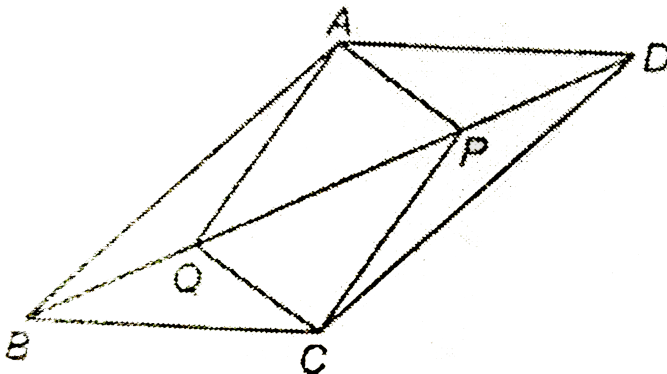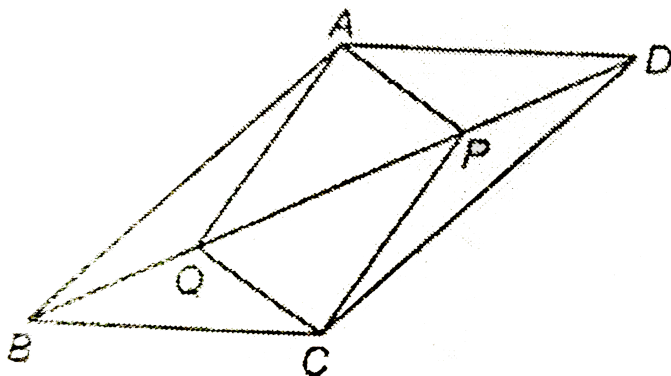**15.** In parallelogram ABCD two points P and Q are taken on diagonal BD such that DP = BQ (set figure). Show that:

$(i) \triangle APD \cong CQB$ $(ii) AP = CQ$

$(iii) \triangle AQB \cong \triangle CPD$ $(iv) AQ = CP$ ltbegt

$(v) APCQ$ is a parallelogram.

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16. In $\triangle ABC$ and $\triangle DEF$, $AB = DE$, $AB \mid\mid DE$, $BC = EF$ and $BC \mid\mid EF$. Vertices A, B and C are joined to vertices D, E and F respectively (see Fig. 8.22).Show that (i) quadrilateral ABED is a parall

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17. In $\triangle ABC$ and $\triangle DEF$, $AB = DE$, $AB \mid\mid DE$, $BC = EF$ and $BC \mid\mid EF$. Vertices A, B and C are joined to vertices D, E and F respectively (see Fig. 8.22).Show that (i) quadrilateral ABED is a parall
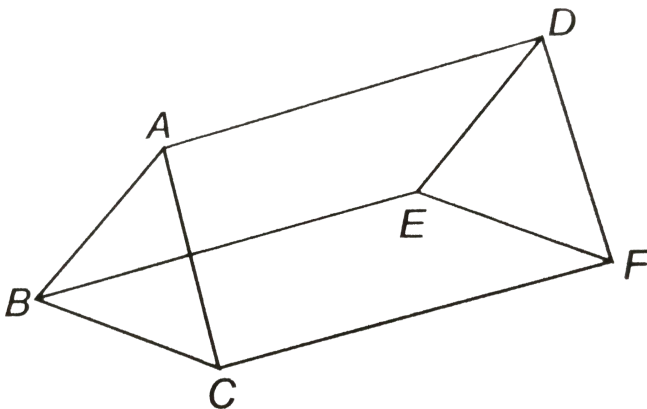
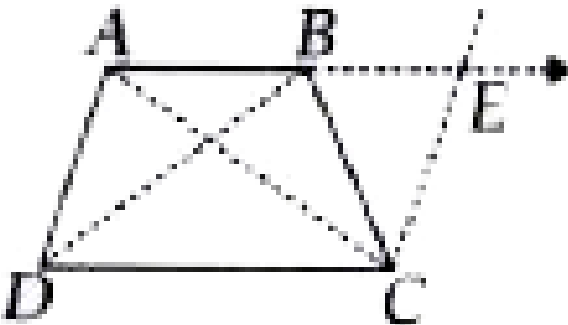**18.** In figure, AB||DE, AB=DE, AC||DF and AC=DF. Prove that BC||EF and BC=EF.

19. In $\triangle ABC$ and $\triangle DEF$, it is given that AB = De and BC = EF. In order that $\triangle ABC \cong \triangle DEF$, we muct have

20. ABCD is a trapezium in which AB||CD and AD=BC (see figure). Show that

$\angle A = \angle B$

Ncert Section Exercise 8 2

1. ABCD is a quadrilateral in which P, Q, R and S are mid-points of the sides AB, BC, CD and DA. AC is a diagonal. Show that :(i) $SR \mid\mid AC$ and $SR = \frac{1}{2}AC$(ii) $PQ = SR$(iii) PQRS is a parallelogram

2. ABCD is a quadrilateral in which P, Q, R and S are mid-points of the sides AB, BC, CD and DA. AC is a diagonal.

Show that :(i) $SR \mid \mid AC$ and $SR = \dfrac{1}{2}AC$(ii)

$PQ = SR$(iii) PQRS is a parallelogram

3. ABCD is a quadrilateral in which P, Q, R and S are mid-points of the sides AB, BC, CD and DA. AC is a diagonal.

Show that :(i) $SR \mid \mid AC$ and $SR = \dfrac{1}{2}AC$(ii)

$PQ = SR$(iii) PQRS is a parallelogram

4. ABCD is a rhombus and P, Q, R and S are wthe mid-points of the sides AB, BC, CD and DA respectively. Show

that the quadrilateral PQRS is a rectangle.

5. ABCD is a rectangle and P, Q, R and S are mid-points of the sides AB, BC, CD and DA respectively. Show that the quadrilateral PQRS is a rhombus.

6. ABCD is a trapezium in which $AB \mid\mid DC$, BD is a diagonal and E is the mid-point of AD. A line is drawn through E parallel to AB intersecting BC at F (see Fig. 8.30). Show that F is the mid-point of BC.

7. In a parallelogram ABCD, E and F are the mid-points of sides AB and CD respectively. Show that the line segments AF and EC trisect the diagonal BD.

8. Show that the line segments joining the mid-points of the opposite sides of a quadrilateral bisect each other.

9. ABC is a triangle right angled at C. A line through the mid-point M of hypotenuse ABand parallel to BC intersects AC at D. Show that(i) D is the mid-point of AC (ii) $MD \perp AC$(iii) $CM = MA = \frac{1}{2}AB$

10. ABC is a triangle right angled at C. A line through the mid-point M of hypotenuse ABand parallel to BC intersects AC at D. Show that(i) D is the mid-point of AC (ii) $MD \perp AC$(iii) $CM = MA = \frac{1}{2}AB$

11. ABC is a triangle right angled at C. A line through the mid-point M of hypotenuse ABand parallel to BC intersects AC at D. Show that(i) D is the mid-point of AC (ii) $MD \perp AC$(iii) $CM = MA = \frac{1}{2}AB$

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1. The quadrilateral in which only one pair of opposite sides are parallel is called a

    A. square

    B. rhombus

C. trapezium

D. parallelogram

Answer: C

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2. The angles of a quadrilateral are in the ratio $1 : 2 : 3 : 4$.
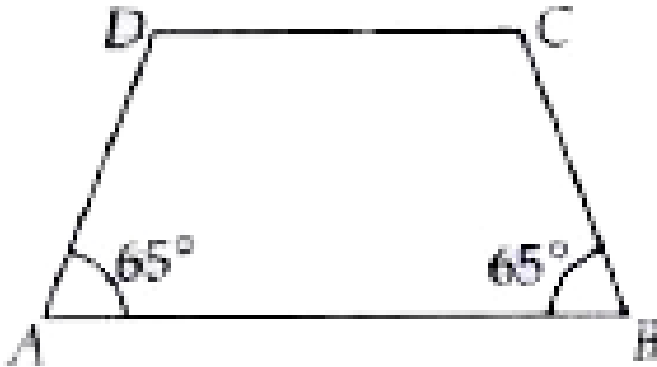
The smallest angle is

A. $36°$

B. $72°$

C. $108°$

D. $144°$

Answer: D

3. In the given figure AB || CD, then measure of $\angle C$ is

A. $65°$

B. $115°$

C. $135°$

D. $125°$

Answer: B

4. A quadrilateral has three acute angles each measuring $70°$. The measure of fourth angle is

A. $140°$

B. $150°$

C. $105°$

D. $120°$

Answer: B

5. In a parallelogram ABCD, angleA = 115 degree. The measure of angle D is equal to

A. $115°$

B. $65°$

C. $135°$

D. $165°$

Answer: B

6. In the given figure, ABCD is a square. The measure of $\angle DBC$ is equal to
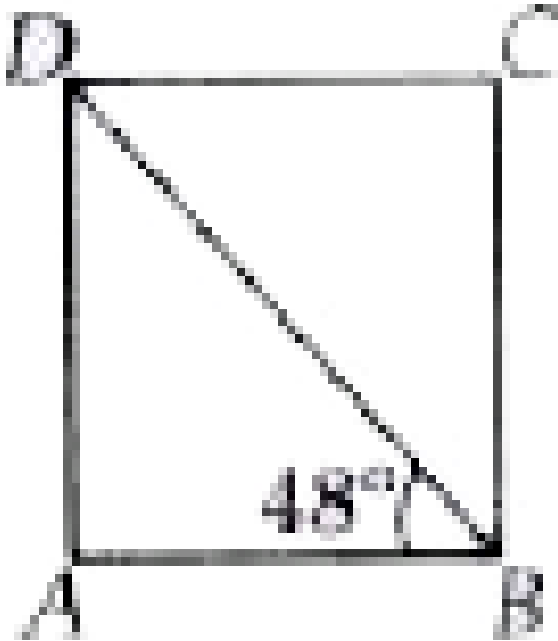
A. $48°$

