JEE Main 2026 (21 January Shift 2)

The positive integer n, for which the solutions of the equation $x(x+2)+(x+2)(x+4)+\cdots+(x+2n-2)(x+2n)=\frac{8n}{3}$ are two consecutive even integers, is :

A	3
B	6
C	12
D	9

$$\underbrace{x(x+2)+(x+2)(x+4)+\cdots(x+2n-2)(x+2n)} = \frac{8n}{3}$$

$$\sum_{r=1}^{n}(x+2r-2)(x+2r) = \frac{8n}{3}$$

$$\sum_{r=1}^{n}\left(x^2+2rx+2rx+4r^2-2x-4r\right) = \frac{8n}{3}$$

$$\sum_{r=1}^{n} x^2+4rx-2x+4r^2-4r = \frac{8n}{3}$$

$$\sum_{r=1}^{n}\left(x^2+x(4r-2)+4(r^2-r)\right) = \frac{8n}{3}$$

$$\sum 1 = \underbrace{1+1+\cdots}_{n}$$

n

$$\sum r^2 = \frac{n(n+1)(2n+1)}{6}$$

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

$$x^2\sum_{r=1}^{n}1+x\left(4\sum_{r=1}^{n}r-2\sum_{r=1}^{n}1\right)+4\left(\sum_{r=1}^{n}r^2-\sum_{r=1}^{n}r\right) = \frac{8n}{3}$$

$$nx^2+x\left(4\cdot\frac{n(n+1)}{2}-2n\right)+4\left(\frac{n(n+1)(2n+1)}{6}-\frac{n(n+1)}{2}\right) = \frac{8n}{3}$$

$$nx^2 + x\left(\frac{4n^2 + \cancel{4n} - \cancel{4n}}{2}\right) + \cancel{4}^{2}\frac{n(n+1)}{\cancel{2}}\left[\frac{2n+1}{3} - 1\right] = \frac{8n}{3}$$

$$\cancel{n}x^2 + 2n^{\cancel{2}}x + 2(\cancel{n})(n+1)\left(\frac{\boxed{2n-2}}{3}\right) = \frac{8\cancel{n}}{3}$$

$$① \quad x^2 + 2nx + \frac{4}{3}(n^2-1) - \frac{8}{3} = 0 \quad \alpha, \beta$$

2, 4, 6, 8 - - - -

2

$$|\alpha-\beta| = \frac{\sqrt{D}}{a} = 2$$

$$D = 4$$

$$b^2 - 4ac = 4$$

$$\cancel{4}n^2 - \cancel{4}(1)\left(\frac{4}{3}(n^2-1) - \frac{8}{3}\right) = \cancel{4}$$

$$n^2 - \frac{4}{3}n^2 + \frac{4}{3} + \frac{8}{3} = 1$$

$$-\frac{n^2}{3} + 4 = 1$$

$$-\frac{n^2}{3} = -3$$

$$n^2 = 9$$

$$n = 3$$

JEE Main 2026 (21 January Shift 1)

Let $a_1 = 1$ and for $n \geqslant 1$, $a_{n+1} = \frac{1}{2}a_n + \frac{n^2-2n-1}{n^2(n+1)^2}$. Then $\left|\sum_{n=1}^{\infty}\left(a_n - \frac{2}{n^2}\right)\right|$ is equal to 2 ____.

$$a_{n+1} = \frac{1}{2}a_n + \frac{n^2-2n-1}{n^2(n+1)^2}$$

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

$$a_{n+1} = \frac{1}{2}a_n + \frac{2}{(n+1)^2} - \frac{1}{n^2}$$

$n^2 - 2n - 1$ $+1-1$

$\boxed{(n-1)^2 - 2}$

$n^2 + n^2 - n^2 - 2n - 1$

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

$$a_{n+1} - \frac{2}{(n+1)^2} = \frac{1}{2}a_n - \frac{1}{n^2}$$

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

$n+1$

$$\left|\sum_{n=1}^{\infty} |\alpha_n|\right|$$

$\alpha_1\ \alpha_2\ \alpha_3 \ldots\ \alpha_n\ \alpha_{n+1}$

$\underline{\text{GP}}$

$$\alpha_{n+1} = \frac{1}{2}\alpha_n$$

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

$\alpha_1 = a_1 - 2 = 1 - 2$

$= -1$

$|\alpha_1 + \alpha_2 + \cdots|$

GP $\quad S_\infty = \frac{a}{1-r}$

$n=1 \qquad \alpha_2 = \frac{1}{2}\alpha_1 \qquad \frac{\alpha_2}{\alpha_1} = \frac{1}{2}$

