CBSE Test Paper 02

CH-9 Areas of Parallelograms & Triangles

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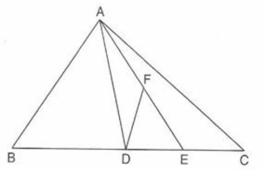
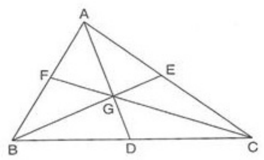
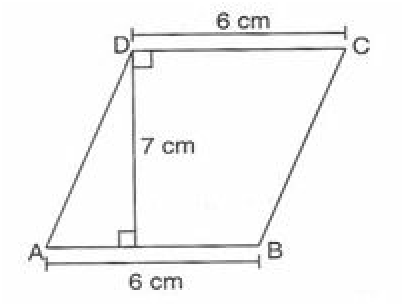
1. The figure obtained by joining the mid-points of the adjacent sides of a rectangle of sides 8 cm and 6 cm is :
    a. a rectangle of area 24 cm^2
    b. a trapezium of area 24 cm^2
    c. a rhombus of area 24 cm^2
    d. a square of area 25 cm^2
2. ABC is a triangle in which D is the mid-point of BC. E and F are mid-points of DC and AE respectively. If $ar\ (\triangle ABC) = 16\ cm^2$, then $ar\ (\triangle DEF)$ is


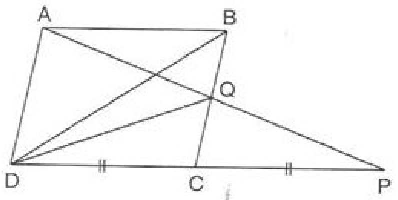
    a. $4\ cm^2$.
    b. $1\ cm^2$.
    c. $8\ cm^2$.
    d. $2\ cm^2$.
3. Medians of $\triangle ABC$ intersects at G. If $ar\ (\triangle ABC) = 27\ cm^2$, then $ar\ (\triangle BGC)$ is


    a. $12\ cm^2$.
    b. $9\ cm^2$.
    c. $18\,cm^2$.
    d. $6\ cm^2$.
4. In the given figure, the area of quadrilateral ABCD is



a. $42\ cm^2$.
b. $13\ cm^2$.
c. $24\ cm^2$.
d. $21\ cm^2$.

5. ABCD is a parallelogram in which DC is produced to P such that DC = CP. AP intersects BC at Q. If $ar\ (\triangle BQD) = 3\ cm^2$, then $ar(\|\ ABCD)$ is



a. $9\ cm^2$.
b. $6\ cm^2$.
c. $15\ cm^2$.
d. $12\ cm^{2\cdot}$.

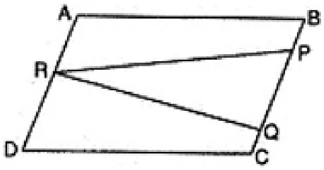
6. Fill in the blanks:

Two parallelograms are on the same base and between the same parallels, then the ratio of their areas is ________.

7. Fill in the blanks:

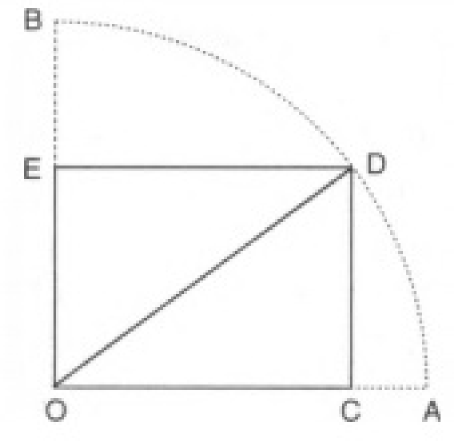
Triangles on the same base and having equal areas lie between the ________.

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 given figure, OCDE is a rectangle inscribed in a quadrant of a circle of radius 10

cm. If OE = $2\sqrt{5}$, find the area of the rectangle.



10. In a triangle ABC, E is the midpoint of median AD. Show that ar($\triangle$BED) = $\frac{1}{4}$ ar($\triangle$ABC).

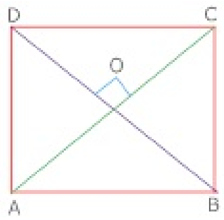
11. Prove that as

$$\text{ar}(\Delta ROS) = \text{ ar } (\Delta PQO) \text{if PS}||\text{RQ}$$

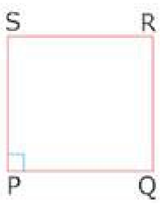
12. Show that ar (ABC) = ar (ABD). ABC and ABD are two triangles on the same base AB if line segment CD is bisected by AO at O

13. In a parallelogram, ABCD, E, F are any two points on the sides AB and BC respectively. Show that ar ($\triangle$ADF) = ar ($\triangle$DCE)

14. Show that the area of a rhombus is half the product of the length of its diagonals.



15. Prove the parallelogram which is a rectangle has the greatest area.



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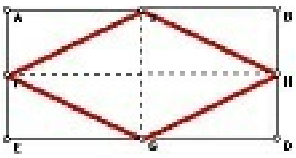
Solution

1. (c) a rhombus of area 24 cm^2

   Explanation: We know, that the figure obtained on joining the midpoints of a rectangle is a rhombus.

