Exercise – I (JEE-Main Pattern)

SECTION–A

- This section contains **TWENTY** questions.
- Each question has **FOUR** options (1), (2), (3) and (4). **ONLY ONE** of these four options is correct.
- For each question, darken the bubble corresponding to the correct option in the ORS.
- For each question, marks will be awarded in one of the following categories:

Full Marks : +4, if only the bubble corresponding to the correct option is darkened.
Zero Marks : 0, if none of the bubbles is darkened.
Negative Marks : –1 in all other cases.

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1. If $a_1, a_2, a_3, \ldots, a_n, \ldots$ are in A.P. such that $a_4 - a_7 + a_{10} = m$, then the sum of first 13 terms of this A.P., is :

(1) $15\,m$ (2) $10\,m$ (3) $12\,m$ (4) $13\,m$

MSS001

2. If a, b, c are in AP, then $(a - c)^2$ equals

(1) $4\left(b^2 - ac\right)$ (2) $4\left(b^2 + ac\right)$ (3) $4b^2 - ac$ (4) $b^2 - 4ac$

MSS002

3. Let $a_1, a_2, a_3, \ldots$ be an A.P. such that $\frac{a_1 + a_2 + \ldots + a_p}{a_1 + a_2 + a_3 + \ldots + a_q} = \frac{p^2}{q^2}$; $p \neq q$. Then $\frac{a_6}{a_{21}}$ is equal to :

(1) $\frac{121}{1861}$ (2) $\frac{11}{41}$ (3) $\frac{121}{1681}$ (4) $\frac{41}{11}$

MSS003

4. If the sum of the first 11 terms of an arithmetical progression equals that of the first 19 terms, then the sum of its first 30 terms, is

(1) equal to 0 (2) equal to – 1 (3) equal to 1 (4) non-unique

MSS004

5. Along a road lies an odd number of stones placed at intervals of 10 m. These stones have to be assembled around the middle stone. A person can carry only one stone at a time. A man carried out the job starting with the stone in the middle, carrying stones in succession, thereby covering a distance of 4.8 km. Then the number of stones is

(1) 15 (2) 29 (3) 31 (4) 35

MSS005

6. Let a_n, $n \in N$ is an A.P. with common difference 'd' and all whose terms are non-zero. If n approaches infinity, then the sum $\frac{1}{a_1 a_2} + \frac{1}{a_2 a_3} + \ldots\ldots + \frac{1}{a_n a_{n+1}}$ will approach

(1) $\frac{1}{a_1 d}$ (2) $\frac{2}{a_1 d}$ (3) $\frac{1}{2a_1 d}$ (4) $a_1 d$

MSS006

7. The first term of an infinite G.P. is 1 and every term is equals to the sum of the successive terms, then its fourth term will be-

(1) $\frac{1}{2}$ (2) $\frac{1}{8}$ (3) $\frac{1}{4}$ (4) $\frac{1}{16}$

MSS007

8. If $a=\sum_{n=0}^{\infty}x^n, b=\sum_{n=0}^{\infty}y^n, c=\sum_{n=0}^{\infty}(xy)^n$ where $|x|,|y|<1$; then-

(1) $abc = a + b + c$ (2) $ab + bc = ac + b$ (3) $ac + bc = ab + c$ (4) $ab + ac = bc + a$

MSS008

9. In a GP, first term is 1. If $4T_2 + 5T_3$ is minimum, then its common ratio is

(1) $\frac{2}{5}$ (2) $-\frac{2}{5}$ (3) $\frac{3}{5}$ (4) $-\frac{3}{5}$

MSS009

10. If G be the GM between x and y, then the value of $\frac{1}{G^2-x^2}+\frac{1}{G^2-y^2}$ is equal to

(1) G^2 (2) $\frac{2}{G^2}$ (3) $\frac{1}{G^2}$ (4) $3G^2$

MSS010

11. If $\frac{1+3+5+.....\text{upto } n \text{ terms}}{4+7+10+....\text{upto } n \text{ terms}}=\frac{20}{7\log_{10}x}$ and $n = \log_{10}x+\log_{10}x^{\frac{1}{2}}+\log_{10}x^{\frac{1}{4}}+\log_{10}x^{\frac{1}{8}}+.....+\infty$, then x is equal to

(1) 10^3 (2) 10^5 (3) 10^6 (4) 10^7

MSS011

12. If $a \neq 1$ and $\ln a^2 + (\ln a^2)^2 + (\ln a^2)^3 + ... = 3\left(\ln a+(\ln a)^2+(\ln a)^3+(\ln a)^4+.....\right)$ then 'a' is equal to

