HI EVERYONE,

THE REAL LEARNING IN MATHEMATICS HAPPENS WHEN YOU ACTIVELY ENGAGE WITH A PROBLEM, EXPLORE DIFFERENT METHODS, AND WORK THROUGH CHALLENGES. THEREFORE, WE STRONGLY ENCOURAGE YOU TO USE THIS SOLUTION KEY RESPONSIBLY.

PLEASE ATTEMPT ALL THE PROBLEMS ON YOUR OWN FIRST, GIVING THEM YOUR BEST AND MOST HONEST EFFORT. THESE SOLUTIONS ARE TO HELP YOU GET UNSTUCK ON A PROBLEM AFTER YOU HAVE ALREADY TRIED YOUR BEST.

YOUR EFFORT AND DEDICATION ARE THE TRUE KEYS TO SUCCESS.

Date of Exam: 9th November 2025

Syllabus: Sequences & Series

Sub: Mathematics

CT-06 CET Exam - Solution

Prof. Chetan Sir

1. Which term of A.P. 72, 70, 68, 66, ... is 40?

(A) 16 (B) 17 (C) 18 (D) 20

Answer: (B)
Solution: The given A.P. is $72, 70, 68, 66, \ldots$ Here, the first term is $a = 72$. The common difference is $d = 70 - 72 = -2$. Let the n^{th} term, a_n, be 40. We use the formula for the n^{th} term of an A.P.:

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

Substitute the known values into the formula:

$$\begin{aligned} 40 &= 72 + (n-1)(-2) \\ 40 - 72 &= -2(n-1) \\ -32 &= -2(n-1) \\ \frac{-32}{-2} &= n-1 \\ 16 &= n-1 \\ n &= 16 + 1 = 17 \end{aligned}$$

Thus, 40 is the 17th term of the A.P.

2. The 10^{th} term of the sequence $\sqrt{3}, \sqrt{12}, \sqrt{27}$, ... is

(A) $\sqrt{243}$ (B) $\sqrt{300}$ (C) $\sqrt{363}$ (D) $\sqrt{432}$

Answer: (B)
Solution: First, let's simplify the given sequence: $\sqrt{3}$ $\sqrt{12} = \sqrt{4 \times 3} = 2\sqrt{3}$ $\sqrt{27} = \sqrt{9 \times 3} = 3\sqrt{3}$ The sequence is $\sqrt{3}, 2\sqrt{3}, 3\sqrt{3}, \ldots$ This is an A.P. with the first term $a = \sqrt{3}$ and the common difference $d = 2\sqrt{3} - \sqrt{3} = \sqrt{3}$. We need to find the 10th term, a_{10}.

$$a_{10} = a + (10-1)d = a + 9d$$

Substitute the values of a and d:

$$a_{10} = \sqrt{3} + 9(\sqrt{3}) = 10\sqrt{3}$$

Now, we convert this back to the format of the options:

$$10\sqrt{3} = \sqrt{10^2 \times 3} = \sqrt{100 \times 3} = \sqrt{300}$$

3. How many terms are there in sequence 3, 6, 9, 12,...., 111 ?

(A) 30 (B) 37 (C) 40 (D) 47

Answer: (B)
Solution: The given sequence is an A.P. with first term $a = 3$ and common difference $d = 6 - 3 = 3$. The last term (let's call it the n^{th} term) is $a_n = 111$. We use the formula $a_n = a + (n-1)d$ to find n.

$$\begin{aligned} 111 &= 3 + (n-1)(3) \\ 111 - 3 &= 3(n-1) \\ 108 &= 3(n-1) \\ \frac{108}{3} &= n - 1 \\ 36 &= n - 1 \\ n &= 36 + 1 = 37 \end{aligned}$$

Therefore, there are 37 terms in the sequence.

