

FlexiPrep

CBSE Class 10-Mathematics: Chapter – 5 Arithmetic Progressions Part 23 (For CBSE, ICSE, IAS, NET, NRA 2022)

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Question 19:

If $(p + 1)^{\text{th}}$ term of an A. P is twice the $(q + 1)^{\text{th}}$ term, show that $(3p + 1)^{\text{th}}$ term is twice the $(p + q + 1)^{\text{th}}$ term.

Answer:

$$\begin{aligned}
 a_{p+1} &= 2a_{q+1} \\
 \Rightarrow a + (p + 1 - 1)d &= 2[a + (q + 1 - 1)d] \\
 \Rightarrow a + pd &= 2[a + qd] \\
 \Rightarrow a + pd &= 2a + 2qd \\
 \Rightarrow pd - 2qd &= a \\
 \Rightarrow (p - 2q)d &= a \\
 \frac{a_{3p+1}}{a_{p+q+1}} &= \frac{a + (3p + 1 - 1)d}{a + (p + q + 1 - 1)d} \\
 &= \frac{(p - 2q)d + 3pd}{p - 2q + (p + q)d} \\
 &= 2
 \end{aligned}$$

Question 20:

The sum of four numbers in AP is 50 and the greatest number four times the least. Find the numbers.

Answer:

Let no. be $(a - 3d)$, $(a - d)$, $(a + d)$, $(a + 3d)$

$$\begin{aligned}
 (a - 3d) + (a - d) + (a + d) + (a + 3d) &= 50 \\
 \Rightarrow 4a &= 50 \\
 \Rightarrow a &= \frac{50}{4}
 \end{aligned}$$

$$= \frac{25}{2}$$

According to question,

$$(a + 3d) = 4 \times (a - 3d)$$

$$\Rightarrow a + 3d = 4a - 12d$$

$$\Rightarrow -3a = -15d$$

$$\Rightarrow a = 5d$$

$$\Rightarrow \frac{25}{2} = 5d$$

$$\Rightarrow \frac{5}{2}$$

$$= d$$

Numbers be 5,10,15,20

Question 21:

Find the sum of all integers between 84 and 719 which are multiples of 5 .

Answer:

$$85,90,95,\dots,715$$

$$a = 85$$

$$d = 5$$

$$a_n = 715$$

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

$$\Rightarrow 85 + (n - 1) \cdot 5 = 715$$

$$\Rightarrow n = 127$$

$$S_{127} = \frac{127}{2}(85 + 715)$$

$$= 50800$$

Question 22:

If m^{th} term of an A. P is $\frac{1}{n}$ and the n^{th} term is $\frac{1}{m}$, show that the sum of mn terms is

$$\frac{1}{2}(mn + 1).$$

Answer:

$$\frac{1}{n} = a + (m - 1) d \cdots (i)$$

$$\frac{1}{m} = a + (n + 1) d \cdots (ii)$$

On solving (i) and (ii)

$$a = \frac{1}{mn},$$

$$d = \frac{1}{mn}$$

$$\begin{aligned} S_{mn} &= \frac{mn}{2} [2a + (mn - 1) d] \\ &= \frac{mn}{2} \left[2 \cdot \frac{1}{mn} + (mn - 1) \cdot \frac{1}{mn} \right] \\ &= \frac{1}{2} (mn + 1) \end{aligned}$$

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