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QUANTITATIVE APTITUDE · FREE STUDY MATERIAL

Number System

Formulas & Shortcut Tricks

Every important formula, shortcut and exam trick for Number System in one place – with solved examples, common mistakes and a one-page revision sheet.

WHAT'S INSIDE

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USEFUL FOR

- Campus placements (TCS, Infosys, Wipro, Accenture)
- SSC CGL / CHSL / MTS
- Bank PO & Clerk (IBPS, SBI, RBI)
- Railways (RRB NTPC, Group D)
- UPSC CSAT & state PSC exams

Practise **Number System** free on LearnFrenzy – questions with instant explanations →

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1 Topic introduction

What it is, why it matters and how it is asked

The Number System is the grammar of arithmetic. It explains what kinds of numbers exist, how they behave when you add, multiply or divide them, and which patterns repeat – divisibility, remainders, unit digits and factors.

Almost every other quantitative chapter – HCF and LCM, simplification, percentages, ratios, interest – quietly uses these rules. A student who is fluent here calculates faster everywhere else.

Why it matters in exams

- SSC exams ask 2–4 direct questions in every paper, and banks hide number rules inside simplification and series.
- Placement tests (TCS NQT, Infosys, Wipro, AMCAT) love remainders, unit digits and factor counting because they test logic, not long calculation.
- Questions are short and scoring: with the right rule most take under 45 seconds.

Where it is used

- Checking a long calculation quickly with digit sums.
- Cyclic events – days of the week, clock positions, repeating patterns – are remainder problems.
- Computer science uses binary numbers, modular arithmetic and prime factorisation (hashing, cryptography).

Common question patterns

Unit digit
Unit digit of a large power or a product of powers.

Remainders
Remainder of a big power or product, using Fermat, Euler or a “make it 1” cycle.

Divisibility
Find the missing digit so that a number is divisible by 8, 9, 11 or 72.

Factors
Number of factors, odd or even factors, sum of factors.

Factorials
Trailing zeros of n!, or the highest power of a prime in n!.

Counting
How many numbers in a range are divisible by 3 or 5, or by neither.

Decimals
Convert a recurring decimal to a fraction.

Series
Sum of natural numbers, squares, cubes, odd or even numbers.

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2 Important formulas

Cards marked MOST USED are the ones to revise first

Types of numbers

Type	What it means	Examples
Natural numbers	Counting numbers	1, 2, 3, 4, …
Whole numbers	Natural numbers together with 0	0, 1, 2, 3, …
Integers	Whole numbers and their negatives	…, −2, −1, 0, 1, 2, …
Rational	Can be written as p/q with q ≠ 0; the decimal ends or repeats	3/8, −5, $0.\overline{3}$
Irrational	Decimal never ends and never repeats	$\sqrt{2}$, $\sqrt{3}$, π
Prime	Exactly two factors: 1 and itself	2, 3, 5, 7, 11, …
Composite	More than two factors	4, 6, 8, 9, 10, …
Co-prime	Two numbers whose HCF is 1 (neither has to be prime)	8 and 15, 9 and 28

1 is neither prime nor composite. 2 is the only even prime. 0 is an even number. There are 25 primes below 100.

Division and place value

Division algorithm

MOST USED

Dividend = Divisor × Quotient + Remainder

Any division can be rebuilt from its parts. The remainder is always smaller than the divisor.

Remainder – 0 ≤ R < Divisor

EXAMPLE A number divided by 17 gives quotient 23 and remainder 11. Number = 17 × 23 + 11 = **402**.

Remainder on a factor of the divisor

MOST USED

If N ÷ d leaves r, and k divides d, then N ÷ k leaves the same remainder as r ÷ k

You never need the number itself – only the old remainder.

EXAMPLE N ÷ 56 leaves 29. Since 8 divides 56, N ÷ 8 leaves 29 ÷ 8 → remainder **5**.

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Place value and face value

Place value = digit × value of its position; Face value = the digit itself

Position gives a digit its worth.

EXAMPLE In 3,52,618 the 5 has place value 50,000 and face value 5. Difference = **49,995**.

