CHAPTER 9

Areas of Parallelograms and Triangles

1. OBJECTIVE QUESTIONS

1. Area of an isosceles triangle, the measure of one of its equal side being 5 cm and the third side 4 cm is
(a) $2\sqrt{21}$ cm^2 (b) $21\sqrt{2}$ cm^2
(c) $22\sqrt{3}$ cm^2 (d) $23\sqrt{3}$ cm^2

Ans : (a) $2\sqrt{21}$ cm^2

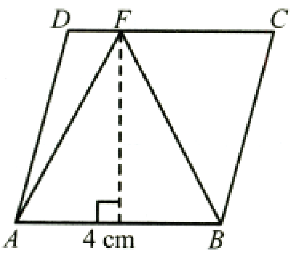
Let, $a = 5\text{ cm},\ b = 4\text{ cm}$
Therefore area of an isosceles triangle

$$= \frac{b}{4} \times \sqrt{4a^2 - b^2}$$

$$= \frac{4}{4}\sqrt{4 \times 25 - 16}\text{ sq. cm}$$

$$= \sqrt{84}\text{ cm} = 2\sqrt{21}\text{ sq. cm}$$

2. In the given figure, $ABCD$ is a parallelogram, then area (ΔAFB) is



(a) 16 cm^2 (b) 8 cm^2
(c) 4 cm^2 (d) 6 cm^2

Ans : (b) 8 cm^2

$$\text{area}(\Delta AFB) = \frac{1}{2}\text{area}(\parallel\text{gm } ABCD)$$

$$= \frac{1}{2} \times 4 \times 4 = 8\text{ cm}^2$$

3. X and Y are respectively two points on the sides DC and AD of the parallelogram $ABCD$. The area of ΔABX is equal to :
(a) $1/3 \times$ area of ΔBYC (b) area of ΔBYC
(c) $1/2 \times$ area of ΔBYC (d) $2 \times$ area of ΔBYC

Ans : (b) area of ΔBYC

4. BD is a median of a triangle ABC. F is a point on AB such that CE intersects BD at E and $BE = ED$. If $BF = 5\text{ cm}$, BA is equal to:
(a) 10 (b) 12
(c) 15 (d) 17

Ans : (c) 15

5. D and E are the mid points of the sides AB and AC of a triangle ABC respectively. Then the area of the triangles ADE and ABC are in the ratio
(a) 1 : 2 (b) 1 : 3
(c) 1 : 4 (d) 2 : 3

Ans : (c) 1 : 4

6. In ΔABC if D is a point on BC and divides it in the ratio $3:5$ i.e. if $BD:DC = 3:5$, then area (ΔADC) : ar $(\Delta ABC) =$
(a) 3 : 5 (b) 3 : 8
(c) 5 : 8 (d) 8 : 3

Ans : (c) 5 : 8

7. The area of a rhombus is 20 cm^2. If one of its diagonals is 5 cm, the other diagonal is
(a) 5 cm (b) 6 cm
(c) 8 cm (d) 10 cm

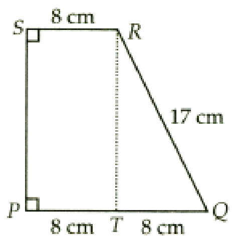
Ans : (c) 8 cm

Area of rhombus $= \frac{1}{2} \times d_1 \times d_2$; where d_1, d_2 are lengths of diagonals.

$$20 = \frac{1}{2} \times 5 \times d_2 \qquad [\text{Since, } d_1 = 5]$$

$$d_2 = 8\text{ cm}$$

8. The area of trapezium $PQRS$ in the adjoining figure is



(a) 112 cm^2 (b) 120 cm^2
(c) 160 cm^2 (d) 180 cm^2

Ans : (d) 180 cm^2

$$\text{area}(\text{trap. } PQRS) = \text{area}(\text{rect.} PSRT) + \text{area}(\Delta QRT)$$

$$= PT \times RT + \frac{1}{2}(QT \times RT)$$

$$= 8 \times RT + \frac{1}{2}(8 \times RT) \qquad \text{...(1)}$$

$$= 12 \times RT$$

Now, in ΔQRT,

$$RT^2 = QR^2 - QT^2$$

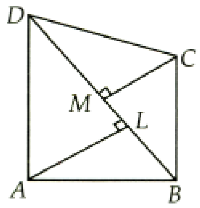
$= 17^2 - 8^2$

$RT = 15\,\text{cm}$

Substitute the value of RT in (1), we get

$\text{area}(\text{trap.}PQRS) = 12 \times 15\,\text{cm}^2 = 180\,\text{cm}^2$

9. In the figure, $ABCD$ is a quadrilateral $BD = 20\,\text{cm}$. If $AL \perp BD$ and $CM \perp BD$ such that $AL = 10$ cm and $CM = 5$ cm, find the area of quad. $ABCD$.



