Exercise-1

Marked Questions may have for Revision Questions.

OBJECTIVE QUESTIONS

Section (A) : Arithmetic Progression and Arithmetic Mean

A-1. The 15^{th} term of the series 4, 1, –2, –5, ... is
(1) –35 (2) –38 (3) –41 (4) –44

A-2. The number of the terms of the sequence 7, 12, 17, 22, ..., 102 is
(1) 18 (2) 19 (3) 20 (4) 21

A-3^. The 19^{th} term of the series 2 + 6 + 10 + ... is
(1) 74 (2) 72 (3) 76 (4) 80

A-4. The middle term of the progression 4,9,14,.....104 is
(1) 44 (2) 49 (3) 59 (4) 54

A-5. Sum of first 20 terms of the series –10, –8, –6,...... is :
(1) –580 (2) 180 (3) 200 (4) –600

A-6. The sum of numbers lying between 10 and 200 which are divisible by 7 will be
(1) 2800 (2) 2835 (3) 2870 (4) 2849

A-7. The sum of all the even positive integers less than 200 which are not divisible by 6 is
(1) 6535 (2) 6539 (3) 6534 (4) 6532

A-8. The value of x satisfying the equation $\frac{x-1}{x}+\frac{x-2}{x}+\frac{x-3}{x}+ ....+ \frac{1}{x} = 3$ is
(1) 5 (2) 6 (3) 7 (4) 8

A-9. If $S_n = n^2a + \frac{n}{4}(n-1)d$ is the sum of first n terms of A.P., then common difference is
(1) $2a + \frac{d}{2}$ (2) $2a - \frac{d}{2}$ (3) $a - \frac{d}{2}$ (4) $a + \frac{d}{2}$

A-10. If the numbers a, b, c, d, e form an A.P., then the value of a – 4b + 6c – 4d + e is
(1) 1 (2) 2 (3) 0 (4) 4

A-11. If a_1, a_2, a_3,........ are in A.P. such that $a_1 + a_5 + a_{10} + a_{15} + a_{20} + a_{24} = 225$, then $a_1 + a_2 + a_3 + ... + a_{23} + a_{24}$ is equal to
(1) 909 (2) 75 (3) 750 (4) 900

A-12. 1/(q + r), 1/(r + p),1/(p + q) are in A.P., then
(1) p, q, r are in A.P (2) p^2, q^2, r^2 are in A.P.
(3) 1/p, 1/q, 1/r are in A.P. (4) p,q/2, r in A.P.

A-13. In the following two A.P.'s how many terms are identical ?
2, 5, 8, 11 .... to 60 terms and 3, 5, 7, ... 50 terms
(1) 15 (2) 16 (3) 17 (4) 18

A-14. Certain numbers appear in both the arithmetic progressions 17, 21, 25...........and 16, 21, 26............ . The sum of the first two hundred terms appearing in both is
(1) 4022 (2) 402200 (3) 201100 (4) 398000

A-15. If the sum of four numbers in A.P. be 48 and that the product of the extremes is to the product of the means is 27 to 35 then the numbers are-
(1) 3,9,15,21 (2) 9,5,7,3 (3) 6,10,14,18 (4) 18, 13, 8, 3

A-16. 11 AM's are inserted between 28 and 10 then 6_{th} AM is
(1) 19 (2) $17\frac{1}{2}$ (3) $20\frac{1}{2}$ (4) 22

A-17. The sum of 6 AM's between 3 and 97 is :
(1) 500 (2) 600 (3) 400 (4) 300

A-18. In an A.P. t_{26} = 51 then sum of its first 51 terms is :
(1) 2500 (2) 2601 (3) 2551 (4) 2401

A-19. There are m A.M. between 1 and 31. If the ratio of the 7_{th} and $(m-1)_{th}$ means is 5 : 9, then $\frac{m}{7}$ is equal to
(1) 2 (2) 1 (3) 3 (4) 4

Section (B) : Geometric progression and Geometric mean

B-1. t_6 of the series $\sqrt{3}, \frac{1}{\sqrt{3}}, \frac{1}{3\sqrt{3}}, ...$ is
(1) $\frac{\sqrt{3}}{729}$ (2) $\frac{1}{243}$ (3) $\frac{1}{81}$ (4) $\frac{\sqrt{3}}{243}$

B-2. The sum of 10 terms of GP $\frac{1}{2}+\frac{1}{4}+\frac{1}{8}$ +............ is
(1) $\frac{2^{10}-1}{2^{10}}$ (2) $\frac{2^{9}-1}{2^{9}}$ (3) $\frac{2^{10}-1}{2^{9}}$ (4) $\frac{2^{9}-1}{2^{10}}$

B-3. The fifth term of a GP is 81 and its 8th term is 2187, then its third term is :
(1) 3 (2) 9 (3) 27 (4) 18

B-4. Which term of the progression 18, –12, 8, ... is $\frac{512}{729}$?
(1) 9_{th} (2) 10_{th} (3) 8_{th} (4) 7_{th}

B-5. 4_{th} term of the geometric progression $x, x_2 + 2, x_3 + 10$ is
(1) 0 (2) 6 (3) 54 (4) 27

B-6. If $3 + 3a + 3a^2 + ...\infty = \frac{45}{8}$ (a > 0), then a equals-
(1) 15/23 (2) 15/7 (3) 7/15 (4) 23/15

B-7. The value of $9^{1/3} . 9^{1/9}. 9^{1/27}$ ......upto ∞, is-
(1) 1 (2) 3 (3) 9 (4) 27

B-8. If the sum of an infinite GP is 4/3 and the sum of the series obtained on squaring each term is 16/27, then its common ratio is
(1) 1/2 (2) 1/4 (3) 1/3 (4) 1/5

B-9. The n_{th} term of a GP is 128 and the sum of its n terms is 255. If its common ratio is 2 then its first term is.
(1) 1/2 (2) 1/4 (3) 1/8 (4) 1

