Important Questions - Areas of Parallelograms and Triangles

9th Standard CBSE

Mathematics

Reg.No. :

Time : 01:00:00 Hrs

Total Marks : 50

Section-A

1) Area of a parallelogram is equal to **1**

(a) $\frac{1}{2} \times Base \times Corresponding \quad altitude$ (b) $\frac{1}{3} \times Base \times Corresponding \quad altitude$ (c) $\frac{1}{4} \times Base \times Corresponding \quad altitude$ (d) $Base \times Corresponding \quad altitude$

2) Area of a triangle is equal to **1**

(a) $\frac{1}{2} \times Base \times Corresponding \quad altitude$ (b) $\frac{1}{4} \times Base \times Corresponding \quad altitude$ (c) $\frac{1}{3} \times Base \times Corresponding \quad altitude$ (d) $Base \times Corresponding \quad altitude$

3) The areas of a parallelogram and a triangle are equal and they lie on the same base. If the altitude of the parallelogram is 2 cm, then the altitude of triangle is **1**

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

4) In the figure, the area of parallelogram PQRS is: **1**

(a) $PQ \times QB$ (b) $QR \times QC$ (c) $SR \times QC$ (d) $PS \times SA$

5) If length of the diagonal of a square is 8 cm, then its area will be **1**

(a) $64cm^2$ (b) $32cm^2$ (c) $16cm^2$ (d) $48cm^2$

6) Two parallelograms are on equal bases and between the same parallels. The ratio of their areas is **1**

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

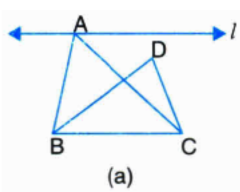
7) If a rectangle and a square stand on the same base and between the same parallels, then the ratio of their areas is **1**

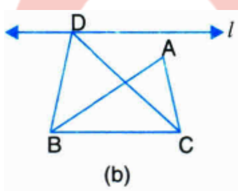
(a) 1:2 (b) 1:4 (c) 1:1 (d) 2:1

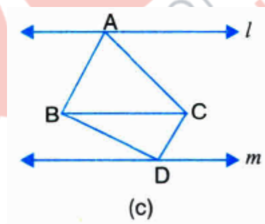
8) ABCD is a quadrilateral whose diagonal AC divides it into two parts equal in area, then ABCD is **1**

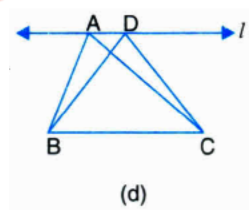
(a) a rhombus (b) a parallelogram (c) a kite (d) a trapezium

9) In which of the following figures, ΔABC and ΔDBC lie on the same base and between the same parallels? **1**

(a) 

(b) 

(c) 

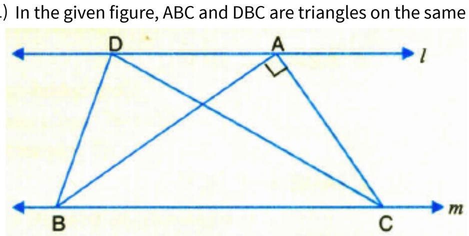
(d) 

10) In ΔABC, E is the mid-point of median AD. Then the ratio of areas of ΔBED to area of ΔABC is: **1**

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

Section-B

11) In the given figure, ABC and DBC are triangles on the same base and between parallel lines I and m. If AB = 3 cm, BC = 5 cm, $\angle A = 90°$, find area of Δ DBC. **2**

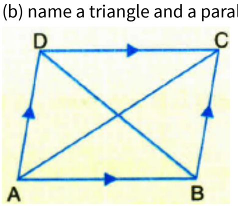


12) In a parallelogram ABCD, AB = 8 cm. The altitudes corresponding to sides AB and AD are respectively 4 cm and 5 cm. Find measure of AD. **2**

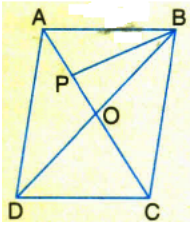
13) In the given figure: **2**

(a) name the two triangles on the same base AB and between the same parallels.