$n=2 \qquad \alpha_3 = \frac{1}{2}\alpha_2 \qquad \alpha_3/\alpha_2 = \frac{1}{2}$

$r = \frac{1}{2}$

$$\left|\frac{-1}{1-\frac{1}{2}}\right| = \left|\frac{-1}{\frac{1}{2}}\right| = 2$$

JEE Main 2026 (21 January Shift 1)

Let $a_1, a_2, a_3, \ldots$ be G.P. of increasing positive terms such that $a_2 \cdot a_3 \cdot a_4 = 64$ and $a_1 + a_3 + a_5 = \frac{813}{7}$. Then $a_3 + a_5 + a_7$ is equal to :

A 3252

B 3256

C 3248

D 3244

$a_1\ a_2\ a_3 \rightarrow$ GP

$a\ ar\ ar^2 \ldots$

$a_2\ a_3\ a_4 = 64$

$(ar)(ar^2)(ar^3) = 64$

$a^3 r^6 = 64$

$ar^2 = 4$

$r^2 = \frac{4}{a}$

$r^2 = \frac{4}{\frac{1}{7}} = 4 \times 7 = 28$

$a_1 + a_3 + a_5 = \frac{813}{7}$

$a + ar^2 + ar^4 = \frac{813}{7}$

$a(1 + r^2 + r^4) = \frac{813}{7}$

$1 + r^2 + r^4 = \frac{813}{7a}$

$1 + \frac{4}{a} + \frac{16}{a^2} = \frac{813}{7a}$

$a^2 + 4a + 16 = \frac{813}{7}a$

$7a^2 + 28a + 112 = 813a$

$7a^2 - 785a + 112 = 0$

$a = \frac{785 \pm \sqrt{}}{}$

$a = \cancel{112}, \frac{1}{7}$

112×7

784

813

28

785

5×157

$a_3 + a_5 + a_7 = ?$

$ar^2 + ar^4 + ar^6$

$ar^2(1 + r^2 + r^4)$

$4(1 + r^2 + r^4)$

$4 \times \frac{813}{7a}$

$4 \times \frac{813}{7 \times \frac{1}{7}}$

$\Rightarrow \underline{3252}$

JEE Main 2026 (08 April Shift 2)

Let $\alpha = 3 + 4 + 8 + 9 + 13 + 14 + \ldots$ upto 40 terms. If $(\tan\beta)^{\frac{\alpha}{1020}}$ is a root of the equation $x^2 + x - 2 = 0, \beta \in \left(0, \frac{\pi}{2}\right)$, then $\sin^2\beta + 3\cos^2\beta$ is equal to:

A $\frac{7}{4}$

B $\frac{5}{2}$

C 2

D $\frac{3}{2}$

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

$\alpha = 3 + 4 + 8 + 9 + 13 + 14 + \ldots$ 40 terms

$= (3 + 8 + 13 + \ldots)$ 20 term $+ \; 4 + 9 + 14 + \ldots$ 20 term

$= \frac{20}{2}[6 + 19 \times 5] + \frac{20}{2}[8 + \underbrace{(20-1)5}_{95}]$

$= 10(101) + 10(103)$

$= 1010 + 1030 = 1040$

$(\tan\beta)^{\frac{\cancel{1040}\,2}{\cancel{1020}}} = \tan^2\beta$

$x^2 + x - 2 = 0$

$x^2 + 2x - x - 2 = 0$

$(x+2)(x-1) = 0$

$x = -2, \quad x = 1$

$\tan^2\beta = 1$

$\beta = 45$

$\sin^2 45 + 3 \times \cos^2 45$

$\frac{1}{2} + \frac{3}{2} = \frac{4}{2} = 2$

JEE Main 2026 (06 April Shift 2)

The sum $1+\frac{1}{2}(1^2+2^2)+\frac{1}{3}(1^2+2^2+3^2)+\ldots$ upto 10 terms is equal to :