4. 7th term of an A.P. is 40. Then the sum of first 13 terms is
(A) 520 (B) 53 (C) 2080 (D) 1040

Answer: (A)
Solution: We are given that the 7th term, a_7, is 40.

$$a_7 = a + (7-1)d = a + 6d = 40$$

We need to find the sum of the first 13 terms, S_{13}. The formula for the sum of n terms is $S_n = \frac{n}{2}[2a + (n-1)d]$.

$$S_{13} = \frac{13}{2}[2a + (13-1)d] = \frac{13}{2}[2a + 12d]$$

Factor out 2 from the brackets:

$$S_{13} = \frac{13}{2} \times 2(a + 6d) = 13(a + 6d)$$

We are already given that $a + 6d = 40$.

$$S_{13} = 13(40) = 520$$

5. Sum of first 5 terms of an A.P. is one fourth of the sum of next five terms. If the first term = 2, then the common difference of the A.P. is
(A) 6 (B) -6 (C) 3 (D) 2

Answer: (B)
Solution: We are given $a = 2$. Let S_5 be the sum of the first 5 terms and S_{10} be the sum of the first 10 terms. The sum of the "next five terms" is $S_{10} - S_5$. The problem states: $S_5 = \frac{1}{4}(S_{10} - S_5)$.

$$\begin{aligned} 4S_5 &= S_{10} - S_5 \\ 5S_5 &= S_{10} \end{aligned}$$

Now, we use the sum formula $S_n = \frac{n}{2}[2a + (n-1)d]$.

$$\begin{aligned} 5 \times \left(\frac{5}{2}[2a + (5-1)d]\right) &= \frac{10}{2}[2a + (10-1)d] \\ 5\left(\frac{5}{2}[2a + 4d]\right) &= 5[2a + 9d] \end{aligned}$$

Divide by 5:

$$\begin{aligned}\frac{5}{2}(2a+4d) &= 2a+9d\\ 5(a+2d) &= 2a+9d\\ 5a+10d &= 2a+9d\end{aligned}$$

Substitute the given value $a = 2$:

$$\begin{aligned}5(2)+10d &= 2(2)+9d\\ 10+10d &= 4+9d\\ 10d-9d &= 4-10\\ d &= -6\end{aligned}$$

6. If $1+6+11+16+....+x = 148$, then x is equal to

(A) 24 (B) 36 (C) 42 (D) 46

Answer: (B)
Solution: The series is an A.P. with first term $a = 1$ and common difference $d = 6-1 = 5$. Let x be the n^{th} term, a_n. The sum of n terms is $S_n = 148$. We have two formulas: 1) $a_n = x = a+(n-1)d = 1+(n-1)5$ 2) $S_n = 148 = \frac{n}{2}(a+a_n) = \frac{n}{2}(1+x)$ From (2): $n(1+x) = 296$. From (1): $x = 1+5n-5 = 5n-4 \implies 5n = x+4 \implies n = \frac{x+4}{5}$. Substitute n into the modified equation (2):

$$\begin{aligned}\left(\frac{x+4}{5}\right)(1+x) &= 296\\ (x+4)(x+1) &= 296\times 5 = 1480\\ x^2+5x+4 &= 1480\\ x^2+5x-1476 &= 0\end{aligned}$$

We can solve this quadratic, or test the options. Let's test option (B) $x = 36$. If $x = 36$, $n = \frac{36+4}{5} = \frac{40}{5} = 8$. Let's find S_8:

$$S_8 = \frac{8}{2}(a+a_8) = 4(1+36) = 4(37) = 148$$

This matches the given sum. So, $x = 36$.

7. If the sum of first n terms of an A.P. be $3n^2 - n$ and its common difference is 6, then its first term is

(A) 2 (B) 3 (C) 1 (D) 4

Answer: (A)
Solution: We are given the sum of n terms, $S_n = 3n^2 - n$. The first term, a_1, is the same as the sum of the first 1 term, S_1.

$$a_1 = S_1 = 3(1)^2 - (1) = 3 - 1 = 2$$

We can verify the common difference. $S_2 = 3(2)^2 - (2) = 3(4) - 2 = 12 - 2 = 10$. S_2 is the sum $a_1 + a_2$. $a_2 = S_2 - S_1 = 10 - 2 = 8$. The common difference $d = a_2 - a_1 = 8 - 2 = 6$. This matches the information given in the question. The first term is 2.