   Let ABDE be a rectangle in which AB = 8 cm and BD = 6 cm.
   And F, G, H and I are the mid-points of the sides AB, BD, DE and AE respectively. FGHI is a rhombus.
   Now, the diagonals of the rhombus FGHI are FH and GI.
   FH = AB = 8 cm and GI = BD = 6 cm
   Area of rhombus FHGI = $\frac{1}{2} \times$FH $\times$ GI = $\frac{1}{2} \times 8 \times 6$ = 24 cm^2
   Therefore, the figure obtained by joining the mid-points of the adjacent sides of a rectangle of sides 8 cm and 6 cm is a rhombus with area 24 cm^2.

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

   Explanation:

   Given: $ar\ (\triangle ABC) = 16\ cm^2$,
   Since AD is median of triangle ABC, and median of triangle divided it into two triangles of equal area, therefore,
   $\text{area}\,(\triangle \text{ABD}) = \text{area}\,(\triangle \text{ADC}) = \frac{16}{2} = 8\ \text{cm}^2$
   Now, since AE is median of triangle ADC, and median of triangle divided it into two triangles of equal area, therefore,
   $\text{area}\,(\triangle \text{ADE}) = \text{area}\,(\triangle \text{AEC}) = \frac{8}{2} = 4\ \text{cm}^2$
   Now, again since DF is median of triangle ADE, and median of triangle divided it into two triangles of equal area, therefore,
   $\text{area}\,(\triangle \text{ADF}) = \text{area}\,(\triangle \text{DEF}) = \frac{4}{2} = 2\ \text{cm}^2$

3. (b) $9\ cm^2$.

Explanation:

According to quesiton,

$\text{area}(\triangle ABD) = \text{area}(\triangle ADC)$ ....(i)

And, $\text{area}(\triangle GBD) = \text{area}(\triangle GDC)$ ....(ii)

Subtracting eq.(ii) from eq.(i), we get

$\text{area}(\triangle AGB) = \text{area}(\triangle AGC)$

Similarly, $\text{area}(\triangle AGB) = \text{area}(\triangle BGC)$

Therefore, $\text{area}(\triangle AGB) = \text{area}(\triangle BGC) = \text{area}(\triangle AGC)$

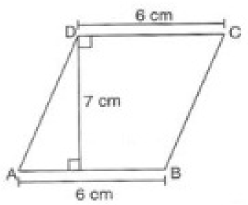
But $\text{area}(\triangle AGB) + \text{area}(\triangle BGC) + \text{area}(\triangle AGC) = \text{area}(\triangle ABC)$

$\Rightarrow 3 \times \text{area}(\triangle BGC) = \frac{27}{3} = 9\ \text{cm}^2$

4. (a) $42\ cm^2$.

Explanation:

In the given figure,



Area of quad. ABCD = Base $\times$ Height = 7 $\times$ 6 = 42 cm^2

5. (d) $12\ cm^{2.}$.

Explanation:

Since triangles BQD and BQA are on the same base BQ and between the same parallels. Therefore,

$\text{area}(\triangle BQD) = \text{area}(\triangle BQA) = 3$ sq. cm

In triangles ABQ and CQP,

$\angle AQB = \angle CQP$ [Vertically opposte angles]

AB = CP [Since CP = DC and DC = AB]

BQ = CQ [Given]

Therefore, $\triangle ABQ \cong \triangle CQP$ [By SAS conguarancy]

$\Rightarrow \text{area}\triangle ABQ = \text{area}\triangle CQP = 3$ sq. cm

Similarly using SAS criterion of congurancy, $\triangle CQP \cong \triangle DCQ$

$\Rightarrow$ area$\triangle$CQP = area$\triangle$DCQ = 3 sq. cm

Now, BD is diagonal of parallelogram ABCD

area $(\|gm\text{ABCD}) = 2 \times$ area $(\triangle\text{BCD}) = 2 \times (3+3) = 12$ sq. cm