(a) 150 cm² (b) 180 cm²
(c) 100 cm² (d) 140 cm²

Ans : (a) 150 cm²

Area of quad. $ABCD = \text{area}(\Delta ABD) + \text{area}(\Delta BCD)$

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

$$= \frac{1}{2} \times 20 \times 10 + \frac{1}{2} \times 20 \times 5$$

$$= 100 + 50 = 150\,\text{cm}^2$$

10. The area of a rhombus if the lengths of whose diagonals are 16 cm and 24 cm, is

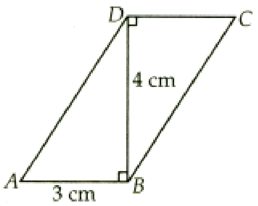
(a) 180 cm² (b) 184 cm²
(c) 198 cm² (d) 192 cm²

Ans : (d) 192 cm²

$$\text{Area of rhombus} = \frac{1}{2} \times d_1 \times d_2$$

$$= \frac{1}{2} \times 16 \times 24\,\text{cm}^2 = 192\,\text{cm}^2$$

11. In the adjoining figure, $ABCD$ is a parallelogram. Then its area is equal to



(a) $9\,\text{cm}^2$ (b) $12\,\text{cm}^2$
(c) $15\,\text{cm}^2$ (d) $36\,\text{cm}^2$

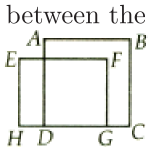
Ans : (b) $12\,\text{cm}^2$

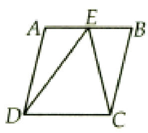
Area of parallelogram = Base × Height

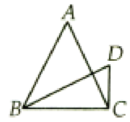
$$= AB \times BD = 4 \times 3\,\text{cm}^2$$

$$= 12\,\text{cm}^2$$

12. Which of the following figures lie on the same base and between the same parallels?

(a) 

(b) 

(c) 

(d) All of these

Ans : (b)

Common base= DC and two parallels are AB and DC

13. The area of a trapezium whose parallel sides are 9 cm & 16 cm and the distance between these sides is 8 cm, is

(a) 60 cm² (b) 72 cm²
(c) 56 cm² (d) 100 cm²

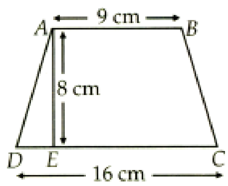
Ans : (d) 100 cm²

Area of trapezium $ABCD$

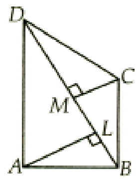
$$= \frac{1}{2}[AB + CD] \times AE$$

$$= \frac{1}{2}[16 + 9] \times 8\,\text{cm}^2$$

$$= \frac{1}{2} \times 25 \times 8\,\text{cm}^2 = 100\,\text{cm}^2$$



14. In the adjoining figure, $ABCD$ is a quadrilateral in which diagonal $BD = 14\,\text{cm}$. If $AL \perp BD$ and $CM \perp BD$ such that $AL = 8\,\text{cm}$ and $CM = 6\,\text{cm}$, then area of quadrilateral $ABCD$ is



(a) 60 cm² (b) 72 cm²
(c) 84 cm² (d) 98 cm²

Ans : (d) 98 cm²

Area of quadrilateral $ABCD$

$$= \text{area}(\Delta ABD) + (\Delta BCD)$$

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

$$= \left[\frac{1}{2} \times 14 \times 8 + \frac{1}{2} \times 14 \times 6\right]\text{cm}^2$$

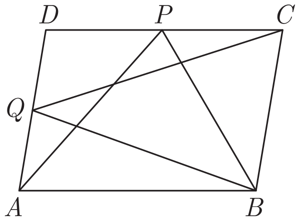
$$= 98\,\text{cm}^2$$

15. If P and Q are any two points lying on the sides DC and AD respectively of a parallelogram $ABCD$, then $\text{ar}(\Delta BQC)$ is equal to

(a) $\text{area}(\Delta APB)$ (b) $\text{area}(\Delta PBC)$
(c) $\text{area}(\Delta APD)$ (d) None of these

Ans : (a) $\text{area}(\Delta APB)$

Since, ΔBQC and $\parallel^{gm} ABCD$ are on same base BC and between same parallels BC and AD



Hence, area$(\Delta BQC) = \frac{1}{2}$area$(\parallel^{gm} ABCD)$ ...(1)

Similarly ΔAPB and $\parallel^{gm} ABCD$ are on same base AB and between same parallels AB and CD.

Hence, area$(\Delta APB) = \frac{1}{2}$area$(\parallel^{gm} ABCD)$ ...(2)
From (1) and (2),

$$\text{area}(\Delta BQC) = \text{area}(\Delta APB)$$

16. In a parallelogram $ABCD$, $AB = 12$ cm and the altitude corresponding to AB is 8 cm. If $AD = 10$ cm, then the altitude corresponding to AD is equal to

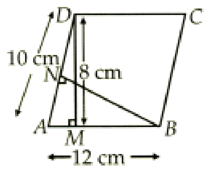
(a) 8.5 cm (b) 9 cm
(c) 9.6 cm (d) 10.8 cm

Ans : (c) 9.6 cm

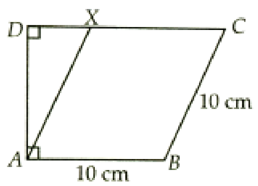
$$\text{Area of parallelogram} = \text{Base} \times \text{Height}$$
$$\text{Area } (\parallel^{gm} ABCD) = AB \times DM$$
$$= (12 \times 8)\,\text{cm}^2 \quad ...(1)$$
$$\text{Also, area of } (\parallel^{gm} ABCD) = AD \times BN$$
$$= BN \times 10 \quad ...(2)$$

From (1) and (2), we get

$$12 \times 8 = BN \times 10$$
$$\frac{12 \times 8}{10} = BN$$
$$BN = 9.6 \text{ cm}$$



17. In the given figure, $\angle BAD = \angle ADC = 90^\circ$ and $AX \parallel BC$. If $AB = BC = 10$ cm and $DC = 16$ cm, then the area of $ABCX$ is