Sums of series

Sum of the first n natural numbers

MOST USED

$$1 + 2 + 3 + \ldots + n = n(n + 1)/2$$

Pair the first and last terms: each pair adds to n + 1, and there are n/2 pairs.

n – how many numbers are added

EXAMPLE $1 + 2 + \ldots + 40 = 40 \times 41/2 =$ **820**.

Sum of squares

$$1^2 + 2^2 + \ldots + n^2 = n(n + 1)(2n + 1)/6$$

Used in “how many squares on a chessboard” type questions too.

EXAMPLE $1^2 + \ldots + 10^2 = 10 \times 11 \times 21/6 =$ **385**.

Sum of cubes

$$1^3 + 2^3 + \ldots + n^3 = [n(n + 1)/2]^2$$

The sum of cubes is the square of the sum of the numbers.

EXAMPLE $1^3 + \ldots + 10^3 = 55^2 =$ **3,025**.

First n odd and first n even numbers

$$1 + 3 + \ldots \text{(n terms)} = n^2;\ 2 + 4 + \ldots \text{(n terms)} = n(n + 1)$$

Count the terms first – that is the n.

EXAMPLE $1 + 3 + \ldots + 49$ has 25 terms, sum $= 25^2 =$ **625**.

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Arithmetic progression (AP)

MOST USED

$T_n = a + (n - 1)d$; $n = (l - a)/d + 1$; $S = n(a + l)/2$

Any evenly spaced list – multiples of 7, odd numbers, page numbers – is an AP.

a – first term **d** – common difference **l** – last term **n** – number of terms

EXAMPLE Three-digit multiples of 7 run from 105 to 994: n = (994 – 105)/7 + 1 = **128**.

Counting multiples

Multiples of k in a range

MOST USED

From 1 to N: $\lfloor N/k \rfloor$; from a to b: $\lfloor b/k \rfloor - \lfloor (a-1)/k \rfloor$

$\lfloor x \rfloor$ means "drop the decimal part". Subtract the multiples that come before a.

EXAMPLE Multiples of 6 from 100 to 400: $\lfloor 400/6 \rfloor - \lfloor 99/6 \rfloor$ = 66 – 16 = **50**.

Divisible by p or q (inclusion–exclusion)

n(p or q) = n(p) + n(q) – n(LCM of p and q)

Numbers divisible by both were counted twice, so subtract them once.

EXAMPLE 1 to 300, divisible by 4 or 6: 75 + 50 – 25 (multiples of 12) = **100**.

Factors (write N = $p^a \times q^b \times r^c$ first)

Number of factors

MOST USED

Total factors = (a + 1)(b + 1)(c + 1)

Each prime can appear 0, 1, …, a times in a factor – that is a + 1 choices.

p, q, r – distinct primes **a, b, c** – their powers

EXAMPLE $360 = 2^3 \times 3^2 \times 5 \rightarrow (3+1)(2+1)(1+1)$ = **24** factors.

Odd and even factors

Odd factors: ignore the power of 2. Even factors = total – odd

An odd factor cannot contain 2 at all.

EXAMPLE 360: odd = (2 + 1)(1 + 1) = 6, even = 24 – 6 = **18**.

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Sum of factors

$$[(p^{a+1} - 1)/(p - 1)] \times [(q^{b+1} - 1)/(q - 1)] \times \ldots$$

Equivalent to $(1 + p + \ldots + p^a)(1 + q + \ldots + q^b)\ldots$

EXAMPLE 360: $(1 + 2 + 4 + 8)(1 + 3 + 9)(1 + 5) = 15 \times 13 \times 6 =$ **1,170**.

Product of factors

$$\text{Product of all factors} = N^{f/2} \ (f = \text{number of factors})$$

Factors pair up to give N.

EXAMPLE 12 has 6 factors, product = $12^3 =$ **1,728**.

Ways to write N as a product of two factors

$$f/2 \text{ ways; } (f + 1)/2 \text{ if N is a perfect square}$$

Each pair (d, N/d) is counted once.

EXAMPLE 360 has 24 factors → **12** ways.

Numbers less than N and co-prime to it (Euler's totient)

$$\phi(N) = N \times (1 - 1/p)(1 - 1/q)(1 - 1/r)\ldots$$

Strike out every multiple of each prime factor of N.