B. $38°$

C. $42°$

D. $52°$

Answer: C

7. If in a quadrilateral, two adjacent sides are equal and the opposite sides are unequal, then it is called a

    A. parallelogram

    B. square

    C. rectangle

    D. kite

Answer: D

8. The angles of a quadrilateral are $r°, (x - 10)°, (x + 30)°$ and $(2x)°$, the smallest angle is equal

A. $68°$

B. $52°$

C. $58°$

D. $47°$

Answer: C

9. Which of the following statements is true ?
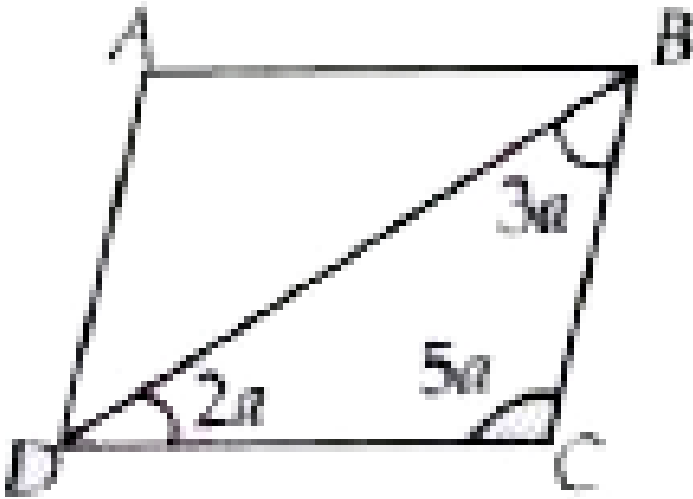
    A. In a parallelogram, the diagonals are equal.

    B. In a parallelogram, the diagonals bisect each other

    C. In a parallelogram, the diagonals intersect each other at right angles.

    D. In any quadrilateral, if a pair of opposite sides are equal, it is parallelogram.

Answer: B

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10. In the given figure, the measure of ZC is equal to $\angle C$

A. $90°$

B. $80°$

C. $75°$

D. $95°$

Answer: A

11. In the given figure, if ABCD is a square, and OX = OC the value of x is
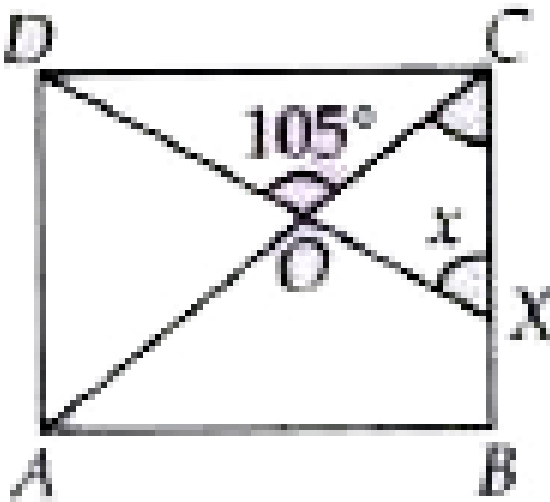
12. In the following figure, ABCD and AEFG are two parallelograms. If $\angle C = 55°$ find $\angle F$.
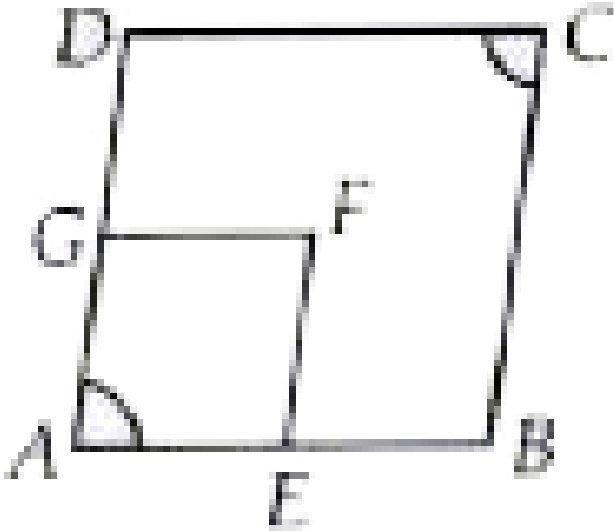
A. $65°$

B. $75°$

C. $85°$

D. $55°$

Answer: D

13. In the given figure, ABCD is a rectangle whose diagonals AC and BD intersect at 0. If $\angle OAB = 28°$, then $\angle OBC$ is equal to
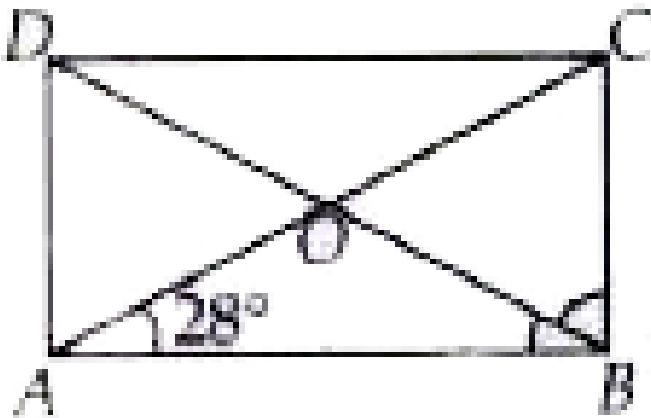
A. $72°$

B. $50°$

C. $62°$

D. $75°$

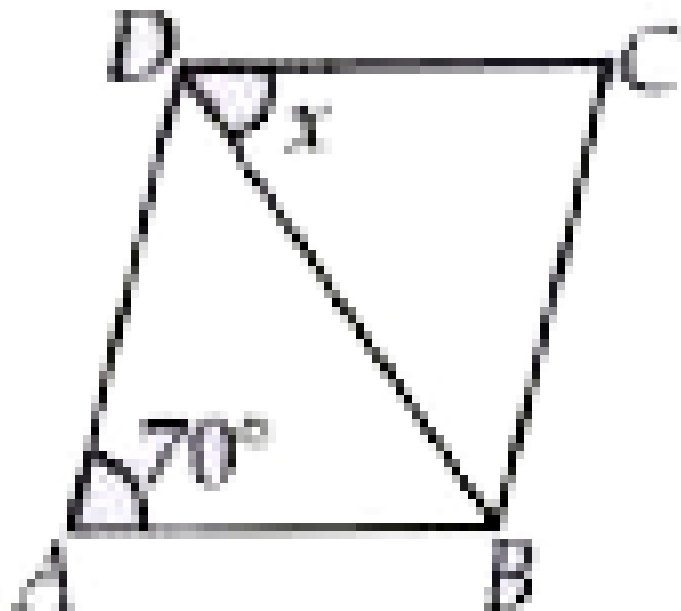**Answer: C**

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14. In the given figure, ABCD is a rhombus. If $\angle A = 70°$, then $\angle CDB$ is equal to

A. 65°

B. 55°

C. 75°

D. 80°

Answer: B

15. Which is not correct about rectangle EFGH ?

A. $\angle E = \angle F = \angle G = \angle H = 90°$

B. EG=FH

C. EF=GH and HE= FG

D. EG and FH are $\perp$ bisectors.

Answer: D

16. In a parallelogram ABCD, if $\angle A = 80°$ then ZB is equal to

    A. $80°$

    B. $180°$

    C. $100°$

    D. $120°$

Answer: C

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17. Two adjacent angles of a parallelogram are in the ratio 2 : 3. The angles are

A. $90°$, $180°$

B. $36°$, $144°$

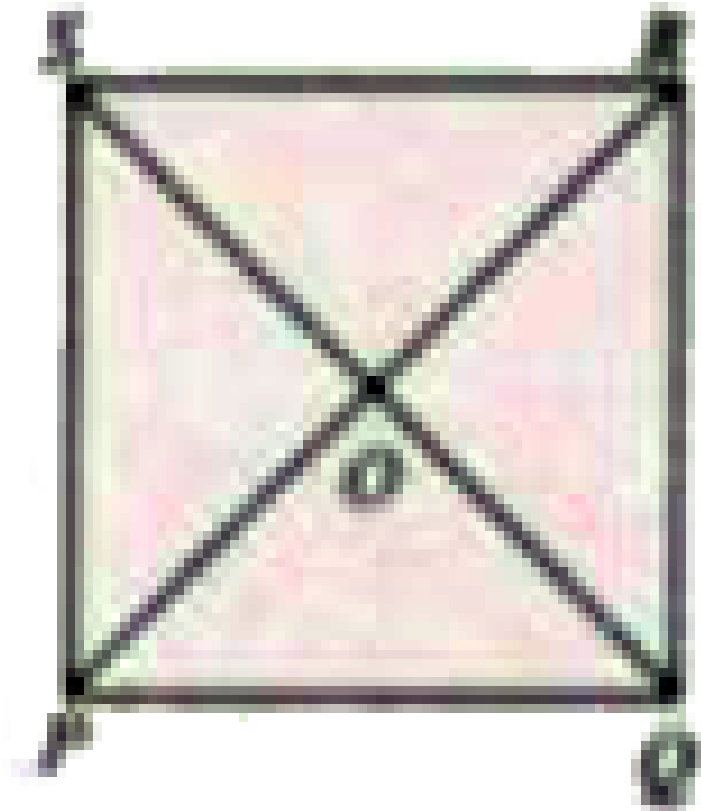C. $72°$, $108°$

D. $52°$, $104°$

Answer: C

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18. PQRS is a square. PR and SQ intersect at O. State the measure of $\angle POQ$.