(A) 130

(B) $\frac{325}{2}$

(C) 155

(D) $\frac{315}{2}$

$$1+\frac{1}{2}(1^2+2^2)+\frac{1}{3}(1^2+2^2+3^2)+\cdots \quad \text{10 term}$$

$$\sum_{r=1}^{n}\frac{1^2+2^2+3^2+\cdots r^2}{r} \qquad \sum r^2=\frac{n(n+1)(2n+1)}{6}$$

$$\sum_{r=1}^{n}\frac{\cancel{r}(r+1)(2r+1)}{6\cancel{r}}$$

$$\frac{1}{6}\sum_{r=1}^{n}(r+1)(2r+1)$$

$$\frac{1}{6}\sum_{r=1}^{n}(2r^2+3r+1)$$

$$\frac{1}{6}\left(2\sum r^2+3\sum r+\sum 1\right)$$

$$\frac{1}{6}\left[2\frac{n(n+1)(2n+1)}{6}+3\frac{n(n+1)}{2}+n\right]$$

$n=10$

$$\frac{1}{6}\left[\frac{\cancel{2}\times 10\times 11\times \cancel{21}^{7}}{\cancel{6}_{\cancel{3}}}+\frac{3\times \cancel{10}^{5}\times 11}{\cancel{2}}+10\right]$$

$$\frac{1}{6}\left[770+165+10\right]$$

$$\begin{array}{r} 880 \\ 65 \\ \hline 945 \end{array}$$

$$\frac{1}{\cancel{6}_{2}}\left[\cancel{945}^{315}\right]=\frac{315}{2}$$

Ans

JEE Main 2026 (06 April Shift 1)

For the functions $f(\theta) = \alpha \tan^2\theta + \beta \cot^2\theta$, and $g(\theta) = \alpha \sin^2\theta + \beta \cos^2\theta$, $\alpha > \beta > 0$, let $\min_{0<\theta<\pi/2} f(\theta) = \max_{0<\theta<\pi} g(\theta)$. If the first term of a G.P. is $\left(\frac{\alpha}{2\beta}\right)$, its common ratio is $\left(\frac{2\beta}{\alpha}\right)$ and the sum of its first 10 terms is $\frac{m}{n}$, $\gcd(m,n) = 1$, then $m+n$ is equal to ______.

$f(\theta) = \alpha \tan^2\theta + \beta \frac{1}{\tan^2\theta}$

$\downarrow$

Min

$=$ A.M. $\geq$ G.M

$$\frac{x + \frac{1}{x}}{2} \geq \left(x \times \frac{1}{x}\right)^{1/2}$$

$$\frac{\alpha \tan^2\theta + \beta \frac{1}{\tan^2\theta}}{2} \geq \left(\alpha \cancel{\tan^2\theta} \times \frac{\beta}{\cancel{\tan^2\theta}}\right)^{1/2}$$

$f(\theta) \geq 2\sqrt{\alpha\beta} \rightarrow$ Min

$2\sqrt{\alpha\beta} = \alpha$

$g(\theta) = \alpha \sin^2\theta + \beta(1 - \sin^2\theta)$

$\downarrow$

max $\Rightarrow (\alpha - \beta)\sin^2\theta + \beta$

$g(\theta)_{Max} \Rightarrow \alpha - \beta + \beta = \alpha$

G.P.

$a = \frac{\alpha}{2\beta}$ $\quad$ $r = \frac{2\beta}{\alpha}$

$$S_n = \frac{a(r^n - 1)}{r - 1}$$

$$4\cancel{\alpha}\beta = \alpha k$$

$$\boxed{\alpha = 4\beta}$$

$$a = \frac{4\beta}{2\beta} \qquad r = \frac{2\beta}{4\beta}$$

$$a = 2 \qquad r = \frac{1}{2} < 1$$

$$S_{10} = \frac{a(1-r^{10})}{1-r}$$

$$= \frac{2\left(1-\left(\frac{1}{2}\right)^{10}\right)}{1-\frac{1}{2}}$$

$$= \frac{2\left(1-\frac{1}{2^{10}}\right)}{\frac{1}{2}}$$

$$= 4\left(1-\frac{1}{2^{10}}\right)$$

$\underline{1024}$

$$\cancel{4}\left(\frac{2^{10}-1}{\cancel{2^{10}}\,2^{8}}\right)$$

$$\frac{1023}{256} \Rightarrow m+n$$

$\underline{1279}$ Ans.