(b) name a triangle and a parallelogram on the same base BC and between the same parallels.



14) ABCD is a parallelogram with area 80 sq. cm. The diagonals AC and BD intersect at O. P is the midpoint of OA. Calculate ar(Δ BOP) **2**



15) P and Q are any two points lying on the sides DC and AD respectively of a parallelogram ABCD. Show that ar(Δ APB)=ar(Δ BQC) **2**

16) Parallelogram ABCD and rectangle ABEF are on the same base AB and have equal areas. Show that the perimeter of the parallelogram is greater than that of the rectangle. **2**

17) A farmer was having a field in the form of a parallelogram PQRS. She took any point A on RS and joined it "to points P and Q. In how many parts the fields is divided? What are the shapes of these parts? The farmer wants to sow wheat and pulses in equal portions of the field separately. How should she do it? **2**

18) Diagonals AC and BD of a trapezium ABCD with AB || DC intersect each other at O. Prove that ar(ΔAOD) = ar(Δ BOC). **2**

19) D and E are points on sides AB and AC respectively of Δ ABC such that ar(Δ DBC) = ar(Δ EBC). Prove that DE || BC. **2**

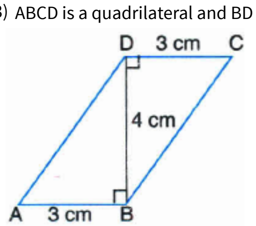
20) ABCD is a' trapezium with AB || DC A line parallel to AC intersects AB at X and BC at Y. Prove that ar(Δ ADX) = ar(Δ ACY) **2**

Section-C

21) Prove that the area of a trapezium is equal to half of the product of its height and sum of parallel sides. **5**

22) Given two points A and B and a positive real number k. Find the locus of a point P such that ar(Δ PAB) = k. **5**

23) ABCD is a quadrilateral and BD is one of its diagonals as shown in figure. Show that ABCD is a parallelogram and find its area. **5**



24) ABCD is a parallelogram whose diagonals intersect at o. If P is any point on BO, prove that **5**
(i) ar(ΔADO) = ar(Δ CDO)
(ii) ar(ΔABP) = ar(Δ CBP)

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Section-A

1) (d) $Base \times Corresponding \quad altitude$ **1**

2) (a) $\frac{1}{2} \times Base \times Corresponding \quad altitude$ **1**

3) (a) 4cm **1**

4) (c) $SR \times QC$ **1**

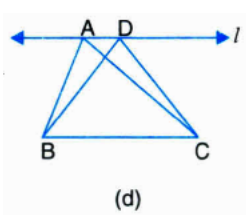
5) (b) $32cm^2$ **1**

6) (b) 1:1 **1**

7) (c) 1:1 **1**

8) (b) a parallelogram **1**

9) (d) **1**



10) (d) 1:4 **1**

Section-B

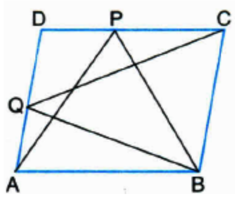
11) $7.5cm^2$ **2**

12) 6.4cm **2**

13) $(a)\Delta DAB, DCAB(b)\Delta DAB, ||gm \quad ABCD$ **2**

14) $10\ cm^2$ **2**

15) Given: P and Q are any two points lying on the sides DC and AD respectively of a parallelogram ABCD. **2**



To Prove: ar(ΔAPB) = ar(Δ BQC).