EXAMPLE $\phi(360) = 360 \times ½ \times ⅔ \times ⅘ =$ **96**.

Factorials

Trailing zeros of n!

MOST USED

$$\text{Zeros} = \lfloor n/5 \rfloor + \lfloor n/25 \rfloor + \lfloor n/125 \rfloor + \ldots$$

Each zero needs a 2 × 5, and 5s are scarcer – so count the 5s.

EXAMPLE 130!: 26 + 5 + 1 = **32** zeros.

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Highest power of a prime p in n! (Legendre)

$$\text{Power} = \lfloor n/p \rfloor + \lfloor n/p^2 \rfloor + \lfloor n/p^3 \rfloor + \ldots$$

Stop when the power of p exceeds n.

EXAMPLE Power of 3 in 50!: 16 + 5 + 1 = **22**.

Remainder theorems

Remainders of sums and products

MOST USED

$$(a \times b) \bmod n = [(a \bmod n) \times (b \bmod n)] \bmod n \text{ (same for +, −)}$$

Replace each big number by its remainder before multiplying.

a mod n – remainder when a is divided by n

EXAMPLE (1,234 × 5,678) ÷ 9: 1,234 → 1, 5,678 → 8, so remainder = **8**.

Fermat's little theorem

$$a^{p-1} \bmod p = 1 \text{ (p prime, a not a multiple of p)}$$

Reduce the power modulo p − 1.

EXAMPLE $5^{60} \div 13$: 5^{12} leaves 1 and 60 = 12 × 5, so remainder = **1**.

Euler's theorem

$$a^{\Phi(n)} \bmod n = 1 \text{ (a and n co-prime)}$$

Fermat for any divisor: reduce the power modulo ϕ(n).

EXAMPLE $7^{82} \div 15$: ϕ(15) = 8, 82 = 8 × 10 + 2, so $7^2 = 49$ → remainder **4**.

Wilson's theorem

$$(p-1)! \bmod p = p - 1 \text{ (p prime)}$$

The factorial one less than a prime leaves remainder −1.

EXAMPLE 16! ÷ 17 leaves **16**.

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Algebraic divisibility

MOST USED

> $a^n - b^n$: always ÷ (a − b), and ÷ (a + b) when n is even. $a^n + b^n$: ÷ (a + b) when n is odd

Spot the pattern in the question and the answer is the sum or difference of the bases.

EXAMPLE $29^{15} + 21^{15}$ (odd power) is divisible by 29 + 21 = **50**.

Unit digits (cyclicity)

Last digit of base	Unit digits of powers 1, 2, 3, 4	Cycle length
0, 1, 5, 6	Always the same digit	1
4	4, 6, 4, 6 (odd power → 4, even → 6)	2
9	9, 1, 9, 1 (odd power → 9, even → 1)	2
2	2, 4, 8, 6	4
3	3, 9, 7, 1	4
7	7, 9, 3, 1	4
8	8, 4, 2, 6	4

Unit digit of a^n

MOST USED

> Find n mod 4 (use 4 when the remainder is 0), then raise the last digit to that power

Every digit repeats within 4 powers, so only n mod 4 matters.

EXAMPLE 8^{126}: 126 mod 4 = 2, $8^2 = 64$ → unit digit **4**.

Recurring decimals and number bases

Pure recurring decimal

> $0.\overline{ab} = ab/99$ (one 9 for each repeating digit)

The repeating block over as many 9s as it has digits.

EXAMPLE $0.\overline{27} = 27/99 = \mathbf{3/11}$.

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Mixed recurring decimal

MOST USED

> **$0.\overline{abc} = (abc - a)/990$ (9s for repeating digits, 0s for the rest)**

All digits minus the non-repeating part, over 9s then 0s.

EXAMPLE $0.3\overline{18} = (318 - 3)/990 = 315/990 =$ **$7/22$**.

When does a fraction terminate?

> **In lowest terms, the denominator has no prime factors other than 2 and 5**

7/40 terminates ($40 = 2^3 \times 5$); 7/30 recurs (30 has a 3).

EXAMPLE $7/40 =$ **0.175**.

Converting bases

> **Base b → decimal: Σ digit × $b^{position}$. Decimal → base b: divide by b repeatedly, read remainders upward**

Positions count from 0 on the right.