(a) 80 cm^2 (b) 40 cm^2
(c) 20 cm^2 (d) 42 cm^2

Ans : (a) 80 cm^2

Since, $AX \parallel BC$ and $\angle BAD = \angle ADC = 90^\circ$
$AB \parallel CD$ or $AB \parallel CX$
Hence, $AXCB$ is a parallelogram

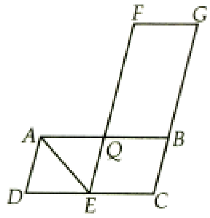
Now, $AX = BC = 10$ cm
and $AB = CX = 10$ cm
Hence, $XD = CD - CX = 16 - 10 = 6$ cm

In ΔAXD, $AD^2 = AX^2 - XD^2$

$$AD^2 = 10^2 - 6^2 = 100 - 36 = 64$$
$$AD = 8 \text{ cm}$$

Area of $\parallel^{gm} ABCX = AB \times AD$
$= 10 \times 8 = 80$ cm^2

18. In fig. $ABCD$ and $FECG$ are parallelograms equal in area.
If area$(AQE) = 12$ cm^2, then area$(\Delta AQE) = 12$ cm^2 then area$(||^{gm} FGBQ)$ is equal to



(a) 12 cm^2 (b) 20 cm^2
(c) 24 cm^2 (d) 36 cm^2

Ans : (c) 24 cm^2

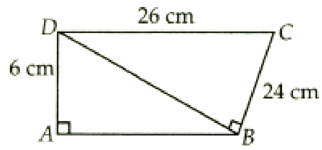
$$\text{area}(\parallel^{gm} ABCD) = \text{area}(\parallel^{gm} FECG)$$
$$\text{area}(\parallel^{gm} ABCD) - \text{area}(\parallel^{gm} BQEC)$$
$$= \text{area}(\parallel^{gm} FECG) - \text{area}(\parallel^{gm} BQEC)$$
$$\text{area}(\parallel^{gm} ADEQ) = \text{area}(\parallel^{gm} FGBQ)$$

Now, area$(\parallel^{gm} AQED)$

$$= \text{area}(\Delta ADE) + \text{area}(\Delta AQE)$$
$$= 12 + 12 = 24 \text{ cm}^2$$

So, area$(\parallel^{gm} FGBQ) = 24$ cm^2

19. In the adjoining figure, the area of quadrilateral $ABCD$ is



(a) 148 cm^2 (b) 144 cm^2
(c) 120 cm^2 (d) 122 cm^2

Ans : (b) 144 cm^2

In ΔBCD by Pythagoras theorem,

$$BD^2 + BC^2 = CD^2$$
$$(BD)^2 + (24)^2 = 26^2$$
$$BD^2 = (10)^2$$
$$BD = 10 \text{ cm}$$

In ΔABD by Pythagoras theorem

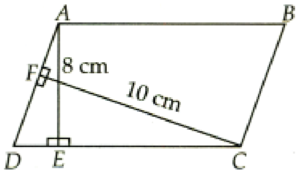
$$AB^2 = BD^2 - AD^2 = (10)^2 - (6)^2$$
$$= 100 - 36 = 64$$
$$AB = 8 \text{ cm}$$

Area of quadrilateral = area(ΔABD) + area(ΔBCD)

$$= \left[\frac{1}{2} \times 6 \times 8 + \frac{1}{2} \times 24 \times 10\right] \text{cm}^2$$
$$= 144 \text{ cm}^2$$

20. In figure, $ABCD$ is a parallelogram, $AE \perp DC$ and

$CF \perp AD$. If $AD = 12$ cm, $AE = 8$ cm and $CF = 10$ cm. Find CD.



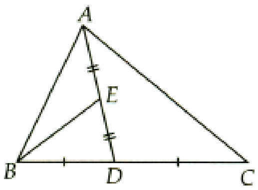
(a) 17 cm (b) 12 cm
(c) 10 cm (d) 15 cm

Ans : (d) 15 cm

We have,
$$AD = 12\text{ cm}$$
$$AE = 8\text{ cm}$$
$$CF = 10\text{ cm}$$

We know that,
$$\text{Area of parallelogram} = \text{base} \times \text{height}$$
$$= AD \times CF$$
$$= 12 \times 10 = 120\text{ cm}^2$$
$$\text{Again area of parallelogram} = \text{Base} \times \text{height}$$
$$= CD \times AE$$
$$= CD \times 8$$
$$120 = CD \times 8$$
$$CD = 15 \text{ cm}$$

21. ABC is a triangle in which D is the mid-point of BC and E is the mid-point of AD, such that the area of $\Delta BED = K$ area of ΔABC. Find K.



(a) 2 (b) 1/4
(c) 4 (d) 1/2

Ans : (b) 1/4

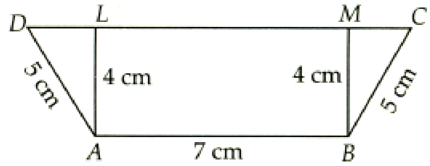
Median of a triangle divides it into two triangles of equal area.

