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தொகுப்பு: ந. சண்முகசுந்தரம் (மருதம் ஆசிரியர்), அ.எண்: 96598 38789

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10th – MATHEMATICS

Unit 2 - Numbers and Sequences

Exercise 2.10



Multiple choice questions

- Euclid's division lemma states that for positive integers a and b , there exist unique integers q and r such that $a = bq + r$, where r must satisfy.

(A) $1 < r < b$ (B) $0 < r < b$ (C) $0 \leq r < b$ (D) $0 < r \leq b$
- Using Euclid's division lemma, if the cube of any positive integer is divided by 9 then the possible remainders are

(A) 0, 1, 8 (B) 1, 4, 8 (C) 0, 1, 3 (D) 1, 3, 5
- If the HCF of 65 and 117 is expressible in the form of $65m - 117$, then the value of m is

(A) 4 (B) 2 (C) 1 (D) 3
- The sum of the exponents of the prime factors in the prime factorization of 1729 is

(A) 1 (B) 2 (C) 3 (D) 4
- The least number that is divisible by all the numbers from 1 to 10 (both inclusive) is

(A) 2025 (B) 5220 (C) 5025 (D) 2520
- $7^{48} \equiv \text{_____} \pmod{100}$

(A) 1 (B) 2 (C) 3 (D) 4
- Given $F_1 = 1$, $F_2 = 3$ and $F_n = F_{n-1} + F_{n-2}$ then F_5 is

(A) 3 (B) 5 (C) 8 (D) 11
- The first term of an arithmetic progression is unity and the common difference is 4. Which of the following will be a term of this A.P.

(A) 4551 (B) 10091 (C) 7881 (D) 13531
- If 6 times of 6th term of an A.P. is equal to 7 times the 7th term, then the 13th term of the A.P. is

(A) 0 (B) 6 (C) 7 (D) 13
- An A.P. consists of 31 terms. If its 10th term is m , then the sum of all the terms of this A.P. is

(A) 16 m (B) 62 m (C) 31 m (D) $\frac{31}{2} m$
- In an A.P., the first term is 1 and the common difference is 4. How many terms of the A.P. must be taken for their sum to be equal to 120?

(A) 6 (B) 7 (C) 8 (D) 9
- If $A = 2^{64}$ and $B = 2^{61} + 2^{62} + 2^{63} + \dots + 2^{64}$ which of the following is true?

(A) B is 2^{64} more than A (B) A and B are equal
(C) B is larger than A by 1 (D) A is larger than B by 1

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13. The next term of the sequence $\frac{3}{16}, \frac{1}{8}, \frac{1}{12}, \frac{1}{18}, \dots$ is

- (A) $\frac{1}{24}$ (B) $\frac{1}{27}$ (C) $\frac{2}{3}$ (D) $\frac{1}{81}$

14. If the sequence t_1, t_2, t_3, \dots are in A.P. then the sequence $t_6, t_{12}, t_{18}, \dots$ is

- (A) a Geometric Progression (B) an Arithmetic Progression
(C) neither an Arithmetic Progression nor a Geometric Progression
(D) a constant sequence

15. The value of $(1^3 + 2^3 + 3^3 + \dots + 15^3) - (1 + 2 + 3 + \dots + 15)$ is

- (A) 14400 (B) 14200 (C) 14250 (D) 14520

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Example 2.5 Find the greatest number that will divide 445 and 572 leaving remainders 4 and 5 respectively.

2. A man has 532 flower pots. He wants to arrange them in rows such that each row contains 21 flower pots. Find the number of completed rows and how many flower pots are left over.
3. Prove that the product of two consecutive positive integers is divisible by 2.
9. A positive integer when divided by 88 gives the remainder 61. What will be the remainder when the same number is divided by 11?
10. Prove that two consecutive positive integers are always coprime.

Example 2.10 'a' and 'b' are two positive integers such that $a^b \times b^a = 800$. Find 'a' and 'b'.

5. If $p_1^{x_1} \times p_2^{x_2} \times p_3^{x_3} \times p_4^{x_4} = 113400$ where p_1, p_2, p_3, p_4 are primes in ascending order and x_1, x_2, x_3, x_4 are integers, find the value of p_1, p_2, p_3, p_4 and x_1, x_2, x_3, x_4 .

9. Find the least number that is divisible by the first ten natural numbers.

Example 2.11 Find the remainders when 70004 and 778 is divided by 7.

Example 2.17 A man starts his journey from Chennai to Delhi by train. He starts at 22.30 hours on Wednesday. If it takes 32 hours of travelling time and assuming that the train is not late, when will he reach Delhi?

Example 2.18 Kala and Vani are friends. Kala says, "Today is my birthday" and she asks Vani, "When will you celebrate your birthday?" Vani replies, "Today is Monday and I celebrated my birthday 75 days ago". Find the day when Vani celebrated her birthday.

7. Today is Tuesday. My uncle will come after 45 days. In which day my uncle will be coming?
10. The duration of flight travel from Chennai to London through British Airlines is approximately 11 hours. The airplane begins its journey on Sunday at 23:30 hours. If the time at Chennai is four and half hours ahead to that of London's time, then find the time at London, when will the flight lands at London Airport.