8. The p^{th} term of the series $(3-\frac{1}{n})+(3-\frac{2}{n})+(3-\frac{3}{n})+.....$ will be

(A) $(3+\frac{p}{n})$ (B) $(3-\frac{p}{n})$ (C) $(3+\frac{n}{p})$ (D) $(3-\frac{n}{p})$

Answer: (B)
Solution: The series is an A.P. The first term is $a = (3-\frac{1}{n})$. The second term is $a_2 = (3-\frac{2}{n})$. The common difference is $d = a_2 - a = (3-\frac{2}{n}) - (3-\frac{1}{n}) = -\frac{2}{n} + \frac{1}{n} = -\frac{1}{n}$. We need to find the p^{th} term, a_p.

$$a_p = a + (p-1)d$$

Substitute the values of a and d:

$$\begin{aligned} a_p &= \left(3-\frac{1}{n}\right) + (p-1)\left(-\frac{1}{n}\right) \\ &= 3 - \frac{1}{n} - \frac{p}{n} + \frac{1}{n} \\ &= 3 - \frac{p}{n} \end{aligned}$$

9. If the 9th term of an A.P. be zero, then the ratio of its 29^{th} and 19^{th} term is
(A) 1 : 2 (B) 2 : 1 (C) 1 : 3 (D) 3 : 1

Answer: (B)
Solution: We are given that the 9th term is zero:

$$a_9 = a + 8d = 0 \implies a = -8d$$

We need to find the ratio $\frac{a_{29}}{a_{19}}$.

$$\begin{aligned} a_{29} &= a + 28d \\ a_{19} &= a + 18d \end{aligned}$$

Substitute $a = -8d$ into the expressions for a_{29} and a_{19}:

$$\begin{aligned} a_{29} &= (-8d) + 28d = 20d \\ a_{19} &= (-8d) + 18d = 10d \end{aligned}$$

Now, find the ratio:

$$\frac{a_{29}}{a_{19}} = \frac{20d}{10d} = \frac{2}{1}$$

The ratio is 2:1.

10. If the first term of an A.P. is 10, last term is 50 and the sum of all the terms is 300, then the number of terms are
(A) 5 (B) 8 (C) 10 (D) 15

Answer: (C)
Solution: We are given: First term $a = 10$. Last term $l = 50$. Sum of n terms $S_n = 300$. We use the sum formula $S_n = \frac{n}{2}(a+l)$.

$$\begin{aligned} 300 &= \frac{n}{2}(10+50) \\ 300 &= \frac{n}{2}(60) \\ 300 &= 30n \\ n &= \frac{300}{30} = 10 \end{aligned}$$

There are 10 terms.

11. The n^{th} term for a G.P. $1, \frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}, \ldots$ is
(A) $(\frac{1}{2})^n$ (B) $(\frac{1}{4})^{n-1}$ (C) $(\frac{1}{2})^{n-1}$ (D) $(\frac{1}{4})^n$

Answer: (C)
Solution: The given sequence is a Geometric Progression (G.P.). The first term is $a = 1$. The common ratio is $r = \frac{1/2}{1} = \frac{1}{2}$. The formula for the n^{th} term of a G.P. is $a_n = ar^{n-1}$.

$$a_n = 1 \times \left(\frac{1}{2}\right)^{n-1} = \left(\frac{1}{2}\right)^{n-1}$$

12. If the first term of a G.P. is 2 and sum to infinity is 6, then $r =$
(A) $\frac{1}{3}$ (B) $\frac{2}{3}$ (C) $\frac{3}{2}$ (D) $\frac{4}{3}$

Answer: (B)
Solution: We are given the first term $a = 2$. The sum to infinity is $S_\infty = 6$. The formula for the sum to infinity of a G.P. (where $|r| < 1$) is $S_\infty = \frac{a}{1-r}$.

$$\begin{aligned} 6 &= \frac{2}{1-r} \\ 6(1-r) &= 2 \\ 1-r &= \frac{2}{6} \\ 1-r &= \frac{1}{3} \\ r &= 1 - \frac{1}{3} = \frac{2}{3} \end{aligned}$$

Since $r = 2/3$, $|r| < 1$, so this is a valid solution.