AD is a median of ΔABC.
$$\text{area}(\Delta ABD) = \text{area}(\Delta ADC)$$
$$= \frac{1}{2}\text{area}(\Delta ABC) \qquad ...(1)$$

Again, BE is a median of ΔABD,
$$\text{area}(\Delta BEA) = \text{area}(\Delta BED)$$
$$= \frac{1}{2}\text{area}(\Delta ABD)$$
$$= \frac{1}{2}\cdot\frac{1}{2}\text{area}(\Delta ABC) \text{(From (1))}$$
$$= \frac{1}{4}\text{area}(\Delta ABC)$$
$$= K\,\text{area}(\Delta ABC)$$

Hence,
$$K = \frac{1}{4}$$

22. In figure, $ABCD$ is a trapezium in which $AB \parallel DC$. Find the length of DC.



(a) 17 cm (b) 11 cm
(c) 13 cm (d) 15 cm

Ans : (c) 13 cm

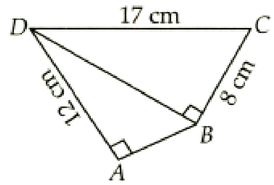
$$AL = BM = 4 \text{ cm}$$
$$AD = BC = 5 \text{ cm}$$
$$AB = ML = 7 \text{ cm}$$

In right ΔALD, $DL^2 = AD^2 - AL^2 = 5^2 - 4^2 = 9$
$$DL = 3\text{ cm}$$

Similarly, $CM = 3\text{ cm}$

Now,
$$CD = CM + ML + DL$$
$$= 3 + 7 + 3 = 13\text{ cm}$$

23. Calculate the area of quad. $ABCD$.



(a) 102 cm^2 (b) 154 cm^2
(c) 132 cm^2 (d) 114 cm^2

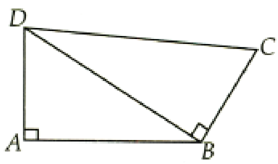
Ans : (d) 114 cm^2

In right ΔDBC,
$$DB^2 = DC^2 - BC^2 = 17^2 - 8^2 = 225$$
$$DB = 15\text{ cm}$$

and inright ΔDAB,
$$AB^2 = DB^2 - AD^2 = 15^2 - 12^2$$
$$= 81$$
$$AB = 9\text{ cm}$$

Now, Area of quad.
$$ABCD = \text{area}(\Delta DAB) + \text{area}(\Delta DBC)$$
$$= \frac{1}{2} \times AB \times AD + \frac{1}{2} \times BC \times DB$$
$$= \frac{1}{2} \times 9 \times 12 + \frac{1}{2} \times 8 \times 15$$
$$= 54 + 60 = 114\text{ cm}^2$$

24. In the given figure, $AB \perp AD$, $BC \perp BD$ and $AD = 9\text{ cm}$, $BC = 8\text{ cm}$ and $CD = 17\text{ cm}$. Find AB.



(a) 14 cm (b) 12 cm
(c) 9 cm (d) 17 cm

Ans : (b) 12 cm

In ΔDBC,

$$BD^2 = DC^2 - BC^2$$
$$= 17^2 - 8^2 = 225$$
$$BD = 15\text{ cm}$$

In ΔABD, $AB^2 = BD^2 - AD^2 = 15^2 - 9^2 = 144$

$$AB = 12\text{ cm}$$

25. $ABCD$ is a parallelogram. E is a point on BA such that $BE = 2EA$ and F is a point on DC such that $DF = 2FC$. If area$(AECF) = k$[area$(ABCD)$] then k equals

(a) 1/3 (b) 2/3

(c) 4/3 (d) 3/4

Ans : (a) 1/3

We have, $BE = 2EA$

and $DF = 2FC$

$$AB - AE = 2AE$$

and $DC - FC = 2FC$

$$AB = 3AE$$

and $DC = 3FC$

$$AE = \frac{1}{3}AB$$

and $FC = \frac{1}{3}DC$

$$AE = FC \qquad [AB = DC[$$

Thus, $AE \parallel FC$ such that $AE = FC$.

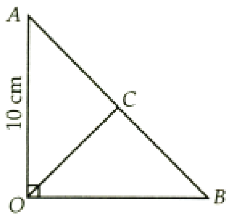
Hence, $AECF$ is a parallelogram.

Clearly, parallelograms $ABCD$ and $AECF$ have the same altitude and

$$AE = \frac{1}{3}AB$$

$$\text{area}(\parallel^{gm} AECF) = \frac{1}{3}\text{area}(\parallel^{gm} ABCD)$$

26. In the adjoining figure, $\angle AOB = 90°$, $AC = BC$, $OA = 10$ cm and $OC = 13$ cm. The area of ΔAOB is



(a) 120 cm^2 (b) 135 cm^2

(c) 140 cm^2 (d) 148 cm^2

Ans : (a) 120 cm^2

Since the mid-point of the hypotenuse of a right triangle is equidistant from the vertices.

Hence, $CA = CB = OC$

$$CA = CB = 13\text{ cm}$$
$$AB = CA + CB = 26\text{ cm}$$

Now, in right ΔOAB,

$$AB^2 = OB^2 + OA^2$$
$$26^2 = OB^2 + 10^2$$
$$OB^2 = 676 - 100 = 576$$
$$OB = 24\text{ cm}$$

$$\text{area}(\Delta AOB) = \frac{1}{2}(OA \times OB)$$
$$= \frac{1}{2}(10 \times 24)\text{ cm}^2$$
$$= 120\text{ cm}^2$$

27. $PQRS$ is an isosceles trapezium in which $PS = 10$ cm, $PQ = SR = 13$ cm and the distance between PS and QR is 12 cm. Find the area of the trapezium.