(1) $e^{1/5}$ (2) $\sqrt{e}$ (3) $\sqrt[3]{e}$ (4) $\sqrt[4]{e}$

MSS012

13. If a, b, c are distinct positive real in H.P., then the value of the expression, $\frac{b+a}{b-a}+\frac{b+c}{b-c}$ is equal to

(1) 1 (2) 2 (3) 3 (4) 4

MSS013

14. If $x=\sum_{n=0}^{\infty}a^n$, $y=\sum_{n=0}^{\infty}b^n$, $z=\sum_{n=0}^{\infty}c^n$ where a, b, c are in A.P. and $|a| < 1, |b| < 1, |c| < 1$, then x, y, z are in-

(1) HP (2) Arithmetic - Geometric Progression
(3) AP (4) GP

MSS014

15. If a, b and c are positive real numbers then $\frac{a}{b}+\frac{b}{c}+\frac{c}{a}$ is greater than or equal to

(1) 3 (2) 6 (3) 27 (4) 5

MSS015

16. If a, b, c are positive real numbers such that $ab^2c^3 = 64$ then minimum value of $\left(\frac{1}{a}+\frac{2}{b}+\frac{3}{c}\right)$ is equal to:-

(1) 6 (2) 2 (3) 3 (4) None of these

MSS016

17. If $x \in R$, the numbers $\left(5^{1+x}+5^{1-x}\right), \frac{a}{2}, \left(25^{x}+25^{-x}\right)$ form an A.P. then 'a' must lie in the interval

(1) [1, 5] (2) [2, 5] (3) [5, 12] (4) [12, ∞)

MSS017

18. 2 + 4 + 7 + 11 + 16 + ... to n terms =

(1) $\frac{1}{6}(n^2+3n+8)$ (2) $\frac{n}{6}(n^2+3n+8)$ (3) $\frac{1}{6}(n^2-3n+8)$ (4) $\frac{n}{6}(n^2-3n+8)$

MSS018

19. The sum $\frac{3}{1^2}+\frac{5}{1^2+2^2}+\frac{7}{1^2+2^2+3^2}+.....$ upto 11-terms is :-

(1) $\frac{11}{4}$ (2) $\frac{60}{11}$ (3) $\frac{7}{2}$ (4) $\frac{11}{2}$

MSS019

20. The sum of the series : $1 + \frac{1}{1+2} + \frac{1}{1+2+3} +$ ..... up to 10 terms, is:

(1) $\frac{22}{13}$ (2) $\frac{18}{11}$ (3) $\frac{20}{11}$ (4) $\frac{16}{9}$

MSS020

SECTION–B

- This section contains **FIVE** Questions. Attempt any five Questions.
- The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value (If the numerical value has more than two decimal places, **truncate/round-off** the value to **TWO** decimal places; e.g. 6.25, 7.00, –0.33, –.30, 30.27, –127.30, if answer is 11.36777..... then both 11.36 and 11.37 will be correct).
- Answer to each question will be evaluated according to the following marking scheme:
  Full Marks : +4, if ONLY the correct numerical value is entered as answer.
  Zero Marks : 0 in all other cases.

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1. The interior angles of a convex polygon form an arithmetic progression with a common difference of 4°. Determine the number of sides of the polygon if its largest interior angle is 172°.

MSS021

2. The first term of an arithmetic progression is 1 and the sum of the first nine terms equal to 369. The first and the ninth term of a geometric progression with real common ratio coincide with the first and the ninth term of the arithmetic progression. Find the seventh term of the geometric progression.

MSS022

3. If $a > 0$, then minimum value of $a + 2a^2 + a^3 + 15 + a^{-1} + a^{-3} + a^{-4}$ is

MSS023

4. Find the sum of the sequence $\frac{1}{1+1^2+1^4}+\frac{2}{1+2^2+2^4}+\frac{3}{1+3^2+3^4}+...\infty$

MSS024

5. If $x > 0$, then find greatest value of the expression $\frac{x^{100}}{1+x+x^2+x^3+.....+x^{200}}$.

MSS025

Exercise – II (JEE-Main PYQs)

1. Let $a_1, a_2, a_3, \ldots\ldots, a_{49}$ be in A.P. such that $\sum_{k=0}^{12} a_{4k+1} = 416$ and $a_9 + a_{43} = 66$.