B-10. If a, b, c are in A.P. as well as in G.P. then which of following is true.
(1) a = b ≠ c (2) a ≠ b ≠ c (3) a = b = c (4) none of these

B-11. If first term of a decreasing infinite G.P. is 1 and sum is S, then sum of squares of its terms is-
(1) S^2 (2) $1/S^2$ (3) $S^2/(2S – 1)$ (4) $S^2/(2S + 1)$

B-12. Three distinct real numbers a,b,c are in G.P. such that a+b+c = xb, then
(1) 0 < x< 1 (2) –1< x< 3 (3) x < –1 or x > 3 (4) –1 < x < 2

B-13. If S is the sum to infinite terms of a G.P. whose first term is 'a', then the sum of the first n terms is
(1) $S\left(1-\frac{a}{S}\right)^n$ (2) $S\left[1-\left(1-\frac{a}{S}\right)^n\right]$ (3) $a\left[1-\left(1-\frac{a}{S}\right)^n\right]$ (4) $\frac{\left[1-\left(1-\frac{a}{S}\right)^n\right]}{S}$

B-14. The rational number, which equals the number $2.\overline{357}$ with recurring decimal is
(1) $\frac{2355}{1001}$ (2) $\frac{2379}{997}$ (3) $\frac{2355}{999}$ (4) $\frac{2355}{990}$

B-15. The sum of 10 terms of the series 0.7 + .77 + .777 + ...is-
(1) $\frac{7}{9}\left(89+\frac{1}{10^{10}}\right)$ (2) $\frac{7}{81}\left(89+\frac{1}{10^{10}}\right)$ (3) $\frac{7}{81}\left(89+\frac{1}{10^{9}}\right)$ (4) $\frac{7}{9}\left(89+\frac{1}{10^{9}}\right)$

B-16. The sum of the first ten terms of the geometric progression is S_1 and the sum of the next ten terms (11th term to 20_{th} term) is S_2, then the common ratio will be-
(1) $\pm\sqrt[10]{\frac{S_1}{S_2}}$ (2) $\pm\sqrt{\frac{S_2}{S_1}}$ (3) $\pm\sqrt[10]{\frac{S_2}{S_1}}$ (4) $\sqrt{\frac{S_1}{S_2}}$

B-17. If a, b, c, d are in G.P., then the value of $(a – c)^2 + (b – c)^2 + (b – d)^2 – (a – d)^2$ is-

(1) 0 (2) 1 (3) a + d (4) a – d

B-18. 4 GM are insested between 3 and 729 then the 3rd GM is

(1) $27\sqrt{3}$ (2) 27 (3) 81 (4) 243

B-19. The A.M. of two numbers is 34 and GM is 16, the numbers are-

(1) 2 and 64 (2) 64 and 3 (3) 64 and 4 (4) 32 and 36

B-20. The product of 6 geometric means between 8 and $\frac{1}{16}$ will be:

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

B-21. If A.M. between positive numbers p and q (p ≥ q) is two times the GM, then p : q is -

(1) 1 : 1 (2) 2 : 1 (3) $\left(2+\sqrt{3}\right):\left(2-\sqrt{3}\right)$ (4) 3 : 1

B-22. If G_1 and G_2 are two geometric means and A is the arithmetic mean inserted between two positive numbers, then the value of $\frac{G_1^2}{G_2}+\frac{G_2^2}{G_1}$ is

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

Section (C) : Harmonic and Arithmetic Geometric Progression

C-1. If the mth term of a H.P. be n and nth term be m, then the rth term will be-

(1) $\frac{r}{mn}$ (2) $\frac{mn}{r+1}$ (3) $\frac{mn}{r}$ (4) $\frac{mn}{r-1}$

C-2. If first and second terms of a HP are a and b, then its nth term will be-

(1) $\frac{ab}{a+(n-1)ab}$ (2) $\frac{ab}{b+(n-1)(a+b)}$ (3) $\frac{ab}{b+(n-1)(a-b)}$ (4) $\frac{ab}{a+(n-1)(a-b)}$

C-3. If a, b, c are in H.P. then the value of $\frac{b+a}{b-a}+\frac{b+c}{b-c}$ is :

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

C-4. If first two terms of a H.P. are 2/5 and 12/13 rspectively then the largest term is :

(1) 14/3 (2) 12/13 (3) 13/12 (4) 3/14

C-5. If a, b, c are in G.P. where a, b, c > 0 then $\frac{1}{1+\log_{10}a},\frac{1}{1+\log_{10}b},\frac{1}{1+\log_{10}c}$ are in :

(1) A.P. (2) G.P. (3) H.P. (4) None of these

C-6. If positive numbers a, b, c, d are in AP, then abc, abd, acd, bcd will be in

(1) AP (2) GP (3) HP (4) Data insufficient

C-7. Equal numbers are always in

(1) A.P. (2) G.P. (3) H.P. (4) not in AP, GP or HP

C-8. If x > 1 and $\left(\frac{1}{x}\right)^a$, $\left(\frac{1}{x}\right)^b$, $\left(\frac{1}{x}\right)^c$ are in G.P., then a, b, c are in

(1) A.P. (2) G.P. (3) H.P. (4) not in AP, GP or HP

C-9. If $\frac{1}{\sqrt{b}+\sqrt{c}}$, $\frac{1}{\sqrt{c}+\sqrt{a}}$, $\frac{1}{\sqrt{a}+\sqrt{b}}$ are in A.P., then 9_{ax+1} , 9_{bx+1},9_{cx+1}, x ≠ 0 are in

(1) A.P. (2) G.P. (3) H.P. (4) not in AP, GP or HP

C-10. The Sum of three consecutive number in HP is 37 and the sum of the reciprocals is 1/4 then number are

