Introduction to Three Dimensional Geometry

Assertion Reason Questions

Direction: In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R).

Choose the correct answer out of thefollowing choices.

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

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

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

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

1. Assertion (A): The points A(1, -1, 3), B(2, 4, 5) and C(5, -13, 11) are collinear.

Reason (R): If AB + BC = AC, then A, B, C are collinear.

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

Explanation: Given three points are A(1, -1, 3). B(2, -4,5) and C(5,-13, 11)

$$|AB| = \sqrt{(1)^2 + (-3)^2 + (2)^2}$$

[Using distance formula]

$$= \sqrt{1+9+4}$$

$$= \sqrt{14}$$

$$|BC| = \sqrt{(3)^2 + (-9)^2 + (6)^2}$$

$$= \sqrt{9+81+36}$$

$$= 3\sqrt{14}$$

$$|AC| = \sqrt{(4)^2 + (-12)^2 + (8)^2}$$

$$\sqrt{16+144+64} = 4\sqrt{14}$$

$$\because \quad AB + BC = \sqrt{14} + 3\sqrt{14}$$

$$= 4\sqrt{14} = AC$$

We know that three points A, B and C are said to be collinear, if

AB + BC = AC

:- Points A, B and C are collinear.

2. Assertion (A): Coordinates of centroid of a triangle formed by the vertices A(3, 2, 0), B(5, 3, 2) and C(0, 2,

4) are $\left(\dfrac{8}{3}, \dfrac{8}{3}, \dfrac{8}{3}\right)$.

Reason (R):

Coordinates of centroid of a triangle with vertices A(x_1, y_1, Z_1), B(x_2, y_2, Z_2) and C(X_3, Y_3, Z_3) is,

$$\left(\frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 + y_3}{3}, \frac{z_1 + z_2 + z_3}{3}\right)$$

3. Assertion (A): The foot of perpendicular drawn from the point A(1, 2, 8) on the xy-plane is (1, 2, 0).

Reason (R): Equation of xy-plane is y = 0.

Ans. (c) (A) is true but (R) is false.

Explanation: We know that in xy-plane, z-coordinate is 0. So, coordinate of foot of perpendicular drawn from point A(1, 2, 8) on xy- plane is (1, 2, 0).

4. Assertion (A): The distance between the points (1+ √11,0,0) and (1, -2, 3) is 2√6 units.

Reason (R): Distance between any two points A(x_1 y_1 z_1) and A

B(x_2 y_2 Z_2) is,

$$|AB| = \sqrt{(x_2 + x_1)^2 + (y_2 + y_1)^2 + (z_2 + z_1)^2}$$

Ans. (c) (A) is true but (R) is false.

Explanation: Let the points A (1+ √11,0,0) and B(1, -2, 3) The distance between the points A and B

$$= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}$$

$$\therefore \quad AB = \sqrt{(1 - 1 - \sqrt{11})^2 + (-2 - 0)^2 + (3 - 0)^2}$$

$$= \sqrt{11 + 4 + 9} = \sqrt{24} = 2\sqrt{6} \text{ units}$$

5. Assertion (A): The points A(3,-1, 2), B(1, 2, -4), C(-1, 1, 2) and D(1, -2, 8) are the vertices of a parallelogram.

Reason (R): Coordinates of mid-point of a line joining the points

A(x1 y1 z1) and B(x2,y2, Z2) is:

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}, \frac{z_1 + z_2}{2}\right).$$

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

Explanation: The given point are A(3, -1, 2), B(1, 2,-4), C(-1, 1, 2) and D(1, -2, 8).