ARITHMETIC PROGRESSIONS

MCQs & A and R WORK SHEET

Test / Exam Name: Arithmetic Progression **Standard: 10th** **Subject: Mathematics**

Student Name: ..... **Section:** ..... **Roll No.:** .....

Questions: 58 **Time: 02:00 hh:mm** **Negative Marks: 0** **Marks: 58**

Instructions

1. MULTIPLE CHOICE QUESTIONS.

Q1. Which of the following is not an A.P.? **1 Mark**

A -1.2, -3.2, -5.2, -7.2, ... **B** a, 2a, 3a, 4a, ... **C** 2, 4, 8, 16, ... **D** 2, 5252, 3, 7272, ...

Ans: C 2, 4, 8, 16, ...

Solution:

In 2, 4, 8, 16, ...

$d = a_2 - a_1 = 4 - 2 = 2$

And $d = a_3 - a_2 = 8 - 4 = 4$

Also $d = a_4 - a_3 = 16 - 8 = 8$

Here, the common difference is not the same for all terms,

$\therefore$ it is not an AP.

Q2. In an A.P. if a = 3.5, d = 0 and n = 101, then a_n = **1 Mark**

A 0 **B** 103.5 **C** 3.5 **D** 1

Ans: C 3.5

Solution:

Given: a = 3.5, d = 0 and n = 101, then

$a_n = a + (n - 1)d$

$= 3.5 + (101 - 1) \times 0 =$

$= 3.5 + 0 = 3.5$

Q3. In an A.P. if d = -4, n = 7 and an = 4, then 'a' is: **1 Mark**

A 20 **B** 6 **C** 28 **D** 7

Ans: C 28

Solution:

Given: d = – 4, n = 7 and an = 4

$\therefore$ an = a + (n - 1)d

? 4 = a + (7 - 1) × (-4)

? 4 = a + 6 × -4

? 4 = a - 24

? a = 28

Q4. The first term of an AP is p and the common difference is q, then its 10th term is: **1 Mark**

A q + 9p. **B** p - 9q. **C** p + 9q. **D** 2p + 9q.

Ans: C p + 9q.

Solution:

10th term = p + (10 - 1)q

$a_{10} = p + 9q.$

Q5. The n^{th} term of the A.P. a, 3a, 5a, ___ is. **1 Mark**

A na **B** (2n – 1) a **C** (2n + 1) a **D** 2na

Ans: C (2n + 1) a

Solution:

a = a, d = 3a - a = 2a

$A_n = a + (n - 1)d$

$= a + (n - 1)2a$

$= a\{1 + 2(n - 1)\}$

$= a\{1 + 2n - 2\}$

$= a(2n - 1) = (2n - 1)a$

Q6. The 10th term of an A.P. 2, 7, 12, ... is: **1 Mark**

A 49 **B** 50 **C** 48 **D** 47

Ans: D 47

Solution:

Here, a = 2, d = 7 - 2 = 5 and n = 10

$a_n = a + (n - 1)d$

? $a_{10} = 2 + (10 - 1) \times 5$

$= 2 + 9 \times 5$

? $a_{10} = 2 + 45 = 47$

Q7. What is 20^{th} term from the end of the AP 3, 8, 13, ..., 253? **1 Mark**

A 163 **B** 158 **C** 153 **D** 148

Ans: B 158

Solution:

The given AP is 3, 8, 13, ..., 248, 253

So, cinsider the AP to be 253, 248,...., 13, 8, 3

a = 253 and d = 248 - 253 = -5

$a_n = a + (n - 1)d$

? $a_{20} = 253 + 19(-5)$

? $a_{20} = 253 - 95$

? $a_{20} = 158$

So, the 20^{th} term will be 158.

Q8. The first three terms of an AP respectively are 3y - 1, 3y + 5 and 5*y* + 1. Then y equals: **1 Mark**

A -3 **B** 4 **C** 5 **D** 2

Ans: C 5

Solution:

Since, 3y - 1, 3y + 5 and 5y + 1 are first three terms of an A.P.

Then, Second term - First term = Third term - Second term = d (common difference)

? 3y + 5 - (3y - 1) = 5y + 1 - (3y + 5)

? 3y + 5 - 3y + 1 = 5y + 1 - 3y - 5

? 6 = 2y - 4

? 2y = 6 + 4

? 2y = 10

? y = 5

Hence, the correct option is (C).

Q9. What is the common difference of an AP in which $a_{18} - a_{14} = 32$? **1 Mark**

A 8 **B** -8 **C** 4 **D** -4

Ans: A 8

Solution:

Let a be the frist term and d be the common difference.