(1) 9, 10, 12 (2) 9, 10, 13 (3) 15, 12, 10 (4) 14, 11, 9

C-11. If H, H_2, H_3, H_4 are 4 HM's between 1/3 and 1/13 then $\frac{1}{H_1}+\frac{1}{H_2}+\frac{1}{H_3}+\frac{1}{H_4}$ is equal to :

(1) 27 (2) 32 (3) 35 (4) 48

C-12. If A,G, H be respectively the AM, GM, and H.M between two positive numbers if x A = yG = zH where x, y, z are non-zero positive real number then x,y,z are in

(1) A.P. (2) G.P. (3) H.P. (4) Data insufficient

C-13. If 18 HM's are interted between $\frac{1}{3}$ and $\frac{1}{41}$ then value of 4_{th} HM is

(1) $\frac{1}{9}$ (2) $\frac{1}{11}$ (3) $\frac{1}{13}$ (4) 11

C-14. The sum of n terms of $1+\frac{2}{3}+\frac{3}{3^2}+.....$ is

(1) $\frac{3}{2}\left(1-\frac{1}{3^n}\right)-\frac{n}{3^n}$

(2) $\left(\frac{3}{2}\right)^2\left(1-\frac{1}{3^n}\right)-\frac{3n}{2.3^n}$

(3) $\left(\frac{3}{2}\right)^2\left(1-\frac{1}{3^n}\right)-\frac{n}{2.3^n}$

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

C-15. The n_{th} terms of the series 1 + $\frac{4}{5}+\frac{7}{5^2}+\frac{10}{5^3}$ +....... is

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

C-16. The sum of infinite terms of the series $5-\frac{7}{3}+\frac{9}{3^2}-\frac{11}{3^3}+......\infty$ is

(1) 27/2 (2) 9/2 (3) 27/8 (4) 27/16

C-17. Sum of infinite series $4 + \frac{8}{3} + \frac{12}{3^2} + \frac{16}{3^3} + - - -$ is
(1) 3 (2) 9 (3) 6 (4) 8

C-18. The value of $2^{\frac{1}{4}} . 4^{\frac{1}{8}} . 8^{\frac{1}{16}} - - - \infty$ is equal to
(1) 3 (2) 2 (3) 6 (4) 8

Section (D) : Relation between A.M. , G.M. and H.M.

D-1. AM of first 15 positive odd natural numbers is
(1) 15 (2) 225 (3) 250 (4) 196

D-2. If $a_r = \frac{1}{r+1}$ then HM of $a_1, a_2, a_3 ....a_{50}$ is
(1) $\frac{1}{25}$ (2) $\frac{2}{51}$ (3) $\frac{2}{53}$ (4) $\frac{1}{26}$

D-3. If positive numbers a, b, c, d are in HP then
(1) ab $\geq$ cd (2) ac $\geq$ bd (3) ad $\geq$ bc (4) a + d < b + c

D-4. If the product of n positive numbers is 1, then their sum will be
(1) a positive integer (2) equivalent to n + 1/n
(3) divisible by n (4) not less than n

D-5. If x > 0, then the expression $\frac{x^{100}}{1+x+x^2+x^3+.....+x^{200}}$ is always less than or equal to
(1) $\frac{1}{201}$ (2) $\frac{1}{200}$ (3) $\frac{100}{201}$ (4) $\frac{201}{100}$

D-6. If a, b, c are three positive numbers then
(1) $\frac{a}{b}+\frac{b}{c}+\frac{c}{a}<3$ (2) $(a+b+c)\left(\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)\geq 9$
(3) a + b +c > 3(abc) (4) $a^2b + b^2c + c^2a \geq 9$ abc

D-7. The A.M. between two positive numbers exceeds the GM by 5 and the GM exceeds the H.M. by 4. Then the numbers are-
(1) 10, 40 (2) 10, 20 (3) 20, 40 (4) 10, 50

D-8. If ratio of AM to GM of two positive numbers a and b is 5 :3 then a : b is (where a >b)
(1) 4 : 1 (2) 2 : 1 (3) 3 : 2 (4) 9 : 1

Section (E) : Σn, Σn^2, Σn^3, Method of difference and V_n method

E-1. If $t_r = 2r^2 + 3$ then $\sum_{r=1}^{10} t_r$ is

(1) 800 (2) 770 (3) 740 (4) 720

E-2. The sum of the series 1.2 + 2.3 + 3.4 + ...up to 20 terms is

(1) 3020 (2) 2020 (3) 3080 (4) 2080

E-3. If $= 2r + 2^r$ then $\sum_{r=1}^{6} t_r$

(1) 170 (2) 172 (3) 168 (4) 166

E-4. The sum of the series $1.3^2 + 2.5^2 + 3.7^2 + ...$to 20 terms is

(1) 188090 (2) 94045 (3) 325178 (4) 812715

E-5. The sum of the series up to n term 1.3.5 + 3.5.7 + 5.7.9 + ... is

(1) $8n^3 + 12n^2 - 2n - 3$ (2) $n(8n^3 + 11n^2 - n - 3)$

(3) $n(2n^3 + 8n^2 + 7n - 2)$ (4) $n^4 + 6n^3 + 7n^2 + n$

E-6. The sum of the infinite series $1^2 + 2^2 x + 3^2 x^2 + ...$is $(-1 < x < 1, x \neq 0)$

(1) $(1 + x)/(1 - x)^3$ (2) $(1 + x)/(1 - x)$ (3) $x/(1 - x)^3$ (4) $1/(1 - x)^3$

E-7. If $(1^2 - t_1) + (2^2 - t_2) + ... + (n^2 - t_n) = \frac{1}{3} n(n^2 - 1)$, then t_n is

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

E-8. The number of terms in the sequence 1,3,6,10,15,21,........5050 is-

(1) 50 (2) 100 (3) 101 (4) 105

E-9. If t_n denotes the n^{th} term of the series (2 + 3 + 6 + 11 + 18 + ...), then t_{50} is