13. The sum of first eight terms of G.P. is 82 times the sum of first four terms. The common ratio of G.P is
(A) 4 (B) 5 (C) 3 (D) 2

Answer: (C)
Solution: We are given $S_8 = 82 \times S_4$. We use the sum formula $S_n = \frac{a(r^n-1)}{r-1}$.

$$\frac{a(r^8-1)}{r-1} = 82 \times \frac{a(r^4-1)}{r-1}$$

Assuming $r \neq 1$ and $a \neq 0$, we can cancel $\frac{a}{r-1}$ from both sides.

$$r^8 - 1 = 82(r^4 - 1)$$

We can factor $r^8 - 1$ as a difference of squares: $(r^4)^2 - 1 = (r^4-1)(r^4+1)$.

$$(r^4-1)(r^4+1) = 82(r^4-1)$$

If $r^4 = 1$ (i.e., $r = \pm 1$), this equation holds, but we typically assume $r \neq 1$ in this context. If $r \neq \pm 1$, we can divide by $(r^4 - 1)$.

$$r^4 + 1 = 82$$

$$r^4 = 81$$
$$r = \pm 3$$

Since the options are all positive, we take $r = 3$.

14. If for a G.P. $r = 2, S_8 = 510$ then $t_3 =$

(A) 8 (B) 4 (C) 16 (D) 12

Answer: (A)
Solution: We are given $r = 2$ and $S_8 = 510$. The sum formula is $S_n = \frac{a(r^n-1)}{r-1}$.

$$S_8 = \frac{a(2^8 - 1)}{2 - 1} = \frac{a(256 - 1)}{1} = 255a$$

We are given $S_8 = 510$, so:

$$510 = 255a$$
$$a = \frac{510}{255} = 2$$

We need to find the 3rd term, t_3 (or a_3).

$$t_3 = ar^{3-1} = ar^2$$

Substitute $a = 2$ and $r = 2$:

$$t_3 = 2 \times (2)^2 = 2 \times 4 = 8$$

15. How many terms of G.P. $2, 2^2, 2^3, \ldots$ needed to get the sum 30?

(A) 4 (B) 8 (C) 5 (D) 6

Answer: (A)
Solution: (Note: The question in the PDF appears to be $2, 22, 23$, which is corrected to the G.P. $2, 2^2, 2^3, \ldots$ i.e., $2, 4, 8, \ldots$) The G.P. is $2, 4, 8, \ldots$ The first term is $a = 2$. The common ratio is $r = 4/2 = 2$. The sum is $S_n = 30$. We use the sum formula $S_n = \frac{a(r^n-1)}{r-1}$.

$$30 = \frac{2(2^n - 1)}{2 - 1}$$
$$30 = \frac{2(2^n - 1)}{1}$$
$$30 = 2(2^n - 1)$$
$$15 = 2^n - 1$$
$$16 = 2^n$$

Since $16 = 2^4$, we have $n = 4$. Thus, 4 terms are needed.

16. Let S_n denote the sum of first n terms of an A.P. If $S_{2n} = 3S_n$ then the ratio $\frac{S_{3n}}{S_n}$ is equal to

(A) 4 (B) 6 (C) 8 (D) 10

Answer: (B)
Solution: We are given $S_{2n} = 3S_n$.

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

Cancel $\frac{n}{2}$ from both sides (assuming $n \neq 0$):

$$\begin{aligned} 2[2a + 2nd - d] &= 3[2a + nd - d] \\ 4a + 4nd - 2d &= 6a + 3nd - 3d \\ (4nd - 3nd) + (-2d + 3d) &= 6a - 4a \\ nd + d &= 2a \\ 2a &= (n+1)d \end{aligned}$$

Now, we need to find the ratio $\frac{S_{3n}}{S_n}$.

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

Substitute $2a = (n+1)d$ into this expression:

$$\begin{aligned} \frac{S_{3n}}{S_n} &= \frac{3[(n+1)d + (3n-1)d]}{[(n+1)d + (n-1)d]} \\ &= \frac{3d[(n+1) + (3n-1)]}{d[(n+1) + (n-1)]} \\ &= \frac{3[n+1+3n-1]}{[n+1+n-1]} \\ &= \frac{3(4n)}{2n} = \frac{12n}{2n} = 6 \end{aligned}$$

17. 150 workers were engaged to finish a certain piece of work in a certain number of days. Four workers dropped the second day, four more dropped third day and so on. It takes 8 more days to finish work now. Find the number of days in which the work was completed ?