$a_{18} - a_{14} = 32$

? a + 17d - (a + 13d) = 32

? a + 17d - a - 13d = 32

? 4d = 32

? d = 8

Q10. Which term of the AP 72, 63 54, ...is 0? **1 Mark**

A 8^{th} **B** 9^{th} **C** 10^{th} **D** 11^{th}

Ans: B 9^{th}

Solution:

The given AP is 72, 63, 54, ...

a = 72 and d = 63 - 72 = -9

$a_n = a + (n - 1)d$

? 0 = 72 + (n -1)(-9)

? -72 = (n - 1)(-9)

? 8 = n - 1

? n = 9

So, the 9^{th} term is 0.

Q11. Choose the correct answer from the given four options: **1 Mark**

If the common difference of an AP is 5, then what is $a_{18} - a_{13}$?

A 5 **B** 20 **C** 25 **D** 30

Ans: C 25

Solution:

Given, the common difference of AP i.e., d = 5

[$\because a_n = a + (n - 1)d$]

Now, $a_{18} - a_{13} = a + (18 - 1)d - [a + (13 - 1)d]$

$a_{18} - a_{13} = a + 17 \times 5 - a\ 12 \times 5$

$a_{18} - a_{13} = 85 - 60$

$a_{18} - a_{13} = 25$

Q12. The common difference of the AP $\frac{1}{p}, \frac{1-p}{p}, \frac{1-2p}{p} \ldots\ldots\ldots$ is : **1 Mark**

A P **B** -P **C** -1 **D** 1

Ans: C -1

Solution:

Common difference

$= \frac{1-p}{p} - \frac{1}{p}$

$= \frac{1-p-1}{p}$

$= \frac{-p}{p}$

$= -1$

Q13. The common difference of the AP $\frac{1}{3}, \frac{1-3b}{3}, \frac{1-6b}{3}, \ldots.$ is: **1 Mark**

A $\frac{1}{3}$ **B** $\frac{-1}{3}$ **C** b **D** $-b$

Ans: D $-b$

Solution:

Common difference

$= \frac{1-3b}{3} - \frac{1}{3}$

$= \frac{1-3b-1}{3}$

$= \frac{-3b}{3}$

$= -b$

Q14. Mark the correct alternative in the following: **1 Mark**

If 18^{th} and 11^{th} term of an A.P. are in the ratio 3 : 2, then its 21^{st} and 5^{th} terms are in the ratio:

A 3 : 2 **B** 3 : 1 **C** 1 : 3 **D** 2 : 3

Ans: B 3 : 1

Solution:

18^{th} term : 11^{th} term = 3 : 2

$\Rightarrow \frac{a_{18}}{a_{11}} = \frac{3}{2} \Rightarrow \frac{a+17d}{a+10d} = \frac{3}{2}$

$\Rightarrow 2a + 34d = 3a + 30d$

$\Rightarrow 34d - 30d = 3a - 2a \Rightarrow a = 4d$

Now $\frac{a_{21}}{a_5} = \frac{a+20d}{a+4d} = \frac{4d+20d}{4d+4d}$

$= \frac{24d}{8d} = \frac{3}{1}$

$a_{21} : a_5 = 3 : 1$

Q15. The 31st term of an A.P. whose first two terms are -3 and 4 is: **1 Mark**

A 210 **B** 200 **C** 137 **D** 207

Ans: D 207

Solution:

Given: a = -3, d = 4 - (-3) = 7

$\therefore a_{31} = -3 + (31 - 1) \times 7$

$= -3 + 30 \times 7$

$= -3 + 210 = 207$

Q16. The sum of first 16 terms of the AP 10, 6, 2, ... is. **1 Mark**

A 320 **B** -320 **C** -352 **D** -400

Ans: B -320

Solution:

Let a be the term and d be the common difference.

AP is 10, 6, 2, ...

a = 10 and d = 6 - 10 = -4

$S_n = \frac{n}{2}[2a + (n\text{-}1)d]$
$\Rightarrow S_{16} = \frac{16}{2}[2(10) + 15(-4)]$
$\Rightarrow S_{16} = 8[20 - 60]$
$\Rightarrow S_{16} = 8[-40]$
$\Rightarrow S_{16} = -320$
So, the sum is -320.

Q17. The common difference of the A.P whose $S_n = 3n_2 + 7n$ is: **1 Mark**

A 5 **B** 1 **C** 2 **D** 6

Ans: D 6

$S = a = 3 \times (1)^2 + 7 \times 1 = 3 + 7 = 10$
$S_2 = 3 \times (2)^2 + 7 \times 2 = 12 + 14 = 26$
$S_3 = 3 \times (3)^3 + 7 \times 3 = 27 + 21 = 48$
Now, $a_2 = S_2 - S_1 = 26 - 10 = 16$
$\therefore$ Common difference (d) $= a_2 - a = 16 - 10 = 6$

Q18. The 9th term of an A.P. is 499 and the 499th term is 9. The term which is equal to zero is: **1 Mark**

A 504th term **B** 510th term **C** 500th term **D** 508th term

Ans: D 508th term

Solution:
$a_9 = a + 8d$
$a_9 = 499$ (given)
$\therefore a + 8d = 499$ .... (i)
$a_{499} = a + 498d$
$a_{499} = 9$
$\therefore a + 498d = 9$ ..... (ii)
Subtract (i) from (ii)
? 490d = -490
? d = -1
Substitute the value of d
? a + 8(-1) = 499
? a = 507
$\therefore$ For $a_n = 0$
? a + (n - 1)d = 0
? 507 + (n - 1) (-1) = 0
? n = 508
So, 508th term is equal to zero.