Proof: ΔAPB and || gm ABCD are on the same base AB between the same parallels AB and DC.

ar(Δ APB)=$\frac{1}{2}ar(||\quad gm\quad ABCD)$ ....(i)

(Δ BQC) and || gm ABCD are on the same parallels BC and AD.

ar(Δ BQC)=$\frac{1}{2}ar(||\quad gm\quad ABCD)$ ....(ii)

from (1) and (2),

ar(Δ APB)=ar(Δ BQC)

16) **2**

Given: Parallelogram ABCD and rectangle ABEF are on the same base AB and have equal areas

To Prove: The perimeter of the parallelogram ABCD is greater than that of rectangle ABEF

Proof: Let AB CD be the parallelogram and ABEF be the rectangle on the same base AB and between the same parallels AB and Fe. Then, perimeter of the parallelogram ABCD = 2(AB + AD) and, perimeter of the rectangle ABEF = 2(AB + AF).

In Δ ADF,

$\angle AFD = 90°$

$\angle ADF$ is an acute angle.($< 90°$)

|Angle sum property of a triangle

$\angle AFD > \angle ADFAD > AF$

|Side opposite to greater angle of a triangle is longer

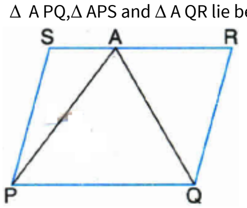
AB+AD>AB+AF

2(AB+AD)>2(AB+AF)

Perimeter of the parallelogram ABCD>Perimeter of the rectangle ABEF.

17) **2**

Δ A PQ,Δ APS and Δ A QR lie between the same parallels.



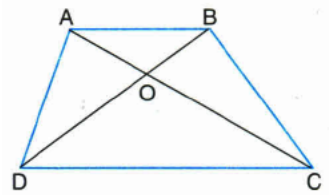
Their altitudes are same. Let it be x. Then,

$ar(\Delta\quad APQ) = \frac{(PQ)(x)}{2}$ $......(1)ar(\Delta\quad APS) + ar(\Delta\quad AQR)$ $= \frac{(AS)(x)}{2} + \frac{(AR)(x)}{2}$ $= \frac{(AS+AR)(x)}{2} = \frac{(SR)(x)}{2}$

|SR = PQ (Opposite sides of
parallelogram are equal)

Therefore, either the farmer should sow wheat in Δ APQ and pulses in the other two triangles APS and AQR or pulses in Δ APQ and wheat in the other two triangles APS and AQR.

18) Given: Diagonals AC and BD of a trapezium ABCD with AB 11DC intersect each other at O. **2**



To Prove: ar(ΔAOD) = ar(ΔBOC).

Proof: ΔABD and ΔABC are on the same base AB and between the same parallels AB and DC.

ar(ΔABD) = ar(ΔABC)

|Two triangles on the same base
(or equal bases) and between the
same parallels are equal in area

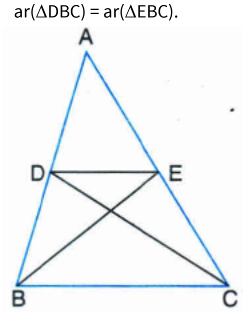
⇒ ar(ΔABD) - ar(ΔAOB)

⇒ ar(ΔABC) - ar(ΔAOB)

I Subtracting ar(Δ AOB)from both sides

⇒ ar(ΔAOD) = ar(ΔBOC).

19) Given: D and E are points on sides AB and AC respectively of ΔABC such that **2**
ar(ΔDBC) = ar(ΔEBC).



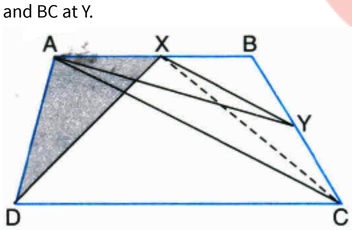
To Prove DE || BC.

Proof: '.' ΔDBC and ΔEBC are on the same base BC and have equal areas.

Their altitudes must be the same.

DE || BC.

20) Given: AB CD is a trapezium with AB || DC. A line parallel to AC intersects AB at X **2**
and BC at Y.