If $a_1^2 + a_2^2 + \ldots\ldots + a_{17}^2 = 140m$, then m is equal to- **[JEE Main 2018]**

(1) 68 (2) 34 (3) 33 (4) 66

MSS031

2. Let A be the sum of the first 20 terms and B be the sum of the first 40 terms of the series $1^2 + 2\cdot2^2 + 3^2 + 2\cdot4^2 + 5^2 + 2\cdot6^2 + \ldots\ldots$. If $B - 2A = 100\lambda$, then λ is equal to : **[JEE Main 2018]**

(1) 248 (2) 464 (3) 496 (4) 232

MSS032

3. Let $a_1, a_2, \ldots\ldots\ldots, a_{30}$ be an A.P., $S = \sum_{i=1}^{30} a_i$ and $T = \sum_{i=1}^{15} a_{(2i-1)}$. If $a_5 = 27$ and $S - 2T = 75$, then a_{10} is equal to : **[JEE Main 2019]**

(1) 57 (2) 47 (3) 42 (4) 52

MSS033

4. The sum of the following series

$$1 + 6 + \frac{9\left(1^2 + 2^2 + 3^2\right)}{7} + \frac{12\left(1^2 + 2^2 + 3^2 + 4^2\right)}{9} + \frac{15\left(1^2 + 2^2 + \ldots. + 5^2\right)}{11} + \ldots.$$ up to 15 terms, is :

[JEE Main 2019]

(1) 7820 (2) 7830 (3) 7520 (4) 7510

MSS034

5. Let x, y be positive real numbers and m, n positive integers. The maximum value of the expression $\frac{x^m y^n}{(1+x^{2m})(1+y^{2n})}$ is :- **[JEE Main 2019]**

(1) $\frac{1}{2}$ (2) $\frac{1}{4}$ (3) $\frac{m+n}{6mn}$ (4) 1

MSS035

6. If α, β and γ are three consecutive terms of a non-constant G.P. such that the equations $\alpha x^2 + 2\beta x + \gamma = 0$ and $x^2 + x - 1 = 0$ have a common root, then $\alpha(\beta + \gamma)$ is equal to : **[JEE Main 2019]**

(1) $\beta\gamma$ (2) 0 (3) $\alpha\gamma$ (4) $\alpha\beta$

MSS036

7. If three distinct numbers a, b, c are in G.P. and the equations $ax^2 + 2bx + c = 0$ and $dx^2 + 2ex + f = 0$ have a common root, then which one of the following statements is correct? **[JEE Main 2019]**

(1) d, e, f are in A.P. (2) $\frac{d}{a}, \frac{e}{b}, \frac{f}{c}$ are in G.P.

(3) $\frac{d}{a}, \frac{e}{b}, \frac{f}{c}$ are in A.P. (4) d, e, f are in G.P.

MSS037

8. If $a_1, a_2, a_3, \ldots\ldots, a_n$ are in A.P. and $a_1 + a_4 + a_7 + \ldots\ldots + a_{16} = 114$, then $a_1 + a_6 + a_{11} + a_{16}$ is equal to : **[JEE Main 2019]**

(1) 38 (2) 98 (3) 76 (4) 64

MSS038

9. Let a, b and c be in G. P. with common ratio r, where $a \neq 0$ and $0 < r \leq \frac{1}{2}$. If $3a, 7b$ and $15c$ are the first three terms of an A. P., then the 4^{th} term of this A. P. is : **[JEE Main 2019]**

(1) $\frac{7}{3}a$ (2) a (3) $\frac{2}{3}a$ (4) $5a$

MSS039

10. If the sum of the first 40 terms of the series, $3 + 4 + 8 + 9 + 13 + 14 + 18 + 19 + \ldots$ is $(102)m$, then m is equal to : **[JEE Main 2020]**

(1) 20 (2) 5 (3) 10 (4) 25

MSS040

11. Let $a_1, a_2, a_3, \ldots$ be a G.P. such that $a_1 < 0$, $a_1 + a_2 = 4$ and $a_3 + a_4 = 16$. If $\sum_{i=1}^{9} a_i = 4\lambda$, then λ is equal to : **[JEE Main 2020]**

(1) –171 (2) 171 (3) $\frac{511}{3}$ (4) –513

MSS041

12. Five numbers are in A.P., whose sum is 25 and product is 2520. If one of these five numbers is $-\frac{1}{2}$, then the greatest number amongst them is : **[JEE Main 2020]**

(1) $\frac{21}{2}$ (2) 27 (3) 16 (4) 7

MSS042

13. The sum, $\sum_{n=1}^{7} \frac{n(n+1)(2n+1)}{4}$ is equal to _____. **[JEE Main 2020]**

MSS043

14. The number of terms common to the two A.P.'s 3, 7, 11, ..., 407 and 2, 9, 16, ..., 709 is _____. **[JEE Main 2020]**

MSS044

15. The product $2^{\frac{1}{4}} \cdot 4^{\frac{1}{16}} \cdot 8^{\frac{1}{48}} \cdot 16^{\frac{1}{128}} \cdot \ldots$ to ∞ is equal to : **[JEE Main 2020]**

