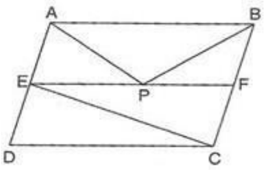
CBSE Test Paper 05

CH-9 Areas of Parallelograms & Triangles

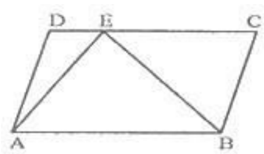
1. The median of a triangle divides it into two
   a. congruent triangles.
   b. triangles of different areas.
   c. right angles.
   d. isosceles triangles.

2. ABCD is a parallelogram and E and F are mid-points of AD and BC respectively. P is any point on EF. If area of $\triangle EFC = 8\ cm^2$, then $ar(\triangle AEP + \triangle BFP)$ is



   a. $16\ \ cm^2$.
   b. $4\ \ cm^2$.
   c. $12\ \ cm^2$.
   d. $8\, cm^2$.

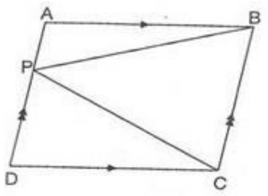
3. In the figure if area of parallelogram ABCD is $30\ \ cm^2$, then $ar\ (ADE) + ar(BCE)$ is equal to



   a. $20\ \ cm^2$.
   b. $30\ \ cm^2$.
   c. $15\ \ cm^2$.

d. $25\ cm^2$.

4. In the given figure, ABCD is a parallelogram. If $ar(\triangle BAP) = 10\,cm^2$ and $ar(\triangle CPD) = 30\,cm^2$,then $ar(\parallel\ ABCD)$ is



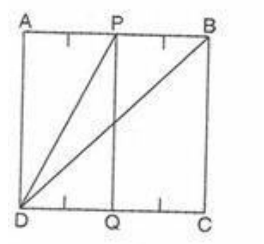
a. $100\ cm^2$.

b. $80\ cm^2$.

c. $60\ cm^2$.

d. $40\ cm^2$.

5. ABCD is a square. P and Q are mid-point of AB and DC respectively. If AB = 8 cm, then $ar\ (\triangle BPD)$ is



a. $16\ cm^2$.

b. $24\ cm^2$.

c. $32\ cm^2$.

d. $18 cm^2$.

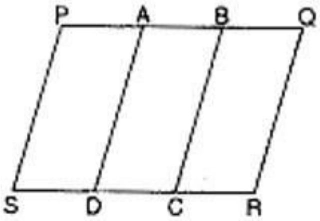
6. Fill in the blanks:

If the sum of the parallel sides of a trapezium is 7 cm and distance between them is 4 cm, then area of the trapezium is________.

7. Fill in the blanks:

If Base = 9 and corresponding altitude = 4, then the area of parallelogram is________.

8. Is the given figure lie on the same base and between the same parallels. In such a case, write common base and the two parallels:

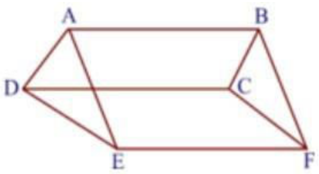


9. In a parallelogram PQRS, PQ = 13. The altitude corresponding to sides PQ is equal to 5 cm. find the area of parallelogram.

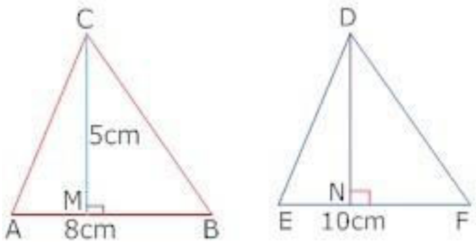
10. ABCD is trapezium with AB || DC. A line parallel to AC intersects AB at X and BC at Y. Prove that ar($\triangle$ ADX) = ar($\triangle$ACY)

11. Show that BDEF is parallelogram. If D, E and F the mid- points of the side BC, CA and AB of triangle ABC

12. In figure, ABCD, DCFE and ABFE are parallelograms. Show that ar (ADE) = ar (BCF).



13. Find the altitude corresponding to side EF if area of $\triangle ABC = \triangle DEF$. If in $\triangle$ABC AB = 8 cm and altitude corresponding to AB is 5 cm. In $\triangle$ DEF, EF = 10 cm



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

15. The medians BE and CF of a triangle ABC intersect at G. Prove that the area of $\triangle$GBC = area of the quadrilateral AFGE.

CBSE Test Paper 05

CH-9 Areas of Parallelograms & Triangles

Solution

1. (b) triangles of different areas.

   Explanation: The median of a triangle divides it into two triangles of different areas. If in a triangle ABC, AD is a median, then

   Area of triangle ABD = Area of triangle ACD.

2. (d) $8\,cm^2$.