JEE Main 2026 (06 April Shift 1)

The sum of the first ten terms of an A.P. is 160 and the sum of the first two terms of a G.P. is 8. If the first term of the A.P. is equal to the common ratio of the G.P. and the first term of the G.P. is equal to common difference of the A.P., then the sum of all possible values of the first term of the G.P. is:

A. $\frac{34}{13}$

B. $\frac{32}{9}$

C. $\frac{32}{13}$

D. $\frac{34}{9}$ ✓

A.P.

$S_{10} = 160$

$a_1 + a_2 + \ldots a_{10} = 160$

$\boxed{a = r}$

$\boxed{A = d}$

$\frac{10}{2}\left[2a + 9d\right] = 160$

$\boxed{2a + 9d = 32}$

$9r + 9A = 32$

$2\left(\frac{8-A}{A}\right) + 9A = 32$

$16 - 2A + 9A^2 = 32A$

G.P.

$A + Ar = 8 \Rightarrow r = \frac{8-A}{A}$

$A(1+r) = 8 \Rightarrow$

$d(1+a) = 8$

$\boxed{d + ad = 8}$

$9A^2 - 34A + 16 = 0$

α, β

$\alpha + \beta = \frac{-b}{a} = \frac{-(-34)}{9}$

$= \frac{34}{9}$ ✓

JEE Main 2026 (06 April Shift 1)

The value of $1^3 - 2^3 + 3^3 - \ldots + 15^3$ is:

A. 1856

B. 2403

C. 1982

D. 1706

$$1^3 - 2^3 + 3^3 - 4^3 + \dots + 15^3$$

$$\underbrace{1^3 + 3^3 + \dots 15^3}_{8\text{ term}} - \Big(\underbrace{2^3 + 4^3 + \dots 14^3}_{7\text{ term}}\Big)$$

$$\sum_{r=1}^{8}(2r-1)^3 - \sum_{r=1}^{7}(2r)^3$$

$$\sum_{r=1}^{8}\left[(2r)^3 - 1 - \underbrace{3(2r)^2(1)}_{3\times 4r^2} + 3(2r)(1)\right] - \sum_{r=1}^{7} 8r^3$$

$$\left(\frac{n(n+1)}{2}\right)^2$$

$$8\sum_{r=1}^{8} r^3 - \sum_{r=1}^{8} 1 - 12\sum_{r=1}^{8} r^2 + 6\sum_{r=1}^{8} r - 8\sum_{r=1}^{7} r^3$$

$$\frac{n(n+1)(2n+1)}{6}$$

$$8\left(\frac{8(9)}{2}\right)^2 - 8 - \cancel{12}^{\,2}\,\frac{8\times 9\times 17}{\cancel{6}} + 6\times\frac{\cancel{8}^{\,4}\times 9}{\cancel{2}} - 8\times\left(\frac{7\times \cancel{8}^{\,4}}{\cancel{2}}\right)^2$$

$$8\times\frac{\cancel{64}^{\,16}\times 81}{\cancel{4}} - 8 - 2\times 153\times 8 + 54\times 4 - 8\times 49\times 16$$

$$8\times 16\times 81 - 8 - 153\times 16 + 54\times 4 - 8\times 49\times 16$$

$$10368 - 8 - 2448 + 216 - 6272$$

$$\underline{\underline{1856}}$$

JEE Main 2026 (05 April Shift 2)

Let $A_1, A_2, A_3, \ldots, A_{39}$ be 39 arithmetic means between the numbers 59 and 159. Then the mean of A_{25}, A_{28}, A_{31} and A_{36} is equal to :

A	131.50
B	129
C	134
D	136

$$\overset{T_1}{a} \quad \overset{T_2}{A_1} \quad \overset{T_3}{A_2} \; \text{-----} \; \cdot \; A_{39} \quad b$$

$$\xleftrightarrow{\quad 39 \quad}$$

$$d = \frac{b-a}{n+1} = \frac{159-59}{39+1} = \frac{100}{40} = \frac{5}{2}$$

$a = 59$

$$= \frac{A_{25} + A_{28} + A_{31} + A_{36}}{4}$$

$$= \frac{T_{26} + T_{29} + T_{32} + T_{37}}{4} = \frac{\overbrace{\underbrace{a+25d+a+28d}_{53} + \underbrace{a+31d+a+36d}_{67}}^{120}}{4}$$

$$= \frac{4a + 120d}{4}$$

$$= a + 30d$$

$$= 59 + \cancel{30}^{15} \times \frac{5}{\cancel{2}} = 59 + 75$$

$$134$$

JEE Main 2026 (05 April Shift 2)

