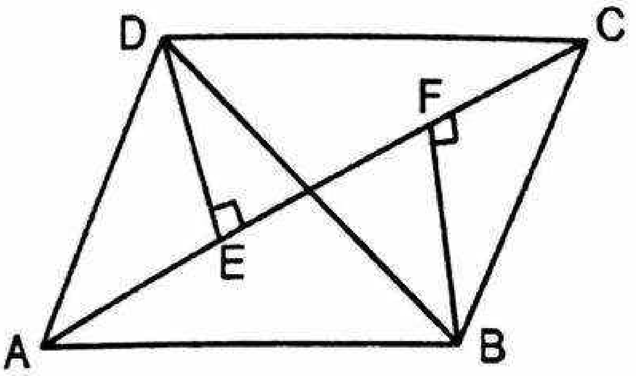
CHAPTER 11

QUADRILATERALS

A plane figure bounded by four line segments AB, BC,CD, and DA is called a quadrilateral. It is denoted by symbol '▭' i.e. ▭ ABCD.



pairs of consecutive (adjacent) angles:
$(\angle A, \angle B)$, $(\angle B, \angle C)$ $(\angle C, \angle D)$, $(\angle D, \angle A)$

pairs of adjacent sides :
(AB,BC), (BC,CD), (CD,DA) and (DA,AB)

Properties :

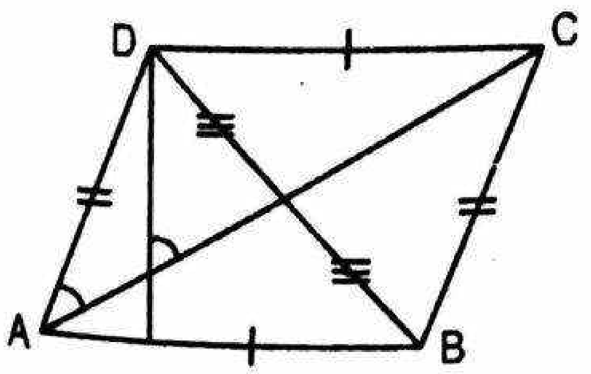
Sum of four interior angles is 360°.
i.e.DA +DB +DC +DD = 360°

The figure formed by joining the mid-points of a quadrilateral is a parallelogram.

Area of ▭ABCD = $\frac{1}{2} AC \times (DE + BF)$

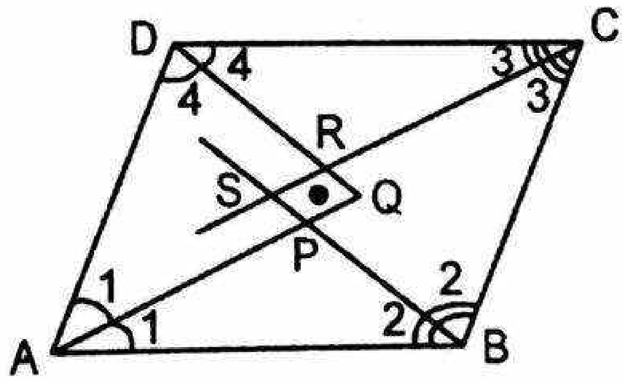
Types of Quadrilaterals :

1. **Parallelogram(||gm) :** A quadrilateral whose opposite sides are parallel.



Properties :

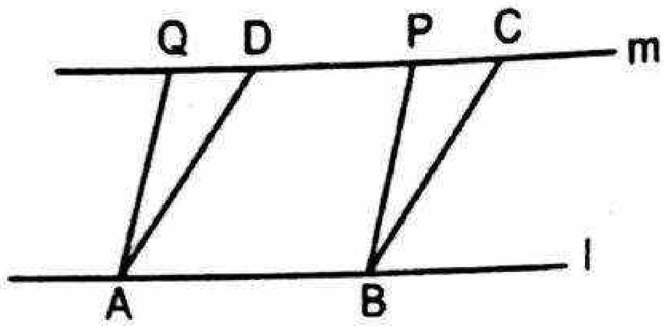
1. The opposite sides are equal and parallel.
2. Opposite angles are equal.($\angle A = \angle C$) and ($\angle B = \angle D$)
3. Sum of any two adjacent angles is 180°.
4. Diagnonals bisecet each-other.
5. Diagonals need not be equal in length.
6. Diagonals beed not bisect at right angle.
7. Each diagonal divides a ||gm into two congruent triangles.
   i.e. $\Delta ABC \cong \Delta ADC$ and $\Delta ABD \cong \Delta BCD$.
8. Bisectors of the angles of a ||gm form a <u>rectangle.</u>
   i.e. PQRS is a rectangle.



9. A ||gm inscribed in a circle is a rectangle.
10. A ||gm circumscribed about a circle is a rhombus.
11. $AC^2 + BD^2 = AB^2 + BC^2 + CD^2 + AD^2$
    $= 2(AB^2 + BC^2)$
12. Area of ||gm ABCD = Base × height
    = AB × h
    = AB × AD Sinq

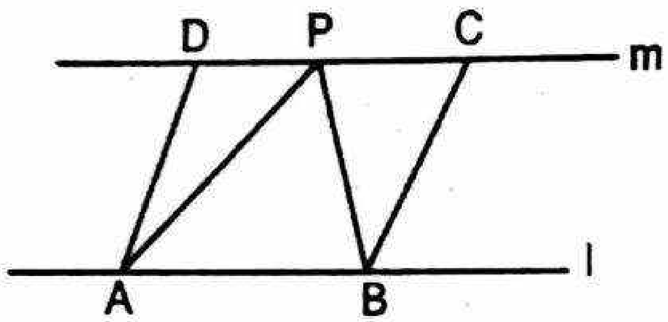
13. A ||gm is a rectangle if its diagonals are equal.

14. ||gm that lie on the same base and between the same parallel lines are equal in area, i.e.



if l || m, then ar(▭ABCD)= ar(▭ABPQ)

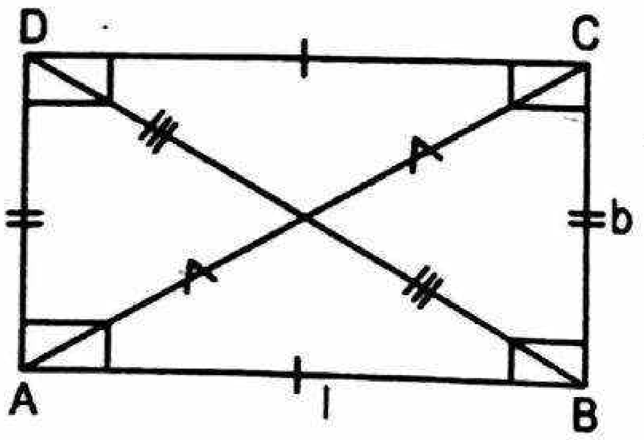
15. if l || m, and ||gm ABCD and Δ APB made on the same base AB then,



ar(Δ APB) $= \frac{1}{2} ar$ (▭ABCD)

16. A ||gm is a rectangle if its diagonals are equal.

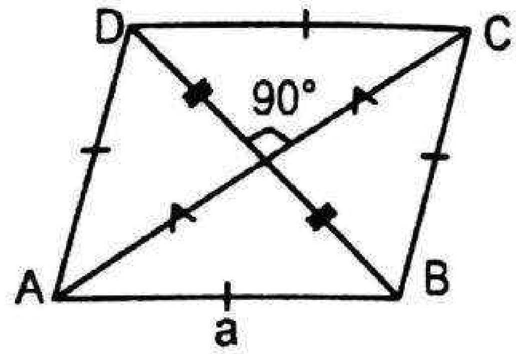
2. **Rectangles:** A rectangle is a ||gm with all angles 90°



Properties :

1. Diagonals are equal and bisect each other, but not necessarily at right angles.
2. For the given perimeter of rectangles, a square has maximum area.
3. The figure formed by joining the mid-points of the adjacent sides of a rectangle is rhombus.
4. Area of rectangle ABCD = length × breadth = $l \times b$
5. Diagonals of a rectangle = $\sqrt{l^2 + b^2}$
6. Bisectors of the angles of a rectangle (a ||gm) form another rectangle.

3. **Rhombus:** A ||gm having all the sides equal is a "rhombus".



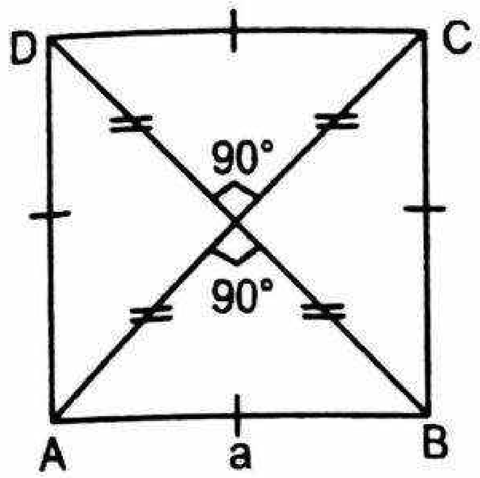
Properties :

1. AB = BC = CD = DA = a (say)
2. Diagonals bisect each other at right angle, but they are not necessarily equal.
3. A rhombus may or may not be a square but all squares are rhombus.
4. The figure formed by joining the mid-points of the adjacent sides of a rhombus is a rectangle.
5. A ||gm is a rhombus if its diagonals are perpendicular to each other.
6. (a) Area of rhombus = $\frac{1}{2} \times$ product of diagonals = $\frac{1}{2} \times d_1 d_2$

   (b) Area of rhombus = Product of adjacent sides × sine of the include angle.
7. AC = d_1 and BD = d_2 (say) then, $d_1^2 + d_2^2 = AB^2 + BC^2 + CD^2 + DA^2 \Rightarrow d_1^2 + d_2^2 = 4a^2$
8. A rhombus is a square if its diagonals are equal.

   i.e. if d1 = d2 $\Rightarrow$ ABCD is a square.

4. **Square:** A square is a rectangle with adjacent sides equal or a rhombus with each angle 90°.



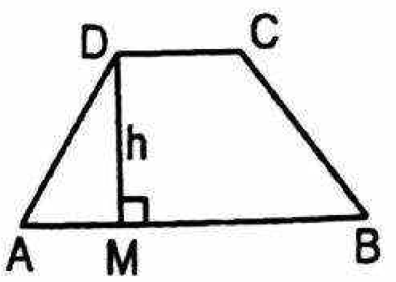
Properties :

1. AB = BC = CD = AD = a (say)

   $\& \angle A = \angle B = \angle C = \angle D = 90°$
2. Diagonals are equal and bisect each other at right angle.
3. The figure formed by joining the mid-points of the adjacent sides of a square is a square.
4. Area = (side)² = $a^2 = \frac{d^2}{2}$,and

   diagonal(d) = $a\sqrt{2}$.

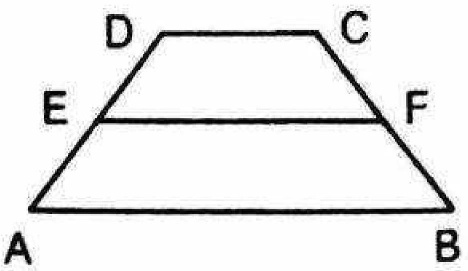
5. **Trapezium:** A trapezium is a quadrilateral with only two sides parallel to each other.



Properties :

1. $\angle A + \angle D = \angle B + \angle C = 180°$
2. If E and F are the mid-points of two non-parallel sides AD and BC respectively, then -

   Median(EF) $= \frac{1}{2}(AB + DC)$

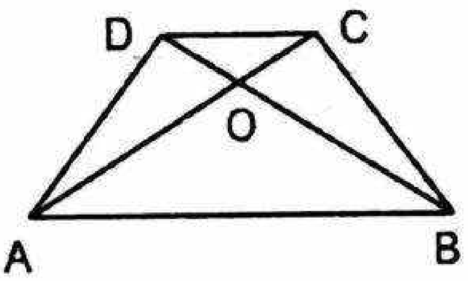


3. Area of rtapezium $= \frac{1}{2}$ (sum of parallel sides) × height

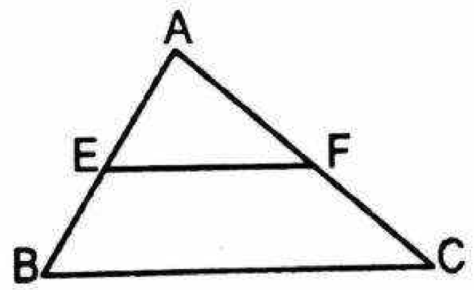
   $= \frac{1}{2} \times (AB + CD) \times DM$

   $= \frac{1}{2}(AB + CD) \times h$
4. Sum of square of diagonals = (sum of squares of non-parallel side) + 2(product of || sides)

   i.e. $AC^2 + BD^2 = BC^2 + AD^2 + 2AB.CD$
5. By joining the mid-points of adjacent sides of a trapezium four similar traignles are obtained.
6. $\frac{AO}{OC} = \frac{BO}{OD}$



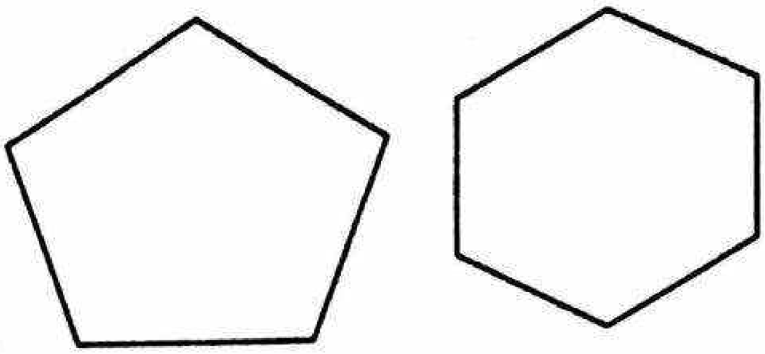
The mid-point Theorem -



E and F are the mid-points of side AB and AC respectively then,

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

PLYGONS:- A closed-figure bounded by three or more than three straight lines.

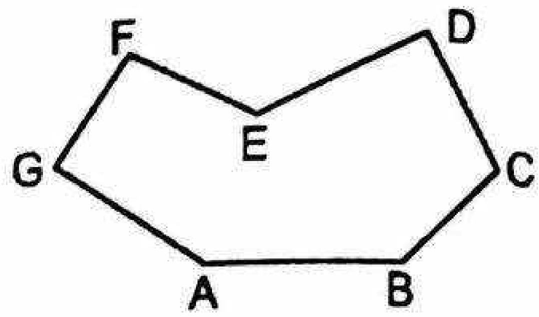


e.g. **No. of sides**	**Name**
3	Triangle
4	Quadrilateral
5	Pentagon
6	Hexagon
7	Heptagon
8	Octogon
9	Nonagon
10	Decagon

Convex Polygon:- A ploygon in which none of its interior angle is more than 180°, is known as a 'convex poygon'.

e.g.

Concave Polygon:- A polygon in which atleast one interior angle is more than 180°, then it is said to be 'concave'.