   Explanation: Here, EFBA and EFCD are parallelograms of equal area. Therefore,

   $\text{area}\,(\triangle\text{ABP}) = \frac{1}{2} \times \text{area}\,(\|gm\text{EFBP})$

   And $\text{area}\,(\triangle\text{EFC}) = \frac{1}{2} \times \text{area}\,(\|gm\text{EFCD})$

   Therefore, $\text{area}\,(\triangle\text{ABP}) = \text{area}\,(\triangle\text{EFC})$

   And $\text{area}\,(\triangle\text{ABP}) = \text{area}\,(\triangle\text{ECD})$

   Now, $\text{area}\,(\triangle\text{ABP}) = \text{area}\,(\|gm\text{ABEF}) - [\text{area}\,(\triangle\text{AEP}) - \text{area}\,(\triangle\text{BFP})]$..... (i)

   Since EC is a diagonal of parallelogram EFCD. Therefore,

   $\text{area}\,(\triangle\text{EFC}) = \text{area}\,(\triangle\text{ECD})$ $- \text{area}\,(\triangle\text{EFC})$.....(ii)

   $\Rightarrow \text{area}\,(\triangle\text{ECD}) = \text{area}\,(\|gm\text{EFCD})$

   From eq.(i) and (ii), we get $= \text{area}\,(\|gm\text{EFCD}) - \text{area}$

   $\text{area}\,(\|gm\text{ABEF}) - [\text{area}\,(\triangle\text{AEP}) + \text{area}\,(\triangle\text{BFP})]$ cm^2

   $\Rightarrow \text{area}\,(\triangle\text{EFC}) = \text{area}\,(\triangle\text{AEP}) + \text{area}\,(\triangle\text{BFP}) = 8$

3. (c) $15\ cm^2$.

   Explanation: In the given figure, parallelogram ABCD and triangle ABE are on the same base and between the same parallels.

   Therefore, $\text{area}\,(\triangle\text{ABE}) = \frac{1}{2} \times \text{area}\,(\|gm\text{ABCD})$

   $\Rightarrow \text{area}\,(\triangle\text{ABE}) = \frac{1}{2} \times 30 = 15\ \text{cm}^2$

Now Area of parallelogram ABCD =

$\text{area}(\triangle ADE) + \text{area}(\triangle ABE) + \text{area}(\triangle BCE)$

$\Rightarrow$ 30 = $\text{area}(\triangle ADE) + 15 + \text{area}(\triangle BCE)$

$\Rightarrow \text{area}(\triangle ADE) + \text{area}(\triangle BCE)$ = 30 - 15

$\Rightarrow \text{area}(\triangle ADE) + \text{area}(\triangle BCE)$ = 15 cm^2

4. (b) $80\ cm^2$.

   Explanation:

   In the given figure,

   $\text{area}(\triangle PBC) = \frac{1}{2} \times \text{area}(\|gm ABCD)$

   $\Rightarrow \text{area}(\triangle ABP) + \text{area}(\triangle PCD) = \frac{1}{2} \times \text{area}(\|gm ABCD)$

   $\Rightarrow \frac{1}{2} \times \text{area}(\|gm ABCD) = 10 + 30$

   $\Rightarrow \text{area}(\|gm ABCD) = 80\ \text{cm}^2$

5. (a) $16\ cm^2$.

   Explanation:

   Since P is the mid-point of AB. Therefore,

   BP = $\frac{1}{2}$ AB = 4 cm

   And, height of the triangle BPD = AD = 8 cm

   Therefore,

   $\text{area}(\triangle BPD) = \frac{1}{2} \times 4 \times 8 = 16\ \text{cm}^2$

6. $14cm^2$

7. 36

8. Since BCDA and PQRS don't have a common base, so the two figures do not lie between the same parallel lines and common base.

9. Area of parallelogram = base x Altitude

   =13 x 5

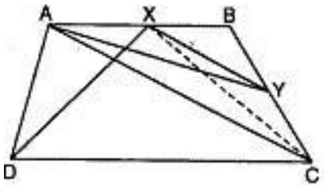
   =65 cm^2

10. Given: ABCD is a trapezium with AB || DC. A line parallel to AC intersect AB at X and

BC at Y.

To Prove : ar($\triangle$ ADX) = ar($\triangle$ACY)

Construction : Join CX.



Proof : ar($\triangle$ADX) = ar($\triangle$ ACX)...[Triangles are on the same base AX and between the same parallels are equal]...(1)

ar($\triangle$ ACX) = ar($\triangle$ ACY)...[Triangles are on the same base AC and between the same parallels are equal]...(2)

ar($\triangle$ ADX) = ar($\triangle$ ACY)...[From (1) and (2)]

11. Join DE, EF and FD E and F are the mid-points of AC and AB

By mid point theorem,

EF|| BC,

EF || BD and DE|| BF

BDEF is a || gram.