Q19. Which term of the AP 25, 20, 15,....is the first negative term? **1 Mark**

A 10^{th} **B** 9^{th} **C** 8^{th} **D** 7^{th}

Ans: D 7^{th}

Solution:
The given AP is 25, 20, 15, ...
a = 25 and d = 20 - 25 = -5
$a_n = a + (n - 1)d < 0$
? 25 + (n - 1)(-5) < 0
? 5 - (n - 1) < 0
? 5 - n + 1 < 0
? 6 < 0
So, the frist negative term will be the 7^{th} term.

Q20. An AP 5, 12, 19, ...has 50 term. Its last term is: **1 Mark**

A 343 **B** 353 **C** 348 **D** 362

Ans: C 348

Solution:
Let a be frist term and d be the common difference.
a = 5
d = 12 - 5 = 7
$a_{50} = a + 49d$
? $a_{50} = 5 + 49(7)$
? $a_{50} = 348$

So, its last term is 348.

Q21. If k, 2k - 1 and 2k + 1 are three consecutive terms of an A.P., the value of k is: **1 Mark**

A 2 **B** 3 **C** -3 **D** 5

Ans: B 3

Solution:

If a, b, c are in A.P.

b - a = c - b ....(1)

According to the given problem

a = k, b = 2k - 1, c = 2k + 1

Using (1)

(2k - 1) - k = (2k + 1) - (2k - 1)

2k - 1 - k = 2k + 1 - 2k - 1

k - 1 = 2

k = 2 + 1

k = 3

Q22. The first term of an A.P. if its $S_n = n^2 + 2n$ is: **1 Mark**

A 3 **B** 0 **C** 1 **D** 2

Ans: A 3

$S = a = (1)^2 + 2 \times 1 = 1 + 2 = 3$

Q23. The sum of first n terms of an AP is $(4n^2 + 2n)$. The nth term of this AP is: **1 Mark**

A (6n - 2) **B** (7n - 3) **C** (8n - 2) **D** (8n + 2)

Ans: C (8n - 2)

Solution:

The sum of frist n terms of an AP is $(4n^2 + 2n)$.

$S_n = 4n^2 + 2n$

? $S_{n-1} = 4n^2 + 2n$

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

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

$= 4n^2 - 8n + 4 + 2n - 2$

$= 4n^2 - 6n + 2$

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

$= 4n^2 + 2n - (4n^2 - 6n + 2)$

$= 4n^2 + 2n - 4n^2 + 6n - 2$

$= 8n - 2$

Q24. Mark the correct alternative in the following: **1 Mark**

The n^{th} term of an A.P., the sum of whose n terms is S_n, is.

A $S_n + S_{n-1}$ **B** $S_n - S_{n-1}$ **C** $S_n + S_{n+1}$ **D** $S_n - S_{n+1}$

Ans: B $S_n - S_{n-1}$

Solution:

S_n is the sum of first n terms

Last term n^{th} term = $S_n - S_{n-1}$

Q25. If a, 7, b, 23, c are in A.P. then the value of c is: **1 Mark**

A 31 **B** 0 **C** 8 **D** -1

Ans: A 31

Solution:

Let d be a common difference. Then,

$a_5 = c = a + 4d$ ... (i)

$a_2 = a + d = 7$ ... (ii)

$a_4 = a + 3d = 23$ ... (iii)

Solving eq. (ii) and (iii),

we get a = -1 and d = 8

$\therefore c = a + 4d$

$= -1 + 4 \times 8 = 31$

Q26. If 4, x_1, x_2, x_3, 28 are in AP then x_3 = ? **1 Mark**

A 19 **B** 23 **C** 22 **D** Cannot be determined

Ans: C 22

Solution:

Given that $4, x_1, x_2, x_3, 28$ are in AP.

Let d be the common difference.