If the sum of the first 10 terms of the series $\frac{1}{1+1^4\times 4}+\frac{2}{1+2^4\times 4}+\frac{3}{1+3^4\times 4}+\frac{4}{1+4^4\times 4}+\ldots$ is $\frac{m}{n}$, $\gcd(m,n)=1$, then $m+n$ is equal to :

A	276
B	284
C	264
D	256

$$\sum_{n=1}^{n}\frac{n}{1+4n^4}$$

$$\sum_{n=1}^{n}\frac{n}{\underbrace{(2n^2)^2+4n^2+1}_{(2n^2+1)^2}-4n^2}$$

$(2n^2+1)^2-(2n)^2 \rightarrow a^2-b^2$

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

$$\frac{1}{4}\sum_{n=1}^{n}\frac{4n}{(2n^2+2n+1)(2n^2-2n+1)}$$

$\rightarrow$ diff $\underline{4n}$

$$\frac{1}{4}\sum_{n=1}^{n}\left[\frac{1}{2n^2-2n+1}-\frac{1}{2n^2+2n+1}\right]$$

$$\frac{1}{1} - \cancel{\frac{1}{5}}$$

$8-4+1$

$$\cancel{\frac{1}{5}} - \frac{1}{13}$$

$8+4+1$

$\vdots$

$$\cancel{\frac{1}{2n^2-2n+1}} - \frac{1}{2n^2+2n+1}$$

$$\frac{1}{4}\left[1 - \frac{1}{2n^2+2n+1}\right]$$

$n = 10$

$$\frac{1}{4}\left[1 - \frac{1}{200+20+1}\right]$$

$$\frac{1}{4} \times \frac{220}{221} = \frac{55}{221} \quad \frac{m}{n} \Rightarrow m+n = 276$$

JEE Main 2026 (05 April Shift 1)

$\sum_{n=1}^{10}\left(\frac{528}{n(n+1)(n+2)}\right)$ is equal to:

A 220

B 65

C 440

D 130

$$528\sum_{n=1}^{10}\frac{1}{n(n+1)(n+2)}$$

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

$$\frac{528}{2}\sum_{n=1}^{10}\left\{\frac{1}{n(n+1)}-\frac{1}{(n+1)(n+2)}\right\}$$

$$\frac{\cancel{n}+2-\cancel{n}}{n(n+1)(n+2)}$$

$$264\left[\frac{1}{1\cdot2}-\cancel{\frac{1}{2\cdot3}}\right.$$

$$\cancel{\frac{1}{2\cdot3}}-\frac{1}{3\cdot4}$$

$$\vdots$$

$$\left.\cancel{\frac{1}{10\cdot11}}-\frac{1}{11\cdot12}\right]$$

$$264\left[\frac{1}{2}-\frac{1}{132}\right]=132-2=\underline{\underline{130}}$$

JEE Main 2026 (05 April Shift 1)

Let the sum of the first n terms of an A.P. be $3n^2 + 5n$. Then the sum of squares of the first 10 terms of the A.P. is:

- A 19780
- B 12860
- C 10220
- D 15220 ✓

$$T_1 + T_2 + \cdots T_n$$

$$S_n = 3n^2 + 5n \longrightarrow T_1^2 + T_2^2 + \cdots T_n^2$$

$$\sum_{r=1}^{n} T_r^2$$

$$\boxed{T_n = S_n - S_{n-1}}$$

$$= 3n^2 + 5n - 3(n-1)^2 - 5(n-1)$$

$$= 3n^2 + 5n - 3(n^2 - 2n + 1) - 5n + 5$$

$$= \cancel{3n^2} + \cancel{5n} - \cancel{3n^2} + 6n - 3 - \cancel{5n} + 5$$

$$\underline{T_n = 6n + 2}$$

$$\sum T_n^2 = \sum (6n+2)^2$$

$$= \sum (36n^2 + 24n + 4)$$

$$= 36\sum n^2 + 24\sum n + 4\sum 1$$

$$\sum T_n^2 = 36\,\frac{n(n+1)(2n+1)}{6} + 24\,\frac{n(n+1)}{2} + 4n$$

$n = 10$

$$= \overset{6}{\cancel{36}}\,\frac{10\times 11\times 21}{\cancel{6}} + \overset{12}{\cancel{24}}\times\frac{10\times 11}{\cancel{2}} + 4\times 10$$