(1) $2^{\frac{1}{2}}$ (2) $2^{\frac{1}{4}}$ (3) 2 (4) 1

MSS045

16. Let $\{a_n\}_{n=1}^{\infty}$ be a sequence such that $a_1 = 1$, $a_2 = 1$ and $a_{n+2} = 2a_{n+1} + a_n$ for all $n \geq 1$. Then the value of $47\sum_{n=1}^{\infty} \frac{a_n}{2^{3n}}$ is equal to _____. **[JEE Main 2021]**

MSS046

17. The number of 4-digit numbers which are neither multiple of 7 nor multiple of 3 is ___. **[JEE Main 2021]**

MSS048

18. The sum of first four terms of a geometric progression (G.P.) is $\frac{65}{12}$ and the sum of their respective reciprocals is $\frac{65}{18}$. If the product of first three terms of the G.P. is 1, and the third term is α, then 2α is _____. **[JEE Main 2021]**

MSS049

19. If for $x, y \in \boldsymbol{R}, x > 0$, $y = \log_{10} x + \log_{10} x^{1/3} + \log_{10} x^{1/9} + ...$ upto ∞ terms and $\frac{2+4+6+....+2y}{3+6+9+....+3y} = \frac{4}{\log_{10} x}$, then the ordered pair (x, y) is equal to : **[JEE Main 2021]**

(1) $(10^6, 6)$ (2) $(10^4, 6)$ (3) $(10^2, 3)$ (4) $(10^6, 9)$

MSS050

20. Let $a_1 = b_1 = 1, a_n = a_{n-1} + 2$ and $b_n = a_n + b_{n-1}$ for every natural number $n \geq 2$. Then $\sum_{n=1}^{15} a_n \cdot b_n$ is equal to _____. **[JEE Main 2022]**

MSS051

21. $\frac{2^3-1^3}{1\times 7} + \frac{4^3-3^3+2^3-1^3}{2\times 11} + \frac{6^3-5^3+4^3-3^3+2^3-1^3}{3\times 15} + ... + \frac{30^3-29^3+28^3-27^3+...+2^3-1^3}{15\times 63}$

is equal to ____. **[JEE Main 2022]**

MSS052

22. If $\frac{1}{2\cdot 3^{10}} + \frac{1}{2^2\cdot 3^9} + ... \frac{1}{2^{10}\cdot 3} = \frac{K}{2^{10}\cdot 3^{10}}$, then the remainder when K is divided by 6 is

[JEE Main 2022]

(1) 1 (2) 2 (3) 3 (4) 5

MSS054

23. If $A = \sum_{n=1}^{\infty} \frac{1}{\left(3+(-1)^n\right)^n}$ and $B = \sum_{n=1}^{\infty} \frac{(-1)^n}{\left(3+(-1)^n\right)^n}$, then $\frac{A}{B}$ is equal to : **[JEE Main 2022]**

(1) $\frac{11}{9}$ (2) 1 (3) $-\frac{11}{9}$ (4) $-\frac{11}{3}$

MSS055

24. The sum to 10 terms of the series $\frac{1}{1+1^2+1^4} + \frac{2}{1+2^2+2^4} + \frac{3}{1+3^2+3^4} + ...$ is:- **[JEE Main 2023]**

(1) $\frac{59}{111}$ (2) $\frac{55}{111}$ (3) $\frac{56}{111}$ (4) $\frac{58}{111}$

MSS090

25. If $\frac{1^3+2^3+3^3+.....\text{upto } n \text{ terms}}{1\cdot 3+2\cdot 5+3\cdot 7+.....\text{upto } n \text{ terms}} = \frac{9}{5}$, then the value of n is **[JEE Main 2023]**

MSS091

26. The 4th term of GP is 500 and its common ratio is $\frac{1}{m}$, $m \in N$. Let S_n denote the sum of the first n terms of this GP. If $S_6 > S_5 + 1$ and $S_7 < S_6 + \frac{1}{2}$, then the number of possible values of m is _____

[JEE Main 2023]

MSS092

27. Let $a_1, a_2, a_3, \ldots$ be a GP of increasing positive numbers. If the product of fourth and sixth terms is 9 and the sum of fifth and seventh terms is 24, then $a_1a_9 + a_2a_4a_9 + a_5 + a_7$ is equal to ___.