Since 28 is the 5^{th} term,

$28 = 4 + 4d$

? $4d = 24$

? $d = 6$

$x_3 = a + (3)d$ .....(x_3 is the fourth term)

? $x_3 = 4 + 3(6)$

? $x_3 = 22$

Q27. Choose the correct answer from the given four options: **1 Mark**

The 4^{th} term from the end of the AP: –11, –8, –5, ..., 49 is:

A 37 **B** 40 **C** 43 **D** 58

Ans: B 40

Solution:

We know that, the n^{th} term of an AP from the end is

$a_n = l - (n - 1)d$ .....(i)

Here, l = Last term and l = 49 [given]

Common difference, d = -8 - (-11)

d = -8 + 11

d = 3

From Eq. (i), $a_4 = 49 - (4 - 1)3$

$a_4 = 49 - 9$

$a_4 = 40$

Q28. The sum of first n positive integers is: **1 Mark**

A $\frac{n(n-1)}{2}$ **B** $\frac{n(n-1)}{3}$ **C** $\frac{n(n+1)}{3}$ **D** $\frac{n(n+1)}{2}$

Ans: D $\frac{n(n+1)}{2}$

Solution:

n positive integers are 1, 2, 3, 4, ... n

Here, a = 1, d = 2 - 1 = 1 and n = n

$s_n = \frac{n}{2}(2a + (n - 1)d)$

$s_n = \frac{n}{2}(2a + (nd - d)$

$= \frac{n}{2}(1 + n)$

$= \frac{n(n+1)}{2}$

Q29. Choose the correct answer from the given four options: **1 Mark**

The famous mathematician associated with finding the sum of the first 100 natural numbers is:

A Pythagoras. **B** Newton. **C** Gauss. **D** Euclid.

Ans: C Gauss.

Solution:

Gauss is the famous mathematician associated with finding the sum of the first natural numbers i.e., 1, 2, 3 ..... 100.

Q30. Mark the correct alternative in the following: **1 Mark**

The sum of first n odd natural numbers is:

A 2n - 1 **B** 2n + 1 **C** n^2 **D** $n^2 - 1$

Ans: C n^2

Solution:

Let, odd numbers are,

1, 3, 5, ...

Here,

First term, a = 1

and Difference, d = 3 - 1 = 2

We know, sum of n terms,

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

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

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

$\Rightarrow S_n = \frac{n}{2} \times 2[1 + n - 1]$

$\Rightarrow S_n = n^2$

Hence, correct choice is (C).

Q31. The sum of first 20 odd natural numbers is: **1 Mark**

A 100 **B** 210 **C** 400 **D** 420

Ans: C 400

Solution:

The frist 20 odd natural numbers will be 1, 3, 5, 7, ...

Here,

a = 1

d = 3 - 1 = 2

n = 20

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

$\Rightarrow S_{20} = \frac{20}{2}\left[2(1) + 19(2)\right]$

$\Rightarrow S_{20} = 10[2 + 38]$

$\Rightarrow S_{20} = 400$

Q32. If the sum of first n even natural numbers is equal to k times the sum of first n odd natural numbers, then k = **1 Mark**

A $\frac{1}{n}$ **B** $\frac{n+1}{2n}$ **C** $\frac{n-1}{n}$ **D** $\frac{n+1}{n}$

Ans: D $\frac{n+1}{n}$

Solution:

Sum of n even natural number = n(n + 1)

and sum of n odd natural numbers = n^2

$\therefore n(n+1) = kn^2$

$\Rightarrow k = \frac{n(n+1)}{n^2} = \frac{n+1}{n}$

Q33. The sum of three terms of an A.P. is 72, then its middle term is: **1 Mark**

A 36 **B** 18 **C** 24 **D** 20

Ans: C 24

Solution:

Let the middle term be a,

then the first term is a - d and next term is a + d

$\therefore$ a - d + a + a + d = 72

? 3a = 72

? a = 24

Q34. Mark the correct alternative in the following: **1 Mark**

The sum of n terms of two A.P.'s are in the ratio 5n + 9 : 9n + 6. Then, the ratio of their 18^{th} term is.

A $\frac{179}{321}$ **B** $\frac{178}{321}$ **C** $\frac{175}{321}$ **D** $\frac{184}{321}$

Ans: D $\frac{184}{321}$

Solution:

Given,

$\frac{\text{Sum of A.P.}_1}{\text{Sum of A.P.}_2} = \frac{S_n}{S'_n} = \frac{5n+9}{9n+6} \ldots\ldots (i)$

We know,

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

For A.P.$_1$ $S_n = \frac{n}{2}[2a + (n-1)d]$

For A.P.$_2$ $S'_n = \frac{n}{2}[2a' + (n-1)d]$

Put the value in Eq. (i)

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

$\Rightarrow \frac{5n+9}{9n+6} = \frac{[2a+(n-1)d]}{[2a'+(n-1)d']}$

Now, put the n = 2n - 1

$\Rightarrow \frac{5(2n-1)+9}{9(2n-1)+6} = \frac{[2a+(2n-1-1)d]}{[2a'+(2n-1-1)d']}$