(1) $49^2 + 2$ (2) $49^2 - 2$ (3) $50^2 - 2$ (4) $50^2 + 2$

E-10. $\sum_{r=2}^{\infty} \frac{1}{r^2 - 1}$ is equal to:

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

E-11. The sum to infinity of the following series $\frac{1}{1.2} + \frac{1}{2.3} + \frac{1}{3.4} + ...$shall be-

(1) ∞ (2) 1 (3) 0 (4) None of these

E-12. The sum of the series $\frac{1}{1.3.5}+\frac{1}{3.5.7}+\frac{1}{5.7.9}+$ .... to n terms is

(1) $\frac{1}{12}-\frac{1}{4(2n+1)(2n+3)}$
(2) $\frac{1}{12}+\frac{1}{4(2n+1)(2n+3)}$
(3) $n(n+1)$
(4) $\frac{1}{12}-\frac{1}{4(2n-1)(2n-3)}$

E-13. The sum of the series $1+\frac{1}{1+2}+\frac{1}{1+2+3}+....+\frac{1}{1+2+3+.....+n}$ is

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

Exercise-2

Marked Questions may have for Revision Questions.

PART - I : OBJECTIVE QUESTIONS

1. If a_1, a_2 , ..., a_n are distinct terms of an A.P., then equations satisfied are
(1) $a_1+2a_2+a_3=0$
(2) $2a_1+2a_2+a_3=0$
(3) $a_1+3a_2-3a_3-a_4=0$
(4) $a_1-4a_2+6a_3-4a_4+a_5=0$

2. If $\log_5 2$, $\log_5(2^x-5)$ and $\log_5(2^x-7/2)$ are in A.P., then value of 2x is equal to
(1) 6 (2) 9 (3) 3 (4) 1

3. The sum of n terms of the series $\log a+\log\frac{a^2}{b}+\log\frac{a^3}{b^2}+$.........is
(1) $n\log\left(\frac{a}{b}\right)$ (2) $n\log(ab)$ (3) $\frac{n^2}{2}\log\frac{a}{b}+\frac{n}{2}\log(ab)$ (4) $\frac{n^2}{2}\log\frac{a}{b}-\frac{n}{2}\log(ab)$

4. If the ratio of sum of n terms of two A.P.'s is (3n + 8) : (7n + 15), then the ratio of 12^{th} terms is
(1) 16 : 7 (2) 7 : 16 (3) 7 : 12 (4) 12 : 5

5. If a and ℓ be the first and last term of an A.P. and S be the sum of its all terms; then its common difference is-
(1) $\frac{\ell^2+a^2}{2S-\ell-a}$ (2) $\frac{\ell^2-a^2}{2S-\ell-a}$ (3) $\frac{\ell^2-a^2}{2S+\ell+a}$ (4) $\frac{\ell^2-a^2}{2S-\ell+a}$

6. If b_1, b_2, b_3 ($b_i > 0$) are three successive terms of a G.P. with common ratio r, then value of r for which the inequality $b_3 > 4b_2 - 3b_1$ holds is given by
(1) $r \geq 3$ (2) $1 < r < 2$ (3) $r > 3$ (4) $r\in(0,1)$

7. Let 1, 2, 4, 8, ... is a G.P. and 4, 8, 16, 32 is another G.P. then 1 + 4, 2 + 8, 4 + 16, 8 + 32, ... are in
(1) A.P. (2) G.P. (3) H.P. (4) Neither A.P nor GP nor HP

8. If a, b, c are in A.P., then b + c − a, c + a − b, a + b − c are in
(1) A.P. (2) G.P. (3) H.P. (4) Neither A.P nor GP nor HP

9. If x, y, z are in G.P. then $x^2 + y^2$, $xy + yz$, $y^2 + z^2$ are in-
(1) A.P. (2) G.P. (3) H.P. (4) Decreasing order

10. If a, b, c, d are in G.P., then $(a^2 - b^2)$, $(b^2 - c^2)$, $(c^2 - d^2)$ are in
(1) A.P. (2) G.P. (3) H.P. (4) Neither A.P nor GP nor HP

11. Three positive numbers form a GP. If the middle number is increased by 8, the three numbers form an AP. If the last number is also increased by 64 along with the previous increase in the middle number, the resulting numbers form a GP again. Then
(1) common ratio = 3 (2) first number = $\frac{4}{9}$ (3) common ratio = –5 (4) first number = 5

12. Let S_1, S_2, S_3 ,..........be squares such that for each n ≥ 1, the length of a side of S_n equals the length of a diagonal of S_{n+1}. If the length of a side of S_1 is 10 cm then for which of the following values of n is the area of S_n less than 1 cm^2 ?
(1) 7 (2) 8 (3) 6 (4) 5

13. If a, b, c be in H.P., then $a - \frac{b}{2}, \frac{b}{2}, c - \frac{b}{2}$ will be in
(1) A.P. (2) G.P. (3) H.P. (4) Increasing order

14. If $\frac{a+be^y}{a-be^y} = \frac{b+ce^y}{b-ce^y} = \frac{c+de^y}{c-de^y}$, then a, b, c, d are in
(1) A.P. (2) G.P. (3) H.P. (4) Increasing order

15. If $a_1, a_2, a_3, ...a_n$ are in H.P. and $a_1a_2 + a_2a_3 + a_3a_4 + ...a_{n-1}a_n = ka_1a_n$, then k is equal to-
(1) 1 (2) 2 (3) n + 1 (4) n –1

16. If in an AP, $t_1 = \log_{10} a$, $t_{n+1} = \log_{10} b$ and $t_{2n+1} = \log_{10} c$ then a, b, c are in
(1) AP (2) GP (3) HP (4) None of these