[JEE Main 2023]

MSS093

28. If $a_n = \frac{-2}{4n^2 - 16n + 15}$, then $a_1 + a_2 + \ldots + a_{25}$ is equal to : **[JEE Main 2023]**

(1) $\frac{51}{144}$ (2) $\frac{49}{138}$ (3) $\frac{50}{141}$ (4) $\frac{52}{147}$

MSS094

Exercise – III (JEE-Advanced Pattern)

SECTION-I

- This section contains **TEN** questions.
- Each question has **FOUR** options for correct answer(*s*). **ONE OR MORE THAN ONE** of these four option(*s*) is (are) correct option(*s*).
- For each question, choose the correct option(*s*) to answer the question.
- Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +4 if only (all) the correct option(*s*) is (are) chosen.
Partial Marks : +3 if all the four options are correct but ONLY three options are chosen.
Partial Marks : +2 if three or more options are correct but ONLY two options are chosen, both of which are correct options.
Partial Marks : +1 if two or more options are correct but ONLY one option is chosen and it is a correct option.
Zero Marks : 0 if none of the options is chosen (i.e. the question is unanswered).
Negative Marks : –2 in all other cases.

For Example : If first, third and fourth are the **ONLY** three correct options for a question with second option being an incorrect option; selecting only all the three correct options will result in +4 marks. Selecting only two of the three correct options (e.g. the first and fourth options), without selecting any incorrect option (second option in this case), will result in +2 marks. Selecting only one of the three correct options (either first or third or fourth option), without selecting any incorrect option (second option in this case), will result in +1 marks. Selecting any incorrect option(*s*) (second option in this case), with or without selection of any correct option(*s*) will result in –2 marks.

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1. If a_1, a_2 , ..., a_n are distinct terms of an A.P., then

(A) $a_1 + 2a_2 + a_3 = 0$ (B) $a_1 - 2a_2 + a_3 = 0$

(C) $a_1 + 3a_2 - 3a_3 - a_4 = 0$ (D) $a_1 - 4a_2 + 6a_3 - 4a_4 + a_5 = 0$

MSS056

2. Let a_1, a_2, a_3 ..... and b_1, b_2, b_3 ..... be arithmetic progressions such that $a_1 = 25$, $b_1 = 75$ and $a_{100} + b_{100} = 100$. Then

(A) the difference between successive terms in progression 'a' is opposite of the difference in progression 'b'.

(B) $a_n + b_n = 100$ for any n.

(C) $(a_1 + b_1), (a_2 + b_2), (a_3 + b_3)$, ... are in A.P.

(D) $\sum_{r=1}^{100}(a_r + b_r) = 10000$

MSS057

3. Real number x_1, x_2, x_3 in A.P. satisfying the equation $x^3 - x^2 + \alpha x + \beta = 0$ then select correct alternative(s)

(A) $\alpha \le \frac{1}{3}$ (B) $\beta \ge -\frac{1}{27}$ (C) $\alpha > \frac{1}{3}$ (D) $\beta < -\frac{1}{27}$

MSS058

4. If a_1, a_2, a_3 ..... are positve numbers in G.P., then which of the following is/are true -

(A) $a_1^3, a_2^3, a_3^3, ...$ are in G.P. (B) $\frac{a_2}{a_1}, \left(\frac{a_3}{a_2}\right)^2, \left(\frac{a_4}{a_3}\right)^3$ ..... are in G.P.

(C) $\ell n a_1, \ell n a_2, \ell n a_3 .....$ are in A.P. (D) $a_1a_2, a_2a_3, a_3a_4 .....$ are in G.P.

MSS059

5. If equation $16x^4 - mx^3 + (2m+17)x^2 - mx + 16 = 0$ has four distinct roots forming a geometric progression, and one of the root is $\frac{1}{2}$, then :

(A) common ratio of G.P. is 4 (B) $m = 170$

(C) sum of the roots = $\frac{85}{8}$ (D) Product of root = 3

MSS060

6. Three numbers a, b, c between 2 and 18 are such that
(i) their sum is 25
(ii) the numbers 2, a, b, are in A.P.
(iii) the number b, c, 18 are in G.P.
then which of the following options are correct.