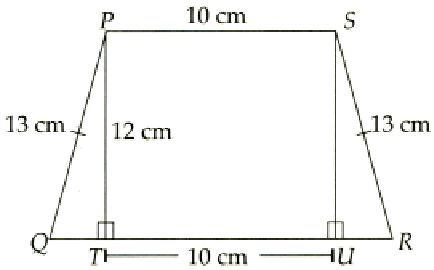
(a) 180 cm^2 (b) 160 cm^2

(c) 176 cm^2 (d) 194 cm^2

Ans : (a) 180 cm^2

In right ΔPQT,

$$QT^2 = PQ^2 - PT^2 = 13^2 - 12^2 = 25$$



$$QT = 5\text{ cm}$$

Similarly, $UR = 5\text{ cm}$

Hence, $QR = QT + TU + UR$

$$= 5 + 10 + 5 = 20\text{ cm}$$

Now, area of trapezium $PQRS$

$$= \frac{1}{2} \times (PS + QR) \times PT$$
$$= \frac{1}{2} \times (10 + 20) \times 12$$
$$= 180\text{ cm}^2$$

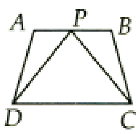
28. Parallelograms on the same base and between the same parallels are equal in

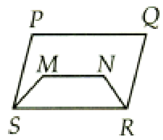
(a) perimeter (b) volume

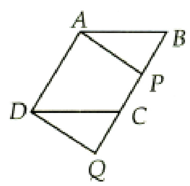
(c) area (d) weight

Ans : (c) area

29. Which of the following figures lie on the same base and between the same parallels?

(a) 

(b) 

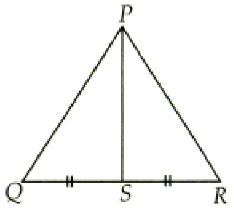
(c) 

(d) Both (a) and (c)

Ans : (d)

30. If PS is median of the triangle PQR, then area(ΔPQS)

: area($\Delta\, QRP$) is



Ans :

(a) 1 : 1 (b) 2 : 1

(c) 1 : 2 (d) Can't be determined

Ans : (c) 1 : 2

PS is median of $\Delta\, PQR$

Hence, area($\Delta\, PQS$) $=$ area($\Delta\, PSR$) $= \frac{1}{2}$area(QRP)
(Since, Median of a triangle divides it into two triangles of equal area)

$$\text{area}(\Delta\, PQS) = \frac{1}{2}\ \text{area}(\Delta\, QRP)$$

$$\frac{\text{area}(\Delta\, PQS)}{\text{area}(\Delta\, QRP)} = \frac{1}{2}$$

Hence, $\quad \text{area}(\Delta\, PQS):\text{area}(\Delta\, QRP) = 1:2$

31. Sides AB and AC of triangle ABC are trisected at D and E then $\Delta\, ADE$ and trapezium $DECB$ have their areas in the ratio of

(a) 1 : 4 (b) 1 : 8

(c) 1 : 9 (d) 1 : 2

Ans : (a) 1 : 4

32. The base BC of triangle ABC is divided at D so that $ED = \frac{1}{2}DC$. Area of $\Delta\, ABD =$

(a) 1/3 of the area of $\Delta\, ABC$

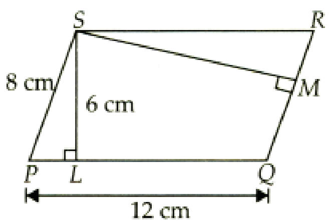
(b) 1/2 of the area of $\Delta\, ABC$

(c) 1/4 of the area of $\Delta\, ABC$

(d) 1/6 of the area of $\Delta\, ABC$

Ans : (a) 1/3 of the area of $\Delta\, ABC$

33. In parallelogram $PQRS$, find SM.



(a) 9 cm (b) 7 cm

(c) 5 cm (d) 12 cm

Ans : (a) 9 cm

Area of parallelogram

$$PQRS = PQ \times SL \text{ or } QR \times SM$$

$$PQ \times SL = QR \times SM$$

$$12 \times 6 = SP \times SM$$

(Since, Opposite sides of a $\parallel^{gm}$)

$$72 = 8 \times SM$$

$$SM = \frac{72}{8} = 9\,\text{cm}$$

34. In the parallelogram $ABCD$, the side AB is produced to point X, so that $BX = AB$. The line DX cuts BC at E. Area of $\Delta\, AED =$

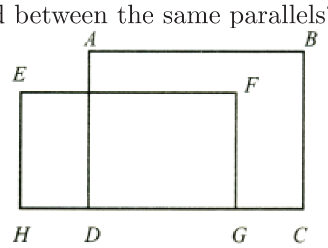
(a) $2 \times$ area ($\Delta\, CEX$) (b) $1/2 \times$ area ($\Delta\, CEX$)

(c) area ($\Delta\, CEX$) (d) $1/3 \times$ area ($\Delta\, CEX$)

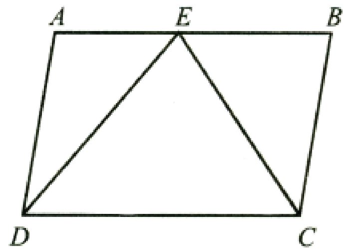
Ans : (a) $2 \times$ area ($\Delta\, CEX$)

35. Which of the following figures lie on the same base and between the same parallels?

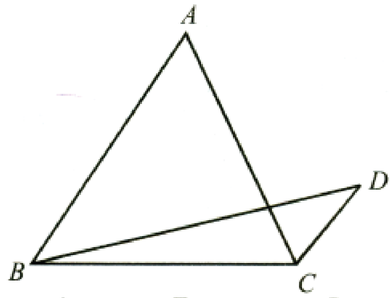
(a)