(A) 25 (B) 30 (C) 15 (D) 10

Answer: (A)
Solution: Let the original number of days be n. Total work = (Number of workers) × (Number of days) = $150 \times n$. In the new scenario, the number of workers on day 1 is 150, day 2 is 146, day 3 is 142, and so on. This forms an A.P. with $a = 150$ and $d = -4$. The work is completed in $n + 8$ days. The total work done is the sum of this A.P. for $n + 8$ terms.

$$S_{n+8} = \frac{n+8}{2}[2(150) + ((n+8) - 1)(-4)]$$

Set the total work equal to the original plan:

$$\begin{aligned} 150n &= \frac{n+8}{2}[300 + (n+7)(-4)] \\ 150n &= \frac{n+8}{2}[300 - 4n - 28] \\ 150n &= \frac{n+8}{2}[272 - 4n] \\ 150n &= (n+8)(136 - 2n) \\ 150n &= 136n - 2n^2 + (8 \times 136) - 16n \\ 150n &= 120n - 2n^2 + 1088 \end{aligned}$$

$$\begin{aligned} 2n^2 + 150n - 120n - 1088 &= 0 \\ 2n^2 + 30n - 1088 &= 0 \\ n^2 + 15n - 544 &= 0 \end{aligned}$$

We solve this quadratic equation. $(n-17)(n+32)=0$. Factoring: $n^2+32n-17n-544=0$, which is $n^2+15n-544=0$. The solutions are $n=17$ or $n=-32$. Since the number of days n must be positive, $n=17$. The question asks for the number of days in which the work was completed, which is the new time: $n+8$. Number of days $=17+8=25$.

18. The sum of first four terms of an A.P. is 56 and sum of last four terms is 112. If the first term is 11, then the number of terms is

(A) 10 (B) 12 (C) 11 (D) none of these

Answer: (C)
Solution: Given first term $a=a_1=11$. Sum of first four terms is $S_4=56$.

$$S_4=\frac{4}{2}[2a+(4-1)d]=2[2(11)+3d]=2[22+3d]$$
$$56=44+6d$$
$$12=6d$$
$$d=2$$

The A.P. is $11, 13, 15, \ldots$ Let the total number of terms be n. The last four terms are $a_n, a_{n-1}, a_{n-2}, a_{n-3}$. Their sum is 112.

$$a_n=a+(n-1)d=11+(n-1)2=11+2n-2=9+2n$$
$$a_{n-1}=a+(n-2)d=11+(n-2)2=11+2n-4=7+2n$$
$$a_{n-2}=a+(n-3)d=11+(n-3)2=11+2n-6=5+2n$$
$$a_{n-3}=a+(n-4)d=11+(n-4)2=11+2n-8=3+2n$$

Summing these four terms:

$$(9+2n)+(7+2n)+(5+2n)+(3+2n)=112$$
$$(9+7+5+3)+(2n+2n+2n+2n)=112$$
$$24+8n=112$$
$$8n=112-24$$
$$8n=88$$
$$n=11$$

There are 11 terms in the A.P.

19. If $1, \log_9(3^{1-x}+2), \log_3(4\cdot 3^x-1)$ are in A.P., then x equals

(A) $\log_3 4$ (B) $1-\log_3 4$
(C) $1-\log_4 3$ (D) $\log_4 3$

Answer: (B)
Solution: (Note: Question is bonus due to typo)
If a, b, c are in A.P., then $2b=a+c$.

$$2\log_9(3^{1-x}+2)=1+\log_3(4\cdot 3^x-1)$$

Use the change of base rule $\log_{b^k}(y)=\frac{1}{k}\log_b(y)$: $\log_9=\log_{3^2}=\frac{1}{2}\log_3$.

$$2\times\frac{1}{2}\log_3(3^{1-x}+2)=\log_3(3)+\log_3(4\cdot 3^x-1)$$
$$\log_3(3^{1-x}+2)=\log_3[3\times(4\cdot 3^x-1)]$$