(A) $a = 5$ (B) $b = 8$ (C) $b + c = 20$ (D) $a + c = 17$

MSS061

7. If a, b, c are positive integers forming first three terms of increasing geometric progression with common ratio 'r', where $b - a$ is perfect cube and $\log_6 a + \log_6 b + \log_6 c = 6$. Let S denotes sum of 10 terms of another G.P. whose first term is 'a' and common ratio is $\frac{5r}{2}$, then

(A) $a + b + c = 189$ (B) $a + b + c = 273$
(C) sum of digits of S is 90. (D) $S = 10^{10} - 1$

MSS062

8. Let $0 < a < b$ such that 2, $2^x - \frac{7}{2}$, $2^x - 5$ are harmonic mean, arithmetic mean and geometric mean of a, b respectively then which of the following option(s) is/are correct

(A) number of possible values of x is 2 (B) number of value of x is 1
(C) $a^2 + b^2$ can be 63 (D) $a^2 + b^2$ can be 3

MSS063

9. The value of $\sum_{n=1}^{\infty}(-1)^{n+1}\frac{n}{5^n}$ is $\frac{a}{b}$, where a & b are relatively prime then

(A) $a > b$ (B) $a < b$ (C) $a > 3$ (D) $b > 10$

MSS064

10. The value of $\sum_{r=2}^{100}\frac{2^r(2-r)}{r(r+1)(r+2)}$ is equal to

(A) $\frac{2}{3} - \frac{2^{100}}{(51)(101)}$ (B) $\frac{2}{3} - \frac{2^{101}}{(101)(102)}$ (C) $\frac{1}{2} - \frac{2^{100}}{100.101}$ (D) $\frac{1}{2} - \frac{2^{100}}{(101)(51)}$

MSS065

SECTION–II

- This section contains **THREE** paragraphs.
- Based on each paragraph, there are **TWO** questions.
- Each question has **FOUR** options (A), (B), (C) and (D) **ONLY ONE** of these four options is correct.
- For each question, darken the bubble corresponding to the correct option in the ORS.
- For each question, marks will be awarded in one of the following categories :

Full Marks : +3 if only the bubble corresponding to the correct answer is darkened.

Zero Marks : 0 in all other cases.

Comprehension # 1 (Q. No. 11 & 12)

A geometric series has first term 'a' and common ratio 'r'. The second term of the series is 4 and the sum upto infinite terms of the series is 25

11. The sum of all possible values of a is-

(A) 5 (B) 15 (C) 20 (D) 25

MSS066

12. If 'r' is taken the larger of its two possible values then the smallest value of n for which S_n exceeds 15 is-

(A) 4 (B) 5 (C) 6 (D) 7

MSS067

Comprehension # 2 (Q. No. 13 & 14)

From first 'n' natural numbers, 2 consecutive numbers are removed the arithmetic mean of the remaining number is $\frac{105}{4}$ then answer the following

13. n is divisible by

(A) 15 (B) 25 (C) 5 (D) 10

MSS068

14. The removed number is(are)

(A) 6 (B) 7 (C) 8 (D) 9

MSS069

Comprehension # 3 (Q. No. 15 & 16)

In a G.P. the sum of the first and last term is 66 and the product of second and the second last term is 128. Sum of all terms is 126

Based on above information, answer the following questions :

15. If an increasing G.P. is considered then number of terms

(A) 2 (B) 4 (C) 6 (D) 8

MSS070

16. Difference of greatest and least term is

(A) 60 (B) 62 (C) 64 (D) 66

MSS071

SECTION–III

- This section contains **ONE** question.
- **Each question has matching lists.** The codes for the lists have choices (A), (B), (C) and (D) out of which **ONLY ONE is correct**
- For each question, marks will be awarded in one of the following categories :

Full Marks : +3 If only correct answer is given.

Zero Marks : 0 If no answer is given.

Negative Marks : –1 For incorrect answer

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17. Match List-I with List-II and select the correct answer using the code given below the list.

	List-I		**List-II**
(P)	Number of common integers in two arithmetic progression 1,3,5,7,...157 and 2,5,8,11...161 is	(1)	25
(Q)	If a and b are roots of $11x^2 - 4x - 2 = 0$, then value of $10(1 + a + a^2 + ...\infty)(1 + b + b^2 + ...\infty)$ is	(2)	26
(R)	If the sum of first 20 terms is same as the sum of first 10 terms in an arithmetic progression then the sum of first 30 terms is less than	(3)	22
(S)	If sum of $\frac{3}{1^2.2^2}+\frac{5}{2^2.3^2}+\frac{7}{3^2.4^2}....+\frac{199}{99^2.100^2}$ is $\frac{a}{b}$ (where a and b are coprime) the value of $20\lvert b - a\rvert$ is	(4)	20
		(5)	10

(A) P → 2; Q → 1; R → 1,2,3; S → 3

(B) P → 2; Q → 3; R → 1,2,3,4,5; S → 4

(C) P → 1; Q → 2; R → 1,2; S → 2

(D) P → 1; Q → 4; R → 3,4; S → 1

MSS072

SECTION–IV

- This section contains **ONE** question.
- Each question contains two columns, Column-I and Column-II.
- Column-I has four entries (A), (B), (C) and (D).
- Column-II has four entries (p), (q), (r), (s).
- Match the entries in Column-I with the entries in Column-II.
- For each question, marks will be awarded in one of the following categories:

Full Marks	: +4	If only correct answer is given.
Zero Marks	: 0	If no answer is given.
Negative Marks	: –1	For incorrect answer

18.