126×11

$$\begin{array}{r} 13860 \\ 1320 \\ 40 \\ \hline 15220 \end{array}$$

$$= 13860 + 1320 + 40$$

$$= 15220 \quad \text{Ans}$$

JEE Main 2026 (04 April Shift 2)

Let $\alpha = \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \ldots \infty$ and $\beta = \frac{1}{3} + \frac{1}{9} + \frac{1}{27} + \ldots \infty$. Then the value of $(0.2)^{\log_{\sqrt{5}}(\alpha)} + (0.04)^{\log_5(\beta)}$ is equal to:

A	4
B	5
C	8
D	25

$\alpha = \underbrace{\frac{1}{4} + \frac{1}{8}}_{2} \underbrace{+ \frac{1}{16}}_{2} + \ldots \infty$

GP

$S_\infty = \frac{a}{1-r}$

$r = \frac{1}{2} \quad a = \frac{1}{4}$

$\alpha = \frac{\frac{1}{4}}{1 - \frac{1}{2}} = \frac{\frac{1}{4}}{\frac{1}{2}} = \frac{1}{4} \times \frac{2}{1}$

$\boxed{\alpha = \frac{1}{2}}$

$\frac{1}{\alpha} = 2$

$\beta = \underbrace{\frac{1}{3} + \frac{1}{9}}_{\times\frac{1}{3}} \underbrace{+ \frac{1}{27}}_{\frac{1}{3}} + \ldots$

$r = \frac{1}{3} \quad a = \frac{1}{3}$

$S_\infty = \beta = \frac{\frac{1}{3}}{1 - \frac{1}{3}}$

$= \frac{\frac{1}{3}}{\frac{2}{3}} = \frac{1}{2}$

$\boxed{\beta = \frac{1}{2}}$

$\frac{1}{\beta} = 2$

$$(0.2)^{\log_{\sqrt{5}}(\alpha)} + (0.04)^{\log_5 \beta}$$

$$\frac{0.2}{10} = \frac{1}{5} = 5^{-1}$$

$\frac{1}{m}\log_a m$

$$\left(5^{-1}\right)^{\log_{5^{1/2}} \alpha} + \left(5^{-2}\right)^{\log_5 \beta}$$

$$\frac{0.04}{\cancel{100}_{25}} = \frac{1}{5^2} = 5^{-2}$$

$\frac{-1}{\frac{1}{2}}$

$$5^{-2\log_5 \alpha} + 5^{-2\log_5 \beta}$$

$a^{\log_a(x)} = \underline{\underline{x}}$

$$\cancel{5^{\log_5}} \alpha^{-2} + 5^{\log_5 \beta^{-2}}$$

$$\alpha^{-2} + \beta^{-2}$$

$$\frac{1}{\alpha^2} + \frac{1}{\beta^2} \Rightarrow 4 + 4 = \underline{\underline{8}}$$

JEE Main 2026 (04 April Shift 1)

The first term of an A.P. of 30 non-negative terms is $\frac{10}{3}$. If the sum of this A.P. is the cube of its last term, then its common difference is:

A	$\frac{5}{87}$
B	$\frac{15}{29}$
C	$\frac{5}{29}$
D	$\frac{25}{83}$

$a_1 \quad a_2 \quad a_3 \quad \ldots \quad a_{30}$

$a_1 = a = \frac{10}{3}$

$d = ?$

$S_{30} = a_{30}^3$

$\frac{30}{2}[2a + 29d] = (a+29d)^3$

$15[2a+29d] = (a+29d)^3$

$15[a + a+29d] = (a+29d)^3$

$15[a+t] = t^3$

$15\left[\frac{10}{3} + t\right] = t^3$

$50 + 15t = t^3$

$a + 29d = 5$

$\frac{10}{3} + 29d = 5$

$29d = 5 - \frac{10}{3} = \frac{5}{3}$

$d = \frac{5}{29 \times 3} = \frac{5}{87}$

$$t^3 - 15t - 50 = 0$$

$t=3$ $\quad 27 - 45 - 50$ ✗

$t=4$ $\quad 64 - 60 - 50$ ✗

$t=5$ $\quad 125 - 75 - 50$ ✓

JEE Main 2026 (02 April Shift 2)