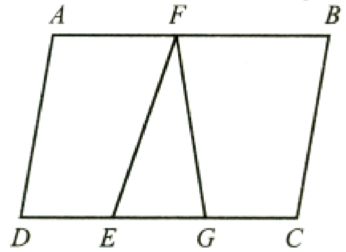
(b)



(c)



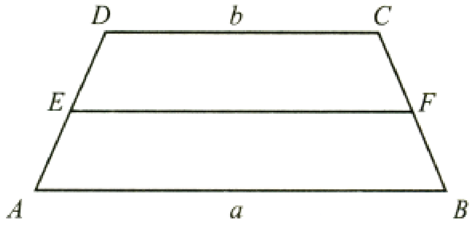
(d)



Ans : (b)

Common base $= DC$ and two parallels are $AB$and DC.
Thus, $DEDC$ and parallelogram $ABCD$ are on same base DC and between same parallel lines AB and DC.

36. $ABCD$ is a trapezium with parallel sides $AB = a$ cm and $DC = b$ cm. E and F are the mid-points of the non-parallel sides. The ratio of ar($ABFE$) and ar ($EFCD$) is



(a) $a:b$ (b) $(3a+b):(a+3b)$
(c) $(a+3b):(3a+b)$ (d) $(2a+b):(3a+b)$

Ans : (c) $(a+3b):(3a+b)$

Since E and F are mid-points of the sides AD and BC, therefore height of both of the trapezium $ABFE$ and $EFCD$ will be same.

$$\frac{\text{area of trapezium } ABFE}{\text{area of trapezium } EFCD} = \frac{\frac{1}{2}(EF+CD)\times h}{\frac{1}{2}(EF+AB)\times h}$$

$$= \frac{EF+b}{EF+a}$$

EF is parallel to both AB and CD and EF

$$= \frac{a+b}{2}$$

$$\frac{\text{area of } ABFE}{\text{area of } EFCD} = \frac{\frac{a+b}{2}+b}{\frac{a+b}{2}+a}$$

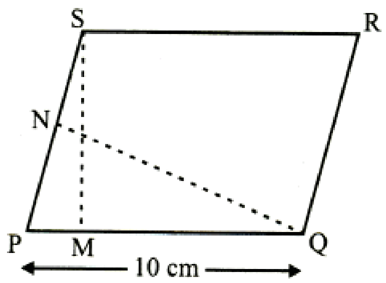
$$= \frac{a+3b}{3a+b}$$

37. In parallelogram $PQRS$, $PQ = 10\,\text{cm}$. The altitudes corresponding to the sides PQ and SP are 6 cm and 8 cm respectively, then SP is.

(a) 2.5 cm (b) 5 cm
(c) 7.5 cm (d) 10 cm

Ans : (c) 7.5 cm

Area of parallelogram = base × height



Hence, area(∥ gm $PQRS$) $= PQ \times SM$

$= 10 \times 6$

$= 60\,\text{cm}^2$ ...(1)

Also, area(∥ gm $PQRS$) $= SP \times QN$

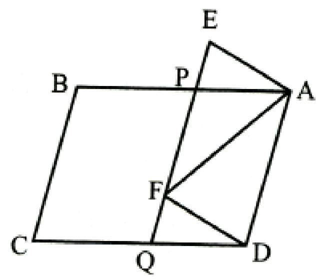
$= SP \times 8$ ...(2)

From (1) and (2), we have

$$60 = SP \times 8$$

$$SP = \frac{60}{8} = 7.5\,\text{cm}$$

38. In figure $ABCD$ and $AEFD$ are two parallelograms, then the ratio of ar(ΔPEA) to the ar(ΔQFD).



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

Ans : (d) 1 : 1

In triangles PEA and QFD, we have

$\angle APE = \angle DQF$ (Corresponding angles)

$AE = DF$ (Opposite sides of ∥ gm $AEFD$)

$\angle AEP = \angle DEQ$ (Corresponding angles)

Hence, $\Delta PEA \cong \Delta QFD$

(ASA congruence criterion)

As congruent triangles have equal area,

Hence, area(ΔPEA) = area(ΔQFD)

Hence, $\frac{\text{area}(\Delta PEA)}{\text{area}(\Delta QFD)} = \frac{1}{1} = 1:1$

2. FILL IN THE BLANK

DIRECTION : Complete the following statements with an appropriate word/term to be filled in the blank space(s).

1. The area of parallelogram is the .... of its base and the corresponding altitude.

Ans : product

2. A .... of a triangle divides it into two triangles of equal area.

Ans : median

3. A diagonal of a parallelogram divides it into two triangles of equal ....

Ans : area

4. The area of a parallelogram is the product of its base and the corresponding ....

Ans : altitude

5. Two triangles having the same base and equal area lie between the same ....

Ans : parallels

3. TRUE/FALSE

DIRECTION : Read the following statements and write your answer as true or false.

1. Parallelograms on the same base and between the same parallels are different in area.

Ans : False

2. The length of the line segment which is perpendicular to the base from the opposite vertex is called the altitude of the parallelogram corresponding to the given base.

Ans : True

3. The base of a triangle is 13 cm and height is 6 cm, so its area is 78 sq cm.

Ans : False

4. If two triangles have a common vertex and their bases lie on the same line, then their areas are proportional to the lengths of their bases.