17. If $a_1, a_2, a_3, ..., a_{2n+1}$ are in AP then $\frac{a_{2n+1}-a_1}{a_{2n+1}+a_1} + \frac{a_{2n}-a_2}{a_{2n}+a_2} + ...+ \frac{a_{n+2}-a_n}{a_{n+2}+a_n}$ is equal to
(1) $\frac{n(n+1)}{2} . \frac{a_2-a_1}{a_{n+1}}$ (2) $\frac{n(n+1)}{2}$ (3) $(n + 1)(a_2 - a_1)$ (4) $\frac{n(n-1)}{2}\left(\frac{a_2-a_1}{a_{n+1}}\right)$

18. The value of x + y + z is 15 if a, x, y, z, b are in A.P. while the value of $\frac{1}{x} + \frac{1}{y} + \frac{1}{z}$ is $\frac{5}{3}$ if a, x, y, z, b are in H.P., then a and b are-
(1) 1, 9 (2) 3, 7 (3) 2, 9 (4) 4, 5

19. If first and (2n – 1)th terms of an A.P., G.P. and H.P. are equal and their nth terms are respectively a, b, c, then
(1) a = b = c (2) a + c = b (3) $ac - b^2 = 0$ (4) 2b = a + c

20. Let $1^2 + 2^2 + 3^2 + ... + n^2 = g(n)$, then g(n) –g(n–1) is equal to
(1) n^2 (2) $(n - 1)^2$ (3) n – 1 (4) n^3

21. If $x_i > 0$, i = 1, 2, ..., 50 and $x_1 + x_2 + .. + x_{50} = 50$, then the minimum value of $\frac{1}{x_1} + \frac{1}{x_2} + ...+ \frac{1}{x_{50}}$ equals
(1) 50 (2) $(50)^2$ (3) $(50)^3$ (4) $(50)^4$

22. If $0 < x, y, ab < 1$, then the sum of the infinite terms of the series
$\sqrt{x}\left(\sqrt{a}+\sqrt{x}\right)+\sqrt{x}\left(\sqrt{ab}+\sqrt{xy}\right)+\sqrt{x}\left(b\sqrt{a}+y\sqrt{x}\right)$ + ...is-

(1) $\frac{\sqrt{ax}}{1+\sqrt{b}}+\frac{x}{1+\sqrt{y}}$ (2) $\frac{\sqrt{x}}{1+\sqrt{b}}+\frac{\sqrt{x}}{1+\sqrt{y}}$ (3) $\frac{\sqrt{x}}{1-\sqrt{b}}+\frac{\sqrt{x}}{1-\sqrt{y}}$ (4) $\frac{\sqrt{ax}}{1-\sqrt{b}}+\frac{x}{1-\sqrt{y}}$

23. The sum to n terms of the series $\frac{1}{2}+\frac{3}{4}+\frac{7}{8}+\frac{15}{16}+$...... is equal to
(1) $2^{-n} + n + 1$ (2) $2^{-n} + n - 1$ (3) $2^{n} + n - 1$ (4) $2^{-n} + n - 2$

24. The sum of the series $1+\frac{3}{4}+\frac{7}{16}+\frac{15}{64}+\frac{31}{256}+$ ..... to infinity is
(1) $\frac{8}{3}$ (2) $\frac{7}{3}$ (3) $\frac{5}{3}$ (4) $\frac{7}{2}$

25. The sum 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
(1) $\frac{1}{3}$ (2) $\frac{2}{3}$ (3) $\frac{4}{3}$ (4) $\frac{1}{2}$

26. Sum of the series
$S = 1^2 - 2^2 + 3^2 - 4^2 + ... - 2002^2 + 2003^2$ is
(1) 2007006 (2) 1005004 (3) 2000506 (4) 2005006

27. Sum of n terms of $1 + (1 + x) + (1 + x + x^2) + (1 + x + x^2 + x^3) +$ ....is-
(1) $\frac{1-x^n}{1-x}$ (2) $\frac{x(1-x^n)}{1-x}$ (3) $\frac{n(1-x)-x(1-x^n)}{(1-x)^2}$ (4) $\frac{n-x(1-x^n)}{(1-x)^2}$

28. If $H_n = 1+\frac{1}{2}+\frac{1}{3}+$........$+\frac{1}{n}$ then value of $1+\frac{3}{2}+\frac{5}{3}+$........$+\frac{2n-1}{n}$ is :
(1) $2n - H_n$ (2) $2n + H_n$ (3) $H_n - 2n$ (4) $H_n + n$

PART - II : MISCELLANEOUS QUESTIONS

Section (A) : ASSERTION/REASONING

DIRECTIONS :

Each question has 4 choices (1), (2), (3) and (4) out of which ONLY ONE is correct.
(1) Both the statements are true.
(2) Statement-I is true, but Statement-II is false.
(3) Statement-I is false, but Statement-II is true.
(4) Both the statements are false.

A-1. **STATEMENT-1 :** The series for which sum to n terms, S_n, is given by $S_n = 5n^2 + 6n$ is an A.P.
STATEMENT-2 : The sum to n terms of an A.P. having non–zero common difference is a quadratic in n, i.e., $an^2 + bn$.

A-2. **STATEMENT-1 :** 3,6,12 are in G.P., then 9,12,18 are in H.P.

STATEMENT-2 : If three consecutive terms of a G.P. are positive and if middle term is added in these terms, then resultant will be in H.P.

A-3. **STATEMENT-1 :** The sum of the first 30 terms of the sequence 1,2,4,7,11,16, 22,...... is 4520.
STATEMENT-2 : If the successive differences of the terms of a sequence form an A.P., then general term of sequence is of the form $an^2 + bn + c$.

A-4. Suppose four distinct positive numbers a_1 , a_2 , a_3 , a_4 are in G.P. Let $b_1 = a_1$, $b_2 = b_1 + a_2$, $b_3 = b_2 + a_3$ and $b_4 = b_3 + a_4$

STATEMENT -1 : The numbers b_1, b_2, b_3, b_4 are neither in A.P. nor in G.P.

and

STATEMENT-2 : The numbers b_1, b_2, b_3, b_4 are in H.P.