Regular Polygon:- A polygon in which all the sides are equal and also the interor angles are equal, is called a 'Regular polygon'.

if n = total no. sides of a regular polygon, then -

1. Sum of interor angles = $(n-2) \times 180°$
2. Each exterior angle $= \left(\dfrac{360°}{n}\right)$
3. Sum of all exterior angle = 360°
4. Each interior angle = 180°- exterior angle
   $\Rightarrow$ interior angle + exterior angle = 180°
5. Number of diagonals $= \dfrac{n(n-3)}{2}$

Exercise
LEVEL - 1

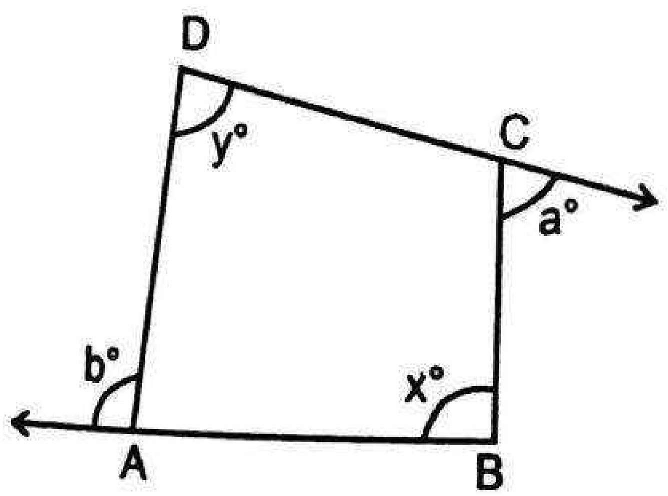
1. In which of the following is the lengths of diagonals equal ?
(a) Rhombus (b) Rectangle
(c) Parallelogram (d) Trapezium

2. How many diagonals are there in a octagon ?
(a) 10 (b) 14
(c) 18 (d) 20

3. A polygons has 44 diagonals. The number of sides of the polygon is :
(a) 11 (b) 10
(c) 13 (d) 12

4. The angles of a quadrilateral are in the ratio 1 : 2 : 3 : 4, the largest angle is :
(a) 120° (b) 134°
(c) 144° (d) 150°

5. The sides BA and DC of a quadrilateral ABCD are produced as shown in figure. Then the true statement is :



(a) $x^\circ + y^\circ = a^\circ + b^\circ$
(b) $x^\circ + a^\circ = y^\circ + b^\circ$
(c) $2x^\circ + y^\circ = a^\circ + b^\circ$
(d) $x + \frac{1}{2}y^\circ = \frac{a^\circ + b^\circ}{2}$

6. Each interior angle of a regular polygon is 120°. The number of sides is :
(a) 7 (b) 6
(c) 5 (d) 8

7. Each interior angle of a regular octagon is :
(a) 120° (b) 90°
(c) 135°
(d) None of these

8. ▱ABCD is a ||gm, AB = 14cm, BC = 18cm and AC = 16cm. Find the length of the other diagonal ?
(a) 30cm (b) 32cm
(c) 26cm (d) 28cm

9. If ABCD is a rhombus, then :
(a) $AC^2 + BD^2 = 4AB^2$
(b) $AC^2 + BD^2 = AB^2$
(d) $AC^2 + BD^2 = 2AB^2$
(d) $2(AC^2 + BD^2) = 3AB^2$

10. The ratio of the measure of an angle of a regular octagon to the measue of its exterior angle is :
(a) 1 : 3 (b) 2 : 3
(c) 3 : 1 (d) 3 : 2

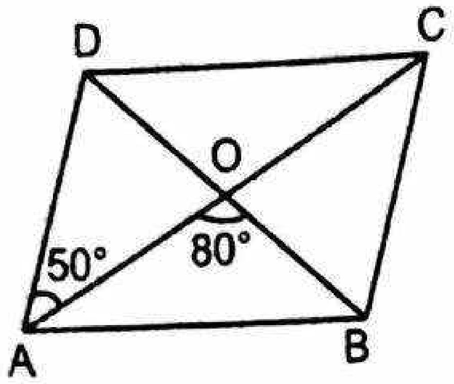
11. The sum of the interior angles of polygon is 1440°. the number of sides of the polygon is :
(a) 9 (b) 10
(c) 8 (d) 12

12. Two parallelograms stand on equal bases and between th same parallels. The ratio of their areas is :
(a) 1 : 1 (b) $\sqrt{2}:1$
(c) 1 : 3 (d) 1 : 2

13. The length of a side of a rhombus is 13cm and one of its diagonal is 24cm. The length of the other diagonal is:
(a) 14cm (b) 12cm
(c) 20cm (d) 10cm

14. The sum of all exterior angles of a convex polygon of n sides is :
(a) 4 right angle
(b) $\frac{2}{n}$ right angle
(c) (2n - 4)right angle
(d) $\frac{n}{2}$ right angle.

15. The diagonals AC and BD of a | |gm ABCD intersect each other at the point O such that $\angle$ DAC = 50° and $\angle$ AOB = 80°. Then $\angle$ DBC = ?



(a) 50° (b) 40°
(c) 45° (d) 30°

16. The perimeter of a | |gm is 22cm. If the longer side measures 6.5cm. What is the measure of the shorter side?
(a) 5.5cm (b) 4.5cm
(c) 6.0cm (d) 5.0cm

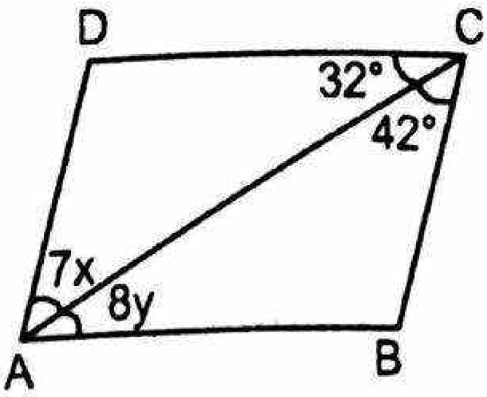
17. If an angle of a | |gm is two-third of its adjacent angle, then the largest angle of | |gm :
(a) 72° (b) 60°
(c) 108° (d) 120°

18. The figure formed by joining the mid-points of the adjacent sides of a rectangle is a :
(a) square (b) rhombus
(c) rectangle (d) trapezium

19. The bisectors of the angles of a | |gm enclosed a :
(a) rectangle (b) rhombus
(c) square (d) trapezium

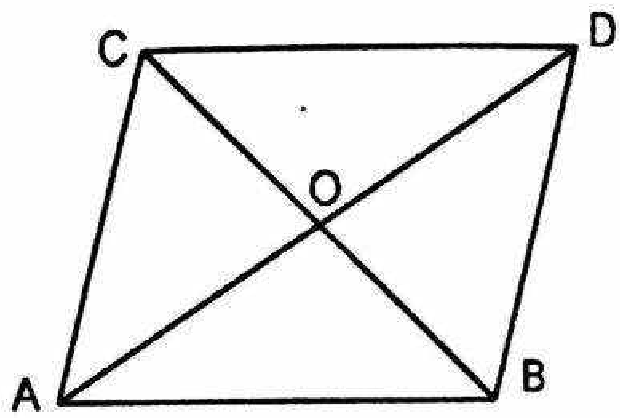
20. If ABCD is | |gm with two adjacent angles A and B equal ot each other, then the | |gm is a :
(a) square (b) rhombus
(c) rectangle
(d) both (a) and (c)

21. In the adjoining figure, the value of x and y are :



(a) 6, 4 (b) 5, 4
(c) 4, 5
(d) None of these

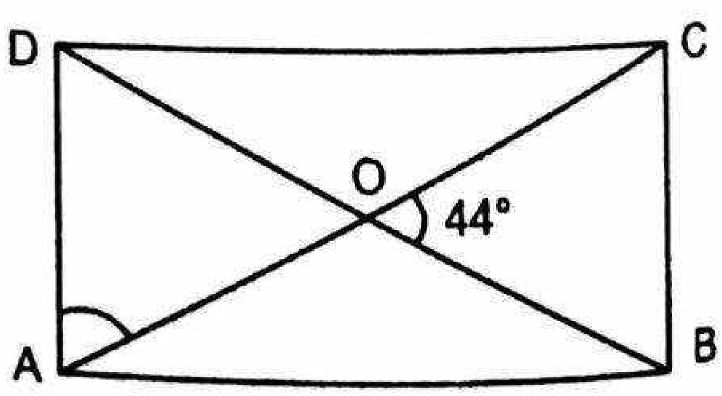
22. In the given figure, ABCD is a | |gm in which diagonals AC and BD intersect at O. If ar(| |gm ABCD) is 56cm², then the ar(Δ OAB) = ?



(a) 28cm² (b) 22cm²
(c) 42cm² (d) 14cm²

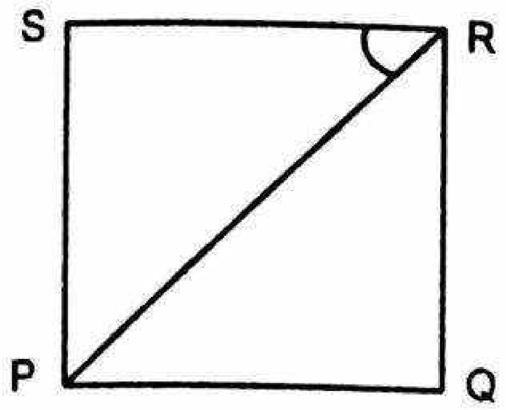
23. If the diagonals of a quadrilateral bisect each other and are perpendicular, the quadrilateral is :
(a) rhombus (b) rectangle
(c) square (d) trapezium

24. The diagonals of rectangle ABCD meet at O. If $\angle$ BOC = 44°, then $\angle$ OAD is equal to :



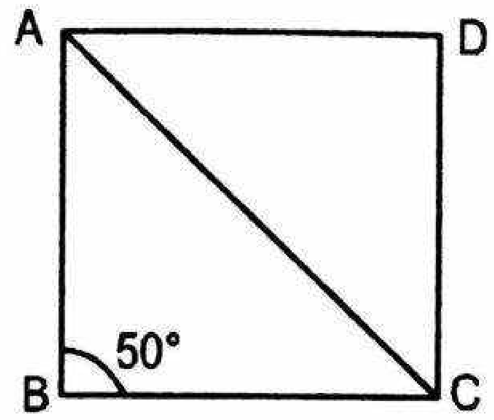
(a) 90° (b) 60°
(c) 100° (d) 68°

25. PQRS is a square. The $\angle$ SRP is equal to :



(a) 90° (b) 45°
(c) 100° (d) 60°

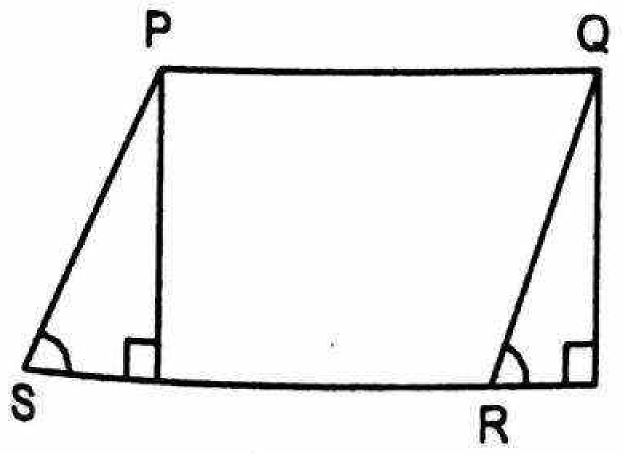
26. ABCD is a rhombus with $\angle$ ABC = 50°, then $\angle$ ACD is :



(a) 50° (b) 90°
(c) 65° (d) 70°

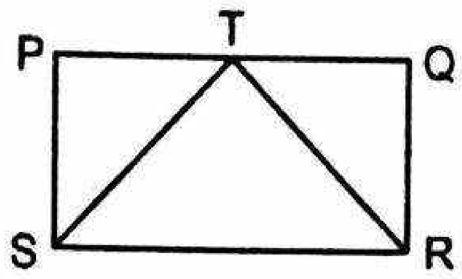
27. One angle of a pentagon is 140°. If the remaining angles are in the ratio 1 : 2 : 3 : 4, the size of the greatest angle is :
(a) 150° (b) 180°
(c) 160° (d) 170°

28. PQRS is a | |gm. PX and QY are respectively, the perpendicular from P and Q to SR and SR produced. Then PX is equal to :



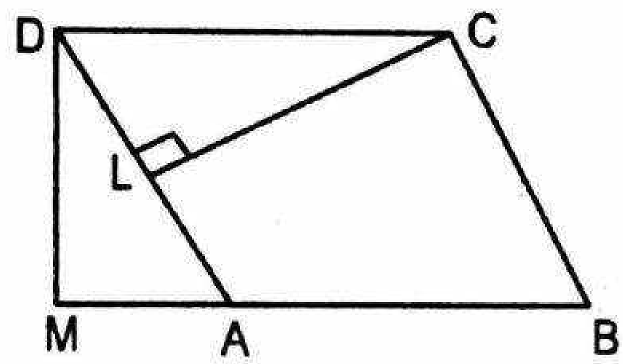
(a) QY (b) 2QY
(c) $\frac{1}{2}QY$ (d) XR

29. In the given figure, what is the ratio of the area of the D STR to the area of the rectangle PQRS ?



(a) 1 : 4 (b) 1 : 2
(c) 1 : 3 (d) 2 : 1

30. ABCD is a | |gm $CL \perp AD$ and $DM \perp BA$. If CD = 16 units, DM = 12 units and CL=15units, then AD =?



(a) 12.8 units (b) 13.6 units
(c) 11.1 units (d) 12.4 units

31. If a square and a rhombus stand on the same base and between two parallel lines then the ratio of the areas of the square and the rhombus is :
(a) 2 : 1 (b) 1 : 4
(c) 1 : 4 (d) 1 : 1

32. If area of a | |gm with sides a and b is A and that of a rectangle with sides a and b is B, then :
(a) A > B (b) A < B
(c) A = B
(d) none of these.

33. In a trapezium ABCD, if AB || CD, then $AC^2 + BD^2$ is equal to :
(a) $BC^2 + AD^2 + 2AB.CD$
(b) $AB^2 + CD^2 + 2AD.BC$
(c) $AB^2 + CD^2 + 2AB.CD$
(d) $BC^2 + AD^2 + 2BC.AD$

34. ABCD is a quadrilateral in which diagonal BD = 64cm, AL ⊥ BD, such that AL = 13.2cm and CM = 16.8cm.The area of the quadrilateral ABCD in square centimetres is :
(a) 422.4 (b) 690.0
(c) 537.6 (d) 960.0

35. Each interior angle of a regular polygon is 144°. The number of sides of the polygon is :
(a) 8 (b) 10
(c) 10 (d) 11

36. ABCD is cyclic trapezium whose sides AD and BC are parallel to each other. If ∠ABC = 72°, then the measure of the ∠BCD is :
(a) 162° (b) 18°
(c) 108° (d) 72°

37. If an exterior angle of a cyclic quadrilateral be 50°, then the interior opposite angle is :
(a) 130° (b) 40°
(c) 50° (d) 90°

LEVEL - 2

1. Any cyclic parallelogram having unequal adjacent sides is necessarily :
(a) square (b) rectangle
(c) rhombus (d) Trapezium

2. In a quadrilateral ABCD, AO and BO are the bisectors of ∠A and ∠B respectively, then ∠AOB is equal to:
(a) ∠C + ∠D
(b) 2∠C + 2∠D
(c) $\frac{1}{2}(\angle C + \angle D)$
(d) $\frac{1}{2}(\angle C - \angle D)$

3. In a parallelogram ABCD, AO and BO are th bisectors of ∠A and ∠B respectively, then ∠AOB is equal to:
(a) 60° (b) 120°
(c) 100° (d) 90°

4. The angle bisectors of a parallelogram form a :
(a) rectangle (b) rhombus
(c) square (d) trapezium

5. The measures of the angles of a quadrilateral taken in order are proportionates to :
(a) parallelogram (b) trapazium
(c) rectangle (d) rhombus

6. If one of the interior angles of a regular polygon is equal to 5/6 times of one of the interior angles of a regular pentagon, then the no. of sides of the polygon :
(a) 3 (b) 4
(c) 6 (d) 8

7. The sum of all the interior angles of a regular polygon is three times the sum of its exterior angles.
The polygon is :
(a) hexagon (b) decagon
(c) octagon (d) monagon

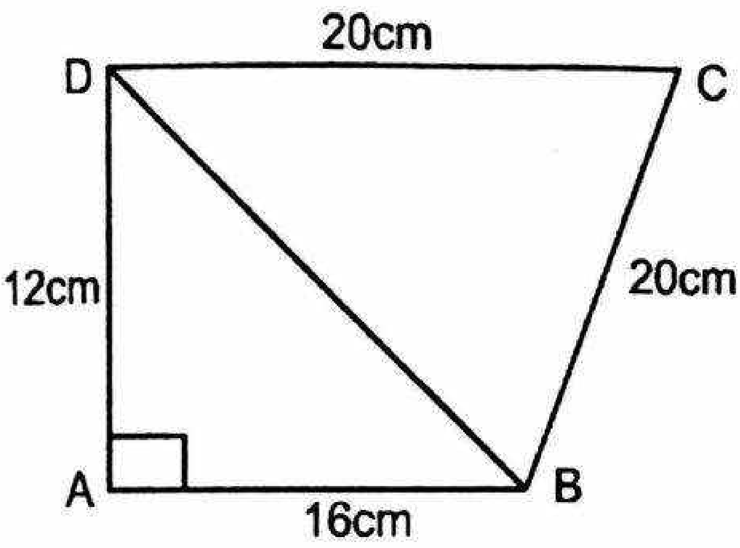
8. The ratio between the no. of sides of two regular polygon is 2 : 3 and the ratio between their interior angles is 6 : 7. The number of sides of these polygongs are respectively :