6. 1 : 1

7. same parallels

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

9. We have, OD = 10 cm and OE = $2\sqrt{5}$ cm

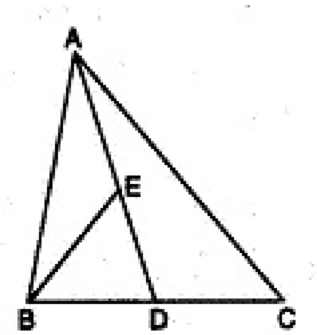
   $\therefore$ OD^2 = OE^2 + DE^2

   $\Rightarrow$ DE = $\sqrt{OD^2 - OE^2}$ = $\sqrt{(10)^2 - (2\sqrt{5})^2}$ = $4\sqrt{5}$ cm

   $\therefore$ ar(rect OCDE) = OE $\times$ DE = $2\sqrt{5} \times 4\sqrt{5}$ cm^2

   = 8 $\times$ 5 cm^2 = 40 cm^2

10. Given: In a triangle ABC, E is the mid-point of median AD.



To Prove : ar($\triangle$BED) = $\frac{1}{4}$ ar($\triangle$ABC)

Proof : In $\triangle$ABC,

As AD is a median

$\therefore$ ar($\triangle$ABD) = ar($\triangle$ACD) = $\frac{1}{2}$ ar($\triangle$ABC) . . .[As median of a triangle divides it into two triangles of equal area] . . .(1)

In $\triangle$ABD,

As BE is median

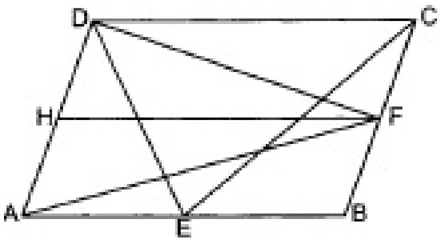
$\therefore$ ar($\triangle$BED) = ar($\triangle$BEA) = $\frac{1}{2}$ ar($\triangle$ ABD) . . .[As a median of a triangle divides it into two triangles of equal area]

$\Rightarrow$ ar($\triangle$BED) = $\frac{1}{2}$ ar($\triangle$ABD) = $\frac{1}{2} \times \frac{1}{2}$ ar($\triangle$ABC) . . .[From (1)]

$=\frac{1}{4}$ ar($\triangle$ ABC)

11. $ar\left(\Delta PSR\right)=ar\left(\Delta PSQ\right)$
$ar\left(\Delta PSR\right)-ar\left(\Delta PSO\right)$
$=ar\left(\Delta PSQ\right)-ar\left(\Delta PSO\right)$
$ar\left(\Delta ROS\right)=ar\left(\Delta PQO\right)$

12. AO is the median of ΔACD
$ar\left(\Delta AOC\right)=ar\left(\Delta AOD\right)$
$ar\left(\Delta BOC\right)=ar\left(\Delta BOD\right)$
$ar\left(\Delta AOC\right)+ar\left(\Delta BOC\right)$
$=ar\left(\Delta AOD\right)+ar\left(\Delta BOD\right)$
$ar\left(\Delta ABC\right)=ar\left(\Delta ABD\right)$

13. 

From the given figure it is clear that $\triangle$ADF and parallelogram ABCD lie on the same base AD and between the same parallels AD and BC.

$\therefore$ar($\triangle$ADF) = $\frac{1}{2}$ ar ($||^{gm}$ ABCD) ....(i)

Also, $\triangle$DCE and $||^{gm}$ ABCD lie on the same base DC and between the same parallels DC and AB.

$\therefore$ar($\triangle$DCE) = $\frac{1}{2}$ ar ($||^{gm}$ ABCD) ....(ii)

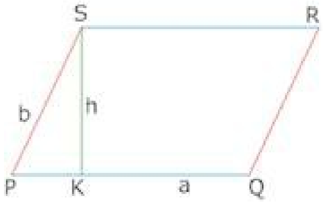
From (i) and (ii), we get

ar ($\triangle$ADF) = ar ($\triangle$DCE)

14. $ar\left(\triangle ABC\right)=\frac{1}{2}\times AC\times OB$ ...(i)
$ar\left(\triangle ACD\right)=\frac{1}{2}\times AC\times DO$ ...(ii)
Adding (i) and (ii)
$ar\left(\triangle ABC+\triangle ACD\right)\frac{1}{2}\times AC\times\left(DO+OB\right)$
$=\frac{1}{2}\times AC\times BD$
Hence, area of rhombus ABCD = $\frac{1}{2}\times AC\times BD$

15. Let PQRS be a parallelogram in which PQ = a and PS = b and h be the altitude

corresponding to base PQ



Area of parallelogram PQRS = Base corresponding Altitude = ah

△PSK is a right angled triangle PS being its hypotenuse.

But hypotenuse is the greatest side of △

Area of ||gram PQRS will be greatest when h is greatest

H = b, then PS = PQ

The ||gram PQRS will be a rectangle.

Hence, the area of ||gram is greatest when it is a rectangle.