ASSERTION REASONING QUESTIONS

DIRECTION : In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark 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.

1. Assertion : The point which divides the line joining the points $A(1, 2)$ and $B(-1, 1)$ internally in the ratio 1: 2 is $\left(\frac{-1}{3}, \frac{5}{3}\right)$

Reason : The coordinates of the point $P(x, y)$ which divides the line segment joining the points $A(x_1, y_1)$ and $B(x_2, y_2)$ in the ratio $m_1 : m_2$ is $\left(\frac{m_1x_2+m_2x_1}{m_1+m_2}, \frac{m_1y_2+m_2y_1}{m_1+m_2}\right)$

Ans: We know that the coordinates of the point $P(x, y)$ which divides the line segment joining the points $A(x_1, y_1)$ and $B(x_2, y_2)$ in the ratio $m_1 : m_2$ is $\left(\frac{m_1x_2+m_2x_1}{m_1+m_2}, \frac{m_1y_2+m_2y_1}{m_1+m_2}\right)$

So, Reason is correct.

Here, $x_1 = 1$, $y_1 = 2$, $x_2 = -1$, $y_2 = 1$, $m_1 = 1$, $m_2 = 2$

Now, x-coordinate $= \frac{m_1x_2+m_2x_1}{m_1+m_2} = \frac{(1\times-1)+(2\times1)}{1+2} = \frac{-1+2}{3} = \frac{1}{3}$

and y-coordinate $= \frac{m_1y_2+m_2y_1}{m_1+m_2} = \frac{(1\times1)+(2\times2)}{1+2} = \frac{1+4}{3} = \frac{5}{3}$

So, Assertion is not correct

Correct option is (d) Assertion (A) is false but reason (R) is true.

2. Assertion : The point on the X -axis which if equidistant from the points $A(-2, 3)$ and $B(5, 4)$ is $(2, 0)$

Reason : The coordinates of the point $P(x, y)$ which divides the line segment joining the points $A(x_1, y_1)$ and $B(x_2, y_2)$ in the ratio $m_1 : m_2$ is $\left(\frac{m_1x_2+m_2x_1}{m_1+m_2}, \frac{m_1y_2+m_2y_1}{m_1+m_2}\right)$

Ans: We know that the coordinates of the point $P(x, y)$ which divides the line segment joining the points $A(x_1, y_1)$ and $B(x_2, y_2)$ in the ratio $m_1 : m_2$ is $\left(\frac{m_1x_2+m_2x_1}{m_1+m_2}, \frac{m_1y_2+m_2y_1}{m_1+m_2}\right)$

So, Reason is correct.

Let $P(x, 0)$ be a point on X -axis such that, $AP = BP$

$\Rightarrow AP^2 = BP^2$

$\Rightarrow (x + 2)^2 + (0 - 3)^2 = (x - 5)^2 + (0 + 4)^2$

$\Rightarrow x^2 + 4x + 4 + 9 = x^2 - 10x + 25 + 16 \quad \Rightarrow 14x = 28 \quad \Rightarrow x = 2$

Hence, required point = $(2, 0)$

So, Assertion is correct

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

3. Assertion : Ratio in which the line $3x + 4y = 7$ divides the line segment joining the points (1, 2) and (- 2, 1) is 3 : 5

Reason : The coordinates of the point $P(x, y)$ which divides the line segment joining the points $A(x_1, y_1)$ and $B(x_2, y_2)$ in the ratio $m_1 : m_2$ is $\left(\frac{m_1x_2+m_2x_1}{m_1+m_2} , \frac{m_1y_2+m_2y_1}{m_1+m_2}\right)$

Ans: We know that the coordinates of the point $P(x, y)$ which divides the line segment joining the points $A(x_1, y_1)$ and $B(x_2, y_2)$ in the ratio $m_1 : m_2$ is $\left(\frac{m_1x_2+m_2x_1}{m_1+m_2} , \frac{m_1y_2+m_2y_1}{m_1+m_2}\right)$

So, Reason is correct.

