

SSC GD Constable Exam: Relationship between Numbers

Syllabus Summary

Overview:

The Relationship between Numbers is a crucial topic in the Mathematics section of the SSC GD Constable Exam, contributing approximately 3–5 questions (6–10 marks out of 160 total marks) in the Computer-Based Examination (CBE). The syllabus focuses on understanding the connections between numbers, including divisibility, factors, multiples, Highest Common Factor (HCF), Lowest Common Multiple (LCM), and their applications in problem-solving. Questions test conceptual understanding, computational skills, and application of number properties at a 10th-grade level. The exam includes 80 questions (2 marks each, 0.50 negative marking per wrong answer) to be completed in 60 minutes.

Key Topics in Relationship between Numbers:

1. Divisibility: Rules for divisibility and their applications.
2. Factors and Multiples: Identifying factors, prime factorization, and multiples.
3. HCF and LCM: Calculating Highest Common Factor and Lowest Common Multiple, and their uses in problem-solving.
4. Prime and Composite Numbers: Identifying and working with prime and composite numbers.
5. Remainder and Factor Theorems: Applying theorems to find remainders and factors.
6. Number Patterns: Recognizing relationships in sequences or series.
7. Word Problems: Applying number relationships in real-world scenarios (e.g., time, quantities, ratios).
8. Properties of Numbers: Using commutative, associative, and distributive properties to understand relationships.

Important Formula and Theorems:

1. Divisibility Rules:
 - Divisible by 2: Last digit is even (0, 2, 4, 6, 8).

- Divisible by 3: Sum of digits is divisible by 3.
- Divisible by 4: Last two digits form a number divisible by 4.
- Divisible by 5: Last digit is 0 or 5.
- Divisible by 6: Number is divisible by both 2 and 3.
- Divisible by 8: Last three digits form a number divisible by 8.
- Divisible by 9: Sum of digits is divisible by 9.
- Divisible by 10: Last digit is 0.
- Divisible by 11: Difference between sum of alternate digits is 0 or divisible by 11.
- Example: 342 is divisible by 3 ($3 + 4 + 2 = 9$) and 2 (last digit 2), hence by 6.

2. HCF and LCM:

- HCF(a, b): Highest Common Factor, found using Euclidean Algorithm ($\text{HCF}(a, b) = \text{HCF}(b, a \bmod b)$).
- Example: $\text{HCF}(12, 18)$: $18 = 12 \times 1 + 6$, $12 = 6 \times 2 + 0$, $\text{HCF} = 6$.
- LCM(a, b): Lowest Common Multiple, calculated as $\text{LCM}(a, b) = (a \times b) / \text{HCF}(a, b)$.
- Example: $\text{LCM}(12, 18) = (12 \times 18) / 6 = 36$.
- Applications:
 - HCF: Used to find the largest size of equal parts (e.g., dividing quantities).
 - LCM: Used to find the smallest common multiple (e.g., time for events to coincide).

3. Prime Factorization:

- Express a number as a product of prime factors.
- Example: $60 = 2^2 \times 3^1 \times 5^1$.
- Used to find HCF (product of common factors with lowest powers) and LCM (product of all factors with highest powers).

4. Remainder Theorem:

- For $a \div b$, $a = b \times q + r$, where q is the quotient, r is the remainder ($0 \leq r < b$).
- Example: $17 \div 5 = 3$ (quotient), remainder 2 ($17 = 5 \times 3 + 2$).

- Fermat's Little Theorem (simplified): If p is prime and a is not divisible by p , $a^{(p-1)} \equiv 1 \pmod{p}$.

- Example: Remainder of $2^6 \div 7 = 1$ (since $2^6 \equiv 1 \pmod{7}$).

5. Factor Theorem:

- A number x is a factor of n if $n \div x$ leaves no remainder ($n \bmod x = 0$).

- Example: 3 is a factor of 12 since $12 \div 3 = 4$ (no remainder).

6. Number Patterns:

- Arithmetic Sequence: $a_n = a_1 + (n-1)d$, where d is the common difference.

- Example: Sequence 3, 7, 11, ... has $d = 4$; 5th term = $3 + (5-1) \times 4 = 19$.

- Geometric Sequence: $a_n = a_1 \times r^{(n-1)}$, where r is the common ratio.

- Example: Sequence 2, 6, 18, ... has $r = 3$; 4th term = $2 \times 3^{(4-1)} = 54$.

7. Properties of Numbers:

- Commutative: $a + b = b + a$; $a \times b = b \times a$.

- Associative: $(a + b) + c = a + (b + c)$; $(a \times b) \times c = a \times (b \times c)$.

- Distributive: $a \times (b + c) = a \times b + a \times c$.

- Example: $3 \times (4 + 5) = 3 \times 4 + 3 \times 5 = 27$.

8. Word Problem Applications:

- HCF: Find the largest number dividing two quantities.

- Example: Largest tile size to cover 24m and 36m lengths = $\text{HCF}(24, 36) = 12\text{m}$.

- LCM: Find the smallest time for events to coincide.

- Example: Bells ringing every 6 and 8 seconds ring together after $\text{LCM}(6, 8) = 24$ seconds.

Key Points for SSC GD Preparation:

- Focus Areas: Divisibility rules, HCF/LCM calculations, prime factorization, and word problems involving number relationships are frequently tested.

- Question Types: Direct questions (e.g., find HCF of 12 and 18), remainder calculations, sequence identification, and word problems (e.g., time for events to coincide).
- Difficulty Level: 10th-grade level, requiring quick calculations and understanding of number properties.
- Practice Tips: Memorize divisibility rules, master HCF/LCM using Euclidean Algorithm, practice remainder calculations, and solve word problems from past SSC GD papers.

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