(a) 4, 8 (b) 8, 12
(c) 10, 15 (d) 6, 9

9. Difference between the interior and exterior angles of regular polygon is 60°. The number of sides in the polygon is :

(a) 5 (b) 6
(c) 8 (d) 9

10. Find the area of ABCD :



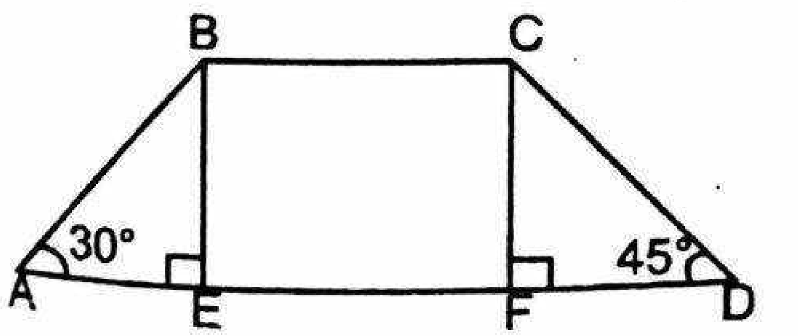
(a) $4(24+25\sqrt{3})cm^2$

(b) $4(25+24\sqrt{3})cm^2$

(c) $2(24+25\sqrt{3})cm^2$

(d) None of these

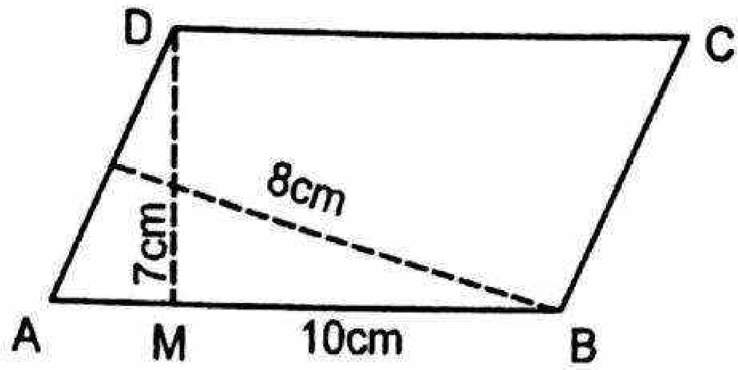
11. In the trapezium ABCD, $\angle$BAE = 30°, $\angle$CDF = 45° BC = 6cm and AB = 12cm. Find the area of trapezium:



(a) $18(3+\sqrt{3})cm^2$ (b) $36\sqrt{3}cm^2$

(c) $12(3+2\sqrt{3})cm^2$ (c) None of these

12. In ||gm ABCD, AB = 10cm. The altitude corresponding to the sides AB and AD are 7cm and 8cm respectively. Find AD :



(a) 8.50cm (b) 8.25cm
(b) 8.75cm (d) 9.00cm

13. ABCD is a trapezium in which AB || DC and AB = 8cm, BC = 10cm, CD = 12cm, AD = 16cm, then $AC^2 + BD^2$ is equal to :

(a) 458cm² (b) 448cm²
(b) 546cm² (d) 548cm²

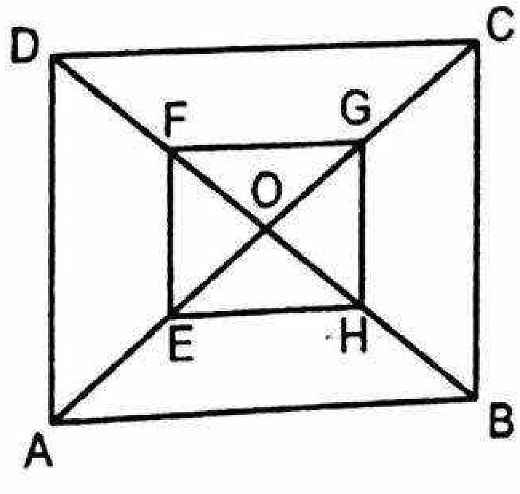
14. A regular polygon is inscribed in a circle. If a side subtends an angle of 36° at the centre, then the number of sides of the polygon is :

(a) 5 (b) 10
(c) 12 (d) 9

15. If O is a point within a rectangle ABCD then :

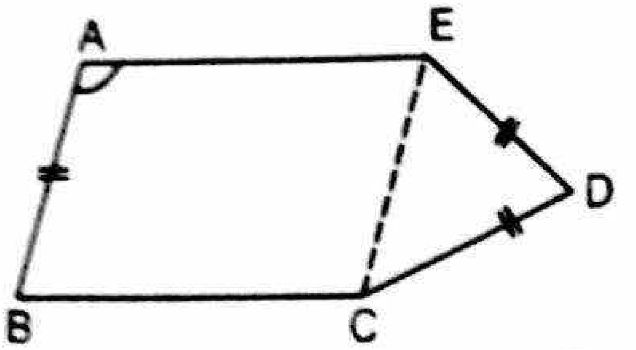
(a) $OA^2 + OC^2 = OB^2 + OD^2$
(b) $OA^2 + OB^2 = OC^2 + OD^2$
(c) OA + OC = OB + OD
(d) OA × OC = OB × OD

16. In the given figure, ABCD is a ||gm and E, F, G, H are the mid-points of AO, DO, CO and BO respectivelyx then $\frac{EF+FG+GH+HE}{AD+DC+CB+BA} = ?$



(a) 1 : 1 (b) 1 : 2
(c) 1 : 3 (d) 1 : 4

17. In the given figure AE = BC and AE || BC and the three sides AB, CD and ED are equal in length. If $\angle A = 102°$, find measure of $\angle BCD$:



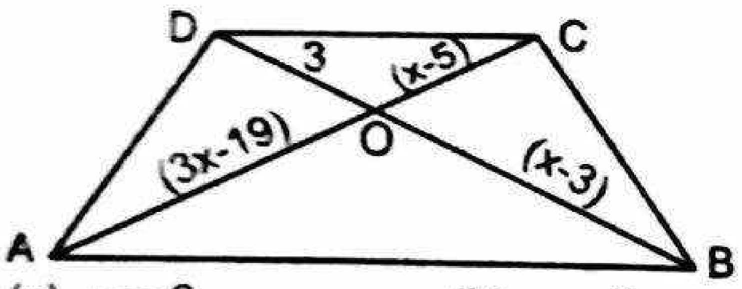
(a) 138° (b) 162°
(c) 88°
(d) None of these

18. If ABCD is a rectangle. P, Q are the mid-points of BC and AD respectively and R is any point on PQ, then DARB equals :

(a) $\frac{1}{6}$(□ABCD) (b) $\frac{1}{3}$(□ABCD)

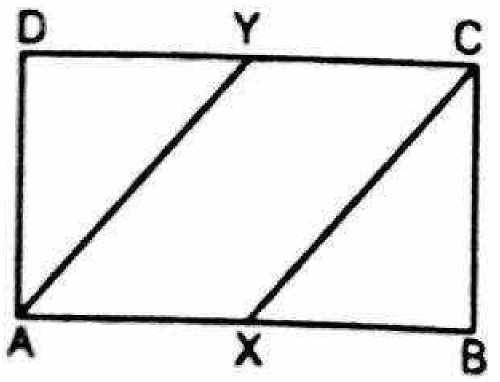
(c) $\frac{1}{4}$(□ABCD) (d) $\frac{1}{2}$(□ABCD)

19. In the given figure, AB || CD, find the value of x :



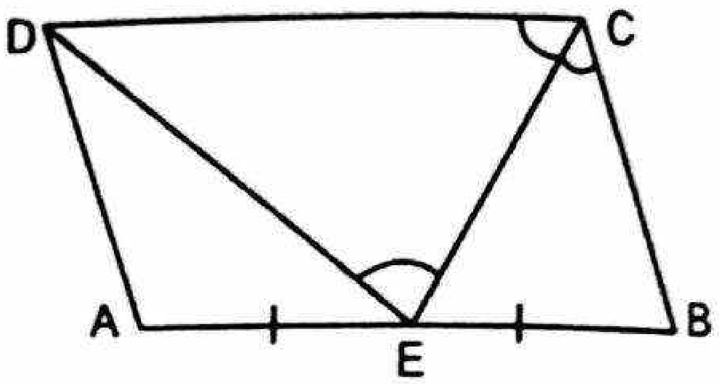
(a) $x = 8$ (b) $x = 9$
(b) $x = 8$ or 9 (d) $x = 10$

20. ABCD is a ||gm and X, Y are the mid-points of sides AB and CD respectively. Then quadrilateral AXCY is :



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

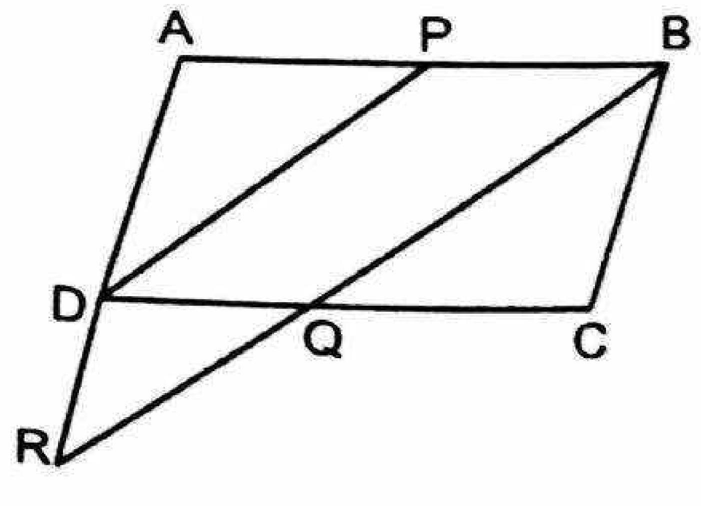
21. ABCD is A ||gm, E is the mid-point of AB and CE bisects $\angle BCD$. Then $\angle DEC$ is :



(a) 60° (b) 90°
(c) 100° (d) 120°

22. The difference between an exterior angle of (n - 1) sided regular polygon and an exterior angle of (n + 2) sided regular polygon is 6°, then the value of n is :
(a) 15 (b) 14
(c) 12 (d) 13

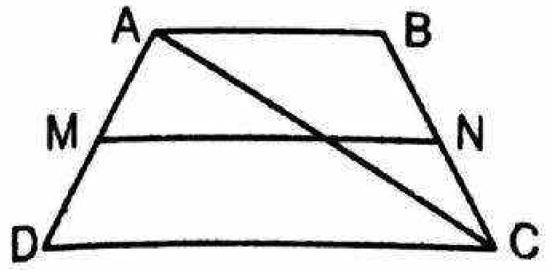
23. P is a mid-point of sideAB to a ||gm ABCD. A line through B parallel to PD meets DC at Q and AD produced at R. Then BR is equal to :



(a) BQ (b) $\frac{1}{2}$BQ

(c) 2BQ
(d) None of these

24. ABCD is a trapezium in which AB || CD. M and N are the mid-points of AD and BC respectively. If AB = 14cm and MN = 15cm, find CD.

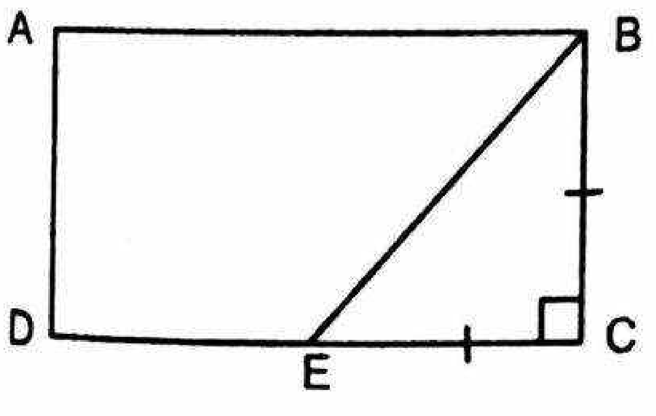


(a) 16 cm (b) 18cm
(c) 8 cm (d) 10cm

25. In a quadrilateral ABCD, $\angle B = 90°$, and $AD^2 = AB^2 + BC^2 + CD^2$. Then $\angle ACD$ is equal to :
(a) 60° (b) 90°
(c) 30° (d) 45°

26. ABCD is a square, F is the mid-point of AB and E is a point on BC such that BE is one-third of BC. If area of D FBE = $147m^2$, then the length of AC is :
(a) $21\sqrt{2}$ m (b) 63m
(c) $63\sqrt{2}$ m (d) $42\sqrt{2}$ m

27. the diagram below, ABCD is a rectangle. The area of isosceles right DBCE is 14, and DE = 3EC. What is area of ABCD ?

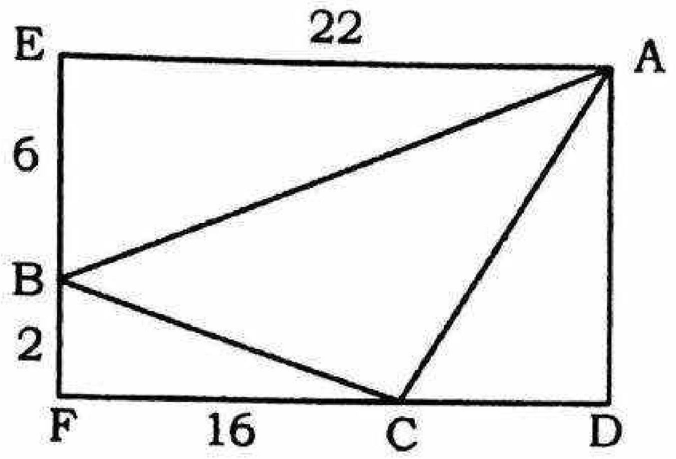


(a) 56 (b) 84
(c) 112 (d) $3\sqrt{28}$

28. In the quadrilateral ABCD

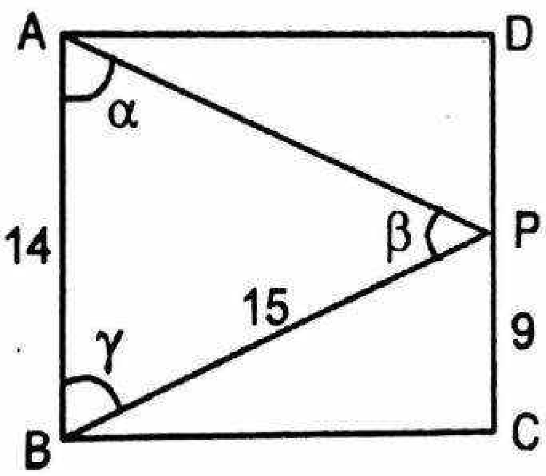
AB + BC + CD + DA is :
(a) greater than 2BD
(b) less than 2BD
(c) equal to 2BD
(d) none of these

29. In the given figure EADF is a rectangle and ABC is a triangle whose vertices lie on the sides of EADF. AE = 22. BE = 6, CF = 16 and BF = 2. Find the length of the line joining the mid-points of the sides AB and BC.



