Exercise No. 9.2

Short Answer Questions with Reasoning:

Write True or False and justify your answer:

1. ABCD is a parallelogram and X is the mid-point of AB. If $\mathrm{ar}(\mathrm{AXCD}) = 24\ \mathrm{cm}^2$, then $\mathrm{ar}(\mathrm{ABC}) = 24\ \mathrm{cm}^2$.

Solution:
Given in the question, ABCD is a parallelogram and X is the mid-point of AB.
So, $\text{area}(ABCD) = \text{area}(AXCD) + \text{area}(\Delta XBC) \quad \ldots \text{(I)}$

Now, diagonal AC of a parallelogram divides it into two triangles of equal area.
$\text{area}(ABCD) = 2\text{area}(\Delta ABC) \quad \ldots \text{(II)}$

Similarly, X is the mid-point of AB, So,
$\text{area}(\Delta CXB) = \frac{1}{2}\text{area}(\Delta ABC) \quad \ldots$ (III)[Median divides the triangle in two triangles of equal area]

$2\text{area}(\Delta ABC) = 24 + \frac{1}{2}\text{area}(\Delta ABC)$ [By using equation (I), (II) and (III)]

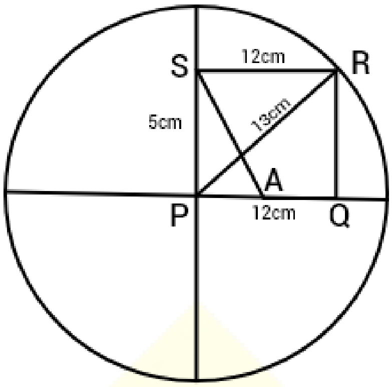
Now, $2\text{area}(\Delta ABC) - \frac{1}{2}\text{area}(\Delta ABC) = 24$

$\frac{3}{2}\text{area}(\Delta ABC) = 24$

Therefore, $\text{area}(\Delta ABC) = \frac{2 \times 24}{3} = 16\text{cm}^2$.

2. PQRS is a rectangle inscribed in a quadrant of a circle of radius 13 cm. A is any point on PQ. If PS = 5 cm, then $\mathrm{ar}(\mathrm{PAS}) = 30\ \mathrm{cm}^2$

Solution:
Given: A is any point on PQ. Since, PA < PQ



Now, area of triangle PQR is:

$\text{area}(\Delta PQR) = \frac{1}{2} \times \text{base} \times \text{height}$

So, $\text{area}(\Delta PQR) = \frac{1}{2} \times PQ \times QR = \frac{1}{2} \times 12 \times 5 = 30\text{cm}^2$ [PQRS is a rectangle, RQ=SP=5 cm]

As PA < PQ

So, $\text{area}(\Delta PAS) < \text{area}(\Delta PQR)$

Or $\text{area}(\Delta PAS) < 30\text{cm}^2$ [$\text{area}(\Delta PQR) = 30\text{cm}^2$]

Hence, the given statement is false.

3. PQRS is a parallelogram whose area is $180\ \text{cm}^2$ and A is any point on the diagonal QS. The area of $\Delta \text{ASR} = 90\ \text{cm}^2$.

Solution:

Given: PQRS is a parallelogram.

As we know that diagonal of a parallelogram divides parallelogram into two triangles of equal area.

So,

$\text{area}(\Delta QRS) = \frac{1}{2}\text{area}(PQRS)$

$= \frac{1}{2} \times 180 = 90\text{cm}^2$

Now, A is any point on SQ. So,

$\text{area}(\Delta ASR) < \text{area}(\Delta QRS)$

Therefore, $\text{area}(\Delta ASR) < 90\text{cm}^2$

Hence, the given statement is false.

4. ABC and BDE are two equilateral triangles such that D is the mid-point of BC. Then $\text{ar}(\text{BDE}) = \frac{1}{4}\text{ar}(\text{ABC})$.

Solution:

Given: Δ ABC and Δ BDE are two equilateral triangles.
Suppose that each sides of triangle ABC be x.

Similarly, D is the mid-point of BC. So, each side of triangle BDE is $\frac{x}{2}$.

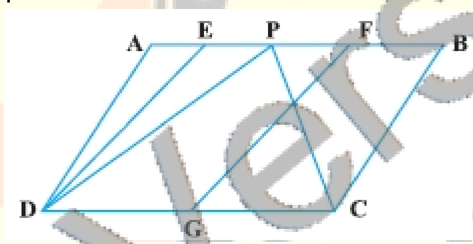
Now,

$$\frac{\text{area}(\Delta BDE)}{\text{area}(\Delta ABC)} = \frac{\frac{\sqrt{3}}{4}\times\left(\frac{x}{2}\right)^2}{\frac{\sqrt{3}}{4}\times x^2} = \frac{x^2}{4x^2} = \frac{1}{4}$$

Therefore, $\text{area}(\Delta BDE) = \frac{1}{4}\text{area}(\Delta ABC)$.

Hence, the given statement is true.

5. In Fig., ABCD and EFGD are two parallelograms and G is the mid-point of CD. Then $\text{ar}(\text{DPC}) = \frac{1}{4}\text{ar}(\text{EFGD})$.



Solution:

As triangle DPC and parallelogram ABCD are on same base DC and between the same parallels AB and DC. So,

$$\text{area}(\Delta DPC) = \frac{1}{2} area(ABCD) \qquad \ldots\text{(I)}$$

Now,

$$\frac{area(EFGD)}{area(ABCD)} = \frac{DG\times h}{DC\times h} = \frac{DG}{2DG} = \frac{1}{2} \text{(G is the mid-point of DC)}$$

Implies that, $\text{area}(EFGD) = \frac{1}{2}\text{area}(ABCD)$

So, $\text{area}(DPC) = \text{area}(EFGD)$ [From equation (I)]

Hence, the given statement is false.