Let the ratio is k : 1. Here, $x_1 = 1$, $y_1 = 2$, $x_2 = -2$, $y_2 = 1$, $m_1 = k$, $m_2 = 1$

Now, x-coordinate $= \frac{m_1x_2+m_2x_1}{m_1+m_2} = \frac{(k\times-2)+(1\times1)}{k+1} = \frac{-2k+1}{k+1}$

and y-coordinate $= \frac{m_1y_2+m_2y_1}{m_1+m_2} = \frac{(k\times1)+(1\times2)}{k+1} = \frac{k+2}{k+1}$

Now, $3x + 4y = 7 \Rightarrow 3\left(\frac{-2k+1}{k+1}\right) + 4\left(\frac{k+2}{k+1}\right) = 7 \Rightarrow 3(-2k+1) + 4(k+2) = 7(k+1)$

$\Rightarrow -6k + 3 + 4k + 8 = 7k + 7 \Rightarrow 7k + 2k = 11 - 7 \Rightarrow 9k = 4 \Rightarrow k = 4/9$

So, Assertion is not correct

Correct Option is (d) Assertion (A) is false but reason (R) is true.

4. Assertion : C is the mid-point of PQ, if P is $(4, x)$, C is $(y, -1)$ and Q is $(-2, 4)$, then x and y respectively are -6 and 1.

Reason : The mid-point of the line segment joining the points $P(x_1, y_1)$ and $Q(x_2, y_2)$ is $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

Ans: We know that the mid-point of the line segment joining the points $P(x_1, y_1)$ and $Q(x_2, y_2)$ is $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

So, Reason is correct.

Since, $C(y, -1)$ is the mid-point of $P(4, x)$ and $Q(-2, 4)$.

We have, $\frac{4-2}{2} = y \Rightarrow y = 1$

and $\frac{x+4}{2} = -1 \Rightarrow x + 4 = -2$

$\Rightarrow x = -6$

So, Assertion is correct

Correct option is (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

5. Assertion : The point (0, 4) lies on *y* -axis.
Reason : The *x* co-ordinate on the point on *y* -axis is zero.

(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.

Ans: We know that the if the point lies on y-axis, its x-coordinate is 0.
So, Reason is correct.
The *x* co-ordinate of the point (0, 4) is zero.
So, Point (0, 4) lies on *y* -axis.
So, Assertion is also correct
Correct option is (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

6. Assertion : The value of y is 6, for which the distance between the points $P(2,-3)$ and $Q(10, y)$ is 10.

Reason : Distance between two given points $A(x_1, y_1)$ *and* $B(x_2, y_2)$ is given by,

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

Ans: We know that the Distance between two given points $A(x_1, y_1)$ *and* $B(x_2, y_2)$ is given by, AB = $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

So, Reason is correct.

Now, PQ = 10 $\Rightarrow$ $PQ^2 = 100$

$\Rightarrow (10 - 2)^2 + (y + 3)^2 = 100$

$\Rightarrow (y + 3)^2 = 100 - 64 = 36$

$\Rightarrow y + 3 = \pm 6$

$\Rightarrow y = -3 \pm 6 \Rightarrow y = 3, -9$

So, Assertion is not correct

Correct option is (d) Assertion (A) is false but reason (R) is true.

7. Assertion : The point (-1, 6) divides the line segment joining the points (-3, 10) and (6, -8) in the ratio 2 : 7 internally.

Reason : Three points *A*,*B* and *C* are collinear if AB + BC = AC

Ans: We know that the three points *A*,*B* and *C* are collinear if AB + BC = AC

So, Reason is correct.