$\Rightarrow \frac{10n-5+9}{18n-9+6} = \frac{[2a+(2n-2)d]}{[2a'+(2n-2)d']}$

$\Rightarrow \frac{10n+4}{18n-3} = \frac{2a+2(n-1)d}{2a'+2(n-1)d'}$

$\Rightarrow \frac{2(5n+2)}{3(6n-1)} = \frac{2[a+(n-1)d]}{2[a'+(n-1)d']}$

$\Rightarrow \frac{2(5n+2)}{3(6n-1)} = \frac{[a+(n-1)d]}{[a'+(n-1)d']}$

We kmow, $a_n = a + (n - 1)d$

$\Rightarrow \frac{2(5n+2)}{3(6n-1)} = \frac{a_n}{a'_n}$

Now put n = 18

$\Rightarrow \frac{2[5(18)+2]}{3[6(18)-1]} = \frac{a_{18}}{a'_{18}}$

$\Rightarrow \frac{2[90+2]}{3[108-1]} = \frac{a_{18}}{a'_{18}}$

$\Rightarrow \frac{2\times92}{3\times107} = \frac{a_{18}}{a'_{18}}$

$\Rightarrow \frac{184}{321} = \frac{a_{18}}{a'_{18}}$

Hence, the correct option is (D).

Q35. Mark the correct alternative in the following: **1 Mark**

If S_r denotes the sum of the first r terms of an A.P. Then, $S_{3n} : (S_{2n} - S_n)$ is:

A n **B** 3n **C** 3 **D** None of these.

Ans: C 3

Solution:

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

and $S_{3n} = \frac{3n}{2}[2a + (3n-1)d]$

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

$[2a + (n-1)d]$

$= \frac{n}{2}[4a + (4n-2)d] -]2a + (n-1)d]$

$= \frac{n}{2}[4a - 2a + (4n - 2 - n + 1)d] = \frac{n}{2}[2a + (3n-1)d]$

$= \frac{1}{3}(S_{3n})$

$\therefore S_{3n} : (S_{2n} - S_n) = 3 : 1$ or $\frac{3}{1} = 3$

Q36. Mark the correct alternative in the following: **1 Mark**

It the sums of n terms of two arithmetic progressions are in the ratio $\frac{3n+5}{5n-7}$, then their n^{th} terms are in the ratio.

A $\frac{3n-1}{5n-1}$ **B** $\frac{3n+1}{5n+1}$ **C** $\frac{5n+1}{3n+1}$ **D** $\frac{5n-1}{3n-1}$

Ans: B $\frac{3n+1}{5n+1}$

Solution:

Given,

$\frac{\text{Sum of A.P}_1}{\text{Sum of A.P}_2} = \frac{S_n}{S'_n} = \frac{3n+5}{5n+7} \ldots\ldots (i)$

We know,

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

For A.P.$_1$ $S_n = \frac{n}{2}[2a + (n-1)d]$

For A.P.$_2$ $S'_n = \frac{n}{2}[2a' + (n-1)d']$

Put the value in eq. (i)

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

$\Rightarrow \frac{3n+5}{5n+7} = \frac{[2a+(n-1)d]}{[2a'+(n-1)d']}$

Now, put the n = 2n - 1

$\Rightarrow \frac{3(2n-1)+5}{5(2n-1)+7} = \frac{[2a+(2n-1-1)d]}{[2a'+(2n-1-1)d']}$

$\Rightarrow \frac{6n-3+5}{10n-5+7} = \frac{[2a+(2n-2)d]}{[2a'+(2n-2)d']}$

$\Rightarrow \frac{6n+2}{10n+2} = \frac{2a+2(n-1)d}{2a'+2(n-1)d'}$

$\Rightarrow \frac{2(3n+1)}{2(5n+1)} = \frac{2[a+(n-1)d]}{2[a'+(n-1)d']}$

$\Rightarrow \frac{3n+1}{5n+1} = \frac{[a+(n-1)d]}{[a'+(n-1)d']}$

$\Rightarrow \frac{3n+1}{5n+1} = \frac{[a+(n-1)d]}{[a'+(n-1)d']}$

We know, $a_n = a + (n - 1)d$

$\Rightarrow \frac{3n+1}{5n+1} = \frac{a_n}{a'_n}$

Hence, correct choice is (B).

Q37. Mark the correct alternative in the following: **1 Mark**

If the first, second and last term of an A.P, are a, b and 2a respectively, its sum is

A $\frac{ab}{2(b-a)}$ **B** $\frac{ab}{(b-a)}$ **C** $\frac{3ab}{2(b-a)}$ **D** None of these.

Ans: C $\frac{3ab}{2(b-a)}$

3. $\frac{3ab}{2(b-a)}$

Solutoin:

In the given problem, we are given first, second and last term of an A.P. We need to find its sum.

So, here

First term = a

Second term (a_2) = b

Last term (l) = 2a

Now, using the formula $a_n = a + (n - 1)d$

$a_2 = a + (2 - 1)d$

$b = a + d$

$d = b - a$ .....(i)

Also,

$a_n = a + (n - 1)d$

$2a = a + nd - d$

$2a - a = nd - d$

$\frac{a+d}{d} = n$ ..... (ii)

Furthere as we know,

$S_n = \frac{n}{2}[a + l]$

Substituting (ii) in the above equation, we get

Using (i), we get

$S_n = \frac{a+(b-a)}{2(b-a)}(3a)$

$S_n = \frac{b}{2(b-a)}(3a)$

Thus,

$S_n = \frac{3ab}{2(b-a)}$

Therefore, the correct option is (C).