A. $45°$

B. $90°$

C. $180°$

D. None of these

Answer: B

19. In a quadrilateral $ABCD$, $\angle A + \angle C = 180°$, then $\angle B + \angle D$ is equal to

A. $360°$

B. $100°$

C. $180°$

D. $80°$

Answer: C

20. In a parallelogram ABCD diagonals AC and BD intersect at O and AC =12.6 cm and BC = 9.4 cm. Find the measures of OC and OD.

A. 6.4 cm 3.8 cm

B. 2.4 cn 3.8 cm

C. 4.5 cm, 6.4 cm

D. 3.8 cm 6.4 cm.

Answer: A

21. One of the diagonals of a rhombus is equal to a side of the rhombus. The pair of unequal angles of the rhombus are

A. $60°$, $80°$

B. $60°$, $120°$

C. $120°$, $240°$

D. $100°$, $120°$

Answer: B

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22. Two adjacent angles of a parallelogram are $(2x + 25)^\circ$ and $(3x - 5)^\circ$. The value of x is

A. 28°

B. 32°

C. 36°

D. 42°

Answer: B

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23. The quadrilateral formed by joining the mid-points of the side for quadilateral 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

Answer: D

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24. In a square $ABCD$, $AB = (2x + 3)cm$ and $BC = (3x - 5)cm$.

Then, the value of x is

A. 5

B. 7

C. 8

D. 10

Answer: C

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25. The two diagonals are equal in a
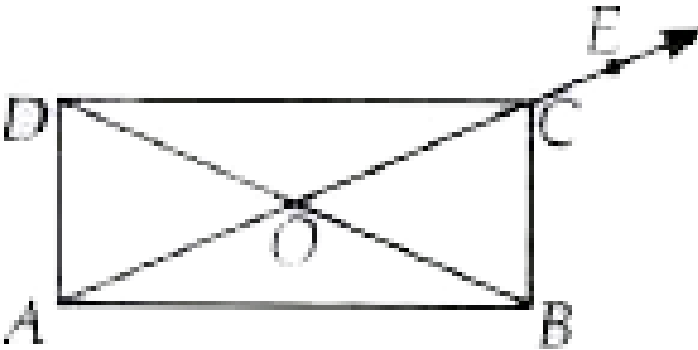
A. parallelogram

B. rhombus

C. rectangle

D. trapezium

Answer: C

26. In figure, ABCD is a rectangle in which diagonal D AC is produced to E. If $\angle ECD = 146°$, find $\angle AOB$.

A. $11°$

B. $115°$

C. $112°$

D. None of these

Answer: C

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27. The angle between the two altitudes of a parallelogram through the vertex of an obtuse angle is $50°$. The two adjacent angles of parallelogram are

A. $50°$, $130°$

B. $60°$, $120°$

C. 55° , 125°

D. 70° , 110°

Answer: A

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28. The diagonals of a rectangle $ABCD$ meet at $O.$ If $\angle BOC = 44^0$, find $\angle OAD.$

A. 22°

B. 68°
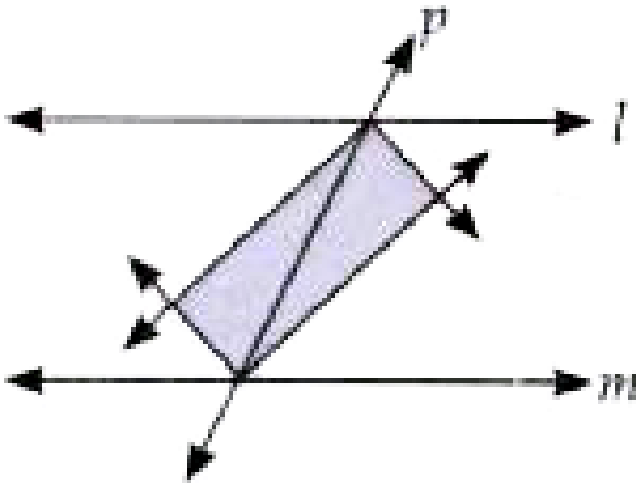
C. 78°

D. 44°

Answer: B

29. Two parallel line l and m are intersected by a transversal p. The quadrilateral formed by the bisectors of interior angles is a
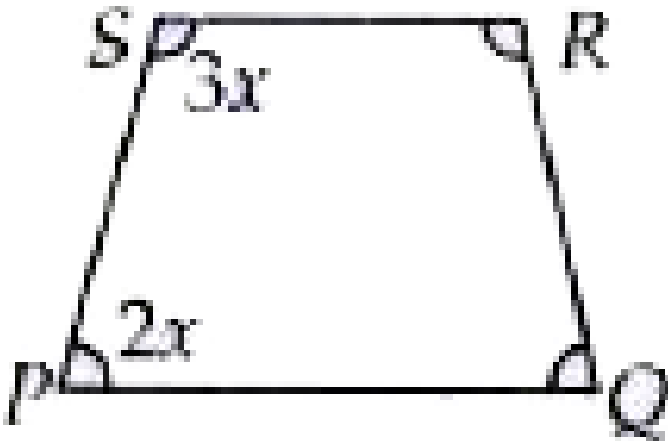

A. Trapezium

B. Kite

C. Parallelogram

D. Square

Answer: C

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30. In figure, PQRS is an isosceles trapezium. Find x

A. $30°$

B. $40°$

C. $36°$
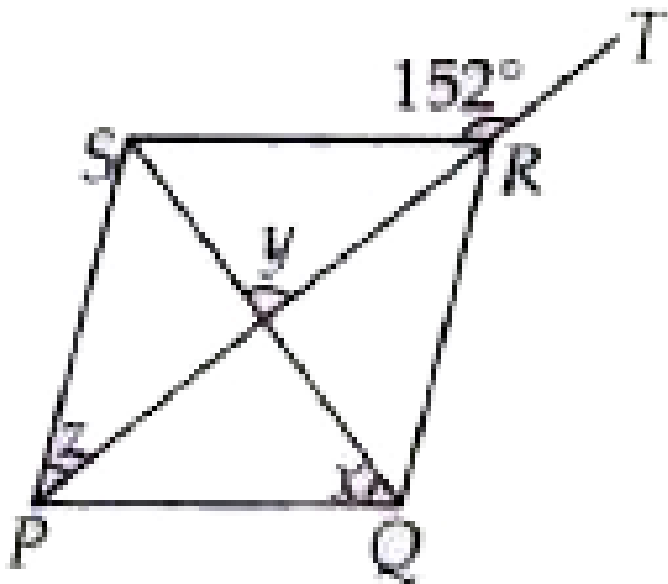
D. $35°$

Answer: C

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31. In figure, PQRS is a rhombus in which the diagonal PR is produced to T. IF $\angle SRT = 152°$ find x, y and

A. $x = 60°$, $y = 90°$, $z = 28°$

B. $x = 62°$, $y = 80°$, $z = 28°$

C. $x = 62°$, $y = 90°$, $z = 28°$

D. None of these

Answer: A

32. In a quadrilateral STAR, if $\angle S = 120°$, and $\angle T : \angle A : \angle R = 5 : 3 : 7$, then the measure of $\angle R$ (in degrees) is____

A. $112°$

B. $120°$

C. $110°$

D. None of these

Answer: A

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33. In a parallelogram ABCD if $\angle A = (3x - 20)^\circ$, $\angle B = (y + 15)^\circ$ and $\angle C = (x + 40)^\circ$, then the values of x and y respectgively are

A. 30°, 95°

B. 95°, 30°

C. 60°, 30°

D. 30°, 60°

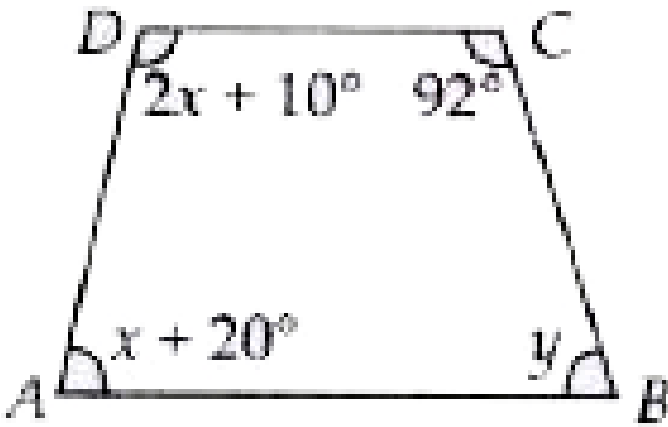**Answer: B**

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34. In figure, ABCD is a Do trapezium. Find the values of x and y.