(a) 4 (b) 5
(c) 3.5 (d) $4\sqrt{2}$

30. ABCD is a rectangle, PC = 9cm, BP = 15cm, AB = 14cm. Then the angles of D APB are such that :



(a) a > b > g (b) a > g > b
(c) b > g > a (d) a > g > a

31. If a regular polygon has each of its angles equal to $\frac{3}{5}$ times of two right angles, then the nubmber of sides is
(a) 3 (b) 5
(c) 6 (d) 8

32. If each interior angle is double of each exterior angle of of a regualr polygon with n sides, then the value fo n is :
(a) 8 (b) 10
(b) 5 (d) 6

33. If the length of the side PQ of the rhombus PQRS is 6 cm and $\angle PQR$ = 120°, then the length of QS, in cm is
(a) 4 (b) 6
(c) 3 (d) 5

34. ABCD is a square. M is the mid-point of AB and N is the mid-point of BC. DM and AN are joined and they meet at O. Then which of the following is correct ?
(a) OA : OM = 1 : 2
(b) AN = MD
(c) $\angle ADM = \angle ANB$
(d) $\angle AMD = \angle BAN$

35. The side AB of a parallelogram ABCD is produced to E in such way that BE = AB. DE intersects BC at Q.The point Q divides BC in the ratio :
(a) 1 : 2 (b) 1 : 1
(c) 2 : 3 (d) 2 : 1

36. Each interior angle of a regular polygon is 18° more than eight times an exterior angle. The number of sides of the polygon is :
(a) 10 (b) 15
(c) 20 (d) 25

37. Measure of each interior angle of a regular polygon can never be :
(a) 150° (b) 105°
(c) 108° (d) 144°

38. ABCD is a rhombus whose side AB = 4cm and $\angle ABC$ = 120°,then the length of diagonal BD is :
(a) 1cm (b) 2cm
(c) 3cm (d) 4cm

39. If the diagonals of a rhombus are 8 and 6, then the square of its sides is:
(a) 25 (b) 55
(c) 64 (d) 36

40. The ratio between the number of sides of two regular polygon is 1 : 2 and the ratio between their interior angles is 2 : 3. The number of sides of these polygons are respectively :
(a) 3, 6 (b) 5, 10
(c) 4, 8 (d) 6, 12

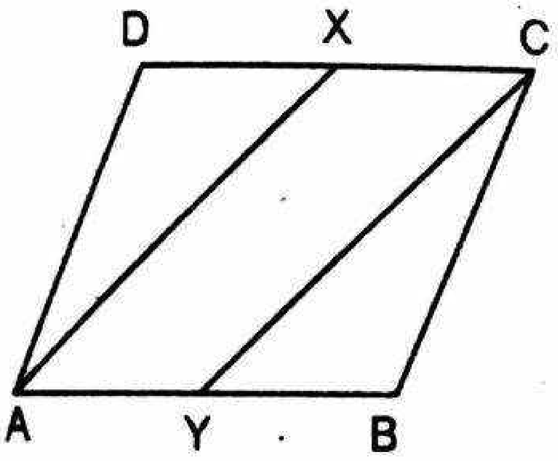
41. The parallel sides of a trapezium are in a ratio 2 : 3 and their shortest distance is 12cm. If the area of the trapezium is 480sq.cm.,the longer of the parallel sides is of length :
(a) 56cm (b) 36cm
(c) 42cm (d) 48cm

42. ABCD is a quadrilateral inscribed in a circle with centre O. If $\angle COD$ = 120° and $\angle BAC$ = 30°, then $\angle BCD$ is :
(a) 75° (b) 90°
(c) 120° (d) 60°

LEVEL - 3

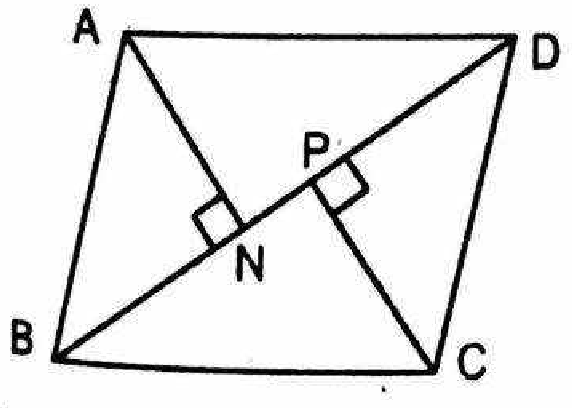
1. If ABCD is a ||gm and AC and BD be its diagonals, then :
   (a) $AB^2 + BC^2 + CD^2 + DA^2 = AC^2 - BD^2$
   (b) $AB^2 + BC^2 + CD^2 + DA^2 = AC^2 + BD^2$
   (c) $4AD^2 = 2AC^2 + 2BD^2$
   (d) $4AB^2 = 2AC^2 - 2BC^2$

2. In the given figure, ABCD is a ||gm and line segments AX, CY bisect the angles A and C respectively, then which one is true :



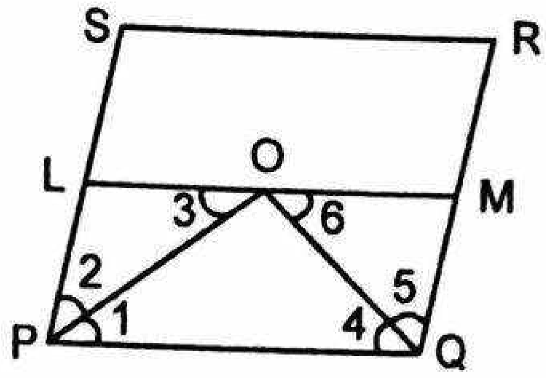
   (a) AX || CY
   (b) AX || CY is a trapezium
   (c) AX is not parallel to CY
   (d) None of these.

3. In the given figure, $AN \perp BD$ and $CP \perp BD$ and ABCD is a parallelogram, then :



   (a) AN ≠ CP (b) AN = CP
   (c) $AN = \frac{1}{2}CP$
   (d) none of these.

4. In the given figure, PQRS is a ||gm, PO and QO are respectively, the angle bisectors of ∠P and ∠Q. Line LOM is drawn parallel to PQ, then :



   (a) LO = 2OM
   (b) $LO = \frac{1}{2}OM$
   (c) LO = OM
   (d) None of these.

5. The diagonals of a ||gm ABCD intersect at O. A line through O intersects AB at X and DC at Y, then:
   (a) LO = 2OY
   (b) OX = OY
   (c) OY = 2OX
   (d) None of these.

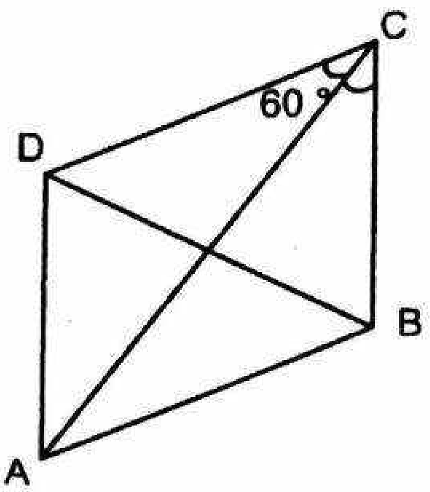
6. ABCD is a ||gm and ∠DAB = 60°. If the bisectors AP and BP of angles A and B respectively, meet at P on CD, then :
   (a) CP = 2DP
   (b) $CP = \frac{1}{2}DP$
   (c) $CP = \frac{1}{3}DP$
   (d) CP = DP

7. In a ||gm ABCD, the bisector of ∠A also bisects BC at X, then :
   (a) AD = 2AB (b) AD = AB
   (c) AD = 3AB
   (d) none of these

8. Diagonals of a | |gm are 8m and 6m respectively. If one of side is 5m, then the area of | |gm is :

(a) $18m^2$ (b) $30m^2$
(c) $24m^2$ (d) $48m^2$

9. ABCD is rhombus in which $\angle C = 60°$, then AC : BD = ?



(a) $\sqrt{3}:1$ (b) $\sqrt{3}:2$
(c) 3 : 1 (d) 3 : 2

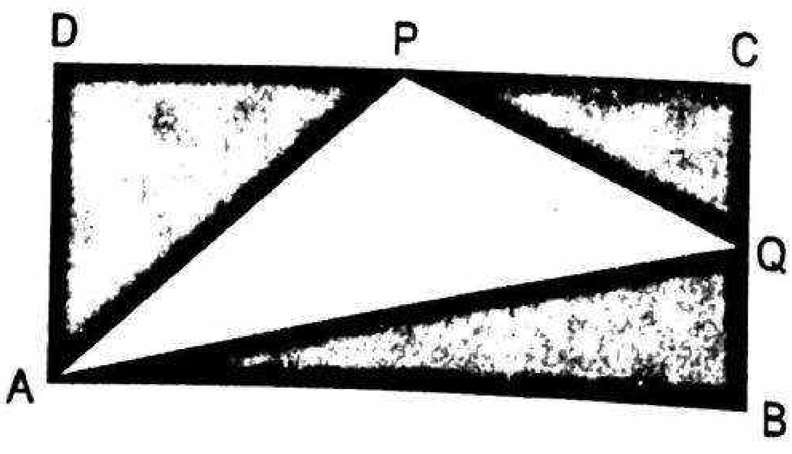
10. In a | |gm, the adjacent side are 36cm and 27cm in length. If thedistance betweenthe longer sides is 12cm, then the distance between the smaller sides is :

(a) 12 cm (b) 16 cm
(c) 14 cm (d) 15 cm

11. The length of the diagonal BD of the | |gm ABCD is 18cm. If P and Q are the centroid of D ADC, then length of PQ is :

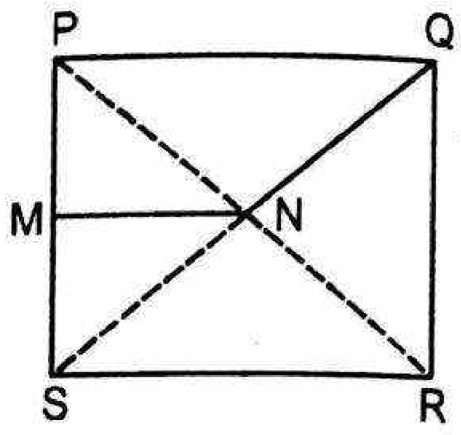
(a) 5.5 cm (b) 7cm
(c) 5 cm (d) 6cm

12. In the given figure, ABCD is a rectangle. P and Q are the mid-points of sides CD and BC respectively. Then the ratio of area of shaded portion : area of unshaded portion is :



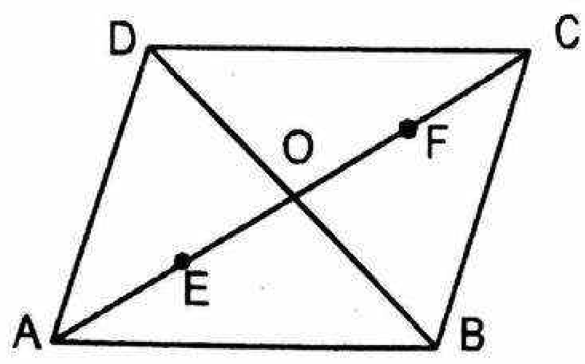
(a) 5 : 4 (b) 3 : 5
(c) 5 : 3 (d) 5 : 8

13. PQRS is a square, M is the mid-point of side PS and N is the intersecting point of its diagonals. Then the ratio Area (□PQNM) : Area (□PQRS) is :



(a) 5 : 8 (b) 3 : 8
(c) 1 : 4
(d) none of these

14. In the adjoining figure ABCD is a | |gm and E,F are the centroids of D ABD and D BCD respectively, then EF equals :

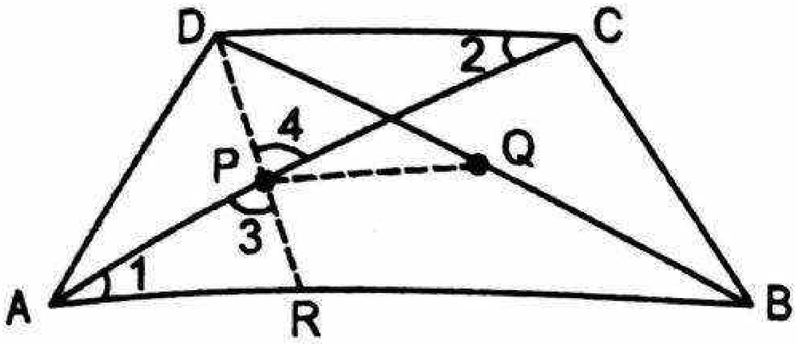


(a) AE (b) BE
(c) CE (d) DE

15. A square and a rhombus have the same base and the rhombus is inclined at 30°. What is the ratio of the area of the square to the area of the rhombus :

(a) $\sqrt{2}:1$ (b) 2 : 1
(c) 1 : 1 (d) $2:\sqrt{3}$

16. ABCD is a trapezium and P, Q are the mid-points of the diagonals AC and BD. Then PQ is equal to :

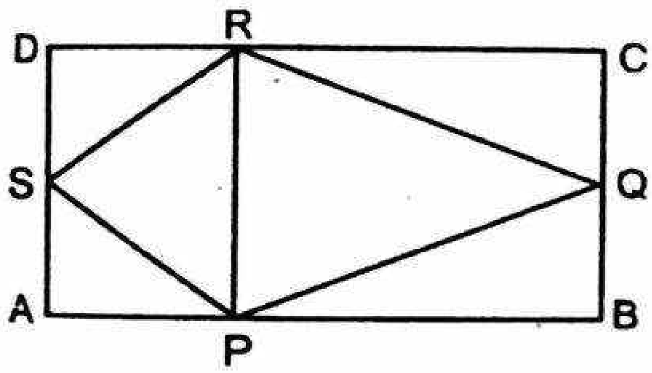


(a) $\frac{1}{2}(AB)$ (b) $\frac{1}{2}(CD)$

(c) $\frac{1}{2}(AB - CD)$

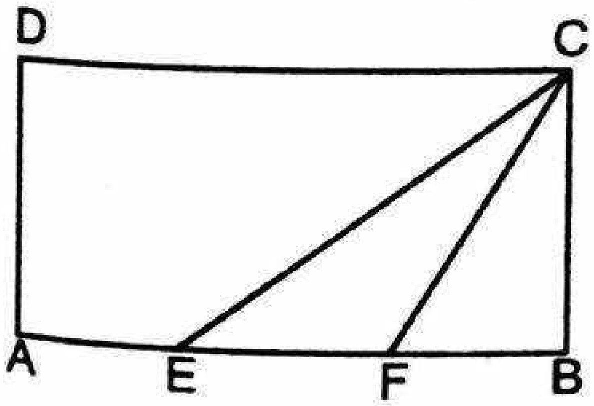
(d) $\frac{1}{2}(AB + CD)$

17. ABCD is a ||gm. P, Q, R and S are points on sides AB, BC, CD and DA respectively such that AP = DR. If the area of the ||gm ABCD is $20cm^2$, then the area of quadrilateral PQRS is :



(a) $10cm^2$ (b) $8cm^2$
(c) $12cm^2$ (d) $8.5cm^2$

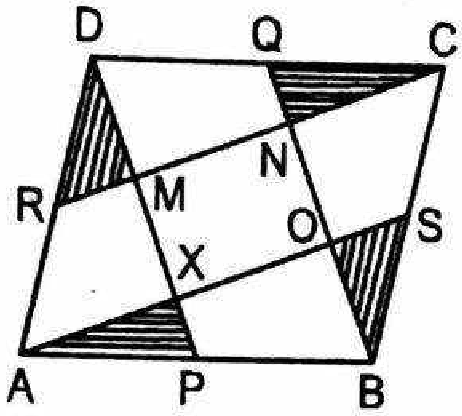
18. In the given figure, ABCD is a rectangle with AE = EF = FB. What is the ratio of the area of the area of the DCEF to that of the rectangle ?



(a) 2 : 5 (b) 2 : 3
(c) 1 : 4 (d) 1 : 6

19. In the ||gm ABCD, P,Q,R and S are mid-poits of sides AB, CD, DA and BC respectively. AS, BQ, CR and DP are joined. Find the ratio of the area of the shaded region to the area of the ||gm ABCD.