Section (B) : MATCH THE COLUMN

B-1.

	Column-I		**Column-I I**
(P)	$\frac{a-b}{b-c} = \frac{a}{a}$ then a, b, c are in	(1)	AP
(Q)	$\frac{a-b}{b-c} = \frac{a}{b}$ then a, b, c are in	(2)	GP
(R)	$\frac{a-b}{b-c} = \frac{a}{c}$ then a, b, c are in	(3)	HP
(S)	p, q, r in AP then p_{th}, q_{th} and rth term of a GP are always in	(4)	Neither AP nor GP nor HP

Codes :

	P	**Q**	**R**	**S**
(1)	2	1	4	3
(2)	2	1	3	4
(3)	1	2	3	2
(4)	1	2	3	4

B-2.

	COLUMN-I		**COLUMN-II**
(P)	log2, log4, logx are in GP then value of x is	(1)	4
(Q)	GM of the roots of equation $x^3 - 6x^2 + 11x - 6 = 0$ is $\lambda^{\frac{1}{3}}$ then value of λ is	(2)	6
(R)	HM of the roots of the equation $3x^2 - 5x + 2 = 0$ is λ then value of 5λ is	(3)	8
(S)	AM of first 10 natural numbers is x then value of 2x is	(4)	11

Codes :

	P	**Q**	**R**	**S**
(1)	4	3	2	1
(2)	3	2	1	4
(3)	1	2	3	2
(4)	3	4	1	2

Section (C) : ONE OR MORE THAN ONE OPTIONS CORRECT

C-1. Indicate the correct alternative(s), for $0 < \varphi < \pi/2$, if:

$x = \sum_{n=0}^{\infty} \cos^{2n}\varphi$, $y = \sum_{n=0}^{\infty} \sin^{2n}\varphi$, $z = \sum_{n=0}^{\infty} \cos^{2n}\varphi \sin^{2n}\varphi$ then:
(1) xyz = xz + y (2) xyz = xy + z (3) xyz = x + y + z (4) xyz = yz + x

C-2. If $a = \underbrace{111\ldots\ldots1}_{55\text{ times}}$, $b = 1 + 10 + 10^2 + 10^3 + 10^4$ and $c = 1 + 10^5 + 10^{10} + \ldots\ldots + 10^{50}$ then
(1) b, $\frac{a}{2}$, c are in A.P. (2) b, $\sqrt{a}$, c are in G.P.
(3) a is a prime number (4) a is a composite number

C-3. If a, b, c are first three terms of a G.P. and the harmonic mean of a and b is 20 and arithmetic mean of b & c is 5, then
(1) no term of this G.P. is square of an integer (2) arithmetic mean of a, b, c is 5
(3) b = ± 6 (4) common ratio of this G.P. is 2

C-4. If the roots of $x^3 + ax^2 + bx - 27 = 0$ are in G.P. with common ratio r, where a, b ∈ R and a + b + 6 = 0, then
(1) a = 3 (2) r = – 1 (3) b = – 3 (4) r + b = – 4

Exercise-3

Marked Questions may have for Revision Questions.
*** Marked Questions may have more than one correct option.**

PART - I : JEE (MAIN) / AIEEE PROBLEMS (PREVIOUS YEARS)

1. Let $a_1, a_2, a_3, \ldots$ be terms of an AP. If $\frac{a_1 + a_2 + \ldots\ldots + a_p}{a_1 + a_2 + \ldots\ldots + a_q} = \frac{p^2}{q^2}$, $p \neq q$, then $\frac{a_6}{a_{21}}$ equals : **[AIEEE 2006 (3, –1), 165]**
(1) $\frac{7}{2}$ (2) $\frac{2}{7}$ (3) $\frac{11}{41}$ (4) $\frac{41}{11}$

2. If $a_1, a_2, \ldots, a_n$ are in HP, then the expression $a_1a_2 + a_2a_3 + \ldots\ldots + a_{n-1}a_n$ is equal to : **[AIEEE 2006 (3, –1), 165]**
(1) $(n - 1)(a_1 - a_n)$ (2) na_1a_n (3) $(n - 1)a_1a_n$ (4) $n(a_1 - a_n)$

3. In a geometric progression consisting of positive terms, each term equals the sum of the next two terms. Then the common ratio of this progression equals **[AIEEE 2007 (3, –1), 120]**
(1) $\frac{1}{2}(1-\sqrt{5})$ (2) $\frac{1}{2}\sqrt{5}$ (3) $\sqrt{5}$ (4) $\frac{1}{2}$

4. If p and q are positive real numbers such that $p^2 + q^2 = 1$, then the maximum value of (p + q) is **[AIEEE 2007 (3, –1), 120]**
(1) 2 (2) $\frac{1}{2}$ (3) $\frac{1}{\sqrt{2}}$ (4) $\sqrt{2}$

5. The sum of first two terms of a geometric progression is 12. The sum of the third and the fourth terms is 48. If the terms of the geometric progression are alternatively positive and negative, then the first term is
(1) – 4 (2) – 12 (3) 12 (4) 4

6. The sum to infinity of the series $1 + \frac{2}{3} + \frac{6}{3^2} + \frac{10}{3^3} + \frac{14}{3^4} + \ldots\ldots$ is **[AIEEE 2009 (4, –1), 144]**

(1) 2 (2) 3 (3) 4 (4) 6

7. A person is to count 4500 currency notes. Let a_n denote the number of notes he counts in the n_{th} minute. If $a_1 = a_2 = ... = a_{10} = 150$ and $a_{10}, a_{11}, ...$ are in an AP with common difference –2, then the time taken by him to count all notes is **[AIEEE 2010 (8, –2), 144]**
(1) 34 minutes (2) 125 minutes (3) 135 minutes (4) 24 minutes