The sum $\frac{1^3}{1} + \frac{1^3+2^3}{1+3} + \frac{1^3+2^3+3^3}{1+3+5} + \cdots$ up to 8 terms, is:

A 72

B 71

C 73

D 70

$$\sum_{n=1}^{n} \frac{1^3+2^3+\cdots\cdots n^3}{1+3+5+\cdots\cdots(2n-1)}$$

odd n^2

$$\sum_{n=1}^{n} \frac{\left(\frac{n(n+1)}{2}\right)^2}{n^2}$$

$$\sum_{n=1}^{n} \frac{\cancel{n^2}(n+1)^2}{4\cancel{n^2}}$$

$$\frac{1}{4}\sum_{n=1}^{n}(n^2+2n+1)$$

$$\frac{1}{4}\left(\sum n^2 + 2\sum n + \sum 1\right)$$

$$\frac{1}{4}\left[\frac{n(n+1)(2n+1)}{6} + \cancel{2}\frac{n(n+1)}{\cancel{2}} + n\right]$$

$\underline{n=8}$

$$\frac{1}{\cancel{4}}\left[\frac{\overset{2}{\cancel{8}}\times\overset{3}{\cancel{9}}\times17}{\underset{\cancel{3}}{\cancel{6}}}+\overset{2}{\cancel{8}}\times9+\overset{2}{\cancel{8}}\right]$$

$$51+18+2$$

$$\underline{71}$$

JEE Main 2026 (02 April Shift 2)

Let $a_1, a_2, a_3, \ldots$ be an A.P. and $g_1 = a_1, g_2, g_3, \ldots$ be an increasing G.P. If $a_1 = a_2 + g_2 = 1$ and $a_3 + g_3 = 4$, then $a_{10} + g_5$ is equal to: 55

$a_1, a_2, a_3, \ldots$ A.P.

$a \quad a+d \quad a+2d$

$1 \quad 1+d \quad 1+2d$

GP $\quad a_1 = g_1 = 1$

$a_1 = g_1, g_2, g_3, \ldots$

$a, ar, ar^2, \ldots$

$1, r, r^2, \ldots$

$a_2 + g_2 = 1$

$1 + d + r = 1$

$d + r = 0$

$r = -d$

$r = -1$

$\boxed{d = -3} \leftarrow \boxed{r = 3}$

$a_3 + g_3 = 4$

$1 + 2d + r^2 = 4$

$r^2 + 2d - 3 = 0$

$d^2 + 2d - 3 = 0$

$d = \dfrac{-2 \pm \sqrt{4+12}}{2}$

$= \dfrac{-2 \pm 4}{2} = 1, -3$

$a_{10} + g_5$

$a + 9d + ar^4 = 1 + 9 \times (-3) + 1 \times 3^4$

$= 1 - 27 + 81 \Rightarrow \boxed{55}$

JEE Main 2026 (02 April Shift 1)

If $\sum_{k=1}^{n} a_k = 6n^3$, then $\sum_{k=1}^{6} \left(\frac{a_{k+1} - a_k}{36}\right)^2$ is equal to 91.

nth term $\boxed{a_n = S_n - S_{n-1}}$

$$\sum_{K=1}^{n} a_K = 6n^3$$

$$S_n = a_1 + a_2 + a_3 + \ldots\ldots a_n = 6n^3$$

$$S_n = 6n^3$$

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

$$= 6n^3 - 6(n-1)^3$$

$$= 6n^3 - 6(n^3 - 3n^2 + 3n - 1)$$

$$= \cancel{6n^3} - \cancel{6n^3} + 18n^2 - 18n + 6$$

$$a_n = 18n^2 - 18n + 6$$

$$\sum_{K=1}^{6} \left(\frac{a_{K+1} - a_K}{36}\right)^2$$

$$a_{K+1} - a_K = 18(K+1)^2 - 18(K+1) + 6$$

$$- 18K^2 + 18n - 6$$

$$= \cancel{18K^2} + 36K + \cancel{18} - \cancel{18K} - \cancel{18} + \cancel{6} - \cancel{18K^2} + \cancel{18K} - \cancel{6}$$

$$a_{K+1} - a_K = 36K$$

$$\frac{a_{K+1} - a_K}{36} = K$$

$$\frac{n(n+1)(2n+1)}{6}$$

$$\sum_{k=1}^{6} k^2$$

$$\frac{k(k+1)(2k+1)}{6}$$

$$\frac{\cancel{6}(7)(13)}{\cancel{6}} = 91 \quad \underline{\text{Ans.}}$$

JEE Main 2026 (02 April Shift 1)