Equate the arguments of the logarithms:

$$3^{1-x}+2=3(4\cdot 3^x-1)$$

$$\frac{3}{3^x} + 2 = 12 \cdot 3^x - 3$$

Let $y = 3^x$.

$$\frac{3}{y} + 2 = 12y - 3$$
$$\frac{3}{y} + 5 = 12y$$

Multiply the entire equation by y (assuming $y \neq 0$, which is true for $y = 3^x$):

$$3 + 5y = 12y^2$$
$$12y^2 - 5y - 3 = 0$$

Factor the quadratic:

$$12y^2 - 9y + 4y - 3 = 0$$
$$3y(4y - 3) + 1(4y - 3) = 0$$
$$(3y + 1)(4y - 3) = 0$$

This gives $y = -1/3$ or $y = 3/4$. Since $y = 3^x$, y must be positive. So, $3^x = -1/3$ is impossible. We are left with $3^x = 3/4$. Take $\log_3$ of both sides:

$$x = \log_3\left(\frac{3}{4}\right) = \log_3(3) - \log_3(4) = 1 - \log_3(4)$$

20. If the ratio of the sum of n terms of two A.P.'s be $(7n + 1) : (4n + 27)$, then the ratio of their 11th term will be
(A) 2 : 3 (B) 3 : 4 (C) 4 : 3 (D) 5 : 6

Answer: (C)
Solution: Let the two A.P.s be AP_1 and AP_2. Let their sums be S_n and S'_n, and their terms be a_n and a'_n. We are given:

$$\frac{S_n}{S'_n} = \frac{\frac{n}{2}[2a + (n-1)d]}{\frac{n}{2}[2a' + (n-1)d']} = \frac{2a + (n-1)d}{2a' + (n-1)d'} = \frac{7n+1}{4n+27}$$

We want to find the ratio of their 11th terms: $\frac{a_{11}}{a'_{11}}$.

$$\frac{a_{11}}{a'_{11}} = \frac{a + 10d}{a' + 10d'}$$

To get this form from the sum ratio, we divide the numerator and denominator by 2:

$$\frac{S_n}{S'_n} = \frac{a + \frac{n-1}{2}d}{a' + \frac{n-1}{2}d'}$$

We can equate $\frac{a_{11}}{a'_{11}}$ and $\frac{S_n}{S'_n}$ by setting the coefficients of d to be equal.

$$\frac{n-1}{2} = 10 \implies n - 1 = 20 \implies n = 21$$

So, the ratio of the 11th terms is found by substituting $n = 21$ into the ratio of the sums.

$$\frac{a_{11}}{a'_{11}} = \frac{7(21)+1}{4(21)+27} = \frac{147+1}{84+27} = \frac{148}{111}$$

Both 148 and 111 are divisible by 37.

$$\frac{148}{111} = \frac{4 \times 37}{3 \times 37} = \frac{4}{3}$$

The ratio is 4:3.

21. The n^{th} term of an A.P. is $3n - 1$. Choose from the following, the sum of its first five terms

(A) 14 (B) 35 (C) 80 (D) 40

Answer: (D)
Solution: We are given the formula for the n^{th} term: $a_n = 3n - 1$. This is an A.P. We can find the first and fifth terms.

$$\text{First term: } a_1 = 3(1) - 1 = 2$$
$$\text{Fifth term: } a_5 = 3(5) - 1 = 14$$

The sum of the first n terms of an A.P. can be found using the formula $S_n = \frac{n}{2}(a_1 + a_n)$. For the sum of the first five terms, S_5:

$$S_5 = \frac{5}{2}(a_1 + a_5) = \frac{5}{2}(2 + 14) = \frac{5}{2}(16) = 5 \times 8 = 40$$

22. There are 15 terms in an arithmetic progression. Its first term is 5 and their sum is 390. The middle term is

(A) 23 (B) 26 (C) 29 (D) 32

Answer: (B)
Solution: We are given: Number of terms $n = 15$. First term $a = 5$. Sum of 15 terms $S_{15} = 390$. When n is odd, the middle term is the $(\frac{n+1}{2})^{th}$ term. Middle term $= (\frac{15+1}{2})^{th}$ term $= 8^{th}$ term (a_8). For an A.P. with an odd number of terms, the sum is $S_n = n \times (\text{middle term})$.

$$S_{15} = 15 \times a_8$$
$$390 = 15 \times a_8$$
$$a_8 = \frac{390}{15} = \frac{390/3}{15/3} = \frac{130}{5} = 26$$

The middle term is 26.

