

Chapter - 5

Arithmetic Progression

(Assertion and Reasoning Questions)

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.

Q.1. Assertion (A) : Let the positive numbers a, b, c be in A.P., then $\frac{1}{bc}, \frac{1}{ac}, \frac{1}{ab}$ are also in A.P.

Reason (R) : If each term of an A.P. is divided by abc , then the resulting sequence is also in A.P.

Q.2. Assertion (A) : Common difference of the AP $-5, -1, 3, 7, \dots$ is 4.

Reason (R) : Common difference of the AP $a, a + d, a + 2d, \dots$ is given by $d = 2\text{nd term} - 1\text{st term}$.

Q.3. Assertion (A) : Sum of first 10 terms of the arithmetic progression $-0.5, -1.0, -1.5, \dots$ is 27.5

Reason (R) : Sum of n terms of an A.P. is given as $S_n = \frac{n}{2}[2a + (n - 1)d]$ where $a =$ first term, $d =$ common difference.

Q.4. Assertion (A) : $a_n - a_{n-1}$ is not independent of n then the given sequence is an AP.

Reason (R) : Common difference $d = a_n - a_{n-1}$ is constant or independent of n.

Q.5. Assertion (A) : The sum of the series with the nth term. $t_n = (9 - 5n)$ is (465), when no. of terms $n = 15$.

Reason (R) : Given series is in A.P. and sum of n terms of an A.P. is

$$S_n = \frac{n}{2}[2a + (n - 1) d]$$

Q.6. Assertion (A) : Three consecutive terms $2k + 1$, $3k + 3$ and $5k - 1$ form an AP than k is equal to 6.

Reason (R) : In an AP a, $a + d$, $a + 2d$,....., the sum to n terms of the AP be

$$S_n = \frac{n}{2}[2a + (n - 1) d]$$

Q.7. Assertion (A) : If n^{th} term of an A.P. is $7 - 4n$, then its common differences is -4.

Reason (R) : Common difference of an A.P. is given by $d = a_{n+1} - a_n$.

Q.8. Assertion (A) : The sum of the first n terms of an AP is given by

$$S_n = 3n^2 - 4n. \text{ Then its } n^{\text{th}} \text{ term } a_n = 6n - 7.$$

Reason (R) : n^{th} term of an AP, whose sum to n terms is S_n , is given by

$$a_n = S_n - S_{n-1}.$$

Q.9. Assertion (A) : If S_n is the sum of the first n terms of an A.P., then its n^{th} term a_n is given by $a_n = S_n - S_{n-1}$.

Reason (R) : The 10th term of the A.P. 5, 8, 11, 14, is 35.

Q.10. Assertion (A) : Common difference of an AP in which $a_{21} - a_7 = 84$ is 14.

Reason (R) : n th term of AP is given by $a_n = a + (n - 1)d$

Q.11. Assertion (A) : Sum of first hundred even natural numbers divisible by 5 is 500.

Reason (R) : Sum of first n-terms of an A.P. is given by $S_n = \frac{n}{2}[a + l]$ where l = last term.

Q.12. Assertion (A) : Arithmetic between 8 and 12 is 10.

Reason (R) : Arithmetic between two numbers 'a' and 'b' is given as $\frac{a + b}{2}$.

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ANSWER KEY

Q.1 : (a)

Q.2 : (a)

Common difference, $d = -1 - 1 (-5) = 4$ So, both A and R are correct and R explains A.

Q.3 : (a)

Both are correct. Reason is the correct reasoning for Assertion.

Assertion,

$$\begin{aligned} S_{10} &= \frac{10}{2}[2(-0.5) + (10 - 1)(-0.5)] \\ &= 5[-1 - 4.5] \\ &= 5(-5.5) = 27.5 \end{aligned}$$

Q.4 : (d)

Assertion is incorrect.

We have, common difference of an AP $d = a_n - a_{n-1}$ is independent of n or constant. So, A is correct but R is incorrect.

Q.5 : (d)

Q.6: (b)

For $2k + 1, 3k + 3$ and $5k - 1$ to form an AP

$$(3k + 3) - (2k + 1) = (5k - 1) - (3k + 3)$$

$$k + 2 = 2k - 4$$

$$2 + 4 = 2k - k = k$$

$$k = 6$$

So, both A and R are correct but R does not explain A

Q.7 : (a)

Both are correct. Reason is the correct explanation.

Assertion,

$$a_n = 7 - 4n$$

$$d = a_{n+1} - a_n$$

$$= 7 - 4(n + 1) - (7 - 4n)$$

$$= 7 - 4n - 4 - 7 + 4n = -4$$

Q.8 : (a)

nth term of an AP be

$$a_n = S_n - S_{n-1}$$

$$a_n = 3n^2 - 4n - 3(n-1)^2 + 4(n-1)$$

$$a_n = 6n - 7$$

So, both A and R are correct and R explains A.

Q.9 : (c)

$$\begin{aligned} a_{10} &= a + 9d \\ &= 5 + 9(3) = 5 + 27 = 32 \end{aligned}$$

Q.10 : (d)

Assertion is incorrect.

We have,

$$\begin{aligned} a_n &= a + (n-1)d \\ a_{21} - a_7 &= \{a + (21-1)d\} - \{a + (7-1)d\} = 84 \end{aligned}$$

$$a + 20d - a - 6d = 84$$

$$14d = 84$$

$$d = \frac{18}{14} = 6$$

$$d = 6$$

So, A is incorrect but R is correct.

Q.11 : (d)

Assertion is incorrect.

Assertion : Even natural numbers divisible by 5 are 10, 20, 30, 40,

They form an A.P. with,

$$a = 10, d = 10$$

$$S_{100} = \frac{100}{2} [2(10) + 99(10)] = 50500$$

Reason is correct.

Q.12 : (a)

Both are correct and Reason is the correct explanation for the Assertion.