Ans : True

5. A median of a triangle divides it into two triangles of equal areas.

Ans : True

6. The area of a parallelogram $ABCD$ is equal to $AB \times CE$, where CE is the altitude from C to AD.

Ans : False

7. The area of a triangle $= 2 \times$ base $\times$ height

Ans : False

8. The area of a trapezium is half of the product of its height and the sum of parallel sides.

Ans : True

9. Any side of a parallelogram can be said its base.

Ans : True

4. MATCHING QUESTIONS

DIRECTION : In the section, each question has two matching lists. Choices for the correct combination of elements from Column-I and Column-II are given as options (a), (b), (c) and (d) out of which one is correct.

1. In ΔABC, If L and M are points on AB and AC respectively such that $LM \parallel BC$. Then match equal areas in both lists.

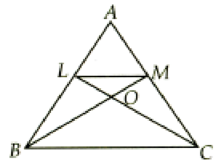
Column-I		Column-II	
(P)	area(ΔLCM)	(1)	area(ΔACL)
(Q)	area(ΔLBC)	(2)	area(ΔLBM)
(R)	area(ΔABM)	(3)	area(ΔMOC)
(S)	area(ΔLOB)	(4)	area(ΔMBC)

	P	Q	R	S
(a)	4	2	3	1
(b)	2	4	1	3
(c)	3	2	4	1
(d)	1	2	3	4

Ans : (b) P − 2, Q − 4, R − 1, S − 3

(P) Clearly, triangles LMB and LMC are on the same base LM and between the same parallels LM and BC.

Hence, area(ΔLMB) $=$ area(ΔLMC)



(Q) Triangles LBC and MBC are on the same base BC and lie between the parallels LM and BC

Hence, area(ΔLBC) $=$ area(ΔMBC)

(R) Adding area(ΔALM) on both sides in (1), we get

$$\text{area}(\Delta LMB) + \text{area}(\Delta ALM) = \text{area}(\Delta LMC) + \text{area}(\Delta ALM)$$

$$\text{area}(\Delta ABM) = \text{area}(\Delta ACL)$$

(S) We have,

$$\text{area}(\Delta LBC) = \text{area}(\Delta MBC)$$

Subtracting area(ΔBOC) from both sides, we get

$$\text{area}(\Delta LBC) - \text{area}(\Delta BOC) = \text{area}(\Delta MBC) - \text{area}(\Delta BOC)$$

$$\text{area}(\Delta LOB) = \text{area}(\Delta MOC)$$

2. $ABCD$ is parallelogram. G is the point on AB such that $AG = 2GB$, E is a point on DC such that $CE = 2DE$ and F is the point on BC such that $BF = 2FC$. Then match equal areas in both lists.

Column-I		Column-II	
(P)	area($ADEG$)	(1)	$\frac{1}{6}$ area($ABCD$)
(Q)	area(ΔEGB)	(2)	area(ΔCBG)
(R)	area(ΔEFC)	(3)	area($GBCE$)
(S)	area(ΔADE)	(4)	$\frac{1}{2}$ area(ΔEBF)

	P	Q	R	S
(a)	4	2	1	3
(b)	1	2	3	4
(c)	2	3	1	4
(d)	3	1	4	2

Ans : (d) P − 3, Q − 1, R − 4, S − 2

3. Match of following

	Column-I		Column-II
(P)	The area of a rhombus if the lengths of diagonals are 16 cm and 24 cm, is	(1)	9.6 cm
(Q)	The area of a trapezium whose parallel sides are 9 cm & 16 cm and the distance between these sides is 8 cm, is	(2)	8 cm

(R)	The area of a rhombus is 20 cm^2. If one of its diagonals is 5 cm, the other diagonal is	(3)	192 cm^2
(S)	In a parallelogram $ABCD$, $AB = 12$ cm and the altitude corresponding to AB is 8 cm. If $AD = 10$ cm, then the altitude corresponding to AD is equal to	(4)	100 cm^2

Ans : P − 3, Q − 4, R − 2, S − 1

(P) Area of rhombus $= \frac{1}{2} \times d_1 \times d_2$

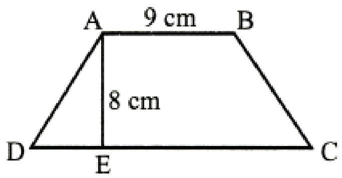
$$= \frac{1}{2} \times 16 \times 24 = 192\text{ cm}^2$$

(Q) Area of trapezium $ABCD$

$$= \frac{1}{2}[AB + CD] \times AE$$

$$= \frac{1}{2}(16 + 9) \times 8$$

$$= 100\text{ cm}^2$$



(R) Area of rhombus $= \frac{1}{2} \times d_1 \times d_2$

$$20 = \frac{1}{2} \times 5 \times d_2$$

$$d_2 = 8\text{ cm}$$

(S) Area of parallelogram $=$ Base × Height

Hence, Area of $ABCD = (12 \times 8)\text{ cm}^2$ ...(1)

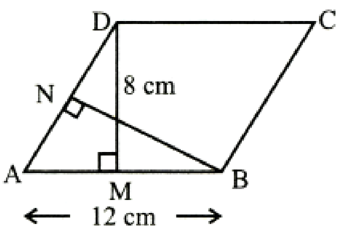
Also, area of $ABCD = AD \times BN$

$= BN \times 10$ ...(2)

From (1) and (2), we get

$$12 \times 8 = BN \times 10$$

$$BN = 9.6\text{ cm}$$



5. ASSERTION AND REASON

DIRECTION : In each of the following questions, a statement of Assertion is given followed by a corresponding statement of Reason just below it. Of the statements, mark the correct answer as

(a) Both assertion and reason are true and reason is the correct explanation of assertion.