Let A be the set of first 101 terms of an A.P., whose first term is 1 and the common difference is 5 and let B be the set of first 71 terms of an A.P., whose first term is 9 and the common difference is 7. Then the number of elements in $A \cap B$, which are divisible by 3, is :

A	5
B	6
C	7
D	4

$A \rightarrow$ 101 term

$a = 1 \quad d = 5$

$AP_1 \quad 1, 6, 11, 16, 21, 26, \ldots\ldots \quad a+(n-1)d$

$1 + 100 \times 5$

501

$B \rightarrow$ 71 term

$a_2 = 9 \quad d_2 = 7$

$AP_2 \quad 9, 16, 23, \ldots\ldots \quad a+(n-1)d$

$9 + 70 \times 7$

499

$d = LCM\{5, 7\} = 35$

Common $16, 51, 86, 121, 156, 191, 226, 261, 296, 331, 366, 401, 436, 471, \cancel{506}$

$51, 156, 261, 366, 471$

5

JEE Main 2026 (02 April Shift 1)

Let $\alpha, \alpha+2, \alpha \in \mathbb{Z}$, be the roots of the quadratic equation $x(x+2)+(x+1)(x+3)+(x+2)(x+4)+\ldots+(x+n-1)(x+n+1)=4n$ for some $n \in \mathbb{N}$. Then $n+\alpha$ is equal to :

A) 2

B) 0

C) 1

D) 3

$$\underbrace{x(x+2)+(x+1)(x+3)+(x+2)(x+4)+\ldots(x+n-1)(x+n+1)}=4n$$

$$\sum_{r=1}^{n}((x+r)-(1))((x+r)+(1))=4n$$

$(a-b)(a+b)$

a^2-b^2

$(x+r)^2-1^2$

$\downarrow$

$x^2+2xr+r^2-1$

$$\sum_{r=1}^{n} x^2+2xr+r^2-1=4n$$

$$x^2\sum_{r=1}^{n}1+2x\sum_{r=1}^{n}r+\sum_{r=1}^{n}r^2-\sum_{r=1}^{n}1=4n \qquad \sum_{r=1}^{n}$$

$1+1+\cdots 1$

n

$$\cancel{n}x^2+\cancel{2}x\cdot\frac{\cancel{n}(n+1)}{\cancel{2}}+\frac{\cancel{n}(n+1)(2n+1)}{6}-\cancel{n}=4\cancel{n}$$

$$x^2+(n+1)x+\frac{(n+1)(2n+1)}{6}-5=0$$

α

$\alpha+2$

$$\alpha+\alpha+2 = -(n+1)$$
$$2\alpha+2 = -n-1$$
$$-n = 2\alpha+3$$
$$n = -2\alpha-3$$

$\alpha = 2 \qquad n = -4-3 = -7$ ✗

$\alpha = -5 \qquad n = 10-3 = 7$

$\alpha = -5 \qquad n = 7$

$\alpha + n \qquad 7+(-5)$

2

$$\alpha(\alpha+3) = \frac{(n+1)(2n+1)}{6} - 5$$
$$= \frac{(-2\alpha-3+1)(2(-2\alpha-3)+1) - 30}{6}$$
$$= \frac{(-2\alpha-2)(-4\alpha-5) - 30}{6}$$
$$\alpha^2+3\alpha = \frac{8\alpha^2+10\alpha+8\alpha+10-30}{6}$$
$$6\alpha^2+\cancel{18\alpha} = 8\alpha^2+\cancel{18\alpha}-20$$
$$2\alpha^2+6\alpha-20 = 0$$
$$\alpha^2+3\alpha-10 = 0$$
$$\alpha^2+5\alpha-2\alpha-10 = 0$$
$$(\alpha+5)(\alpha-2) = 0$$
$$\alpha = 2, \quad \alpha = -5$$