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Example 2.21 The general term of a sequence is defined as

$$a_n = \begin{cases} n(n+3); & n \in \mathbb{N} \text{ is odd} \\ n^2 + 1 & ; n \in \mathbb{N} \text{ is even} \end{cases}$$

Find the eleventh and eighteenth terms.

Example 2.22 Find the first five terms of the following sequence.

$$a_1 = 1, a_2 = 1, a_n = \frac{a_{n-1}}{a_{n-2} + 3}; n \geq 3, n \in \mathbb{N}$$

6. If $a_1 = 1, a_2 = 1$ and $a_n = 2a_{n-1} + a_{n-2}, n \geq 3, n \in \mathbb{N}$, then find the first six terms of the sequence.

Example 2.23 Check whether the following sequences are in A.P. or not?

(i) $x + 2, 2x + 3, 3x + 4, \dots$ (ii) $2, 4, 8, 16, \dots$ (iii) $3\sqrt{2}, 5\sqrt{2}, 7\sqrt{2}, 9\sqrt{2}, \dots$

Example 2.24 Write an A.P. whose first term is 20 and common difference is 8.

An Arithmetic progression having a common difference of zero is called a constant arithmetic progression.

Example 2.27 Determine the general term of an A.P. whose 7th term is -1 and 16th term is 17.

Example 2.29 In an A.P., sum of four consecutive terms is 28 and the sum of their squares is 276. Find the four numbers.

Example 2.30 A mother divides ₹207 into three parts such that the amount are in A.P. and gives it to her three children. The product of the two least amounts that the children had ₹4623. Find the amount received by each child.

7. If nine times ninth term is equal to the fifteen times fifteenth term, show that six times twenty fourth term is zero.

8. If $3 + k, 18 - k, 5k + 1$ are in A.P. then find k .

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10th to 12th important Questions upload soon.

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14. Priya earned ₹15,000 in the first month. Thereafter her salary increased by ₹1500 per year. Her expenses are ₹13,000 during the first month and the expenses increases by ₹900 per year. How long will it take for her to save ₹20,000 per month.

Example 2.32 Find the sum of $0.40 + 0.43 + 0.46 + \dots + 1$.

Example 2.33 How many terms of the series $1 + 5 + 9 + \dots$ must be taken so that their sum is 190?

Example 2.36 Find the sum of all natural numbers between 300 and 600 which are divisible by 7.

Example 2.38 The houses of a street are numbered from 1 to 49. Senthil's house is numbered such that the sum of numbers of the houses prior to Senthil's house is equal to the sum of numbers of the houses following Senthil's house. Find Senthil's house number?

11. If $S_1, S_2, S_3, \dots, S_m$ are the sums of n terms of m A.P.'s whose first terms are $1, 2, 3, \dots, m$ and whose common differences are $1, 3, 5, \dots, (2m - 1)$ respectively, then show that

$$S_1 + S_2 + S_3 + \dots + S_m = \frac{1}{2} mn(mn + 1).$$

12. Find the sum $\left[\frac{a-b}{a+b} + \frac{3a-2b}{a+b} + \frac{5a-3b}{a+b} + \dots \text{to 12 terms} \right]$.

Example 2.43 In a Geometric progression, the 4th term is $\frac{8}{9}$ and the 7th term is $\frac{64}{243}$. Find the Geometric Progression.

Example 2.44 The product of three consecutive terms of a Geometric Progression is 343 and their sum is $\frac{91}{2}$. Find the three terms.

10. A man joined a company as Assistant Manager. The company gave him a starting salary of ₹60,000 and agreed to increase his salary 5% annually. What will be his salary after 5 years?
12. If a, b, c are three consecutive terms of an A.P. and x, y, z are three consecutive terms of a G.P. then prove that $x^{b-c} \times y^{c-a} \times z^{a-b} = 1$.

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Example 2.50 Find the rational form of the number 0.6666...

Example 2.51 Find the sum to n terms of the series $5 + 55 + 555 + \dots$

Example 2.53 A person saved money every year, half as much as he could in the previous year. If he had totally saved ₹ 7875 in 6 years then how much did he save in the first year?

8. Kumar writes a letter to four of his friends. He asks each one of them to copy the letter and mail to four different persons with the instruction that they continue the process similarly. Assuming that the process is unaltered and it costs ₹2 to mail one letter, find the amount spent on postage when 8th set of letters is mailed.
9. Find the rational form of the number $0.\overline{123}$.

Example 2.58 If $1 + 2 + 3 + \dots + n = 666$ then find n .

4. How many terms of the series $1^3 + 2^3 + 3^3 + \dots$ should be taken to get the sum 14400?
5. The sum of the cubes of the first n natural numbers is 2025, then find the value of n .
6. Rekha has 15 square colour papers of sizes 10 cm, 11 cm, 12 cm, ..., 24 cm. How much area can be decorated with these colour papers?
5. If $(m + 1)^{\text{th}}$ term of an A.P. is twice the $(n + 1)^{\text{th}}$ term, then prove that $(3m + 1)^{\text{th}}$ term is twice the $(m + n + 1)^{\text{th}}$ term.
7. Two A.P.'s have the same common difference. The first term of one A.P. is 2 and that of the other is 7. Show that the difference between their 10th terms is the same as the difference between their 21st terms, which is the same as the difference between any two corresponding terms.

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