

Followings are of 2 Marks each (Q01-05).

Q01. Evaluate : $\sum_{r=2}^{10} (3 + 2^{2r})$.

Q02. Prove that the sum of n arithmetic means between any two numbers is n times the single arithmetic mean between them.

Q03. For what value of n , $\frac{a^{n+1} + b^{n+1}}{a^n + b^n}$ is the arithmetic mean of a and b ?

Q04. Sum of terms of an infinite geometric progression is 15 and the sum of the squares of these terms is 45. Deduce the progression.

Q05. Let $x = 1 + a + a^2 + \dots$ and $y = 1 + b + b^2 + \dots$ where $|a| < 1, |b| < 1$.

Then, prove that : $1 + ab + a^2b^2 + \dots = \frac{xy}{x + y - 1}$. [2 × 5 = 10]

Followings are of 3 Marks each (Q06-07).

Q06. If a, b, c are in G.P. and x be the A.M. between a, b and y be the A.M. between b, c respectively, then show that $\frac{a}{x} + \frac{c}{y} = 2$.

Q07. Prove that $P^2 = \left(\frac{S}{R}\right)^n$ where S be the sum, P the product and R the sum of reciprocals of n terms in a geometric progression.

OR

Evaluate : $5 + 55 + 555 + 5555 + \dots$ upto n terms. [3 × 2 = 6]

Following is of 4 Marks (Q08).

Q08. **PASSAGE BASED QUESTION :** Let $G_1, G_2, G_3, \dots, G_n$ be n G.M.'s between a and b .

Then $a, G_1, G_2, G_3, \dots, G_n, b$ are in G.P. Here 'b' is the $(n+2)^{\text{th}}$ term i.e., $b = ar^{(n+2)-1} = ar^{n+1}$.

This gives, $r = \left(\frac{b}{a}\right)^{\frac{1}{n+1}}$.

Thus first G.M. means 2^{nd} term of the G.P. i.e., $G_1 = ar = a \left(\frac{b}{a}\right)^{\frac{1}{n+1}}$; second G.M. means 3^{rd} term of the

G.P. i.e., $G_2 = ar^2 = a \left(\frac{b}{a}\right)^{\frac{2}{n+1}}$ and so on.

Hence, n^{th} G.M. between a and b is given as, $G_n = ar^n = a \left(\frac{b}{a}\right)^{\frac{n}{n+1}}$.

Based on the above information, answer the following questions.

(a) Insert four geometric means between 5 and 160.

(b) Find the value of k , such that $\frac{a^{k+1} + b^{k+1}}{a^k + b^k}$ represents the single geometric mean between positive numbers a and b . [2 × 2 = 4]

Followings are of 5 Marks each (Q09-10).

Q09. The ratio of A.M. and G.M. of two positive numbers a and b is $m : n$. Deduce $a : b$.

OR

Sum of three numbers in G.P. is 56. If we subtract 1, 7, 21 from these numbers in that order, we obtain an A.P. Find these numbers.

Q10. If p, q, r are in the geometric progression and the equations, $px^2 + 2qx + r = 0$ and $dx^2 + 2ex + f = 0$ have a common root, then show that $\frac{d}{p}, \frac{e}{q}, \frac{f}{r}$ are in arithmetic progression. [5 × 2 = 10]

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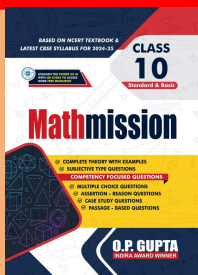
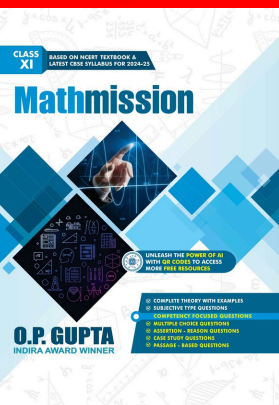
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