Let the ratio is k : 1. Here, $x_1 = -3$, $y_1 = 10$, $x_2 = 6$, $y_2 = -8$, $x = -1$, $y = 6$

Now, y-coordinate $= \frac{m_1y_2+m_2y_1}{m_1+m_2} = \frac{(k\times-8)+(1\times10)}{k+1} = \frac{-8k+10}{k+1} = 6$

$\Rightarrow$ -8k + 10 = 6k + 6

$\Rightarrow$ 10 – 6 = 6k + 8k

$\Rightarrow$ 14k = 4

$\Rightarrow k = \frac{4}{14} = \frac{2}{7}$

So, Assertion is correct

But reason (R) is not the correct explanation of assertion (A).

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

8. Assertion : The possible values of x for which the distance between the points A(x, -1) and B(5, 3) is 5 units are 2 and 8.

Reason : Distance between two given points $A(x_1, y_1)$ *and* $B(x_2, y_2)$ is given by,

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

Ans: We know that the Distance between two given points $A(x_1, y_1)$ *and* $B(x_2, y_2)$ is given by, AB = $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

So, Reason is correct.

Now, AB = 5 $\Rightarrow$ $AB^2 = 25$

$\Rightarrow (x - 5)^2 + (-1 - 3)^2 = 25$

$\Rightarrow (x - 5)^2 = 25 - 16 = 9$

$\Rightarrow x - 5 = \pm 3$

$\Rightarrow x = 5 \pm 3 \Rightarrow x = 2, 8$

So, Assertion is also correct

Correct option is (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

9. Assertion : If the points A(4, 3) and B(x, 5) lies on a circle with the centre O(2,3) then the value of x is 2.

Reason : The mid-point of the line segment joining the points $P(x_1, y_1)$ and $Q(x_2, y_2)$ is $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

Ans: We know that the mid-point of the line segment joining the points $P(x_1, y_1)$ and $Q(x_2, y_2)$ is $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

So, Reason is correct.

Given, the points A (4,3) and B (x, 5) lie on a circle with center O(2,3).

Then OA = OB $\Rightarrow (OA)^2 = (OB)^2$

$\Rightarrow (4-2)^2 + (3-3)^2 = (x-2)^2 + (5-3)^2$

$\Rightarrow (2)^2 + (0)^2 = (x-2)^2 + (2)^2 \Rightarrow 4 = (x-2)^2 + 4 \Rightarrow (x-2)^2 = 0$

$\Rightarrow x - 2 = 0 \Rightarrow x = 2$

So, Assertion is correct

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

10. Assertion : The co-ordinates of the point which divides the join of A(-5, 11) and B(4,-7) in the ratio 7 : 2 is (2, -3)

Reason : The coordinates of the point $P(x, y)$ which divides the line segment joining the points $A(x_1, y_1)$ and $B(x_2, y_2)$ in the ratio $m_1 : m_2$ is $\left(\frac{m_1x_2+m_2x_1}{m_1+m_2}, \frac{m_1y_2+m_2y_1}{m_1+m_2}\right)$

Ans: We know that the coordinates of the point $P(x, y)$ which divides the line segment joining the points $A(x_1, y_1)$ and $B(x_2, y_2)$ in the ratio $m_1 : m_2$ is $\left(\frac{m_1x_2+m_2x_1}{m_1+m_2}, \frac{m_1y_2+m_2y_1}{m_1+m_2}\right)$

So, Reason is correct.

Here, $x_1 = -5$, $y_1 = 11$, $x_2 = 4$, $y_2 = -7$, $m_1 = 7$, $m_2 = 2$

Now, x-coordinate $= \frac{m_1x_2+m_2x_1}{m_1+m_2} = \frac{(7\times4)+(2\times-5)}{7+2} = \frac{28-10}{9} = \frac{18}{9} = 2$

and y-coordinate $= \frac{m_1y_2+m_2y_1}{m_1+m_2} = \frac{(7\times-7)+(2\times11)}{7+2} = \frac{-49+22}{9} = \frac{-27}{9} = -3$

So, Assertion is also correct

Correct option is (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).