12. As we know that opposite sides of a parallelogram are always equal.

$\therefore$ In parallelogram ABFE, AE = BF and AB = EF

In parallelogram DCFE, DE = CF and DC = EF

In parallelogram ABCD, AD = BC and AB = DC

Now in $\triangle$ADE and $\triangle$ BCF,

AE = BF[Opposite sides of parallelogram ABFE]

DE = CF[Opposite sides of parallelogram DCFE]

And AD = BC[Opposite sides of parallelogram ABCD]

$\therefore$ $\triangle$ADE $\cong$ $\triangle$BCF [By SSS congruency]

$\therefore$ ar ($\triangle$ADE) = ar ($\triangle$BCF)

[$\because$ Area of two congruent figures is always equal]

13. ar($\triangle$ ABC) = ar($\triangle$DEF)

$\frac{1}{2} \times AB \times CM = \frac{1}{2} \times EF \times DN$

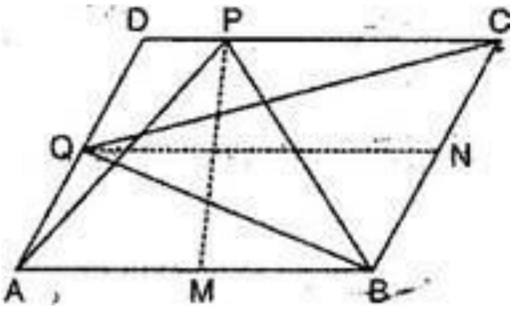
$\frac{1}{2} \times 8 \times 5 = \frac{1}{2} \times 10 \times DN$

20 = 5DN

DN = 4 cm

Altitude corresponding to side EF is 4 cm

14. Given: ABCD is a parallelogram. P is a point on DC and Q is a point on AD.



To prove: ar (ΔAPB) = ar (Δ BQC)

Construction: Draw PM || BC and QN || DC.

Proof: Since QC is the diagonal of parallelogram QNCD.

$\therefore$ ar ($\triangle$ QNC) = $\frac{1}{2}$ ar (|| gm QNCD) .... (i)

Again BQ is the diagonal of parallelogram ABNQ.

$\therefore$ ar ($\triangle$ BQN) = ar (|| gm ABNQ)...........(ii)

Adding eq. (i) and (ii),

ar ($\triangle$ QNC) + ar ($\triangle$ BQN) = ar (|| gm QNCD) + ar (|| gm ABNQ)

$\Rightarrow$ ar (Δ BQC) = ar (|| gm ABCD) .... (iii)

Again AP is the diagonal of || gm AMPD.

$\therefore$ ar ($\triangle$ APM) = $\frac{1}{2}$ ar (|| gm AMPD) .... (iv)

And PB is the diagonal of gm PCBM.

$\therefore$ar ($\triangle$ PBM) = $\frac{1}{2}$ ar (|| gm PCBM) ....(v)

Adding eq. (iv) and (v),

ar ($\triangle$ APM) + ar ($\triangle$ PBM) = $\frac{1}{2}$ ar (||gm AMPD) + $\frac{1}{2}$ ar (|| gm PCBM)

ar ($\triangle$ APM) + ar ($\triangle$ PBM) =$\frac{1}{2}$ ar (|| gm AMPD) +$\frac{1}{2}$ ar (|| gm PCBM)

$\Rightarrow$ ar ($\triangle$ APB) =$\frac{1}{2}$ ar (||gm ABCD) .... (vi)

From eq. (iii) and (vi),

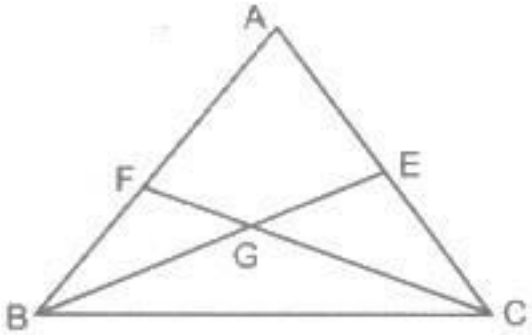
ar ($\triangle$ BQC) = ar (APB) or ar (APB) = ar ($\triangle$ BQC)

15. BE and CF are medians of a triangle ABC intersect at G. We have to prove that the ar($\triangle$GBC) = area of the quadrilateral AFGF.

Since, median (CF) divides a triangle into two triangles of equal area, so we have

$ar(\Delta BCF) = ar(\Delta ACF)$

$\Rightarrow \; ar(\Delta GBF) + ar(\Delta GBC) = ar(AFGE) + ar(\Delta GCE)$ ...(1)



Since, median (BE) divides a triangle into two triangle of equal area, so we have

$\Rightarrow \; ar(\Delta GBF) + ar(AFGE) = ar(\Delta GCE) + ar(\Delta GBE)$ ...(2)

Subtracting (2) and (1), we get

$ar(\Delta GBC) - ar(AFGE) = ar(AFGE) - ar(\Delta GBC)$

$\Rightarrow \; ar(\Delta GBC) + ar(\Delta GBC) = ar(AFGE) + ar(AFGE)$

$\Rightarrow \; 2ar(\Delta GBC) = 2ar(AFGE)$

Hence, $ar(\Delta GBC) = ar(AFGE)$