(a) 1/5 (b) 1/4
(c) 4/15 (d) 1/6



20. Side AB of rectangle of ABCD is divided into four equal parts by points x, y, z. The ratio of the

$$\frac{\text{area }(\Delta XYC)}{\text{Area(Recatanlge ABCD)}} \text{ is :}$$

(a) 1/7 (b) 1/6
(c) 1/9 (d) 1/8

21. In a quadrilateral ABCD, with unequal sides if the diagonals AC and BD intesect at right angles,then :

(a) $AB^2 + BC^2 = CD^2 + DA^2$
(b) $AB^2 + CD^2 = BC^2 + DA^2$
(c) $AB^2 + AD^2 = BC^2 + CD^2$
(d) $AB^2 + BC^2 = 2(CD^2 + DA^2)$

22. Two circles with centres A and B and radius 2 units touch each other externally at 'C'. A third circle with centre 'C' and radius '2' units meets other two at D and E. Then the area of the quadrilateral ABCDE is :

(a) $2\sqrt{2}$ sq.unit (b) $3\sqrt{3}$ sq.unit
(c) $3\sqrt{2}$ sq.unit (d) $2\sqrt{3}$ sq.unit

Hints and Solutions:

LEVEL-1

2.(d) no. of diagonals of a polygon of n sides

$$= \frac{n(n-3)}{2} = \frac{8(8-3)}{2} = 20$$

3.(a) $= \frac{n(n-3)}{2} = 44 \Rightarrow n(n-3) = 88$

$= 11 \times 8$

$\therefore$ n = 11

4.(c) angles be x, $2x$, $3x$, $4x$

$\therefore$ $x + 2x + 3x + 4x = 360° \Rightarrow 10x = 360° \Rightarrow x = 36°$

$\therefore$ largest angle = $4x$ = 144°

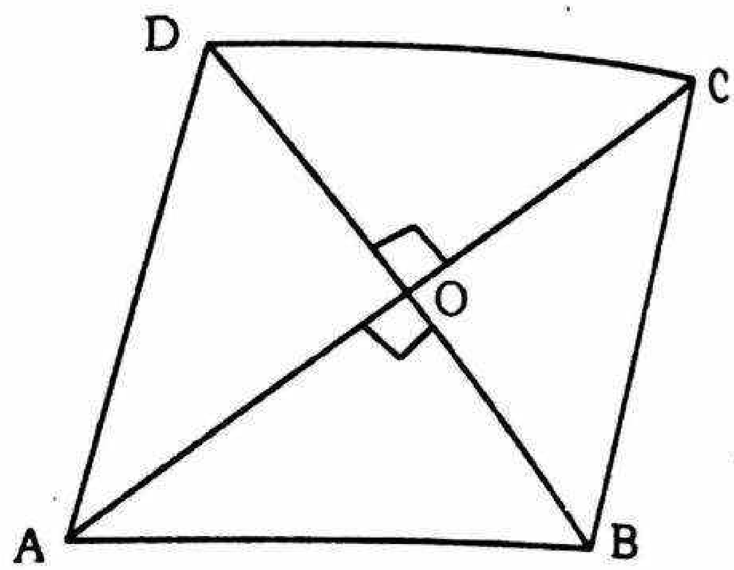
5.(a) $\angle DAB = 180°$- b and $\angle BCD =$

$2(AB^2 + BC^2) = AC^2 + BD^2$

$\Rightarrow$ $BD^2 = [2(196 + 324)] - 256$

$BD^2 = 784 \Rightarrow BD = 28cm$

9.(a) Since diagonals bisect each other at right angles and allsides are equal.



$AO^2 + BO^2 = AB^2$

Let BD = 24cm

$\therefore$ BM = 12cm

$\therefore$ $AM=\sqrt{13^2-12^2}=5cm$

$\therefore$ AD= 2AM = 10cm

15.(d) $\angle$ACB = $\angle$DAC = 50° (Alternate inerior $\angle$ s)

$\angle$ BOC = 180° – 80° = 100°

$\therefore$ Now, in ΔBOC,

$\angle$DBC = 180° - (100° + 50°) = 30°

16.(b) Perimeter of ||gm = 22cm

$\Rightarrow$ 2(a + b) = 22cm $\Rightarrow$ a + b = 11

$\Rightarrow$ b = 11 - a = 11 - 6.5 = 4.5cm

$\therefore$ shorter side, b = 4.5cm

17.(c) Since, adjacent angles of a ||gm are supplementary.

$\therefore$ $x+\frac{2}{3}\times x=180° \Rightarrow \frac{5x}{3}=180°$

$\Rightarrow$ $x=108°$

$\therefore$ $\frac{2}{3}x=\frac{2}{3}\times 108° = 72°$

$\therefore$ angles are = 108°, 72°, 108°, 72°

$\therefore$ largest angle = 108°

20.(d) $\angle$A + $\angle$B = 180° and $\angle$A = $\angle$B

$\Rightarrow$ $\angle$A = $\angle$B = 90°

So, the given ||gm may be a square or a rectangle as in both the cases the adjacent angles are equal.

21.(a) $7x = 42 \Rightarrow x = 6$

and $8y = 32 \Rightarrow y = 4$

22.(d) $ar(\Delta OAB)=\frac{1}{4}ar(||gmABCD)$

$=\frac{1}{4}\times 56 = 14cm^2$

24.(d) Since, the diagonals of a rectangle bisect each other.

$\therefore$ OA = OD $\Rightarrow$ $\angle$ODA = $\angle$OAD

But, $\angle$AOD = 44° (vertically opposite angle to $\angle$BOC)

$\therefore$ OAD = $\frac{1}{2}(180° - 44°)$

$=\frac{1}{2}(136°) = 68°$

25.(b) PQRS is a square, SP = SR and $\angle$S = 90°

and $\angle$SRP = $\angle$SPR = $\frac{1}{2}(90°)$=45°

Hence, $\angle$SRP = 45°

26.(c) Since, AB = BC

$\therefore$ $\angle$BAC = $\angle$BCA = $\frac{1}{2}$(180°-50°)

= 65°

27.(c) Sum of interior angles of pentagon = (n - 2)$\times$18

= (5 - 2)$\times$180° = 540°

$\Rightarrow$ 140° + x + 2x + 3x + 4x = 540

$\Rightarrow$ 10x = 400 $\Rightarrow$ x = 40

$\therefore$ largest angle = 4x = 4$\times$40 = 160°

28.(a) In D PSX and D QRY

$\angle$X = $\angle$Y = 90° and SX = RY

[$\because$ SX = SY - XY and RY = SY - SR = SY - PQ = SY - XY]

and PS = QR (sides of a ||gm)

$\therefore$ DPSX $\cong$ DQRY (R.H.S axion)

$\therefore$ PX = QY

29.(b) $\frac{\text{Area of }(\Delta STR)}{\text{Area of }(\Delta PQRS)}=\frac{\frac{1}{2}(SR\times PS)}{(SR\times PS)}$

$\frac{1}{2}$ = 1: 2

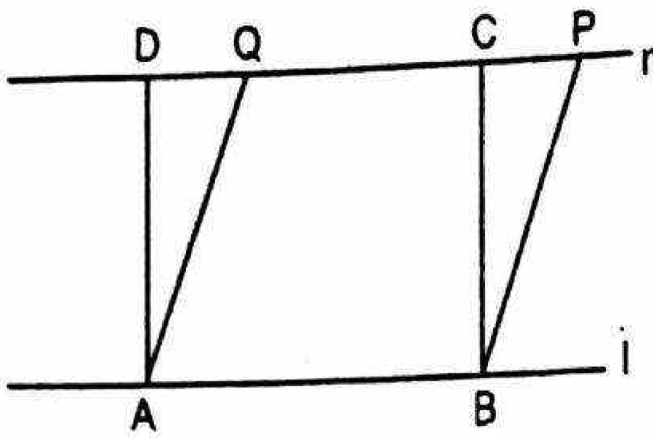
30.(a) Area of ||gm ABCD = Base$\times$height

$\Rightarrow$ AB$\times$DM = AD$\times$CL

$\Rightarrow$ 16$\times$12 = AD $\times$CL

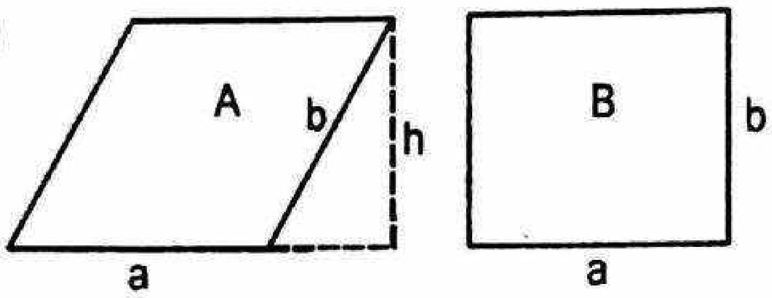
= AD$\times$15 $\Rightarrow$ AD = 12.8 units

31.(d)



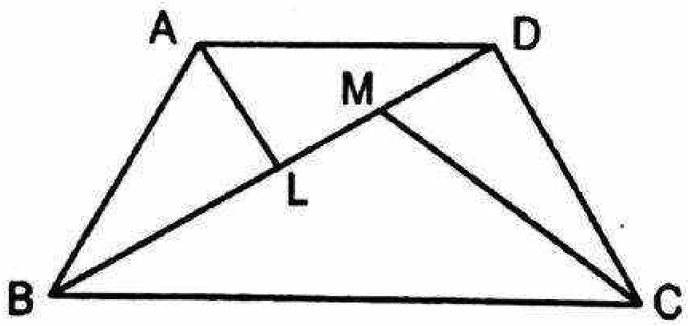
area of square ABCD = area of rhombus ABPQ
b/c they lie on the same base AB and between two parallel lines (l || m).

32.(b)



B = ab
A = ah $\Rightarrow$ A < ab [$\because$ h < b]
$\Rightarrow$ A < B

34.(d)



Area of quadrilateral ABCD
= Area of D ABD + Area of D BCD

$$= \frac{1}{2} \times BD \times AL + \frac{1}{2} \times BD \times CM$$

$$= \frac{1}{2} \times BD(AL + CM)$$

$$= \frac{1}{2} \times 64(13.2 + 16.8)$$

$$= \frac{1}{2} \times 64 \times 30 = 960\text{sq.cm.}$$

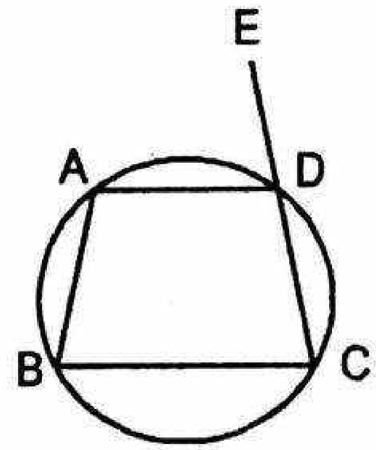
35.(c) If the number of sides of the polygon be n, then

$$\left(\frac{2n-4}{n}\right) \times 90° = 144°$$

$$\frac{(2n-4)5}{n} = 8$$

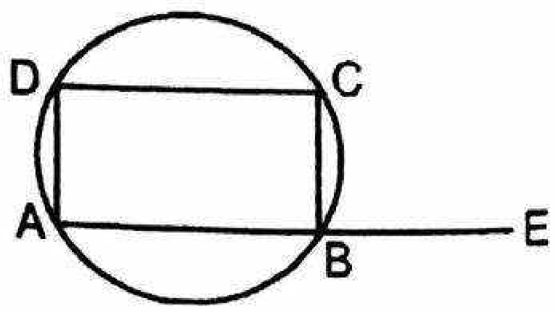
$\Rightarrow$ 10n - 20 = 8n
$\Rightarrow$ 2n = 20
$\Rightarrow$ n = 10

36.(d)



$\angle ABC + \angle CDA = 180°$
$\Rightarrow \angle CDA = 180° - 72°$
$= 108°$
$\therefore \angle ADE = 180° - 108°$
$= 72°$
AD || BC
$\angle BCD = \angle ADE = 72°$(corresponding angles)

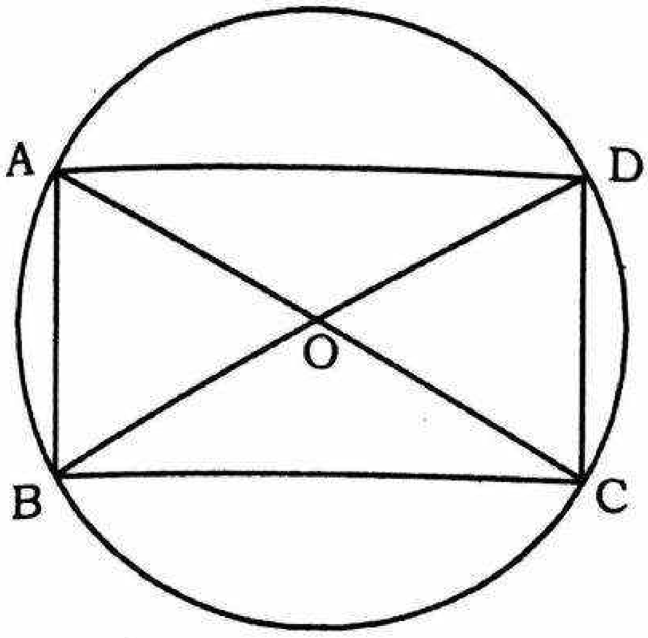
37.(c)



$\angle ABC + \angle ADC = 180°$
$\angle CBE = 50° = \angle ADC$
$\therefore \angle ABC = 180° - 50°$
$= 130°$
$\therefore \angle ADC = 180° - 130°$
$= 50°$

LEVEL-2

1.(b)



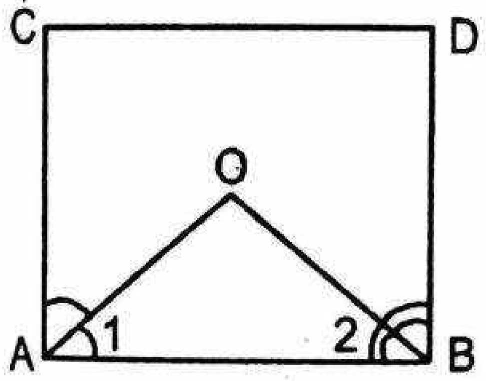
$\angle BAD = \angle BCD = 90°$ (angle made in semicircle)

Similarly,

$\angle ABC = \angle ADC = 90°$

$\Rightarrow$ ABCD is a rectangle

2.(c)



$\angle AOB = 180° - (\angle 1 + \angle 2)$

$= 180° - \left(\frac{1}{2}\angle A + \frac{1}{2}\angle B\right)$

$= 180° - \frac{1}{2}[360° - (\angle C + \angle D)]$

$[\because \angle A + \angle B + \angle C + \angle D = 360°]$

$\therefore \angle AOB = 180° - 180° + \frac{1}{2}(\angle C + \angle D)$

$= \frac{1}{2}(\angle C + \angle D)$

3.(d) $\angle AOB = \frac{1}{2}(\angle C + \angle D)$[solution of Q.(2)]

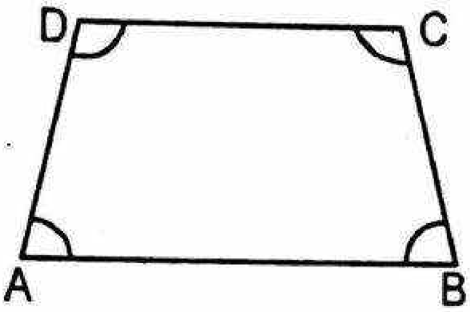
$= \frac{1}{2}(180°)$ $[\because \angle C + \angle D = \angle A + \angle B = 180°]$

$= 90°$

5.(b) $x + 2x + 3x + 4x = 360 \Rightarrow x = 36$

$\therefore$ The angles of quadrilateral (in order) are

36°,72°,108°,144°



Since, opposite angles are supplementary,

Therefore, AB | | CD. Hence, it is a trapezium.

6.(b) interior angle of pentagon =

$180° - \frac{360°}{5} = 108°$

$\therefore$ interior angle of required polygon

$= \frac{5}{6} \times 108° = 90°$

$\therefore$ each exterior angle of the requird polygon = 180°- 90° = 90°

$\therefore$ no. of sides = $\frac{360}{90} = 4$

7.(c) Sum of all exterior angle = 360°

$\therefore$ sum of interior angle = $360° \times 3$

$= (n-2) \times 180°$

$\Rightarrow$ n = 8 (no. of sides)

8.(d) go thruogh option, let us consides the correct option (d). no. of sides.