A. $x = 50°$, , $y = 80°$

B. $x = 50°$, $y = 88°$

C. $x = 80°$, $y = 50°$

D. None of these

Answer: A

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35. In a quadrilateral $ABCD\angle A + \angle C$ is 2 times $\angle B + \angle D$. If $\angle A = 140° \angle D = 60°$, then $\angle B$=

A. 60°

B. 80°

C. 120°

D. None of these

Answer: A

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Exercise Multiple Choice Questions Level 2

1. In the given figure, ABCD is a parallelogram, then

$\angle DBA$ and $\angle BDA$ are respectively equal to
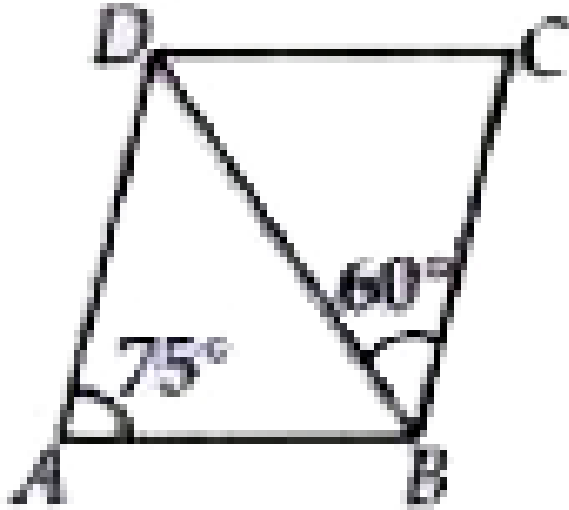
A. $45°$, $60°$

B. $60°$, $45°$

C. $70°$, $35°$

D. $35°$, $35°$

Answer: A

2. If the sides BA and DC of quadrilateral ABCD are produced as shown in the given figure, then
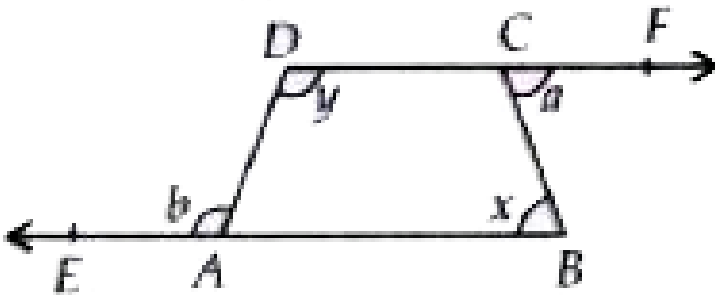
A. $x + y = a + b$

B. $x - y = a - b$

C. $\dfrac{x - y}{2} = a - b$

D. $2(x + y) = a + b$

Answer: B

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3. If an angle of a parallelogram is two-third of its adjacent angle, find the angles of the parallelogram.

    A. $37°$, $143°$, $37°$, $143°$

    B. $108°$, $72°$, $108°$, $72°$

    C. $68°$, $112°$, $68°$, $112°$

    D. None of these

Answer: B

4. Find the measure of all the angles of a parallelogram, if one angle is 24^0 less than twice the smallest angle.

    A. 37° , 143° , 37° , 143°

    B. 108° , 72° , 108° , 72°

    C. 68° , 112° , 68° , 112°

    D. None of these

Answer: C

5. In the given figure, ABCD is a quadrilateral, the line segments bisecting $\angle C$ and $\angle D$ meet at E. Then $2\angle CED$ is equal to
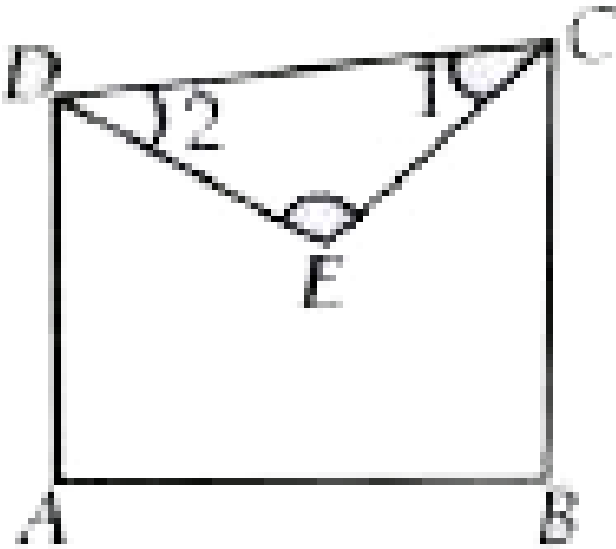
A. $\angle A + \angle B$

B. $\angle A + \angle C$

C. $\angle B + \angle D$

D. $\angle C + \angle D$

Answer: A

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6. In a parallelogram KITE, $\angle KIT = 75°$, $KA \perp IT$, KA and EI intersect at B where A is a point on IT. If EB = 2KI, then the measure of $\angle KBE$ is

A. $62°$

B. $65°$

C. $68°$

D. $70°$

Answer: B

7. P and Q are the points of trisection of the diagonal BD of a parallelogram ABCD. Then which of the following is true?

    A. CQ is parallel to AP

    B. CQ is perpendicular to AP

    C. CQ intersects AP

    D. None of these

Answer: A

8. Which type of quadrilateral is formed when the angles

A, B, C and D are in the ratio 2:4:5: 7?

A. Rhombus

B. Square

C. trapezium

D. Rectangle

Answer: C

9. The side of a rhombus is 10 cm. The smaller diagonal is $\frac{1}{3}$ of the greater diagonal. Find the length of the greater diagonal.

A. $6\sqrt{10}cm$

B. $10\sqrt{6}cm$

C. $6\sqrt{5}cm$

D. $5\sqrt{6}cm$

Answer: A

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10. In the given figure, $ABCD$ is a parallelogram. E and F are the centroids of $\triangle\, ABD$ and $\triangle\, BCD$, respectively.EF is equal to

    A. AE

    B. BE

    C. CE

    D. DE

Answer: A

11. P is the mid-point of the side CD of a parallelogram ABCD. A line through C parallel to PA intersects AB at Q and DA produced at R. Prove that DA = AR and CQ = QR.

    A. DA=AR

    B. CQ=QR

    C. APCQ is parallelogram

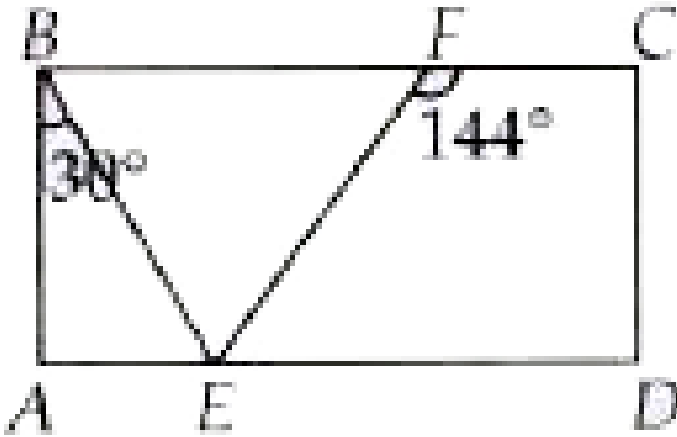   D. None of these

Answer: B

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12. In the accompanying following B diagram of rectangle $ABCD$, $\angle ABE = 30°$ and $\angle CFE = 144°$. Find the measure of angle BEF

A. $84°$
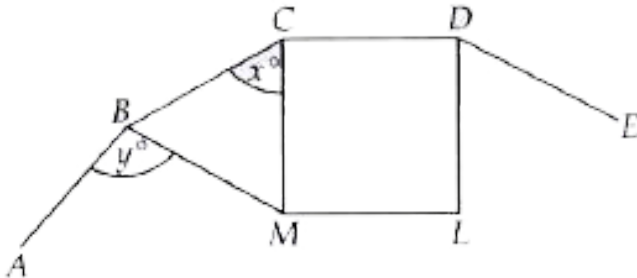
B. $36°$

C. $96°$

D. $74°$

Answer: A

13. ABCDE... is part of a regular polygon which has interior angles of $160°$. CDLM is a square.

Find the value of x and y respectively.

A. 70105

B. 70150

C. 105,70

D. 150,70

Answer: A

14. The lie segments joining the midpoints of the ajdacent sides of a quadirlateral form

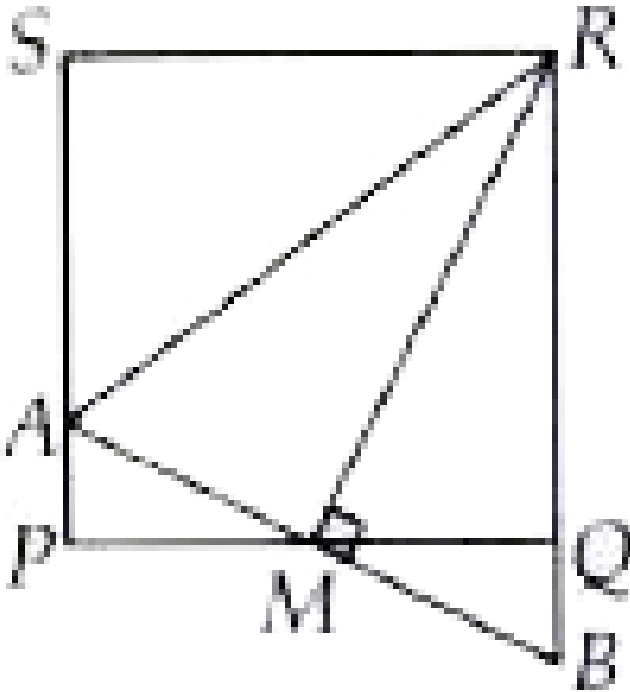   A. Parallelogram

    B. Square

    C. Rhombus

    D. Rectangle

Answer: A

15. In the following figure, PQRS is a square. M is the mid-point of PQ and $AB \perp RM$. Then, which of the following is false?