To Prove: ar(ΔADX) = ar(ΔACY).

Construction: Join CX.

Proof: ΔADX and ΔACX are on the same base AX and between the same parallels AB and DC.

ar(ΔADX) = ar(ΔACX) ...(1)

|Two triangles on the same base
(or equal bases) and between the
same parallels are equal in area

ΔACX and ΔACY are on the same base AC and between the same parallels AC and XY.

ar(ΔACX) = ar(ΔACY) ...(2)

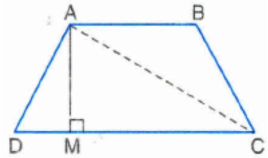
|Two triangles on the same base
(or equal bases) and between the
same parallels are equal in area

From (1) and (2), we get

ar(ΔADX) = ar(ΔACY).

Section-C

21) Given: ABCD is a trapezium with AB || CD. AM is its height. 5



To Prove: ar(trapezium ABCD)

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

Construction: Join AC

Proof:ar(trapezium ABCD)

$ar(\Delta \quad ADC) + ar(\Delta \quad ABC) = \frac{1}{2} \times DC \times AM + \frac{1}{2} \times AB \times AM = \frac{1}{2} \times (DC + AB) \times AM = \frac{1}{2}(AB + Dc)(AM)$

22) Given: Two points A and B and a positive real number k. 5

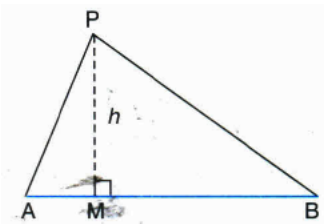
To find: The locus of a point P such that ar(Δ PAB) = k.

Construction: Draw $PM \perp AB$

Determination: Let PM = h

ar(ΔPAB) = k |Given

$\Rightarrow \frac{1}{2}(AB)(PM) = k \Rightarrow \frac{1}{2}(AB)(h) = k \qquad h = \frac{2k}{AB}$



Points A and B are given. AB is fixed.

Also, k being a positive real number k is fixed.

h is a fixed positive real number.

The locus of P is a line parallel to the line

AB at a fixed distance of $h = \frac{2k}{AB}$ on either side of it.

23) Given: ABCD is a quadrilateral and BD is one of its diagonals. 5

To Prove: ABCD is a parallelogram and to determine its area.

Proof:$\angle ABD = \angle BDC(= 90°)$ |Given

But these angles form a pair of equal alternate.interior angles for lines AB, DC and a transversal BD

AB || DC

Also, AD = DC (= 3 cm) I Given

Hence, quadrilateral ABCD is a parallelogram.

I A quadrilateral is a parallelogram if its one pair of opposite sides are parallel and equal

Now,

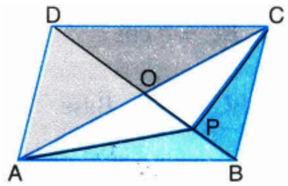
$ar(||gm \quad ABCD) = base \times Corresponding \quad altitude \qquad = 3 \times 4 \qquad = 12cm^2$

24) Given: ABCD is a parallelogram whose diagonals intersect at O. P is any point on BO. **5**

To prove:

(i) ar(ΔADO) = ar(Δ CDO)

(ii) ar(Δ ABP) = ar(Δ CBP)



Proof:

i) Diagonals of a parallelogram bisect each other

AO=OC

O is the midpoint of AC

DO is a median of Δ DAC

ar(Δ ADO) = ar(Δ CDO)

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

(ii)BO is a median of Δ BAC

ar(Δ BOA) = ar(Δ BOC) ....(1)

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

PO is a median of Δ PAC

ar(Δ POA) = ar(Δ POC) ....(2)

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

Subtracting (2) from (1), we get

ar(Δ BOA) - ar(Δ POA) = ar(Δ BOC) - ar(Δ POC)

ar(Δ ABP) = ar(Δ CBP)