6 : 9 = 2 : 3

exterior angles = 60°, 40°

interior angles = (180° - 40°)

= 120 : 140

= 6 : 7

hence, option (d) is correct.

Alternatively:-

Let the no. of sides be 2n and 3n. And let their interior angles be $6y^\circ$ and $7y^\circ$.

∴ exterior angles are $(180° - 6y^\circ)$ and $(180 - 7y)^\circ$

∴ $\frac{360}{3n} = 180° - 6y$ ______(i)

$\frac{360}{3n} = 180° - 7y$ ______(ii)

solving (i) and (ii), we get n = 3

∴ no. of sides of the polygon are 6, 9.

9.(b) Go through options.

Alternatively :

Let interior angle = I and exterior angle = E

∴ I + E = 180° ______(i)

and I - E = 60° ______(ii) (given)

on solving (i) and (ii), we get I = 120° and E = 60°

∴ number of sides = $\frac{360°}{60} = 6$

10.(a) BD = $\sqrt{12^2 + 16^2} = 20cm$ (Δ ABD right angle triangle)

∴ Δ BCD is equilateral traingle.

∴ Area of ▭ ABCD = Area of Δ ABD + Area of Δ BCD

$= \frac{1}{2} \times 16 \times 12 + \frac{\sqrt{3}}{4}(20)^2$

$= 96 + 100\sqrt{3}$

$= 4(24 + 25\sqrt{3})$ cm²

11.(a) $\frac{BE}{AB} = \sin 30° = \frac{1}{2}$

$\Rightarrow$ BE = $\frac{1}{2} \times$ AB = 6cm = CF

and $\frac{CF}{DF} = \tan 45° = 1$

∴ DF = CF = 6cm

∴ AE = $\sqrt{12^2 - 6^2} = 6\sqrt{3}cm$

AD = 6 + 6 + $6\sqrt{3}$ = 6 $(2 + \sqrt{3})$

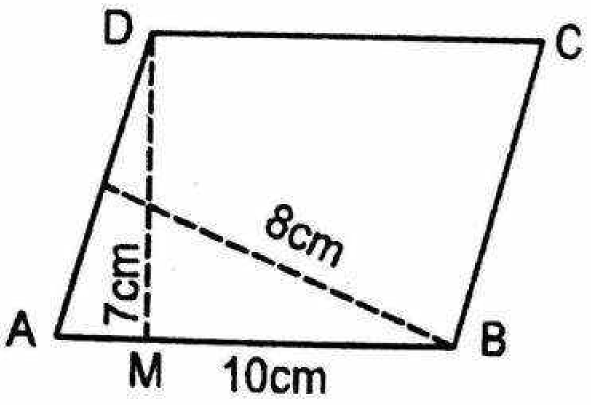
Area of trapezium ADCB

$= \frac{1}{2} \times (AD + BC) \times BE$

$= \frac{1}{2} \times [6(2 + \sqrt{3}) + 6] \times 6$

$= 3(2 + \sqrt{3} + 1) \times 6 = 18(3 + \sqrt{3})$cm²

12.(c)



Area of ||gm = Base × Height

∴ ar(||gm ABCD) = AB × DM

= (10 × 7)cm² ______(i)

also, ar(||gm ABCD) = AD × BN

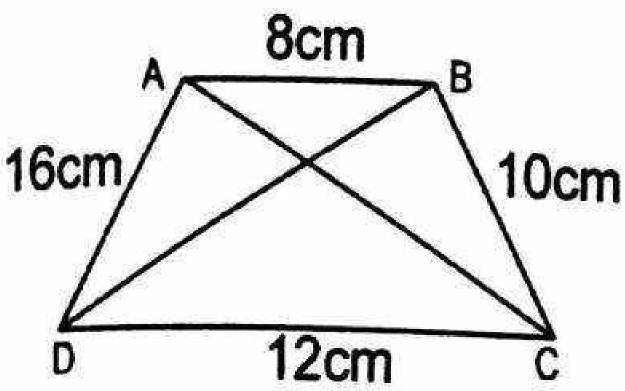
= (AD × 8)cm² ______(ii)

from (i) and (ii), we have,

10 × 7 = AD × 8

$\Rightarrow$ AD = $\frac{35}{4}$ = 8.75cm

13.(d)

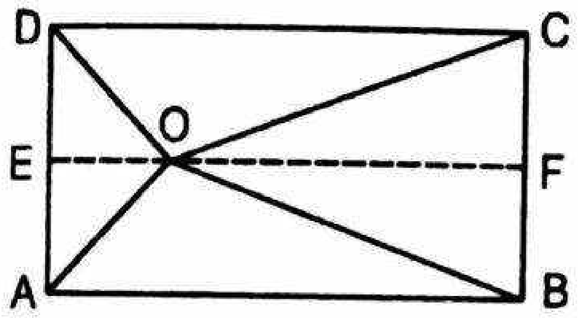


$$AC^2 + BD^2 = (AD^2 + BC^2) + 2\,(AB \times CD)$$
$$= (256 + 100) + 2\,(8 \times 12)$$
$$= 356 + 192$$
$$= 548cm^2$$

14.(b) Let no. of sides = n
each equal side subtends equal angle at the centre.

$$\therefore\ n \times 36 = 360° \Rightarrow n = \frac{360}{36} = 10$$

15.(a)



Draw EF || AB
In right angled Δ EOA and Δ OCF.
$OA^2 = OE^2 + AE^2$ and $OC^2 = OF^2 + CF^2$

$\therefore$ $OA^2 + OC^2$
$= OE^2 + AE^2 + OF^2 + CF^2$ ____(i)

Similarly in the right angled Δ DEO and Δ OBF,
$OB^2 + OD^2 = OE^2 + OF^2 + DE^2 + BF^2$
$\Rightarrow$ $OB^2 + OD^2 = OE^2 + OF^2 + CF^2 + AE^2$ ----(ii)
($\because$ DE = CF and BF = AE)
$\therefore$ from (i) and (ii)
$OA^2 + OC^2 = OB^2 + OD^2$

16.(b) By mid-point theorem

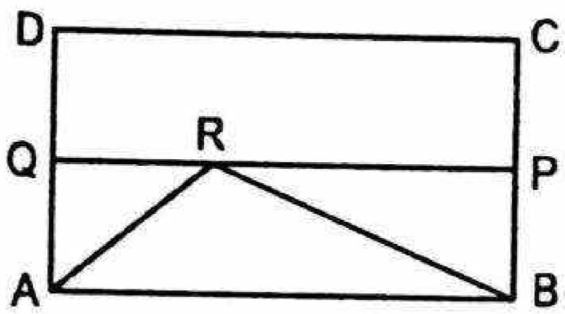
$$\frac{EF}{AD} = \frac{FG}{DC} = \frac{GH}{CB} = \frac{HE}{BA} = \frac{1}{2}$$

$$\therefore\ \frac{EF + FG + GH + HE}{AD + DC + CB + BA}$$

$$\therefore\ \frac{\frac{1}{2}(AD + DC + CB + BA)}{(AD + DC + CB + BA)} = \frac{1}{2}$$

17.(b) $\angle BCE = 102°$, AB = CD = ED (given)
$\therefore$ CD = ED = CE [$\because$ AB = CE]
Δ ECD is a equilateral triangle.
$\therefore$ $\angle ECD = 60°$
$\angle BCD = 102° + 60°$
$= 162°$

18.(c) AB || PQ || CD. So, ABPQ is a rectangle



$$\therefore\ \Delta ARB = \frac{1}{2}(\square ABPQ)$$
$$= \frac{1}{2} \times \left(\frac{1}{2} \times \square ABCD\right)$$
$$= \frac{1}{4}(\square ABCD)$$

19.(c) Since, the diagonals of a trapezium divide each other proportionally,

$$\therefore\ \frac{AO}{CO} = \frac{BO}{OD} \Rightarrow \frac{3x - 19}{x - 5} = \frac{x - 3}{3}$$
$$\Rightarrow 9x - 57 = x^2 - 8x + 5$$
$$\Rightarrow x^2 - 17x + 72 = 0$$
$$\Rightarrow x = 8 \text{ or } x = 9$$

20.(a) $AX = \frac{1}{2}AB$ and $CY = \frac{1}{2}DC$

but, AB = DC $\Rightarrow \frac{1}{2}AB = \frac{1}{2}DC$

$\Rightarrow$ AC = CY

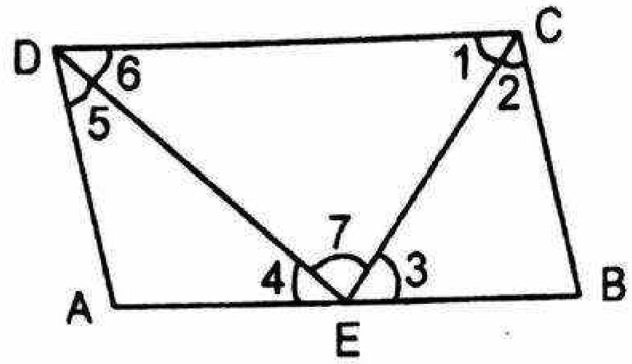
also, AB || DC[$\because$ ABCD is a ||gm]

Thus in quadrilateral AXCY,

$\Rightarrow$ AX || CY and AX = YC

Hence, quadrilateral AXCY is a ||gm.

21.(b)



AB || DC and EC cuts them

$\Rightarrow$ $\angle 3 = \angle 1$

$\Rightarrow$ $\angle 3 = \angle 2$ ($\because \angle 1 = \angle 2$)

$\Rightarrow$ n = 13 ($\because$ n can not be negative)

23.(c) In D ARB, P is the mid-point of AB and PD || BR

$\Rightarrow$ D is the mid-point of AR.

$\because$ ABCD is a ||gm

$\Rightarrow$ DC || AB $\Rightarrow$ DQ || AB

Thus, in D D is the mid-point of AR and DQ || AB

$\therefore$ Q is the mid-point of RB $\Rightarrow$ BR = 2BQ.

24.(a) MN = $\frac{1}{2}$(AB + CD) $\Rightarrow 2 \times 15 = 14 +$ CD

$\Rightarrow$ CD = 16cm.

25.(b)

27.(c) Area of (D BCE) = $\frac{1}{2} \times x \times x$

$= 14 \Rightarrow x^2 = 28$

$\therefore$ Area of (□ ABCD) = $(DE + EC) \times x$

$= 4EC \times x$

$= 4x.x$

$\Rightarrow 4x^2 = 4 \times 28$

$= 112$

28.(a) As we know that sum of two sides of a triangle is greater than the third side.

$\therefore$ in D ABD - AB + DA > BD____(i)

and in D BDC - BC + CD > BD__(ii)

$\therefore$ from (i) and (ii) AB + BC + CD + DA > 2BD.

29.(b) EF = AD = 8 ($\because$ EADF is a rectangle)

CD = 22 - 16 = 6

So, in right angled D ADC,

$AC = \sqrt{8^2 + 6^2} = 10$

$\therefore$ length of the line joining the mid-points of AC & BC = $\frac{1}{2}(AC) = 5$

30.(a) DP = 14 - 9 = 5cm

From D BPC, $BC^2 = 15^2 - 9^2$

$= 12^2$

$\Rightarrow BC = 12cm.$

From D APD, $AP^2 = AD^2 + DP^2$

$= 12^2 + 5^2$

$\Rightarrow AP = 13cm$

In D ABP, AP < AB < BP. Therefore

$\gamma < \beta < \alpha$

i.e. a > b > g

31.(b) Each interior angle of a regular polygon

$= 180 \times \frac{3}{5} = 108°$

$\therefore$ Each exterior angle = 180° - 108°

= 72

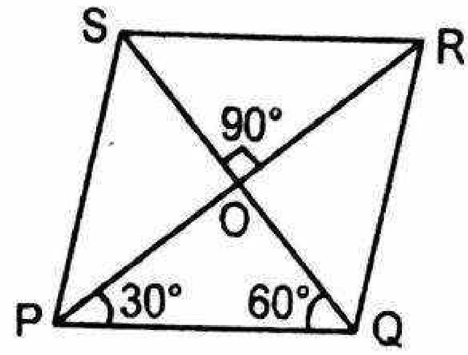
$\therefore$ no. of sides = $\frac{360}{72} = 5$

32.(d) $\frac{(2n-4) \times 90°}{n} = \frac{360°}{n} \times 2$

$(2n - 4) \times 90° = 2 \times 360°$

$2n - 4 \Rightarrow 8 \Rightarrow 2n = 12 \Rightarrow n = 6$

33.(b)



$\angle PQO = \frac{1}{2} PQR = 60°$

FromΔPOQ,

$\angle OPQ = 180° - 90° - 60°$

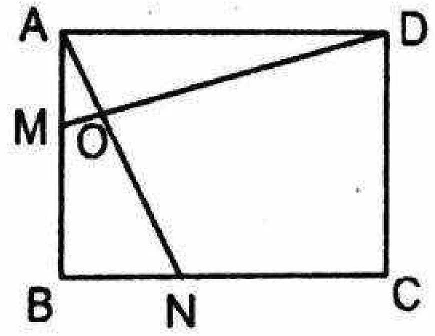
$= 30°$

$\sin OPQ = \frac{OQ}{PQ}$

$\Rightarrow OQ = PQ \sin 30° = 6 \times \frac{1}{2} = 3$

$\therefore QS = 2 \times 3 = 6cm$

34.(b)



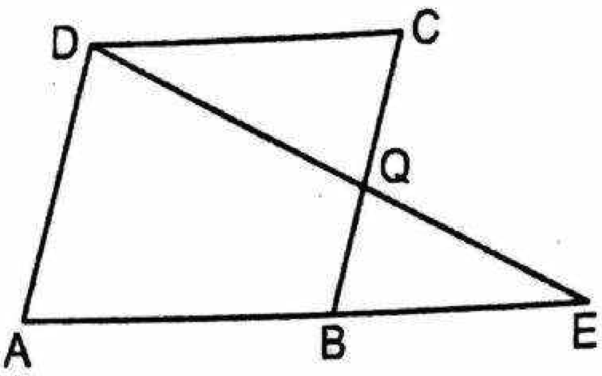
If AB = $2x$, then BN = x

$\therefore AN = \sqrt{4x^2 + x^2} = \sqrt{5}x$

Similarly

$MD = \sqrt{4x^2 + x^2} = \sqrt{5}x$

35.(b)



AD || BC

$\Rightarrow$ AD || BQ

Point B is the mid-point of AE.

$\therefore$ Q is the mid-point of DE.