8. A man saves Rs. 200 in each of the first three months of his service. In each of the subsequent months his saving increases by Rs. 40 more than the saving of immediately previous month. His total saving from the start of service will be Rs. 11040 after : **[AIEEE 2011, I, (4, –1), 120]**
(1) 18 months (2) 19 months (3) 20 months (4) 21 months

9. Let a_n be the n_{th} term of an A.P. If $\sum_{r=1}^{100} a_{2r} = \alpha$ and $\sum_{r=1}^{100} a_{2r-1} = \beta$, then the common difference of the A.P. is : **[AIEEE 2011, II, (4, –1), 120]**
(1) $\alpha - \beta$ (2) $\frac{\alpha - \beta}{100}$ (3) $\beta - \alpha$ (4) $\frac{\alpha - \beta}{200}$

10. **Statement-1:** The sum of the series 1 + (1 + 2 + 4) + (4 + 6 + 9) + (9 + 12 + 16) + ... + (361 + 380 + 400) is 8000. **[AIEEE-2012, (4, –1)/120]**
Statement-2 : $\sum_{k=1}^{n} (k^3 - (k-1)^3) = n^3$, for any natural number n.
(1) Statement-1 is false, Statement-2 is true.
(2) Statement-1 is true, statement-2 is true; statement-2 is a correct explanation for Statement-1.
(3) Statement-1 is true, statement-2 is true; statement-2 is **not** a correct explanation for Statement-1.
(4) Statement-1 is true, statement-2 is false.

11. If 100 times the 100_{th} term of an AP with non zero common difference equals the 50 times its 50_{th} term, then the 150_{th} term of this AP is : **[AIEEE-2012, (4, –1)/120]**
(1) – 150 (2) 150 times its 50_{th} term
(3) 150 (4) zero

12. The sum of first 20 terms of the sequence 0.7, 0.77, 0.777,....., is **[AIEEE - 2013, (4, – 1) 120]**
(1) $\frac{7}{81}(179 - 10^{-20})$ (2) $\frac{7}{9}(99 - 10^{-20})$ (3) $\frac{7}{81}(179 + 10^{-20})$ (4) $\frac{7}{9}(99 + 10^{-20})$

13. If $(10)^9 + 2(11)^1(10)^8 + 3(11)^2(10)^7 + ... + 10(11)^9 = k(10)^9$, then k is equal to **[JEE(Main) 2014, (4, – 1), 120]**
(1) 100 (2) 110 (3) $\frac{121}{10}$ (4) $\frac{441}{100}$

14. Three positive numbers form an increasing G.P. If the middle term in this G.P. is doubled, the new numbers are in A.P. Then the common ratio of the G.P. is **[JEE(Main) 2014, (4, – 1), 120]**
(1) $2 - \sqrt{3}$ (2) $2 + \sqrt{3}$ (3) $\sqrt{2} + \sqrt{3}$ (4) $3 + \sqrt{3}$

15. If m is the A. M. of two distinct real numbers l and n(l, n > 1) and G_1, G_2 and G_3 are three geometric means between l and n, then $G_1^4 + 2G_2^4 + G_3^4$ equals : **[JEE(Main) 2015, (4, – 1), 120]**
(1) $4l^2mn$ (2) $4lm^2n$ (3) $4lmn^2$ (4) $4l^2m^2n^2$

16. The sum of first 9 terms of the series $\frac{1^3}{1}+\frac{1^3+2^3}{1+3}+\frac{1^3+2^3+3^3}{1+3+5}+.........$ is : **[JEE(Main) 2015, (4, – 1), 120]**

(1) 71 (2) 96 (3) 142 (4) 192

17. If the 2^{nd}, 5^{th} and 9^{th} terms of a non-constant A.P. are in G.P., then the common ratio of this G.P. is: **[JEE(Main) 2016, (4, – 1), 120]**

(1) $\frac{4}{3}$ (2) 1 (3) $\frac{7}{4}$ (4) $\frac{8}{5}$

18. If the sum of the first ten terms of the series $\left(1\frac{3}{5}\right)^2+\left(2\frac{2}{5}\right)^2+\left(3\frac{1}{5}\right)^2+4^2+\left(4\frac{4}{5}\right)^2+..........$, is $\frac{16}{5}$ m, then m is equal to : **[JEE(Main) 2016, (4, – 1), 120]**

(1) 101 (2) 100 (3) 99 (4) 102

19. For any three positive real numbers a, b and c, $9(25a^2 + b^2) + 25(c^2 – 3ac) = 15b(3a + c)$, Then **[JEE(Main) 2017, (4, – 1), 120]**

(1) b , c and a are in G.P. (2) b, c and a are in A.P.
(3) a, b and c are in A.P. (4) a, b and c are in G.P.

20. Let $a,b,c \in R$. If $f(x) = ax^2 + bx + c$ is such that $a + b + c = 3$ and $f(x + y) = f(x) + f(y) + xy$, $\forall x,y \in R$, then $\sum_{n=1}^{10} f(n)$ is equal to **[JEE(Main) 2017, (4, – 1), 120]**

(1) 330 (2) 165 (3) 190 (4) 225

21. If, for a positive integer n, the quadratic equation, $x(x + 1) + (x + 1)(x + 2) +.....+ (x + \overline{n-1})(x + n) = 10n$ has two consecutive integral solutions, then n is equal to **[JEE(Main) 2017, (4, – 1), 120]**

(1) 12 (2) 9 (3) 10 (4) 11

PART - II : JEE (ADVANCED) / IIT-JEE PROBLEMS (PREVIOUS YEARS)

1. If $a_1, a_2, a_3, ..., a_n$ are positive real numbers whose product is a fixed number c, then the minimum value of $a_1 + a_2 + a_3 + ... + a_{n-1} + 2a_n$ is **[IIT-JEE-2002, Scr. , (3, –1), 90]**

(A) $n(2c)^{1/n}$ (B) $(n + 1)\, c^{1/n}$ (C) $2nc^{1/n}$ (D) $(n + 1)(2c)^{1/n}$

