

CLASS 8 · HOTS · OLYMPIAD PREPARATION · SHORT NOTES

Chapter 3: HOTS: Number Play (Class 8)

Topic-wise short notes with solved examples

Higher order thinking questions on number play for Class 8: sums of consecutive numbers, divisibility tests for 3, 9 and 11, remainders and digital roots, each with a full solution.

1 Solved HOTS questions

- Divisibility tests: a number is divisible by 3 (or 9) when its digit sum is; it is divisible by 11 when the difference between the sum of the digits in the odd places and the sum of those in the even places is 0 or a multiple of 11. A number leaves the same remainder as its digit sum when divided by 9.

Example 1.1 Show that the sum of three consecutive whole numbers is always a multiple of 3.

SOLUTION

Let the numbers be $n - 1$, n and $n + 1$.

Their sum is $3n$, which is a multiple of 3.

The sum is always $3n$

Example 1.2 Find the digit $*$ so that the number $34*5$ is divisible by 3. List all the possible digits.

SOLUTION

The digit sum is $3 + 4 + * + 5 = 12 + *$. It must be a multiple of 3.

So $*$ can be 0, 3, 6 or 9.

0, 3, 6 or 9

Example 1.3 Find the digit a so that the number $3a85$ is divisible by 11.

SOLUTION

The digits in the odd places (from the left) are 3 and 8, with sum 11. The digits in the even places are a and 5, with sum $a + 5$.

The difference $11 - (a + 5) = 6 - a$ must be 0 or a multiple of 11, so $a = 6$.

Check: $3685 = 11 \times 335$.

$a = 6$

Example 1.4 Find the remainder when 347 is divided by 9, without dividing.

SOLUTION

The digit sum is $3 + 4 + 7 = 14$, and $1 + 4 = 5$.

$$347 = 9 \times 38 + 5.$$

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Example 1.5 Show that the difference between a two-digit number and the number formed by reversing its digits is always a multiple of 9.

SOLUTION

Let the number be $10a + b$. The reversed number is $10b + a$.

The difference is $(10a + b) - (10b + a) = 9a - 9b = 9(a - b)$.

Example: $83 - 38 = 45 = 9 \times 5$.

The difference is $9(a - b)$