A. AM=MB

B. RA=RB

C. $\Delta RMA = \Delta RMB$

D. $\Delta RAM \cong \Delta RMB$

Answer: D

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Exercise Match The Following

1. Match the following:

	List-I		List-II
(P)	Trapezium	(1)	Each angle is 90°.
(Q)	Rectangle	(2)	Equal adjacent sides but unequal opposite sides.
(R)	Rhombus	(3)	Unequal sides.
(S)	Kite	(4)	All sides are equal.

A. P-1, Q-2, R-3,5-4

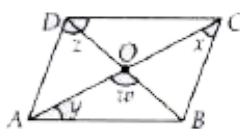B. P-2, Q-3, R-4, S-1

C. P-4, Q-3, R-2, S-1

D. P-3, Q-1, R-4, S-2

Answer: D

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2. By using the given figure of quadrilateral ABCD, match List-I with List-II.

List-I	List-II
(P) If $ABCD$ is a parallelogram, then sum of the angles x, y and z is	(1) $25°$
(Q) If $ABCD$ is a rhombus, where $\angle D = 130°$, then the value of x is	(2) $180°$
(R) If $ABCD$ is a rhombus, the value of w is	(3) $50°$
(S) If $ABCD$ is a parallelogram, where $x + y = 130°$, the value of z is	(4) $90°$

A. P-1, 0-2, R-3, S-4

B. P-3, 0-4, R-2, S-1

C. P-2, Q-1, R-4, S-3

D. P-2, Q-4, R-3, S-1

Answer: C

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1. Assertion : Two opposite angles of a parallelogram are $(3x - 2)^\circ$ and $(50 - x)^\circ$. The measure of one of the angle is 37° .

Reason : Opposite angles of a parallelogram are equal

    A. If both assertion and reason are true and reason is the correct explanation of assertion

    B. If both assertion and reason are true but reason is not the correct explanation of assertion.

    C. If assertion is true but reason is false.

    D. If assertion is false but reason is true.

Answer: A

2. Assertion : ABCD is a square. AC and BD intersect at O.

The measure of $\angle AOB = 90°$

Reason : Diagonals of a square bisect each other at right

angles.

- A. If both assertion and reason are true and reason is

  the correct explanation of assertion

- B. If both assertion and reason are true but reason is

  not the correct explanation of assertion.

- C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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3. Assertion : In ABC, median AD is produced to X such that AD = DX. Then ABXC is a parallelogram.

Reason : Diagonals AX and BC bisect each other at right angles.

A. If both assertion and reason are true and reason is the correct explanation of assertion

B. If both assertion and reason are true but reason is

   not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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4. Assertion : In $\triangle ABC, E$ and F are the midpoints of

AC and AB respectively. The altitude AP at BC intersects
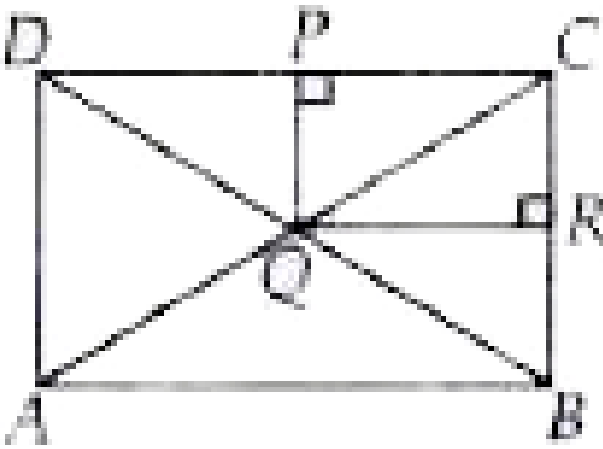
FE at Q. Then, AQ = QP.

Reason : Q is the midpoint of AP.

A. If both assertion and reason are true and reason is

the correct explanation of assertion

B. If both assertion and reason are true but reason is

not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: B

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5. Assertion : ABCD and PQRC are rectangles and Q is a midpoint of AC. Then DP = PC.

Reason : The line segment joining the midpoints of any two sides of a triangle is parallel to the third side and equal to half of it.

A. If both assertion and reason are true and reason is the correct explanation of assertion

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: B

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1. The angles of a quadrilateral are $100°$, $98°$ and $92°$ respectively. Find the fourth angle.

    A. $70°$

    B. $80°$

    C. $40°$

D. 90°

Answer: A

2. The sum of the four angles of a quadrilateral is 360°.

In a quadrilateral ABCD, the angles A, B, C and D are in the ratio 1:2: 4:5, then the measure of each angle of a quadrilateral is

A. 36°, 60°, 108°, 156°

B. 30°, 60°, 120°, 150°

C. 42°, 54°, 110°, 154°

D. $72°$, $108°$, $36°$, $144°$

Answer: B

3. The sum of the four angles of a quadrilateral is $360°$.

Three angles of a quadrilateral are respectively equal to

$110°$, $50°$ and $40°$. Find its fourth angle.

A. $160°$

B. $120°$

C. $80°$

D. $140°$

Answer: A

Exercise Comprehension Type Passage Ii

1. In a parallelogram ABCD, the sum of any two consecutive angles is $180°$ and opposite angles are equal.

In a parallelogram $ABCD$, $\angle D = 115°$, determine the measure of $\angle A$ and $\angle B$

    A. $\angle A = 85°$, $\angle B = 115°$

    B. $\angle A = 65°$, $\angle B = 65°$

C. $\angle A = 65°$, $\angle B = 115°$
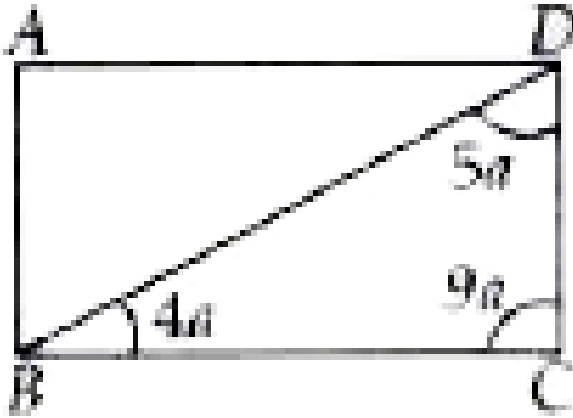
D. $\angle A = 75°$, $\angle B = 105°$

Answer: C

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2. In a parallelogram ABCD, the sum of any two consecutive angles is $180 degree$ and opposite angles are equal.

In the given figure, find $\angle A$ in the parallelogram .

A. $90°$

B. $60°$

C. $30°$

D. $110°$

Answer: A

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3. In a parallelogram ABCD, the sum of any two consecutive angles is $180°$ and opposite angles are equal.

Find the value of $\angle Q$ and $\angle P$, if $\angle P = 10a$ and $\angle R = 50°$ in a parallelogram PQRS.

A. $\angle = 50°$, $\angle P = 130°$

B. $\angle Q = 130°$, $\angle P = 50°$

C. $\angle Q = 100°$, $\angle P = 120°$

D. $\angle Q = 50° + \angle P = 100°$

Answer: B

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1. The line segment joining the midpoints of any two sides of a triangle is parallel to the third side and equal to half of it.

In the given figure, the side AC of $\triangle ABC$ is produced to E such that CE = FAC. If D is the midpoint of BC and ED produced meets AB at F and CP, DQ are drawn parallel to BA, then FD=
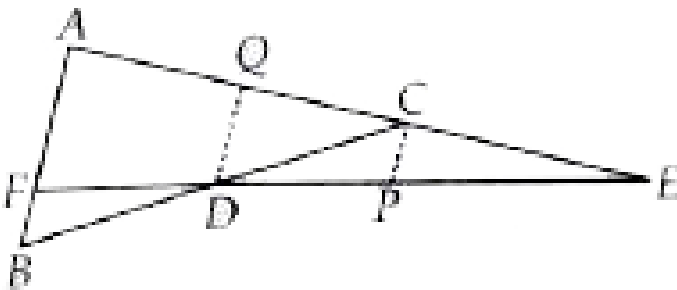
A. $\dfrac{1}{2}FE$

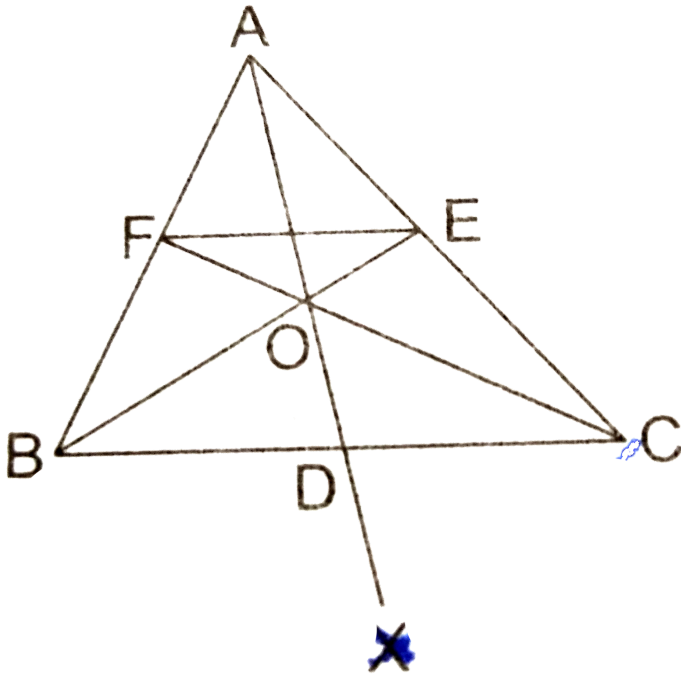B. $\dfrac{1}{3}EF$

C. 2FE

D. FE

Answer: B

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2. In the given figure, sid BC of $\triangle ABC$ is biseted at D and O is any point AD.BO and CO produced meet AC and AB at E and F respetively, and AD is respectively, and AD is produced to X so that D is the midpoint of OX. Prove that

$AO : AX = AF : AB$ and show that $EF \mid \mid BC$.