	Column - I	**Column - II**	
(A)	The cofficient of x^{49} in the product $(x-1)(x-3)(x-5)(x-7)\ldots\ldots(x-99)$	(p)	–2500
(B)	Let S_n denote sum of first n terms of an A.P. If $S_{2n}=3S_n$, then $\frac{S_{3n}}{S_n}$ is	(q)	9
(C)	The sum $\sum_{r=2}^{\infty}\frac{1}{r^2-1}$ is equal to	(r)	3/4
(D)	The length, breadth, height of a rectangular box are in G.P. (length > breadth > height) The volume is 27, the total surface area is 78. Then the length is	(s)	6

MSS073

Exercise - IV (JEE-Advanced PYQs)

1. If the sum of first n terms of an A.P. is cn^2, then the sum of squares of these n terms is **[JEE 2009]**

(A) $\frac{n(4n^2-1)c^2}{6}$ (B) $\frac{n(4n^2+1)c^2}{3}$ (C) $\frac{n(4n^2-1)c^2}{3}$ (D) $\frac{n(4n^2+1)c^2}{6}$

MSS074

2. Let $a_1, a_2, a_3 \ldots\ldots\ldots a_{11}$ be real numbers satisfying $a_1 = 15$, $27 - 2a_2 > 0$ and $a_k = 2a_{k-1} - a_{k-2}$ for $k = 3,4\ldots\ldots\ldots 11$. If $\frac{a_1^2 + a_2^2 + \ldots\ldots + a_{11}^2}{11} = 90$, then the value of $\frac{a_1 + a_2 + \ldots\ldots + a_{11}}{11}$ is equal to **[JEE 2010]**

MSS075

3. The minimum value of the sum of real numbers a^{-5}, a^{-4}, $3a^{-3}$, 1, a^8 and a^{10} with $a > 0$ is **[JEE 2011]**

MSS076

4. Let $a_1, a_2, a_3, \ldots\ldots\ldots, a_{100}$ be an arithmetic progression with $a_1 = 3$ and $S_p = \sum_{i=1}^{p} a_i, 1 \le p \le 100$. For any integer n with $1 \le n \le 20$, let $m = 5n$. If $\frac{S_m}{S_n}$ does not depend on n, then a_2 is **[JEE 2011]**

MSS077

5. Let $a_1, a_2, a_3, \ldots\ldots$ be in harmonic progression with $a_1 = 5$ and $a_{20} = 25$. The least positive integer n for which $a_n < 0$ is **[JEE 2012]**

(A) 22 (B) 23 (C) 24 (D) 25

MSS078

6. Let $S_n = \sum_{k=1}^{4n} (-1)^{\frac{k(k+1)}{2}} k^2$. Then S_n can take value(s) **[JEE Advanced 2013]**

(A) 1056 (B) 1088 (C) 1120 (D) 1332

MSS079

7. A pack contains n cards numbered from 1 to n. Two consecutive numbered cards are removed from the pack and the sum of the numbers on the remaining cards is 1224. If the smaller to the numbers on the removed cards is k, then $k - 20$ = **[JEE Advanced 2013]**

MSS080

8. Let a, b, c be positive integers such that $\frac{b}{a}$ is an integer. If a, b, c are in geometric progression and the arithmetic mean of a, b, c is $b + 2$, then the value of $\frac{a^2 + a - 14}{a + 1}$ is **[JEE Advanced 2014]**

MSS081

9. Suppose that all the terms of an arithmetic progression (A.P.) are natural numbers. If the ratio of the sum of the first seven terms to the sum of the first eleven terms is 6 : 11 and the seventh term lies in between 130 and 140, then the common difference of this A.P. is **[JEE Advanced 2015]**

MSS082

10. Let $b_i > 1$ for $i = 1, 2, ..., 101$. Suppose $\log_e b_1, \log_e b_2, ..., \log_e b_{101}$ are in Arithmetic Progression (A.P.) with the common difference $\log_e 2$. Suppose $a_1, a_2, ..., a_{101}$ are in A.P. such that $a_1 = b_1$ and $a_{51} = b_{51}$. If $t = b_1 + b_2 + ... + b_{51}$ and $s = a_1 + a_2 + ... + a_{51}$ then **[JEE Advanced 2016]**