(b) Both assertion and reason are true but reason is not the correct explanation of assertion.

(c) Assertion is true but reason is false.

(d) Assertion is false but reason is true.

1. Assertion : A triangle and a rhombus are on the same base and between the same parallels. The ratio of the areas of the triangle and the rhombus is 1 : 2.

Reason : The area of a triangle is half of the area of a parallelogram on the same base and between the same parallels.

Ans : (a) Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

Assertion: Area of $\Delta = \frac{1}{2}$ area of rhombus

$$\frac{\text{Area of } \Delta}{\text{Area of rhombus}} = \frac{1}{2} \equiv 1:2$$

2. Assertion : A quadrilateral $ABCD$ is such that diagonal BD divides its area in two equal parts. Then BD bisects AC.

Reason : AAS criterion of congruency is used.

Ans : (a) Both assertion and reason are true and reason is the correct explanation of assertion.

Given : A quadrilateral $ABCD$ in which diagonal BD bisects it i.e., area$(\Delta ABD) =$ area(ΔBDC)

Construction : Join AC. Suppose AC and BD intersect at O. Draw $AL \perp BD$ and $CM \perp BD$.

To prove : $AO = OC$

Proof : We have, area$(\Delta ABD) =$ area(ΔBDC)

Thus, $\Delta s\, ABD$ and BDC are on the same base AB and have equal area. Therefore, their corresponding altitudes are equal i.e., $AL = CM$.

Now, in ΔALO and ΔCMO, we have

$\angle 1 = \angle 2$ [Vertically opposite angles]

$\angle ALO = \angle CMO$ [Each equal to 90°]

and $AL = CM$ [Proved above]

$\Delta ALO \cong \Delta CMO$ [AAS congruency]

$AO = CO$ [C.P.C.T.]

3. Assertion : The area of an equilateral triangle is $16\sqrt{3}\text{ cm}^2$ whose each side is 8 cm.

Reason : Area of an equilateral triangle is given by $\frac{\sqrt{3}}{4}(\text{side})^2$.

Ans : (a) Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

$$\text{Area of triangle} = \frac{\sqrt{3}}{4}(8)^2\text{ cm}^2$$

$$= \frac{\sqrt{3}}{4} \times 8 \times 8 = 16\sqrt{3}\text{ cm}^2$$

4. Assertion : If the diagonals of a rhombus are 8 cm and 12 cm, then the area of rhombus is given by 96 cm^2.

Reason : Area of rhombus is $\frac{1}{2} \times d_1 \times d_2$, where d_1 and d_2 are lengths of the diagonals.

Ans : (d) Assertion is false but reason is true.

$$\text{Area of rhombus} = \frac{1}{2} \times d_1 \times d_2$$

$$= \frac{1}{2} \times 8 \times 12\,\text{cm}^2 = 48\,\text{cm}^2$$

5. **Assertion :** In a parallelogram $PQRS$, QS is one of the diagonals then $\text{area}(\Delta PQS) = (\text{area}\,\Delta QRS)$
Reason : If a planar region formed by a figure R is made up of two non-overlapping planar regions formed by figures R_1 and R_2, then $\text{area}(R) = \text{area}(R_1) + \text{area}(R_2)$.
Ans : (b) Both assertion and reason are true but reason is not the correct explanation of assertion.

In ΔPQS and ΔQRS

We have, $PQ = SR$

$PS = RQ$ [$PQRS$ is a parallelogram]

and $QS = SQ$ [Common side]

$\Delta PQS \cong \Delta RSQ$ [By SSS congruency]

Hence, $\text{area}(\Delta PQS) = \text{area}(\Delta RSQ)$

6. **Assertion :** If area of ΔABD is equal to $24\,\text{cm}^2$ then area of parallelogram $ABCD$ is $24\,\text{cm}^2$.

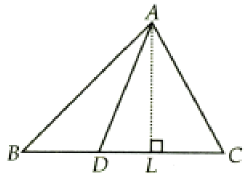
Reason : If a triangle and a parallelogram are on the same base and between same parallels, then area of the triangle is equal to half of the parallelogram.
Ans : (d) Assertion is false but reason is true.

$$\text{Area of } (\Delta ABD) = \frac{1}{2}\,\text{area (paralle log ram } ABCD)$$

$$\text{Area of parallelogram } ABCD = 2 \times \text{Area of } (\Delta ABD)$$

$$= 2 \times 24 = 48\,\text{cm}^2$$

7. **Assertion :** In the given figure, the point D divides the side BC of ΔABC in the ratio m : n.



Then $\dfrac{\text{area}(\Delta ABD)}{\text{area}(\Delta ADC)} = \dfrac{m}{n}$

Reason : Area of triangle

$$= \frac{1}{2} \times \text{Base} \times \text{Height}$$

Ans : (a) Both assertion and reason are true and reason is the correct explanation of assertion.

$$\frac{\text{area}(\Delta ABD)}{\text{area}(\Delta ADC)} = \frac{(1/2) \times BD \times AL}{(1/2) \times DC \times AL}$$

$$= \frac{BD}{DC} = \frac{m}{n}$$

8. **Assertion :** Two parallelograms are on equal bases and between the same parallels. The ratio of their areas is 1 : 1.
Reason : Two parallelograms on the same base (or equal bases) and between the same parallel lines are equal in area.
Ans : (a) Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.