In Ds DQC and BQE,

$\angle DQC = \angle BQE$

$\angle DCQ = \angle QBE$

$\angle CDQ = \angle QEB$

$\Rightarrow \Delta DQC \cong \Delta EQB$

$\Rightarrow$ BQ = CQ

$\Rightarrow$ Q divides BC in the ratio 1 : 1

36.(c) $\therefore \left(\frac{n-2}{n}\right) \times 180$

$= 8 \times \frac{360°}{n} + 18$

$\Rightarrow (n - 2) \times 10 = 160 + n$

$\Rightarrow 10n - 20 = 160 + n$

$\Rightarrow 9n = 180$

$\Rightarrow n = 20$

37.(b) $\therefore \frac{(2n-4)\times 90°}{n} = 105°$

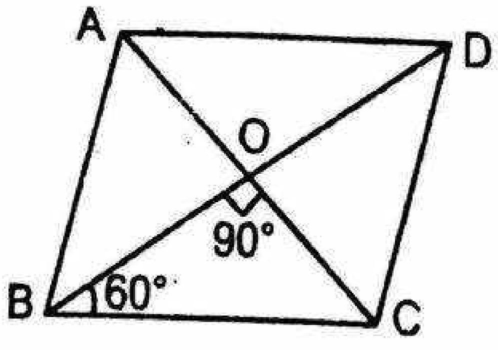
$\Rightarrow (12n - 4) \times 6 = 7n$

$\Rightarrow 12n - 24 = 7n$

$\Rightarrow 5n = 24$

$\Rightarrow n = \frac{24}{5}$ Which is impossible

38.(d)



From D BOC,

$\cos 60° = \frac{BO}{4}$

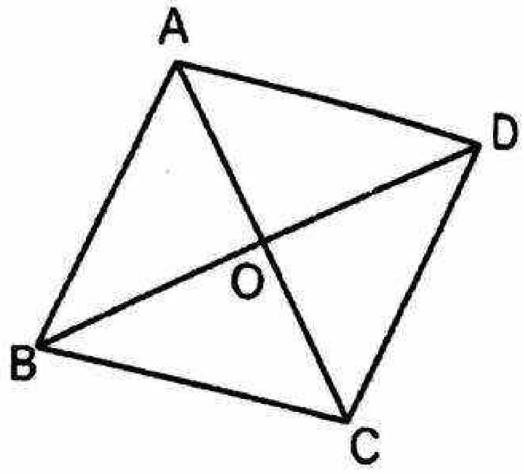
$BO = \frac{1}{2} \times 4 = 2cm$

$\therefore$ BD = 2 × 2 = 4 cm

39.(a) BO = 4 units: OC = 3units

$\angle BOC = 90°$

$\therefore BC = \sqrt{4^2 + 3^2} = 5\,units$



$\therefore BC^2 = 25$sq.units

40.(c) $\therefore \frac{\frac{(2n-4)\times 90°}{n}}{\frac{(4n-4)\times 90°}{2n}} = \frac{2}{3}$

$\Rightarrow \frac{(2n-4)\times 4}{4n-4} = \frac{2}{3}$

$\Rightarrow \frac{2n-4}{4n-4} = \frac{1}{3}$

$\Rightarrow 6n - 12 = 4n - 4$

$\Rightarrow 6n - 4n = 12 - 4 = 8$

$\Rightarrow 2n = 8 \Rightarrow n = 4$

41. (d) Sides of the trapezium = $2x$ and $3x$cm

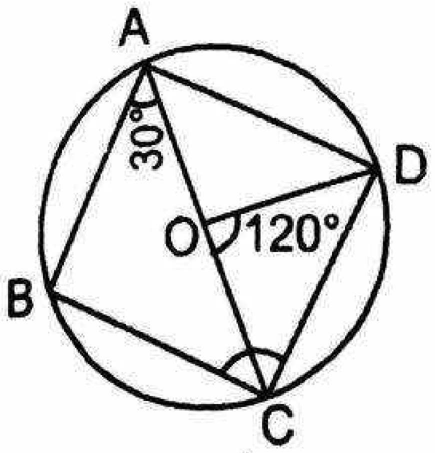
$\therefore \frac{1}{2}(2x + 3x) \times 12 = 480$

$\Rightarrow 5x = \frac{480}{6} = 80$

$\Rightarrow x = \frac{80}{5} = 16$

Longer side = 16 × 3 = 48 cm

42. (b)



$\angle COD = 120°$

$\angle BAC = 30°$

$\angle CAD = \frac{1}{2} \times 120° = 60°$

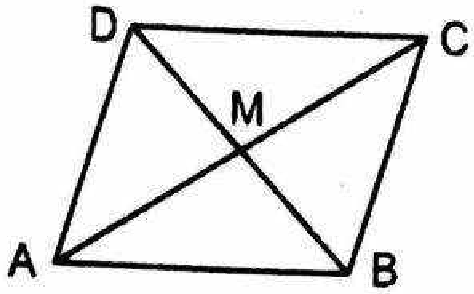
(angle made on other part of circle is half of angle made at centre by same are)

$\therefore$ $\angle BAD = 90°$

$\therefore$ $\angle BCD = 180° - 90°$
$= 90°$
(cyclie quadrilateral)

LEVEL-3

1.(b)



Since diagonals of | | gm bisect each other.

$\therefore$ M will be the mid-point of each of the diagonal AC and BD.

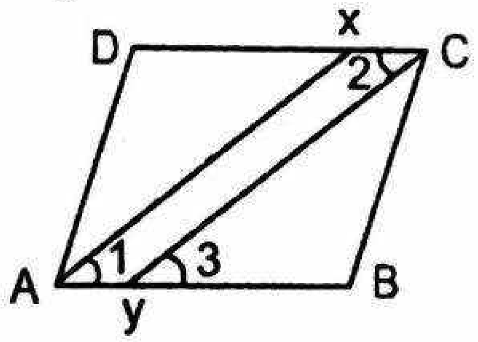
$\therefore$ In D ABC, $AB^2 + BC^2 = 2(AM^2 + MB^2)$ (Appolonius Theorem)

In D ADC,

$AD^2 + CD^2 = 2\ (AM^2 + DM^2)$
$= 2\ (AM^2 + MB^2)$
$[DM = MB]$

Adding, $AB^2 + BC^2 + CD^2 + DA^2$
$= 4AM^2 + 4MB^2$
$= (2AM)^2 + (2MB)^2$
$= AC^2 + BD^2$

2.(a)



ABCD is | | gm (given)

$\therefore$ $\angle A = \angle C$

$\Rightarrow$ $\frac{1}{2}\angle A = \frac{1}{2}\angle C$

$\Rightarrow$ $\angle 1 = \angle 2$ ______(i)

Now, AB | | DC and the transversal CY intersects then:

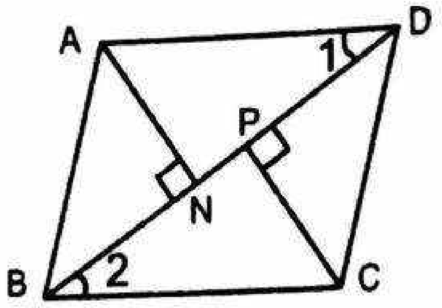
$\therefore$ $\angle 2 = \angle 3$ ______(iii)

from (i) and (ii), we get $\angle 1 = \angle 3$

Thus, transversal AB intersects AX and YC at A and Y such that $\angle 1 = \angle 3$ i.e. corresponding angles are equal.

$\therefore$ AX | | CY.

3.(b)



in D ADN and D CBP,

$\angle 1 = \angle 2$ [$\because$ AD || CD]

$\angle AND = \angle CPD$ and AD = BC ($\because$ opposite sides of a ||gm are equal)

So, by AAS criterion of congruence

$\therefore$ AN = CP

4.(c) Since PQRS is a ||gm.

$\therefore$ PS || QR

$\Rightarrow$ PL || QM and LM || PQ (given)

$\Rightarrow$ PQML is a ||gm

$\Rightarrow$ PL = QM (Opposite sides of a ||gm are equal)

$\angle 1 = \angle 2$ ___(i) [OP is the bisector of $\angle P$]

and $\angle 1 = \angle 3$___(ii) [$\because$ PQ || LM]

from (i) and (ii) $\angle 2 = \angle 3$

$\therefore$ in OPL, $\angle 2 = \angle 3$

$\Rightarrow$ OL = PL ______(iii)

Similarly, $\angle 4 = \angle 5$ and $\angle 4 = \angle 6$

$\therefore$ $\angle 5 = \angle 6$

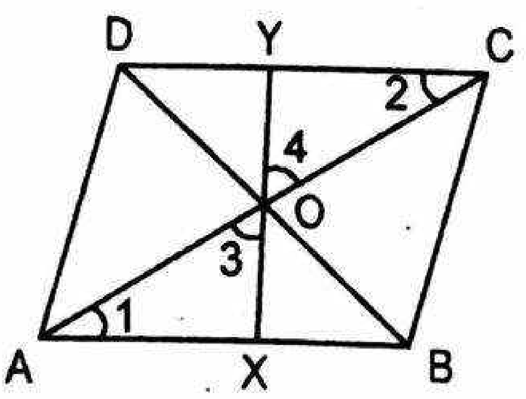
$\therefore$ in D QOM, $\angle 5 = \angle 6$

$\Rightarrow$ OM = QM

$\Rightarrow$ OM = PL _______(iv) [$\because$ PL = QM]

$\therefore$ from (iii) and (iv), OL = OM

5.(b)



in D OAX and D OCY.

$\angle 1 = \angle 2$ ($\because$ AB || DC)

$\angle 3 = \angle 4$ (vertically opposite angles)

and OA = OC ($\because$ diagonals of a ||gm bisect each other)

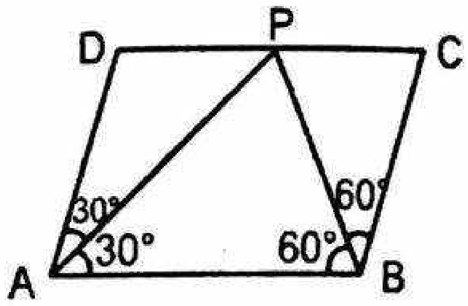
$\therefore$ D OAX $\cong$ D OCY

$\Rightarrow$ OX = OY

6.(d) $\angle DAB = 60°$

$\Rightarrow$ $\angle B = 120°$

$\therefore$ $\angle ABP = PBC = \dfrac{120°}{2} = 60°$



$\angle DPA = \angle BAP = 30°$ [$\because$ AB || DC and AP inter sects them]

Thus, in D ADP ,

$\angle DPA = \angle DAP = 30°$

$\Rightarrow$ AD = DP ______(i)

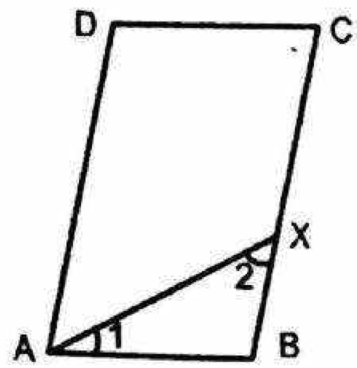
Similarly, $\angle BPC = \angle ABP = 60°$

$\therefore$ in D BPC, $\angle BPC = \angle PBC = 60°$

$\Rightarrow$ BC = CP = AD ____(ii) ($\because$ BC = AD)

$\therefore$ from (i) and (ii) CP = DP.

7.(a)



$\angle B = 180° - \angle A = 180° - 2\angle 1$

in D ABX,

$\angle 1 + \angle 2 + \angle B = 180°$

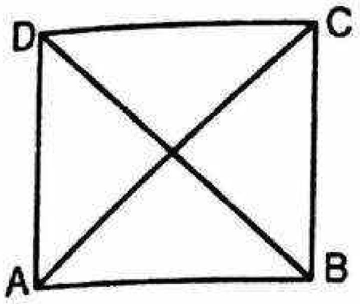
$\Rightarrow$ $\angle 1 + \angle 2 + 180° - 2\angle 1 = 180°$

$\Rightarrow$ $\angle 1 = \angle 2$

$\Rightarrow$ AB = BX $\Rightarrow$ 2BX = 2AB

$\Rightarrow$ BC = 2AB $\Rightarrow$ AD = 2AB

8.(c)



Let BD = 6cm and AC = 8m

$\therefore$ AO = 4m and BO = 3m

let AB = 5m $\therefore \angle AOB = 90°$

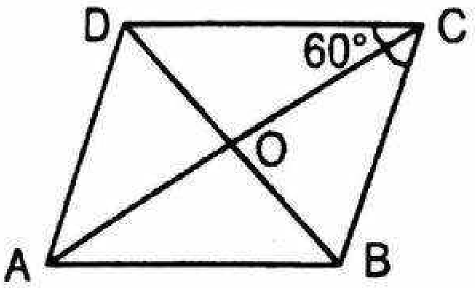
$\Rightarrow \angle BOC = \angle AOD = \angle DOC = 90°$

Here, ABCD is a rhombus

$\therefore$ Area of rhombus ABCD

$$= \frac{AC \times BD}{2} = \frac{6 \times 8}{2} = 24m^2$$

9.(a)



inD BDC, BC = CD

$\Rightarrow \angle BDC = \angle DBC = x°$ (let)

$\therefore x + x + 60° = 180° \Rightarrow x = 60°$

$\therefore$ D BDC is an equilateral triangle

$\therefore$ BD = BC = a (let)

inD AOB, $\angle AOB = 90°$

$\therefore AB^2 = OA^2 + OB^2$

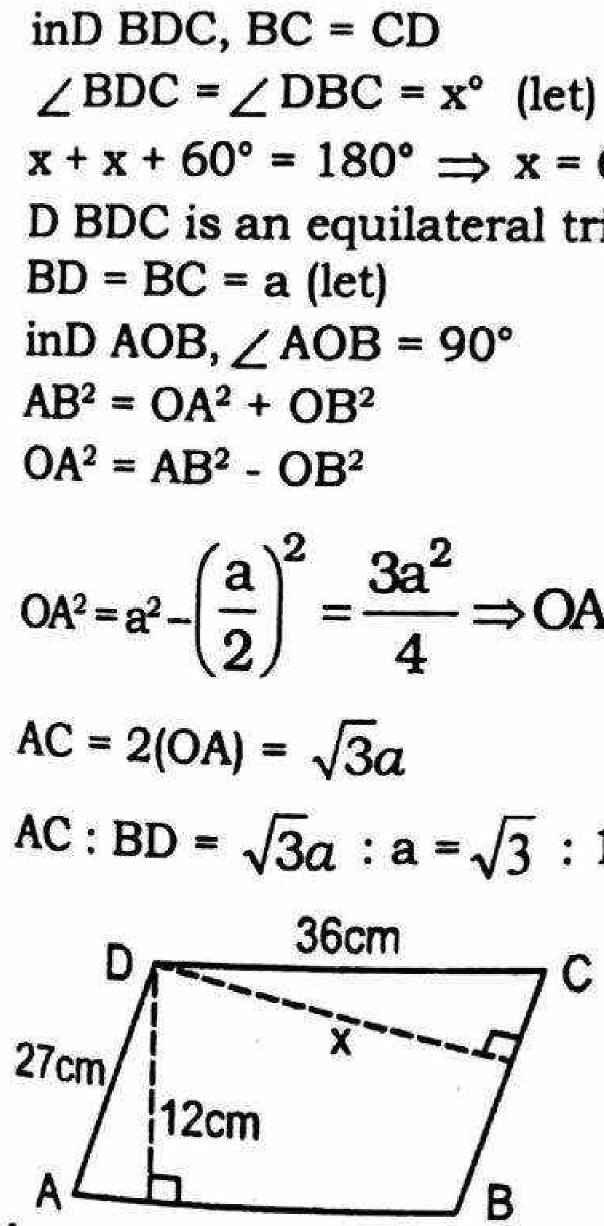
$\Rightarrow OA^2 = AB^2 - OB^2$

$$\Rightarrow OA^2 = a^2 - \left(\frac{a}{2}\right)^2 = \frac{3a^2}{4} \Rightarrow OA = \frac{\sqrt{3}a}{2}$$

$\Rightarrow AC = 2(OA) = \sqrt{3}a$

$\therefore AC : BD = \sqrt{3}a : a = \sqrt{3} : 1$

10.(b)



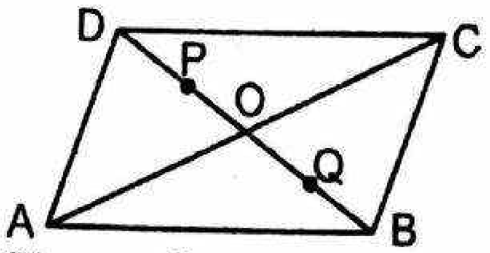
let distance = x

Area of ||gm = Base $\times$ Height

$36 \times 12 = x \times 27$

$\Rightarrow x = 16$

11.(d)



Since, diagonals of a ||gm bisect each other.