A. 3AC
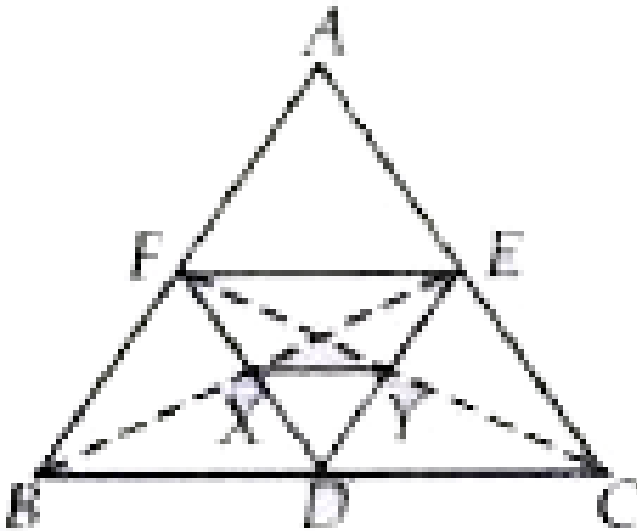
B. $\dfrac{1}{2}AC$

C. 2AC

D. $\dfrac{1}{3}AC$

Answer: D

3. In the given figure, D, E and F are the midpoints of the sides BC, CA and AB of $\triangle ABC$. BE bisect DF at X while CF bisect DE at Y, then BC = a XY. Find a.

A. 3

B. 4

C. 2

D. $1/4$

Answer: B

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Exercise Subjective Problems Very Short Answer Type

1. Find the measure of all the angles of a parallelogram, if one angle of the adjacent angles is $20°$ less than thrice the smallest angle

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2. In Fig. 13.98, $BE \perp AC$. AD is any line from A to BC intersecting BE in H. P. O and R are respectively the mid-points of AH, AB and BC. Prove that $\angle POR = 90°$.

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3. In a parallelogram $ABCD$, $\angle D = 135^0$, determine the measures of $\angle A$ and $\angle B$

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4. ABCD is a parallelogram in which $\angle A = 78°$. Compute $\angle B, \angle C$ and $\angle D$.

5. In Figure, $ABCD$ is a parallelogram in which $\angle A = 60^0$. If the bisectors of $\angle A$ and $\angle B$ meet at P, prove that $AD = DP, PC = BC$ and $DC = 2AD$.

Figure

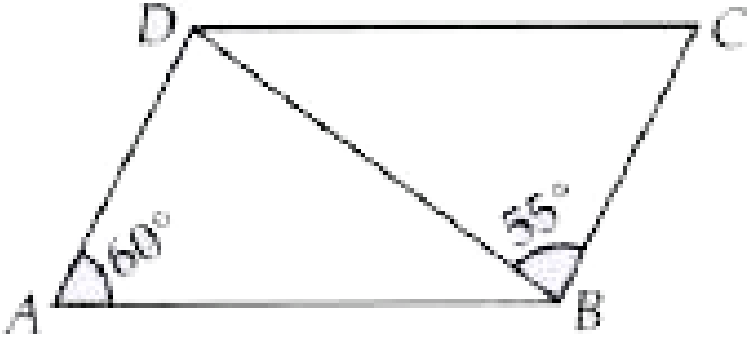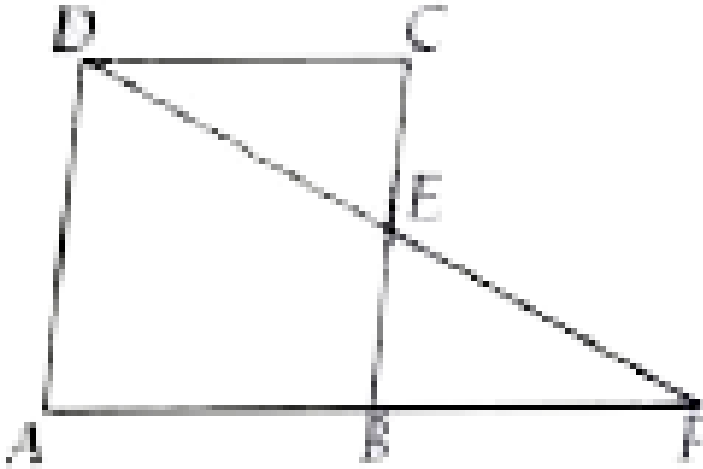**6.** In the given figure, ABCD is a parallelogram in which $\angle DAB = 60^\circ$ and $\angle DBC = 55^\circ$. Compute

$\angle CDB$ and $\angle ADB$.

7. In the given figure, ABCD is a parallelogram and E is the midpoint of side BC. If DE and AB when produced meet at

F, prove that AF = 2AB.
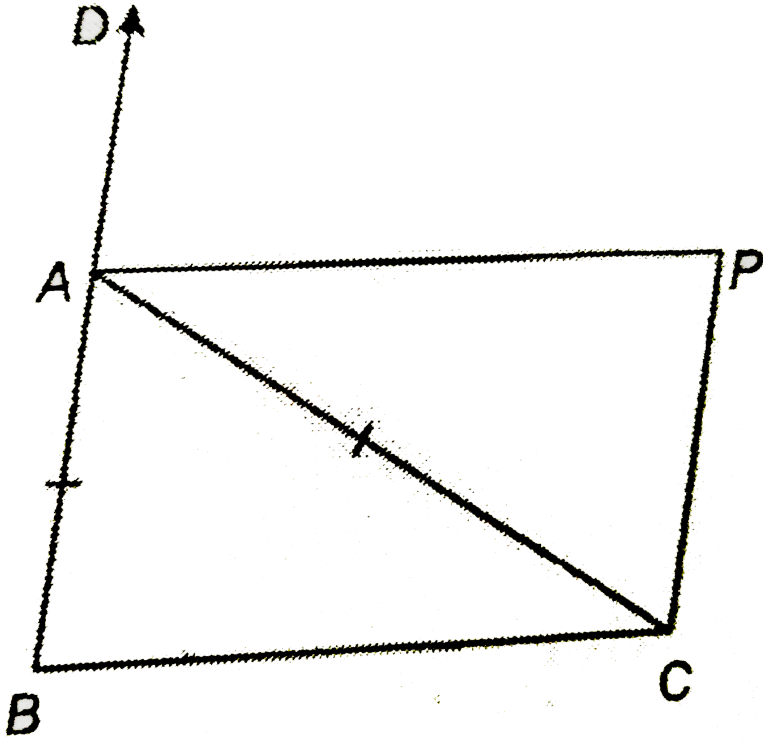
8. In the adjoining figure, $\triangle ABC$ is an isosceles triangle in which AB = AC. Side CP is parallel to AB and AP is the bisector of exterior angle CAD of $\triangle$ ABC. Prove that

$\angle PAC = \angle BCA$ and $\square ABCP$ is a parallelogram.

9. ABCD is a rectangle with $\angle ABD = 50°$. Determine $\angle DBC$.

10. In ΔABC, $\angle A = 50°$, $\angle B = 30°$ and $\angle C = 100°$ What are the angles of the triangle formed by joining the midpoints of the sides of this triangle?
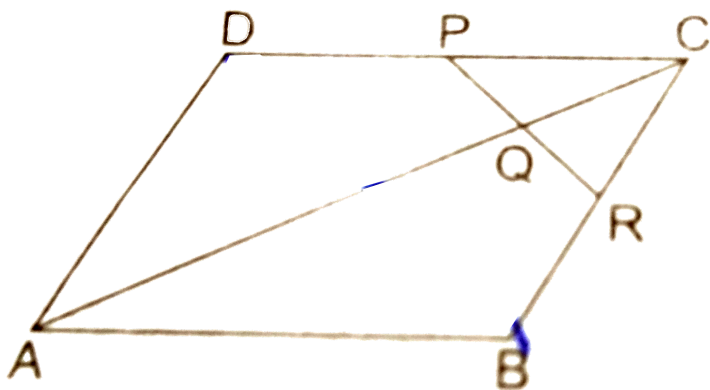
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Exercise Subjective Problems Short Answer Type

1. Let ABC be an isosceles triangle with $AB = AC$ and let D, E, F be the mid-points of BC, CA and AB respectively. Show that $AD \perp FE$ and AD is bisected by FE.

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2. ABCD is a parallelogram in which P is the midpoint of DC and Q is a point on AC such that $CQ = \frac{1}{4}AC$. If PQ produced meets BC at R, prove that R is the midpoint of BC.

3. $ABCD$ is a parallelogram. P is a point on AD such that $AP = \dfrac{1}{3}AD$ and Q is a point on BC such that $CQ = \dfrac{1}{3}BP$. Prove that $AQCP$ is a parallelogram.

4. In a parallelogram ABCD, prove that it is a rhombus, if diagonals bisect each other at $90°$

5. ABC is a triangle. D is a point on AB such that $AD = \dfrac{1}{4}AB$ and E is a point on AC such that $AE = \dfrac{1}{4}AC$. Prove that $DE = \dfrac{1}{4}BC$.

