Chapter 05 Prime Time

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Mindmap

- Factors and Multiples
  - Factor: A number that divides another number exactly
    Example: Factors of 12 → 1, 2, 3, 4, 6, 12
  - Multiple: Product of a number and any whole number
    Example: Multiples of 5 → 5, 10, 15, 20…
- Prime Numbers
  - Numbers with exactly two factors: 1 and itself
    Example: 2, 3, 5, 7, 11, 13…
  - Smallest prime number: 2 (only even prime)
- Composite Numbers
  - Numbers with more than two factors
    Example: 4, 6, 8, 9, 10…
- Even and Odd Numbers
  - Even: Divisible by 2 → 2, 4, 6…
  - Odd: Not divisible by 2 → 1, 3, 5…
- Twin Primes
  - Pair of prime numbers differing by 2
    Example: (3, 5), (5, 7), (11, 13)
- Prime Factorisation
  - Expressing a number as product of prime numbers
    Example: $24 = 2 \times 2 \times 2 \times 3 = 2^3 \times 3$
- Divisibility Rules
  - By 2: Last digit even
  - By 3: Sum of digits divisible by 3
  - By 4: Last two digits divisible by 4
  - By 5: Ends with 0 or 5
  - By 6: Divisible by both 2 and 3
  - By 9: Sum of digits divisible by 9
  - By 10: Ends with 0
- HCF (Highest Common Factor)
  - Greatest number that divides two or more numbers
    Example: HCF of 12 and 18 → Factors: 12 → 1,2,3,4,6,12; 18 → 1,2,3,6,9,18 → HCF = 6
- LCM (Least Common Multiple)
  - Smallest number divisible by two or more numbers
    Example: LCM of 4 and 6 → Multiples of 4: 4,8,12,16…; 6: 6,12,18… → LCM = 12

Notes with Relevant Examples

1. Factors
    - Definition: A factor divides a number without leaving a remainder.
    - Example: Factors of 15 → 1, 3, 5, 15
2. Multiples
    - Definition: Obtained by multiplying the number by 1, 2, 3…
    - Example: First five multiples of 7 → 7, 14, 21, 28, 35
3. Prime vs Composite
    - 17 → Prime (factors: 1, 17)
    - 21 → Composite (factors: 1, 3, 7, 21)
4. Even/Odd
    - Even numbers end in 0, 2, 4, 6, 8
    - Odd numbers end in 1, 3, 5, 7, 9
5. Twin Primes
    - (17, 19) is a twin prime pair (difference = 2)
6. Prime Factorisation
    - $36 = 2 \times 2 \times 3 \times 3 = 2^2 \times 3^2$
7. Divisibility Rule Example
    - 234 → Sum = 2+3+4 = 9 → divisible by 3 and 9
    - 450 → Ends with 0 → divisible by 2, 5, 10
8. HCF by Prime Factorisation
    - $24 = 2^3 \times 3$
    - $36 = 2^2 \times 3^2$
    - Common = $2^2 \times 3 = 12$ → HCF = 12
9. LCM by Prime Factorisation
    - $8 = 2^3$, $12 = 2^2 \times 3$
    - LCM = $2^3 \times 3 = 24$

Unit Test

1. List all the factors of 20.
2. Write the first four multiples of 9.
3. Identify which of the following are prime: 13, 25, 29, 33.
4. Is 56 divisible by 4? Justify using the divisibility rule.
5. Find the HCF of 18 and 24.
6. Find the LCM of 6 and 8.
7. Write a pair of twin primes between 20 and 40.
8. Express 48 as a product of prime factors.
9. Which is the smallest even prime number?
10. Is 1 a prime number? Give reason.

Worksheets

Worksheet A

1. Write all factors of 28.
2. Find the first five multiples of 11.
3. Separate the following into prime and composite: 2, 9, 15, 17, 23, 27, 31.
4. Check divisibility of 315 by 3 and 9.
5. Find HCF of 30 and 45.

Worksheet B

1. What is the LCM of 5 and 10?
2. Express 60 as product of prime factors.
3. List twin prime pairs less than 20.
4. Is 0 an even number? Why?
5. Find the common factors of 16 and 24.

Solutions to Unit Test

1. Factors of 20: 1, 2, 4, 5, 10, 20
2. Multiples of 9: 9, 18, 27, 36
3. Prime numbers: 13, 29
4. Yes. Last two digits = 56. 56 ÷ 4 = 14 → divisible by 4.
5. Factors of 18: 1,2,3,6,9,18; 24: 1,2,3,4,6,8,12,24 → HCF = 6
6. Multiples of 6: 6,12,18,24…; 8: 8,16,24… → LCM = 24
7. (29, 31) or (41, 43) → only (29, 31) lies between 20–40
8. $48 = 2 \times 2 \times 2 \times 2 \times 3 = 2^4 \times 3$
9. 2
10. No. 1 has only one factor (itself), but prime numbers must have exactly two factors.

Solutions to Worksheets

Worksheet A

1. Factors of 28: 1, 2, 4, 7, 14, 28
2. Multiples of 11: 11, 22, 33, 44, 55
3. Prime: 2, 17, 23, 31; Composite: 9, 15, 27
4. Sum of digits = 3+1+5 = 9 → divisible by both 3 and 9
5. $30 = 2 \times 3 \times 5$; $45 = 3 \times 3 \times 5$ → HCF = $3 \times 5 = 15$

Worksheet B

1. LCM of 5 and 10 = 10
2. $60 = 2 \times 2 \times 3 \times 5 = 2^2 \times 3 \times 5$
3. (3,5), (5,7), (11,13), (17,19)
4. Yes. 0 is divisible by 2 (0 ÷ 2 = 0, remainder 0)
5. Factors of 16: 1,2,4,8,16; 24: 1,2,3,4,6,8,12,24 → Common: 1,2,4,8