# Chapter - 5

# Arithmetic Progression

## ( Assertion and Reasoning Questions )

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**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, ..... is 4.

**Reason (R) :** Common difference of the AP a, a + d, a + 2d,…….is given by d = 2nd term-1st term.

**Q.3. Assertion (A) :** Sum of first 10 terms of the arithmetic progression -0.5, -1.0, -1.5, ..... 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 $S_n = 3n^2 - 4n.$ Then its n th 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 $S_n = \frac{n}{2}[a + \ell]$ 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,

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

**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)

$$\text{For } 2k+1, 3k+3 \text{ and } 5k-1 \text{ to form an AP}$$

$$\begin{aligned}(3k+3)-(2k+1) &= (5k-1)-(3k+3)\\ k+2 &= 2k-4\\ 2+4 &= 2k-k = k\\ k &= 6\end{aligned}$$

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,

$$\begin{aligned}a_n &= 7-4n\\ d &= a_{n+1}-a_n\\ &= 7-4(n+1)-(7-4n)\\ &= 7-4n-4-7+4n = -4\end{aligned}$$

**Q.8** : (a)

n th term of an AP be

$$\begin{aligned} a_n &= S_n - S_{n-1} \\ a_n &= 3n^2 - 4n - 3(n-1)^2 \\ &\qquad +4(n-1) \\ a_n &= 6n - 7 \end{aligned}$$

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.

$$\begin{aligned} \text{We have,} \qquad a_n &= a + (n-1)d \\ a_{21} - a_7 &= \{a + (21-1)d\} \\ &\qquad -\{a + (7-1)d\} = 84 \\ a + 20d - a - 6d &= 84 \\ 14d &= 84 \\ d &= \frac{18}{14} = 6 \\ d &= 6 \end{aligned}$$

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.