Exercise Subjective Problems Long Answer Type

1. In a parallelogram $ABCD$, the bisector of $\angle A$ also bisects BC at X. prove that $AD = 2AB$.

2. $ABCD$ is a parallelogram. AD is a produced to E so that $DE = DC$ and EC produced meets AB produced in F. Prove that $BF = BC$.

3. ABCD and APCR are the two parallelograms and AC is the common diagonal. Prove that PBRD is a parallelogram.

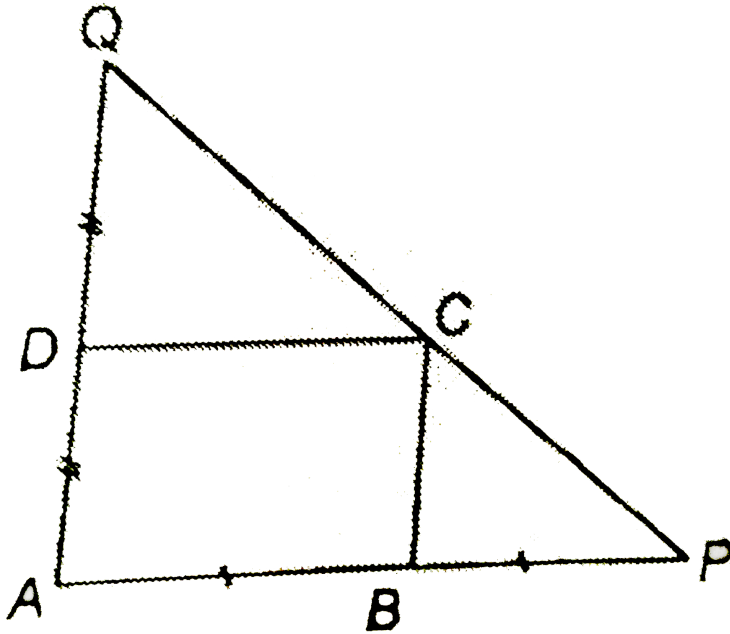**4.** In the adjoining figure, ABCD is a paralogram. The side AB is produced to P such that AB=BP and the side AD is

produced to Q such that AD = DQ. Prove that CP = CQ.

5. In the adjoining figure, ABCD is a parallelogram and E is the midpoint of AD. A line through D, drawn parallel to

EB, meets AB produced at F and BC at L. Prove that (i)

$AF = 2DC$, (ii) $DF = 2DL$

Exercise Integer Numerical Value Type

1. The perimeter of a parallelogram is 20 cm. If the longer side measures 6 cm, then measure of the shorter side is equal to
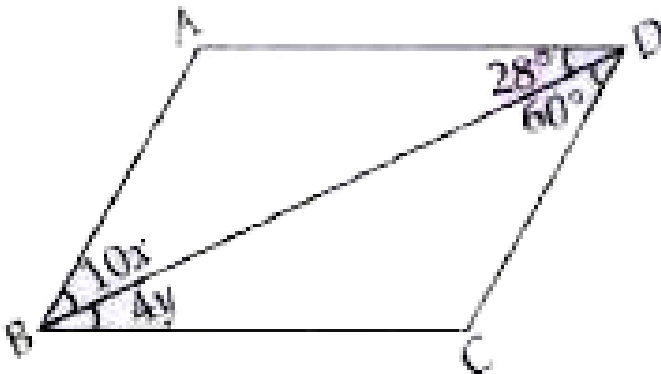
2. In a rhombus $ABCD$, $\angle A = 60°$ and $AB = 6cm$. The length of the diagonal BD is equal to

3. In the given figure, if ABCD is a parallelogram, then the value of 2x +y is equal to ____ degrees.

4. The lengths of the diagonals of a rhombus are 16 cm and 12 cm. The length of each side of the rhombus is k cm. The value of 3k is
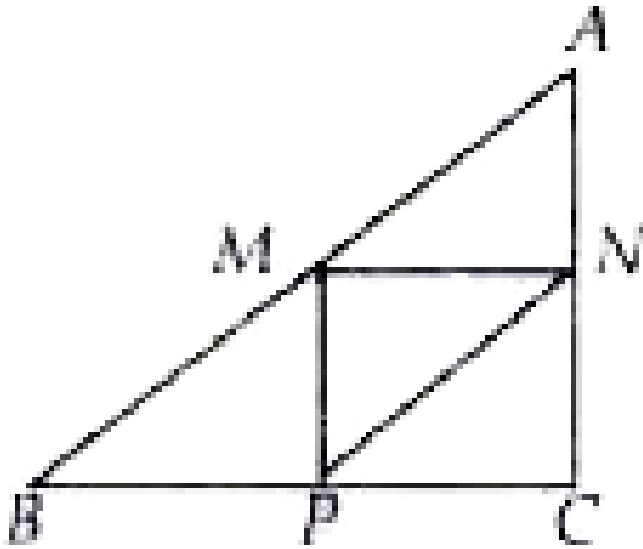
5. In a square ABCD, AB = (4x + 3) cm and BC = (5x - 6) cm. Then, the value of x is

6. In the given figure, M, N and P are the midpoints of AB, AC and BC respectively. If MN = 3 cm, NP = 3.5 cm and MP =

2.5 cm, then (BC + AC) - AB is

7. In a $\triangle ABC$, D, E and F are the midpoints of BC, CA and AB respectively. If the lengths of side AB, BC and CA are 7 cm, 8 cm and 9 cm respectively, the perimeter of $\triangle DEF$ is a cm. The value of a/2 is

8. In a triangle ABC, P, Q and R are the midpoints of side BC, CA and AB respectively. If AC = 21 cm, BC = 29 cm and AB = 30 cm, then find the perimeter of the quadrilateral ARPQ

9. If the bisectors of two adjacent angles A and B of a quadrilateral ABCD intersect at a point O such that $\angle C + \angle D = k\angle AOB$, then the value of k-1 is

10. The diagonals of a rhombus are 8 cm and 6 cm, then the length of each side of the rhombus is

Olympiad Hots Corner

1. The length of the parallel sides of a trapezium are 14 cm and 7 cm. If the perpendicular distance between them is 8 cm, then the area of the trapezium is:

A. 86

B. 84

C. 64

D. 76

Answer: B

2. If the diagonals of a rhombus are 30 cm and 40 cm, then the length of side of rhombus is

    A. 20 cm

    B. 22 cm

    C. 25 cm

    D. 45 cm
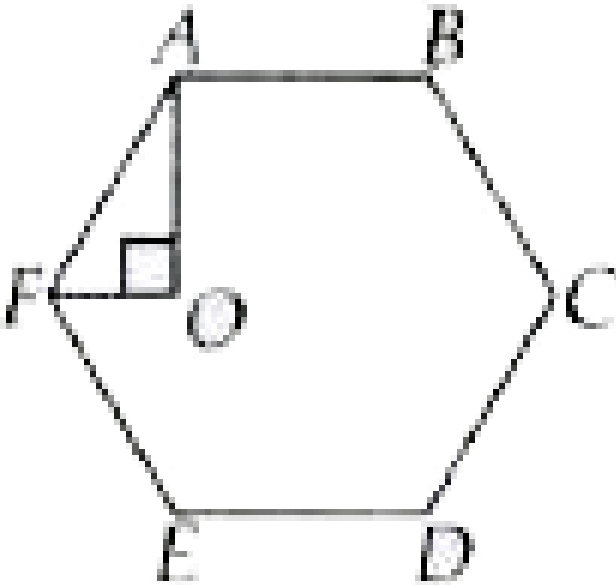
Answer: C

3. In the given figure, ABCDEF is a regular hexagon and $\angle AOF = 90°$. FO is parallel to ED. What is the ratio of the area of the triangle AOF to that of the hexagon ABCDEF?

A. $\dfrac{1}{12}$

B. $\dfrac{1}{6}$

C. $\dfrac{1}{24}$

D. $\dfrac{1}{8}$

Answer: A

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4. The diagonals of rectangle ABCD intersect each other at O. If $\angle BOC = 44°$, then the value of $\angle OAD$ will be

A. $120°$

B. $68°$

C. $90°$

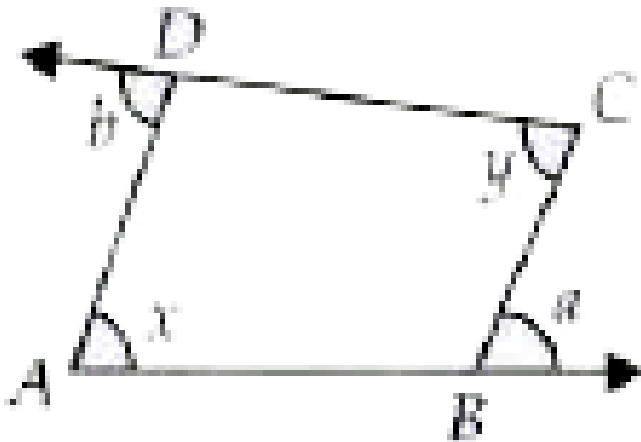D. $44°$

Answer: B

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5. Sides AB and CD of a quadrilateral ABCD are extended as in figure. Then a + b is equal to
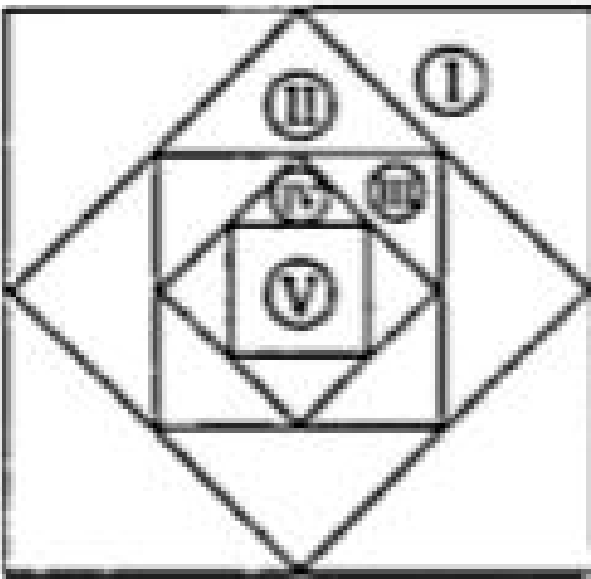
A. x+2y

B. x-y

C. x+y

D. 2x+y

Answer: C

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6. In the figure shown square II is formed by joining the

mid-points of square I

and so on . In this way total five squares are drawn . The

sides of the square I is 'a' cm.