Q38. If the angles of a triangle are in A.P. and the greatest angle is twice the least then one of its angles is: **1 Mark**

A 60° **B** 45° **C** 70° **D** 50°

Ans: A 60°

Solution:

Let a - d, a, a + d be the three angles of the triangle that form A.P.

Given: that the greatest angle is twice the least.

Now, 2(a - d) = a + d

2a - 2d = a + d

a = 3d ... (i)

Now by angle sum property,

(a - d) + a + (a + d) = 180°

3a = 180°

a = 60°... (ii)

from (i) and (ii),

3d = 60°

d = 20°

Now, the angles are,

a - d = 60° - 20° = 40°

a = 60°

a + d = 60° + 20° = 80°

Q39. If the angles of a right angled triangle are in A.P. then the angles of that triangle will be: **1 Mark**

A 45°, 45°, 90° **B** 20°, 70°, 90° **C** 30°, 60°, 90° **D** 40°, 50°, 90°

Ans: C 30°, 60°, 90°

Solution:

Let the three angles of a triangle be a - d, a and a + d

∴ a - d + a + a + d = 180°

? 3a = 180°

? a = 60°

∴ one angle is of 60° and other is 90° (given).

Let the third angle be x°, then

60° + 90° + x° = 180°

? 150° + x° = 180°

? x° = 180° - 150° = 30°

∴ The angles of the right-angled triangle are 30°, 60°, 90°

Q40. Mark the correct alternative in the following: **1 Mark**

If $\frac{5+9+13+,\ldots.\text{ to n terms}}{7+9+11+,\ldots..\text{to (n+1) term}} = \frac{17}{16}$, then n =

A 8 **B** 7 **C** 10 **D** 11

Ans: B 7

Solution:

Sum of 5 + 9 + 13 + ... to n term

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

Here, a = 5, d = 9 - 5 = 4

$\therefore$ Sum $= \frac{n}{2}[2 \times 5 + (n-1) \times 4]$

$= \frac{n}{2}[10 + 4n - 4]$

$= \frac{n}{2}[6 + 4n = n(3+2n)]$

and sum of 7 + 9 + 11 + ... to (n + 1) terms

$= \frac{n+1}{2}[2 \times 7 + (n+1-1)2]$

$= \frac{n+1}{2}[14 + 2n] = (n+1)(7+n)$

$\therefore$ $\frac{5+9+13+\ldots..\text{to n terms}}{7+9+11+\ldots..\text{ to (n+1) terms}} = \frac{17}{16}$

$\Rightarrow$ $\frac{n(3+2n)}{(n+1)(7+n)} = \frac{17}{16}$

? 16n(3 + 2n) = 17(n + 1)(7 + n)

? $48n + 32n^2 = 17(n^2 + 8n + 7)$

? $48n + 32n^2 = 17n^2 + 136n + 119$

? $48n + 32n^2 - 17n^2 - 136n - 119 = 0$

? $15n^2 - 88n - 119 = 0$

? $15n^2 - 105n + 17n - 119 = 0$

$\left\{\begin{array}{c} \because\ 15 \times (-119) = 1785 \\ -1785 = 17 \times (105) \\ -88 = 17 - 105 \end{array}\right\}$

? 15n(n - 7) + 17(n - 7) = 0

? (n - 7)(15n + 17) = 0

Either, n - 7 = 0, then n = 7 or 15n + 17 = 0, then $n = \frac{-17}{15}$ which is not possible being fraction.

$\therefore$ $n = 7$

Q41. The 17th term of an A.P. exceeds its 10th term by 7, then the common difference is: **1 Mark**

A -1 **B** 1 **C** 2 **D** 0

Ans: B 1

Solution:

According to question,

Given that the 17th term of an A.P exceeds its 10th term by 7.

d = ?

? a + 16d = a + 9d + 7

? 16d - 9d = 7

? 7d = 7

$\Rightarrow d = \frac{7}{7} = 1$

$\therefore$ common difference = 1.

Q42. How many three-digit numbers are divisible by 9? **1 Mark**

A 86 **B** 90 **C** 96 **D** 100

Ans: D 100

Solution:

The two-digit numbers divisible by 9 start from

108, 117, 126, 135, ..., 999

Here,

a = 108

d = 9

a_n = a + (n - 1)

? 999 = 108 + (n - 1)(9)

? 999 = 108 + 9n - 9

? 900 = 9n

? n = 100

Q43. The number of two digit numbers divisible by 3 is: **1 Mark**

A 31 **B** 29 **C** 3 **D** 30

Ans: D 30

Solution:

The two digit numbers divisible by 3 are

12, 15, 18, ... , 99

Here, a = 12, d = 15 - 12 = 3 and an = 99

∴ an = a + (n - 1)d

? 99 = 12 + (n - 1) × 3

? 87 = (n - 1) × 387 = (n - 1) × 3

? n - 1 = 29n - 1 = 29

? n = 30

Q44. The 13^{th} term of an AP is 4 times its 3^{rd} term. If its 5^{th} term is 16 then the sum of its first ten terms is: **1 Mark**

A 150 **B** 175 **C** 160 **D** 135

Ans: B 175

Solution:

Let a be frist term and d be the common difference.