(A) $s > t$ and $a_{101} > b_{101}$ (B) $s > t$ and $a_{101} < b_{101}$

(C) $s < t$ and $a_{101} > b_{101}$ (D) $s < t$ and $a_{101} < b_{101}$

MSS083

11. The sides of the right angled triangle are in arithmetic progression. If the triangle has area 24, then what is the length of its smallest side ? **[JEE Advanced 2017]**

MSS084

12. Let X be the set consisting of the first 2018 terms of the arithmetic progression 1, 6, 11, ... , and Y be the set consisting of the first 2018 terms of the arithmetic progression 9, 16, 23, ... Then, the number of elements in the set $X \cup Y$ is _____ **[JEE Advanced 2018]**

MSS085

13. Let m be the minimum possible value of $\log_3\left(3^{y_1} + 3^{y_2} + 3^{y_3}\right)$, where y_1, y_2, y_3 are real numbers for which $y_1 + y_2 + y_3 = 9$. Let M be the maximum possible value of $(\log_3 x_1 + \log_3 x_2 + \log_3 x_3)$, where x_1, x_2, x_3 are positive real numbers for which $x_1 + x_2 + x_3 = 9$. Then the value of $\log_2(m^3) + \log_3(M^2)$ is _____. **[JEE Advanced 2020]**

MSS086

14. Let $a_1, a_2, a_3, ...$ be a sequence of positive integers in arithmetic progression with common difference 2. Also, let $b_1, b_2, b_3, ...$ be a sequence of positive integers in geometric progression with common ratio 2. If $a_1 = b_1 = c$, then the number of all possible values of c, for which the equality $2(a_1 + a_2 + ...+ a_n) = b_1 + b_2 + ... + b_n$ holds for some positive integer n, is _____

[JEE Advanced 2020]

MSS087

15. Let $\ell_1, \ell_2, ..., \ell_{100}$ be consecutive terms of an arithmetic progression with common difference d_1, and let $w_1, w_2, ..., w_{100}$ be consecutive terms of another arithmetic progression with common difference d_2, where $d_1 d_2 = 10$. For each $i = 1, 2, ..., 100$, let R_i be a rectangle with length ℓ_i, width w_i and area A_i. If $A_{51} - A_{50} = 1000$, then the value of $A_{100} - A_{90}$ is _____.

[JEE Advanced 2022]

MSS088

16. Let $\overbrace{75....57}^{r}$ denote the $(r + 2)$ digit number where the first and the last digits are 7 and the remaining r digits are 5. Consider the sum $S = 77 + 757 + 7557 + ...+ \overbrace{75....57}^{98}$. If $S = \dfrac{\overbrace{75....57}^{99} + m}{n}$, where m and n are natural numbers less than 3000, then the value of $m + n$ is

[JEE Advanced 2023]

MSS089

ANSWER KEY

Exercise – I (JEE – Main Pattern)

Section-A	Q.	1	2	3	4	5	6	7	8	9	10
	A.	4	1	2	1	3	1	2	3	2	3
	Q.	11	12	13	14	15	16	17	18	19	20
	A.	2	4	2	1	1	3	4	2	4	3
Section-B	Q.	1	2	3	4	5					
	A.	12	27	22	0.50	$\left(\frac{1}{201}\right)$					

Exercise – II (JEE – Main PYQs)

Question	1	2	3	4	5	6	7	8	9	10
Answer	2	1	4	1	2	1	3	3	2	1
Question	11	12	13	14	15	16	17	18	19	20
Answer	1	3	504	14	1	7	5143	3	4	27560
Question	21	22	23	24	25	26	27	28		
Answer	120	4	3	2	5	12	60	3		

Exercise – III (JEE – Advanced Pattern)

Section-I	Q.	1	2	3	4	5	6	7	8	9	10
	A.	B,D	A,B,C,D	A,B	A,B,C,D	A,B,C	A,B,C,D	A,C,D	B,C	B,C,D	A,B
Section-II	Q.	11	12	13	14	15	16				
	A.	D	B	B,C,D	B,C	C	B				
Section-III	Q.	17									
	A.	B									
Section-IV	Q.	18									
	A.	A → p ; B → s ; C → r; D → q									

Exercise – IV (JEE – Advanced PYQs)

Question	1	2	3	4	5	6	7	8	9	10
Answer	C	0	8	9 or 3	D	A,D	5	4	9	B
Question	11	12	13	14	15	16				
Answer	6	3748	8.00	1.00	18900.00	1219				