What is the perimeter of all the five squres ?

A. $\dfrac{\left(4\sqrt{2}+1\right)a}{\left(\sqrt{2}+1\right)}cm$

B. $\dfrac{5}{6}acm$

C. $\left(7+3\sqrt{2}\right)acm$

D. None of these

Answer: C

---

7. Shape made by the bisectors of angles of a parallelogram is

    A. Rectangle

    B. Square

    C. Circle

    D. Straight line

Answer: A

8. $\triangle ABC$ is an equilateral triangle, AB = 6. The points P, Q and Rare midpoints of AB, BC and CA respectively. The perimeter of PBCR is
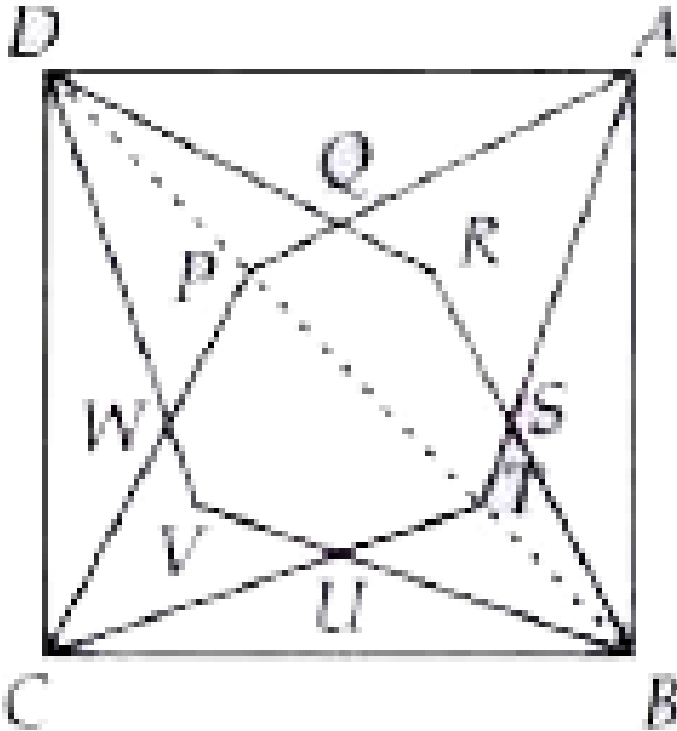
A. 18

B. 15

C. 9

D. 12

Answer: B

9. The figure below is made up of a square ABCD and two similar rhombuses, ATCP and DRBV. Given that $\angle BVD = 135°$, then find $\angle PCT$ and $\angle ABD$ respectively.

A. $135°$, $135°$

B. $135^\circ, 45^\circ$

C. $45^\circ, 135^\circ$
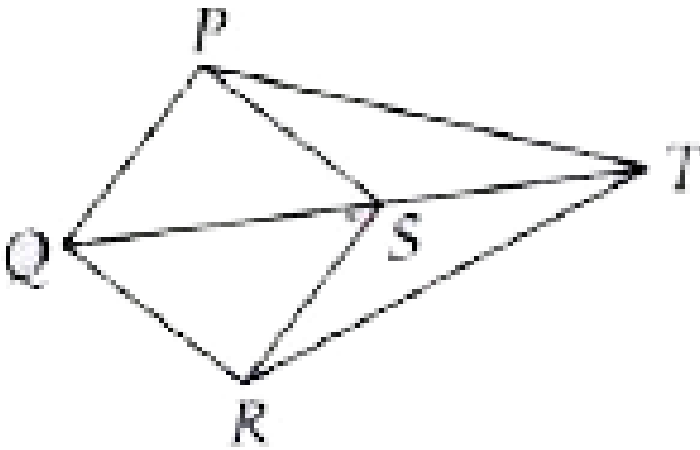
D. $45^\circ, 45^\circ$

Answer: D

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10. In the figure, PQ = QR = RS = SP = SQ = 6 cm and PT = RT = 14 cm. The length of ST (in cm) is

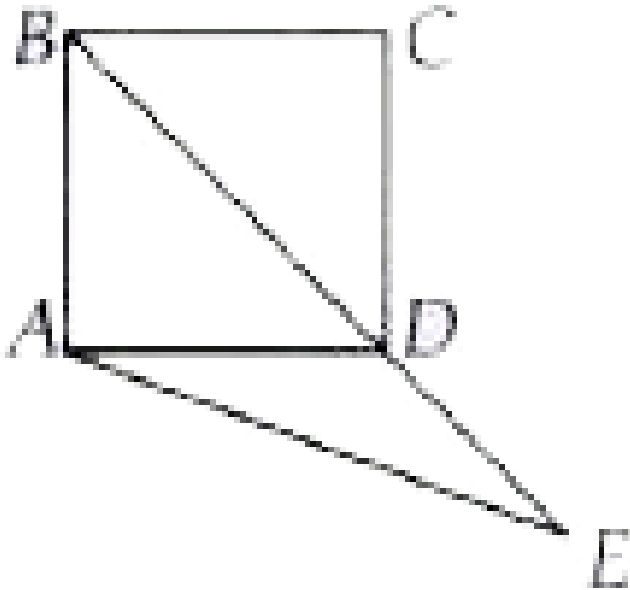A. $4\sqrt{10}$

B. $\left(7\sqrt{3} - 2\right)$

C. 10

D. 11

Answer: C

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11. In the following diagram, ABCD is a square, diagonal BD is extended through D to E. AD = DE and AE is drawn as given in figure. What is the measure of $\angle DAE$?

A. $45°$

B. $22.5°$

C. $135°$

D. 90°

Answer: B

> ▶ Watch Video Solution

12. If AP and BP are the bisectors of the angle A and angle B of a parallelogram ABCD, then value of the angle APB is

A. 30°

B. 45°

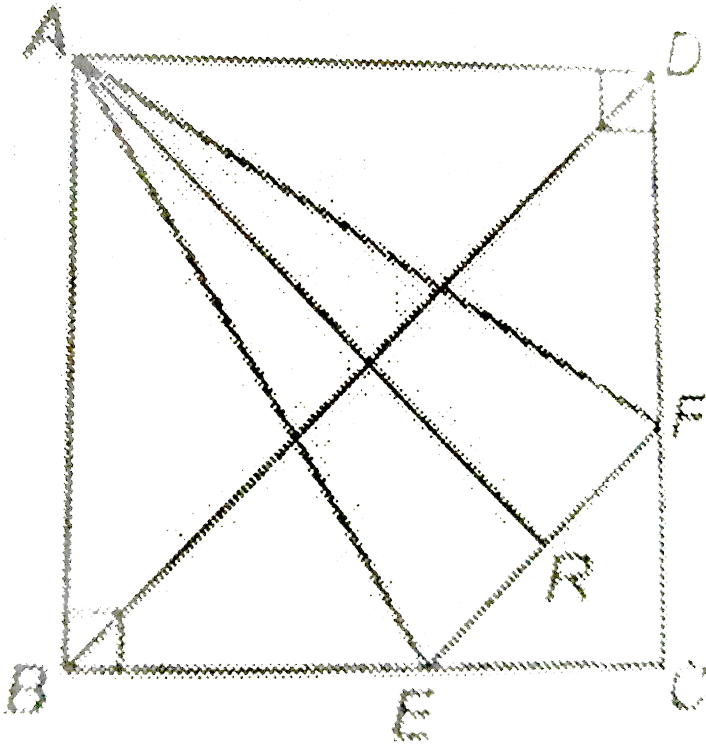C. 60°

D. 90°

Answer: D

13. ABCD is a square EF is parallel to BD. R is the mid-point of EF. Prove that :

(i) $BE = DF$

(ii) AR bisects angle BAD

(iii) If AR produced it will pass through C.

A. (i) only

B. (ii) only

C. Both (i) and (ii)

D. Neither (i) nor (ii)

Answer: C

14. Three statements are given below:

I. In a ‖gm, the angle bisectors of two adjacent angles enclose a right angle.

I. The angle bisectors of a ‖gm form a rectangle.

III. The triangle formed by joining the midpoints of the sides of an isosceles triangle is not necessarily an isosceles triangle.

Which is true?

    A. (i) only

    B. (ii) only

C. Both (i) and (ii)

D. Neither (i) nor (ii)

Answer: C

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15. In a rhombus of side 10 cm one of the diagonals is 12 cm long. Find the length of second diagonal.

A. 4 cm

B. 8 cm

C. 12 cm

D. 16 cm

Answer: D

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