23. If the third term of a G.P. is 4, then product of first five terms is

(A) 4^3 (B) 4^5 (C) 4^4 (D) 4^2

Answer: (B)
Solution: We are given the 3rd term, $a_3 = 4$. In a G.P., $a_3 = ar^2$, so $ar^2 = 4$. We need to find the product of the first five terms: P_5.

$$P_5 = a_1 \times a_2 \times a_3 \times a_4 \times a_5$$
$$= (a) \times (ar) \times (ar^2) \times (ar^3) \times (ar^4)$$

Combine the a's and r's:

$$P_5 = a^5 r^{0+1+2+3+4} = a^5 r^{10}$$

This can be rewritten as:

$$P_5 = (ar^2)^5$$

We are given that $ar^2 = 4$.

$$P_5 = (4)^5$$

24. The n^{th} term of the series $\frac{1}{2} + \frac{3}{4} + \frac{7}{8} + \frac{15}{16} + \ldots$ is

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

Answer: (B)
Solution: Let's analyze the terms of the series:

$$a_1 = \frac{1}{2} = \frac{2-1}{2} = 1 - \frac{1}{2} = 1 - \frac{1}{2^1}$$
$$a_2 = \frac{3}{4} = \frac{4-1}{4} = 1 - \frac{1}{4} = 1 - \frac{1}{2^2}$$
$$a_3 = \frac{7}{8} = \frac{8-1}{8} = 1 - \frac{1}{8} = 1 - \frac{1}{2^3}$$
$$a_4 = \frac{15}{16} = \frac{16-1}{16} = 1 - \frac{1}{16} = 1 - \frac{1}{2^4}$$

Following this pattern, the n^{th} term a_n is:

$$a_n = 1 - \frac{1}{2^n}$$

25. The interior angles of a polygon are in A.P. If the smallest angle be 120° and the common difference be 5°, then the number of sides is

(A) 8 (B) 10 (C) 9 (D) 6

Answer: (C)
Solution: Let the number of sides of the polygon be n. The number of interior angles is also n. The sum of the interior angles of an n-sided polygon is given by the formula:

$$\text{Sum} = (n-2) \times 180^\circ$$

The angles are in an A.P. with first term $a = 120^\circ$ and common difference $d = 5^\circ$. The sum of these n angles is given by the A.P. sum formula:

$$S_n = \frac{n}{2}[2a + (n-1)d] = \frac{n}{2}[2(120) + (n-1)5]$$

Equating the two expressions for the sum:

$$(n-2) \times 180 = \frac{n}{2}[240 + 5n - 5]$$
$$(n-2) \times 180 = \frac{n}{2}[235 + 5n]$$
$$360(n-2) = n(235 + 5n)$$
$$360n - 720 = 235n + 5n^2$$
$$5n^2 + 235n - 360n + 720 = 0$$
$$5n^2 - 125n + 720 = 0$$

Divide the entire equation by 5:

$$n^2 - 25n + 144 = 0$$

Factor the quadratic equation:

$$(n-9)(n-16) = 0$$

This gives two possible solutions: $n = 9$ or $n = 16$. We must check if these solutions are valid. The largest angle of a convex polygon must be less than 180°. The largest angle is $a_n = a + (n-1)d$. Case 1: $n = 9$

$$a_9 = 120 + (9-1)5 = 120 + 8(5) = 120 + 40 = 160^\circ$$

This is less than 180°, so $n = 9$ is a valid solution. Case 2: $n = 16$

$$a_{16} = 120 + (16-1)5 = 120 + 15(5) = 120 + 75 = 195^\circ$$

This is greater than 180°, which is not possible for a convex polygon. Therefore, the only valid number of sides is $n = 9$.