Heron's Formula

Assertion & Reason Type Questions

Directions: In the following questions, a statement of Assertion (A) is followed by a statement of a Reason (R). Choose the correct choice as:

a. Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

b. Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

c. Assertion (A) is true but Reason (R) is false.

d. Assertion (A) is false but Reason (R) is true.

Q1.

Assertion (A): If the sides of a ΔABC are $a = 5$ cm, $b = 6$ cm and $c = 7$ cm, then area of ΔABC is $6\sqrt{6}$ cm^2.

Reason (R): The area of triangle having sides a, b and c with semi-perimeter s is given by

$$\Delta = \sqrt{s(s-a)(s-b)(s-c)}$$

Answer : (a) Assertion (A): Given sides are a = 5 cm, b = 6 cm and c = 7 cm.

Now, semi-perimeter of a ΔABC is $s = \frac{a+b+c}{2}$

$$= \frac{5+6+7}{2} = \frac{18}{2} = 9 \text{ cm}$$

$\therefore$ Area of triangle, $\Delta = \sqrt{s(s-a)(s-b)(s-c)}$

$$= \sqrt{9(9-5)(9-6)(9-7)}$$

$$= \sqrt{9 \times 4 \times 3 \times 2}$$

$$= 3 \times 2\sqrt{3 \times 2}$$

$$= 6\sqrt{6} \text{ cm}^2$$

So, Assertion (A) is true.

Reason (R): It is true to say that the area of triangle is given by $\Delta = \sqrt{s(s-a)(s-b)(s-c)}$.

Hence, both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

Q2.

Assertion (A): If the height of triangle is 9 cm and area is 144 cm^2, then its base is 30 cm.

Reason (R): Area of triangle can be determined by $\Delta = \frac{1}{2} \times \text{base} \times \text{height}$.

Answer : (d) Assertion (A): Given, h = 9 cm and Area = 144 cm^2

$$\therefore \text{ Area of triangle } = \frac{1}{2} \times \text{base} \times \text{height}$$

$$\Rightarrow \quad 144 = \frac{1}{2} \times \text{base} \times 9$$

$$\Rightarrow \quad \text{base} = \frac{144 \times 2}{9} = 32 \text{ cm}$$

So, Assertion (A) is false.

Reason (R): It is true to say that area of triangle can be determined by

$$\Delta = \frac{1}{2} \times \text{base} \times \text{height}$$

Hence, Assertion (A) is false but Reason (R) is true.

Q3.

Assertion (A): If the area of an equilateral triangle is $49\sqrt{3}$ cm^2, then the semi-perimeter of triangle is 42 cm.

Reason (R): If a, b and c are the sides of a triangle, then semi-perimeter of a ΔABC is:

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

Answer :

(d) **Assertion (A):** Given area of an equilateral triangle is $\Delta = 49\sqrt{3}\ cm^2$

$\therefore \quad \frac{\sqrt{3}}{4}(side)^2 = 49\sqrt{3}$

$\Rightarrow \quad (Side)^2 = (7 \times 2)^2$

$\Rightarrow \quad Side = 14\ cm$

$\therefore$ The perimeter of an equilateral triangle is

$3a = 3 \times 14 = 42\ cm$

Thus, the semi-perimeter of an equilateral triangle is

$$\frac{3a}{2} = \frac{42}{2} = 21\ cm$$

So, Assertion (A) is false.

Reason (R): It is true to say that the semi-perimeter of a triangle is given by $s = \frac{a+b+c}{2}$

Hence, Assertion (A) is false but Reason (R) is true.

Q4.

Assertion (A): The area of triangle PQR in which PQ = 5 cm, QR = 4 cm and PR = 7 cm, is $12\sqrt{2}\ cm^2$.

Reason (R): The area of triangle having sides a, b and c with semi-perimeter 's' is given by $\sqrt{s(s+a)(s+b)(s+c)}$.

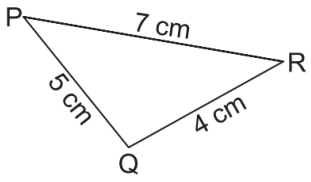
Answer :

(c) **Assertion (A):** In ΔPQR, sides are $a = PQ = 5\ cm$, $b = QR = 4\ cm$ and $c = PR = 7\ cm$

Now, semi-perimeter of ΔPQR, $s = \frac{a+b+c}{2}$

$= \frac{5+4+7}{2} = \frac{16}{2}$

$= 8$ cm.



$\therefore$ Area of $\Delta PQR = \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{8(8-5)(8-4)(8-7)}$

$= \sqrt{8 \times 3 \times 4 \times 3} = 3 \times 4\sqrt{2}$

$= 12\sqrt{2}$ cm^2

So, Assertion (A) is true.

Reason (R): It is false

Hence, Assertion (A) is true but Reason (R) is false.