$a_{13} = 4a_3$

? a + 12d = 4(a + 2d)

? a + 12d = 4a + 8d

? 4d = 3a ....(i)

$a_5 = 16$

? a + 4d = 16

Substituting (i), we get

? a + 3a = 16

? a = 4

So, d = 3

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

$\Rightarrow S_{10} = \frac{10}{2}\left[2(4) + 9(3)\right]$

$\Rightarrow S_{10} = 5\left[8 + 27\right]$

$\Rightarrow S_{10} = 5[35]$

$\Rightarrow S_{10} = 175$

Q45. Choose the correct answer from the given four options: **1 Mark**

The sum of first five multiples of 3 is:

A 45 **B** 55 **C** 65 **D** 75

Ans: A 45

Solution:

The first five multipies of 3 are 3, 6, 9, 12 and 15.

Here, first term, a = 3, common difference, d = 6 - 3 = 3

and number of terem, n = 5

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

$\therefore S_5 = \frac{5}{2}\left[2a + (5-1)d\right]$

$S_5 = \frac{5}{2}\left[2 \times 3 + 4 \times 3\right]$

$S_5 = \frac{5}{2}(6 + 12) = 5 \times 9 = 45$

Q46. Mark the correct alternative in the following: **1 Mark**

Sum of n term of the series $\sqrt{2} + \sqrt{8} + \sqrt{18} + \sqrt{32} + \ldots\ldots$ is

A $\frac{n(n+1)}{2}$ **B** $2n(n+1)$ **C** $\frac{n(n+1)}{\sqrt{2}}$ **D** 1

Ans: C $\frac{n(n+1)}{\sqrt{2}}$

Solution:

The series is given

$\sqrt{2} + \sqrt{8} + \sqrt{18} + \sqrt{32} + \ldots.$

$\Rightarrow \sqrt{2} + 2\sqrt{2} + 3\sqrt{2} + 4\sqrt{2} + \ldots\ldots$

Here $a = \sqrt{2}$ and $d = 2\sqrt{2} - \sqrt{2} = \sqrt{2}$

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

$= \frac{n}{2}[2\sqrt{2} + (n-1)\sqrt{2}]$

$= \frac{n}{2}[2\sqrt{2} + \sqrt{2}n - \sqrt{2}]$

$= \frac{n}{2}(\sqrt{2}n + \sqrt{2})$
$= \frac{n\sqrt{2}}{2}(n+1) = \frac{n(n+1)}{\sqrt{2}}$

Assertion & reason Questions

Q47.Directions: In the following questions, the Assertions (A) and Reason(s) (R) have been put forward. Read both the statements carefully and choose the correct alternative from the following: **1 Mark**

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

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

A Both assertion (A) and reason (R) are true and reason (R) isthe 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: D Assertion (A) is false but reason (R) is true

Solution:

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.

Q48.Assertion: The common difference of the A.P. 19, 18, 17, ... is 1. **1 Mark**

Reason: Let a_1, d_2, a_3, a_4, ... is an A.P.

Then, common difference of this A.P. will be the difference between any two consecutive terms, i.e., common difference (d) = $a_2 - a_1$ or $a_3 - a_2$ or $a_4 - a_3$ and so on.

A Assertion and Reason both are correct statements and Reason is the correct explanation of Assertion.

B Assertion and Reason both are correct statements but Reason is not the correct explanation of Assertion.

C Assertion is correct statement but Reason is wrong siatement.

D Assertion is wrong statement but Reason is correct statement.

Ans: D Assertion is wrong statement but Reason is correct statement.

Solution:

Clearly, Reason is correct.

Given, A.P. is 19, 18, 17, ...

Here, $a_1 = 19$, $a_2 = 18$, $a_3 = 17$ and so on.

$\therefore$ Common difference (d) = $a_2 - a_1 = 18 - 19 = -1$

Q49.Asse:rtion: If n^{th} term of an A.P. is 7 - 4n, then its common differences is -4. **1 Mark**

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

A Both assertion (A) and reason (R) are true and reason (R) isthe 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: A Both assertion (A) and reason (R) are true and reason (R) isthe correct explanation of assertion (A).

Solution:

Both are correct. Reason is the correct explanation.

Assertion, $a_n = 7 - 4n$

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

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

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

Q50.Assertion: 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 $a_n = S_n - S_{n-1}$. **1 Mark**

Reason: The 10" term of the A.P. 5, 8, 11, 14, ... is 35.