$\therefore BO = OD = \frac{18}{2} = 9cm$

P = centroid of D ABC

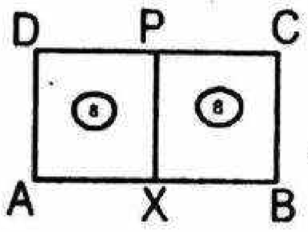
$\therefore OP = \frac{1}{3}OB = \frac{1}{3} \times 9 = 3cm$

Q = centroid of D ADC

$\therefore OQ = \frac{1}{3}OD = \frac{1}{3} \times 9 = 3cm$

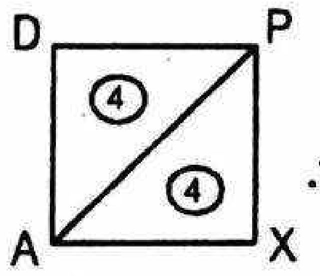
$\therefore$ PQ = OP + OQ = 3 + 3 = 6cm

12.(c) Let total area of rectangle ABCD = 16 unit

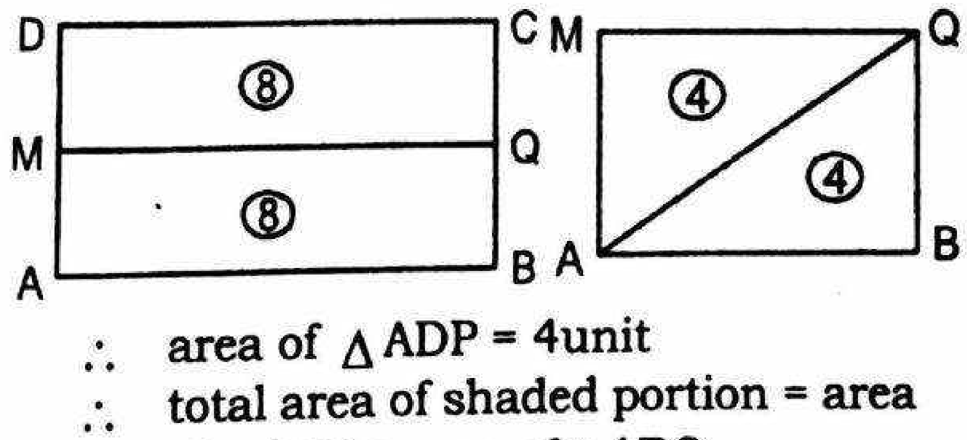


$\therefore$ area of $\square$ AXPD = $\frac{16}{2}$ = 8 unit

$\therefore$ area of ΔPCQ = 2 unit



$\therefore$ area of ΔABQ = 4 unit



$\therefore$ area of ΔADP = 4unit

$\therefore$ total area of shaded portion = area of ΔADP + area of ΔABQ

$= 4 + 2 + 4 = 10$ unit

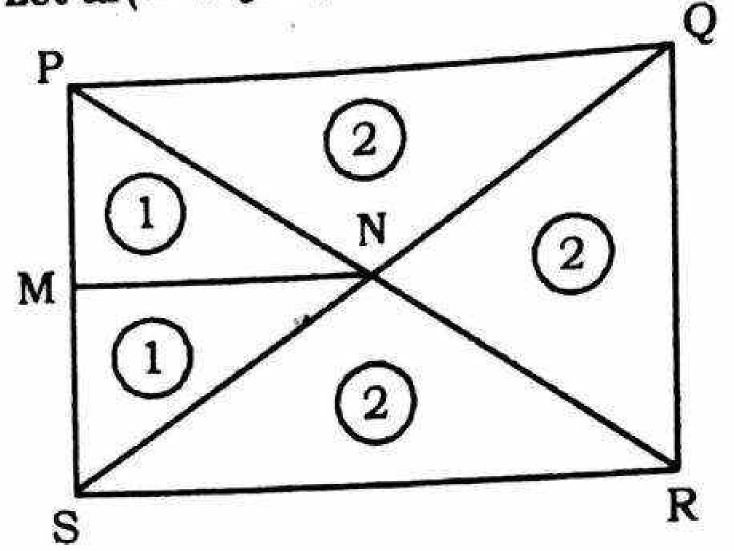
$\therefore$ area of unshaded portion = area of Δ APQ

$= 16 -$ Area of shaded portion

$= 16 - 10 = 6$unit

$\therefore$ required ratio $= 10 : 6 = 5 : 3$

13.(b) Let ar(□ PQRS) = 8 units



Area of PQNM = area of Δ PNQ + area of Δ PNM

$= 2 + 1 = 3$ units

$\therefore$ area (□PQNM) : area (□PQRS)

$= 3 : 8$

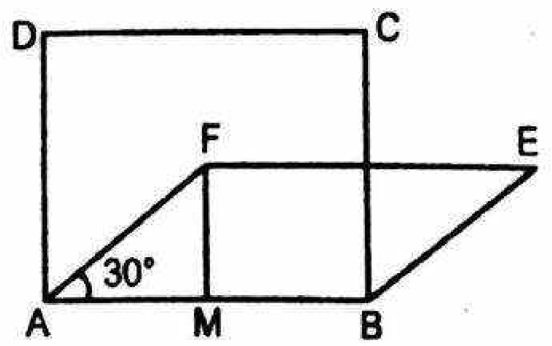
14.(a) AE : EO = 2 : 1 and CF : FO = 2 : 1

$\therefore OE = \frac{1}{3}AO$ and $OF = \frac{1}{3}OC$

$\therefore EF = OE + OF =$

$\frac{1}{3}(AO + OC) = \frac{1}{3}AC = AE$

15.(b)



ABCD is a square and ABEF is a rhombus

$\sin 30° = \frac{FM}{AF} = \frac{1}{2}$

$\Rightarrow FM = \frac{AF}{2}, AF = AB = a$

Area of square $= a^2$ (AB = AD = a)

Area of rhombus = AB × FM

$= a \times \left(\frac{a}{2}\right) = \frac{a^2}{2}$

$\therefore \frac{\text{Area of square}}{\text{Area of rhombus}} = \frac{2}{1}$

16.(c) In D APR and D DPC,

$\angle 1 = \angle 2$ (alternate angles)

AP = CP ($\because$ P is mid-point of AC)

and $\angle 3 = \angle 4$ (vertically opposite angles)

So, D APR $\cong$ D DPC (ASA)

$\Rightarrow$ AR = DC and PR = DP

Again, P & Q are the mid-points of sides DR and DB respectively. In D DRB,

$PQ = \frac{1}{2}BR$

$\therefore PQ = \frac{1}{2}(AB - AR)$

$\therefore PQ = \frac{1}{2}(AB - CD)$ ($\because$ AR = DC)

17.(a) Area of (D PRS + D PQR) $= \frac{1}{2}$ (area of □ APRD) $+ \frac{1}{2}$(area of □BPRC)

$= \frac{1}{2}(AP \times AD) + \frac{1}{2}(PB \times BC)$

$= \frac{1}{2}(AP \times AD) + \frac{1}{2}(PB \times AD)$ ($\because$ BC = AD)

$= \frac{1}{2}AD\,(AP + PB)$

$= \frac{1}{2}(AD \times AB)$

$= \frac{1}{2}$(area of □ ABCD)

$= \frac{1}{2} \times 20 = 10\text{cm}^2$

18.(d) Let BC = x and FB = y = EF = AE

$\therefore$ AB = CD = 3y

Now, Area of

$\Delta CBF = \frac{1}{2}xy$

and area of $\Delta CBE = \frac{1}{2}x \times 2y = xy$

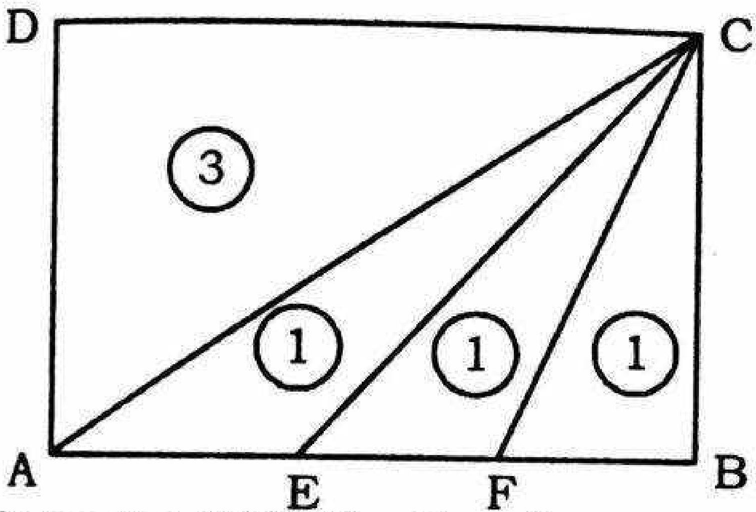
$\therefore$ area of $\Delta CEF = xy - \frac{1}{2}xy = \frac{1}{2}xy$

and area of rectangle ABCD = 3xy

$\therefore$ required ratio = $\frac{1}{2}xy : 3xy$

= 1 : 6

Alternatively :



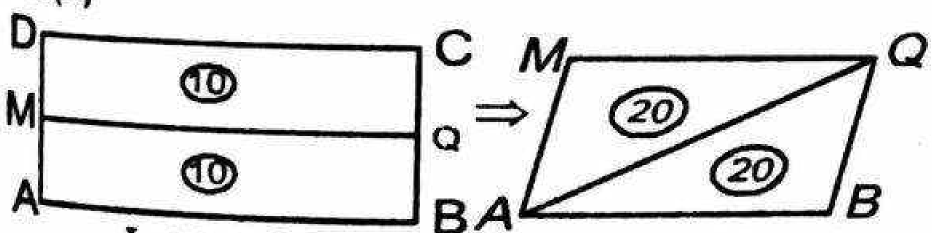
Let ar(□ ABCD) = 6 units

Base and height are same

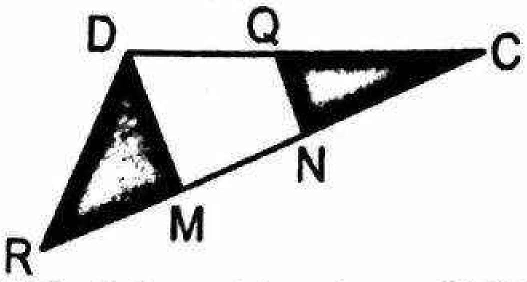
ar(Δ CAE) = ar(Δ CEF) = ar(Δ CFB) = 1 unit

$\therefore$ required ratio = 1 : 6

19.(a)



Let total area of | | ABCD = 40 units



In Δ DMC, Q is mid point of DC and QN | | DM

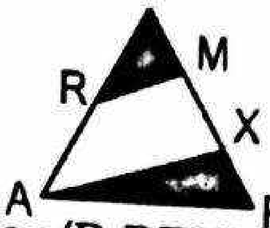
[$\because$ DPBQ is also a | | gm)

$\Rightarrow$ N is the mid-point of DM

$\therefore$ ar (Δ QCN) : ar(Δ DMC) = 1 : 4

$\therefore$ ar (Δ QCN) = 1unit (let)

$\Rightarrow$ ar (Δ DMQN) = 4 - 1 = 3unit



Similarly, in DAX

ar (D DRM) : ar (D DAX) = 1 : 4

ar (D DRM) = 1 unit

$\Rightarrow$ ar (D DAX) = 4 - 1 = 3unit

$\therefore$ ar(D DRM) + ar (D QNC)

= 1 +1

= 2unit

and ar(D DRC) = 4 + 1 = 5unit

but from (i) ar (D DRC) = 10 unit (2 times)

$\therefore$ ar (D DRM) + ar (D QNC)

= 2 × (2 times)

= 4 units

Similary, ar (D APX) + ar (D BOS)

= 2 × 2

= 4units

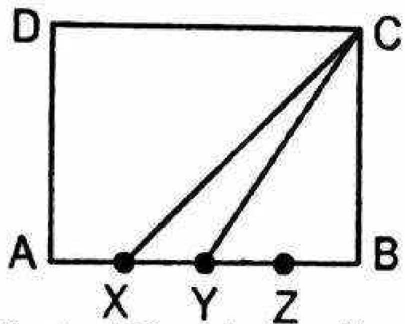
$\therefore$ total shaded area = 4 + 4

= 8 units

& area of | | gm ABCD = 40units

$\therefore$ required ratio = $\frac{8}{40} = \frac{1}{5}$

20.(d)



Let, AB = 4x units and

BC = y units

$\therefore$ □ ABCD = 4xy sq. units

In Δ XYC

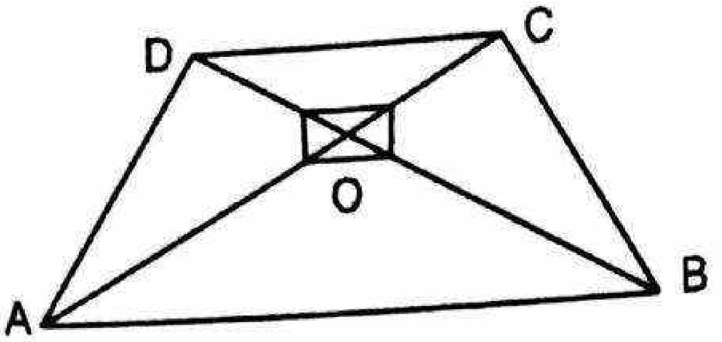
XY = x units

Height = y units

$\therefore$ Area of $\Delta XYC = \frac{1}{2}xy$

$\therefore \frac{\Delta XYC}{\text{Rectangle ABCD}} = \frac{\frac{1}{2}xy}{4xy} = \frac{1}{8}$

21.(b)



$OB^2 + OC^2 = BC^2$

$OC^2 + OD^2 = CD^2$

$OD^2 + OA^2 = AD^2$

$OA^2 + OB^2 = AB^2$

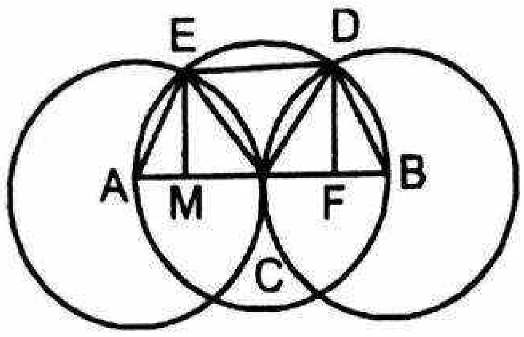
$\therefore\ 2(OB^2 + OA^2 + OD^2 + OC^2)$

$= AB^2 + BC^2 + CD^2 + DA^2$

$\Rightarrow\ 2(AB^2 + CD^2) = AB^2 + BC^2 + CD^2 + DA^2$

$\Rightarrow\ AB^2 + CD^2 = BC^2 + DA^2$

22.(b)



$\therefore$ EC = BD = 2cm & EC || BD

$\therefore$ ED || BC & ED = BC = 2cm

$\therefore$ ABDE will be a trapezium

AB = 4units

$DE = \frac{1}{2}AB = 2units$

$\therefore\quad DF = \sqrt{2^2 - 1^2} = \sqrt{3}$ units

$= \frac{1}{2}(AB + DE) \times DF$

$= \frac{1}{2}(4 + 2) \times \sqrt{3}$

$= 3\sqrt{3}$ sq.cm

Answer-Key

LEVEL - 1

1. (b)	2. (d)	3. (a)
4. (a)	5. (a)	6. (b)
7. (c)	8. (d)	9. (a)
10. (c)	11. (b)	12. (a)
13. (d)	14. (a)	15. (d)
16. (b)	17. (a)	18. (b)
19. (a)	20. (d)	21. (a)
22. (d)	23. (a)	24. (d)
25. (b)	26. (c)	27. (c)
28. (a)	29. (b)	30. (a)
31. (d)	32. (b)	33. (a)
34. (d)	35. (c)	36. (d)
37. (c)		

LEVEL - 2

1. (b)	2. (c)	3. (d)
4. (a)	5. (b)	6. (b)
7. (c)	8. (d)	9. (b)
10. (a)	11. (a)	12. (c)
13. (d)	14. (b)	15. (a)
16. (b)	17. (b)	18. (c)
19. (c)	20. (a)	21. (b)
22. (d)	23. (c)	24. (a)
25. (b)	26. (d)	27. (c)
28. (a)	29. (b)	30. (a)
31. (b)	32. (d)	33. (b)
34. (b)	35. (b)	36. (c)
37. (b)	38. (d)	39. (a)
40. (c)	41. (d)	42. (b)

LEVEL - 3

1. (b)	2. (a)	3. (b)
4. (c)	5. (b)	6. (d)
7. (a)	8. (c)	9. (a)
10. (b)	11. (d)	12. (c)
13. (b)	14. (a)	15. (b)
16. (c)	17. (a)	18. (d)
19. (a)	20. (d)	21. (b)
22. (b)		