2. Suppose a, b, c are in A.P. and a^2, b^2, c^2 are in G.P. if a < b < c and a + b + c = $\frac{3}{2}$, then the value of a is **[IIT-JEE-2002, Scr. , (3, –1), 90]**

(A) $\frac{1}{2\sqrt{2}}$ (B) $\frac{1}{2\sqrt{3}}$ (C) $\frac{1}{2}-\frac{1}{\sqrt{3}}$ (D) $\frac{1}{2}-\frac{1}{\sqrt{2}}$

3. If $\alpha \in \left(0, \frac{\pi}{2}\right)$, then $\sqrt{x^2+x}+\frac{\tan^2\alpha}{\sqrt{x^2+x}}$ is always greater than or equal to: **[IIT-JEE-2003, Scr. , (3, –1), 84]**

(A) 2 tan α (B) 1 (C) 2 (D) $\sec^2 \alpha$

4. An infinite G.P. has first term as x and sum upto infinity as 5. Then the range of values of ‘x’ is: **[IIT-JEE-2004, Scr. , (3, –1), 84]**

(A) $x \le -10$ (B) $x \ge 10$ (C) $0 < x < 10$ (D) $-10 \le x \le 10$

5. In the quadratic equation $ax^2 + bx + c = 0$, $a \neq 0$, $\Delta = b^2 - 4ac$ and $\alpha + \beta$, $\alpha^2 + \beta^2$, $\alpha^3 + \beta^3$ are in G.P. where α, β are the root of $ax^2 + bx + c = 0$, then **[IIT-JEE-2005, Scr. , (3, –1), 84]**

(A) $\Delta \neq 0$ (B) $b\Delta = 0$ (C) $c\Delta = 0$ (D) $\Delta = 0$

6. Let $a_1, a_2, a_3,....$ be in harmonic progression with $a_1 = 5$ and $a_{20} = 25$. The least positive integer n for which $a_n < 0$ is **[IIT-JEE 2012, Paper-2, (3, –1), 66]**

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

7. The least value of $\alpha \in R$ for which $4\alpha x^2 + \frac{1}{x} \geq 1$, for all $x > 0$, is **[JEE (Advanced) 2016, Paper-1, (3, –1)/62]**

(A) $\frac{1}{64}$ (B) $\frac{1}{32}$ (C) $\frac{1}{27}$ (D) $\frac{1}{25}$

8. 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, Paper-2, (3, –1)/62]**

(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 $a_{101} < b_{101}$]

Answers

EXERCISE # 1

Section (A)

A-1. (2) **A-2.** (3) **A-3.** (1) **A-4.** (4) **A-5.** (2) **A-6.** (2) **A-7.** (3)
A-8. (3) **A-9.** (1) **A-10.** (3) **A-11.** (4) **A-12.** (2) **A-13.** (3) **A-14.** (2)
A-15. (3) **A-16.** (1) **A-17.** (4) **A-18.** (2) **A-19.** (1)

Section (B)

B-1. (4) **B-2.** (1) **B-3.** (2) **B-4.** (1) **B-5.** (3) **B-6.** (3) **B-7.** (2)
B-8. (1) **B-9.** (4) **B-10.** (3) **B-11.** (3) **B-12.** (3) **B-13.** (2) **B-14.** (3)
B-15. (2) **B-16.** (3) **B-17.** (1) **B-18.** (1) **B-19.** (3) **B-20.** (2) **B-21.** (3)
B-22. (1)

Section (C)

C-1. (3) **C-2.** (3) **C-3.** (2) **C-4.** (2) **C-5.** (3) **C-6.** (3) **C-7.** (1)
C-8. (1) **C-9.** (2) **C-10.** (3)
C-11. (2) **C-12.** (2)
C-13. (2)
C-14. (2)
C-15. (1) **C-16.** (3)
C-17. (2) **C-18.** (2)

Section (D)

D-1. (1) **D-2.** (3) **D-3.** (3) **D-4.** (4) **D-5.** (1) **D-6.** (2) **D-7.** (1)
D-8. (4)

Section (E)

E-1. (1) **E-2.** (3) **E-3.** (3) **E-4.** (1) **E-5.** (3) **E-6.** (1) **E-7.** (4)
E-8. (2) **E-9.** (1) **E-10.** (2) **E-11.** (2) **E-12.** (1) **E-13.** (3)

EXERCISE # 2

PART - I

1. (4) **2.** (1) **3.** (3) **4.** (2) **5.** (2) **6.** (3) **7.** (1)

8.	(1)	**9.**	(2)	**10.**	(2)	**11.**	(1)	**12.**	(2)	**13.**	(2)	**14.**	(2)
15.	(4)	**16.**	(2)	**17.**	(1)	**18.**	(1)	**19.**	(3)	**20.**	(1)	**21.**	(1)
22.	(4)	**23.**	(2)	**24.**	(1)	**25.**	(4)	**26.**	(1)	**27.**	(3)	**28.**	(1)

PART - II

Section (A)

A-1. (1) **A-2.** (1) **A-3.** (3) **A-4.** (2)

Section (B)

B-1. (3) **B-2.** (2)

Section (C)

C-1. (2, 3) **C-2.** (2, 4) **C-3.** (1, 2) **C-4.** (1, 2)

EXERCISE # 3

PART - I

1.	(3)	**2.**	(3)	**3.**	(4)	**4.**	(4)	**5.**	(2)	**6.**	(2)	**7.**	(1)
8.	(4)	**9.**	(2)	**10.**	(2)	**11.**	(4)	**12.**	(3)	**13.**	(1)	**14.**	(2)
15.	(2)	**16.**	(2)	**17.**	(1)	**18.**	(1)	**19.**	(2)	**20.**	(1)	**21.**	(4)

PART - II

1.	(A)	**2.**	(D)	**3.**	(A)	**4.**	(C)	**5.**	(C)	**6.**	(D)	**7.**	(C)
8.	(B)												