A Both assertion (A) and reason (R) are true and reason (R) isthe 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: C Assertion (A) is true but reason (R) is false.

Solution:

$a_{10} = a + 9d$
$= 5 + 9(3)$
$= 5 + 27 = 32$

Q51.Assertion: If the first term of an A.P. is 4, last term is 81 and the sum of the given terms is 510. Then, there are 12 terms in the given A.P. **1 Mark**

Reason: If a is the first term, l is the last term and n is the number of terms of an A.P., then $s_n = \frac{n}{2}(a + l)$

A Assertion and Reason both are correct statements and Reason is the correct explanation of Assertion.

B Assertion and Reason both are correct statements but Reason is not the correct explanation of Assertion.

C Assertion is correct statement but Reason is wrong siatement.

D Assertion is wrong statement but Reason is correct statement.

Ans: D Assertion is wrong statement but Reason is correct statement.

Solution:

Let n be the number of terms.

We have, $s_n = \frac{n}{2}(a + l)$

$\Rightarrow \frac{n}{2}(4 + 81) = 510$

$\Rightarrow n = \frac{510 \times 2}{85} = 12.$

Q52.Assertion: The 10th term from the end of the A.P. 7, 10, 18, ..., 184 is 163. **1 Mark**

Reason: In an A.P. with first term a, common difference d and last term l, the n^{th} term from the end is l - (n - 1)d.

A Assertion and Reason both are correct statements and Reason is the correct explanation of Assertion.

B Assertion and Reason both are correct statements but Reason is not the correct explanation of Assertion.

C Assertion is correct statement but Reason is wrong siatement.

D Assertion is wrong statement but Reason is correct statement.

Ans: D Assertion is wrong statement but Reason is correct statement.

Solution:

Clearly, Reason is correct.

Now, 10^{th} term from end = l - (n - 1)d

= 184 - (10 - 1)3 = 184 - 27 = 157

Q53.Assertion: The n' term of a sequence is 3n - 2. It is an A.P. **1 Mark**

Reason: A sequence is not an A.P. ifitsn is not a linear expression in n.

A Assertion and Reason both are correct statements and Reason is the correct explanation of Assertion.

B Assertion and Reason both are correct statements but Reason is not the correct explanation of Assertion.

C Assertion is correct statement but Reason is wrong siatement.

D Assertion is wrong statement but Reason is correct statement.

Ans: A Assertion and Reason both are correct statements and Reason is the correct explanation of Assertion.

1. Assertion and Reason both are correct statements and Reason is the correct explanation of Assertion.

Q54.Assertion: Arithmetic between 8 and 12 is 10. **1 Mark**

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

A Both assertion (A) and reason (R) are true and reason (R) isthe 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: A Both assertion (A) and reason (R) are true and reason (R) isthe correct explanation of assertion (A).

Solution:

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

Q55.Assertion: The sum of the series with the nth term. $t_n = (9 - 5n)$ is (465), when no. of terms n = 15. **1 Mark**

Reason: Given series is in A.P. and sum of n terms of an A.P. is $s_n = \frac{n}{2}[2a + (n-1)d]$

A Both assertion (A) and reason (R) are true and reason (R) isthe 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: D Assertion (A) is false but reason (R) is true

4. Assertion (A) is false but reason (R) is true

Q56. Assertion : Sum of first 10 terms of the arithmetic progression -0.5, -1.0, -1.5, ... is 27.5 **1 Mark**

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

A Both assertion (A) and reason (R) are true and reason (R) isthe 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: A Both assertion (A) and reason (R) are true and reason (R) isthe correct explanation of assertion (A).

Solution:

Assertion,

$s_n = \frac{10}{2}[2(-0.5) + (10 - 1) + (-0.5)]$

$= 5[-1 - 4.5]$

$= 5(-5.5) = 27.5$

Q57. Assertion: Common difference of an AP in which a_{21} - a_7 = 84 is 14. **1 Mark**

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

A Both assertion (A) and reason (R) are true and reason (R) isthe 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: D Assertion (A) is false but reason (R) is true

Solution:

We have a_n = a + (n - 1)d

a_{21} - a_7 = {a + (21 - 1) d} - {a + (7 - 1) d} = 84

a + 20d - a - 6d = 84

14d = 84

$d = \frac{84}{14} = 6$

d = 6

So, A is incorrect but R is correct

Q58. Assertion: Three consecutive terms 2k + 1, 3k + 3 and 5k - 1 form an AP than & is equal to 6. **1 Mark**

Reason: In an AP a, a + d, a + 2d,....., n terms of the AP be $s_n = \frac{n}{2}(2a + (n\text{-}1)d)$

A Both assertion (A) and reason (R) are true and reason (R) isthe 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: B Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

Solution:

For 2k + 1, 3k + 3and5k - 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.