EXAMPLE $(231)_5 = 2 \times 25 + 3 \times 5 + 1 =$ **66**.

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3 Shortcut tricks & smart techniques

Each trick says when to use it – that matters as much as the trick

Divisibility rules at a glance

MOST USED

USE WHEN Missing-digit questions, simplifying fractions, and killing wrong options.

Divisor	Rule
2, 5, 10	Last digit is even / 0 or 5 / 0
3, 9	Sum of digits divisible by 3 / 9
4	Last two digits form a multiple of 4
8	Last three digits form a multiple of 8
6, 12, 72	Combine co-prime rules: 2 & 3, 3 & 4, 8 & 9
11	(Sum of odd-place digits) – (sum of even-place digits) is 0 or a multiple of 11
7, 11, 13	Split into 3-digit groups from the right; alternating sum divisible by 7 / 11 / 13 (because 1001 = 7 × 11 × 13)

EXAMPLE 1,234,233: groups 1 | 234 | 233 → 233 – 234 + 1 = 0, so it is divisible by 7, 11 *and* 13 in one step.

Unit digit in three seconds

MOST USED

USE WHEN Any “unit digit of …” question, and to eliminate options in long products.

1. Keep only the last digit of each base.
2. Reduce each power mod 4 (0 → 4).
3. Multiply the resulting unit digits and keep the last digit.

EXAMPLE $23^{47} \times 17^{62}$: $3^3 \to 7$, $7^2 \to 9$, $7 \times 9 = 63 \to$ unit digit **3**.

Negative remainders

USE WHEN The base is just below a multiple of the divisor.

1. Write the base as (multiple – small number).
2. Odd power keeps the minus sign, even power removes it.
3. Add the divisor to turn a negative remainder positive.

EXAMPLE $64^{37} \div 13$: $64 = 65 - 1 \to (-1)^{37} = -1 \to$ remainder $13 - 1 =$ **12**.

Make the remainder 1

USE WHEN Big powers with a small divisor, when Fermat or Euler feels slow.

1. Try small powers of the base until one leaves remainder 1.
2. Split the big power into that block.
3. Only the leftover power matters.

EXAMPLE $2^{200} \div 7$: $2^3 = 8$ leaves 1; $200 = 3 \times 66 + 2$, so remainder $= 2^2 =$ **4**.

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Take out the common factor

USE WHEN The base and the divisor share a factor, so Fermat/Euler do not apply directly.

1. Divide the number and the divisor by their common factor.
2. Find the remainder of the smaller problem.
3. Multiply that remainder back by the common factor.

EXAMPLE $2^{50} \div 12$: take out 4 → $2^{48} \div 3$ leaves 1, so remainder = 1 × 4 = **4**.

Digit-sum check (casting out nines)

MOST USED

USE WHEN To verify a multiplication or pick between close options in seconds.

1. Reduce each number to a single digit by adding its digits.
2. Do the same operation on these digits.
3. The answer's digit sum must match – if not, the answer is wrong.

EXAMPLE Is 487 × 236 = 1,14,932? Digit sums 1 × 2 = 2, and 1+1+4+9+3+2 = 20 → 2. Matches ✓

Last two digits of a number ending in 1

USE WHEN Powers like 41^{57}, 71^{23}, 21^{99}.

1. Last digit is always 1.
2. Tens digit = unit digit of (tens digit of base × power).

EXAMPLE 41^{57}: 4 × 57 = 228 → tens digit 8, so the last two digits are **81**.

Highest power of a composite number in n!

USE WHEN Questions like "largest power of 12 that divides 30!".

1. Break the composite into primes ($12 = 2^2 \times 3$).
2. Find the power of each prime in n! (Legendre).
3. Divide by its exponent and take the smallest result.

EXAMPLE 12 in 30!: power of 2 = 26 → 26/2 = 13; power of 3 = 14. Answer = **13**.

Counting "neither" with inclusion–exclusion

USE WHEN "How many numbers are divisible by none of 2, 3, 5?"

1. Add the singles, subtract the pairs, add the triple.
2. Subtract that total from the range.

EXAMPLE 1 to 1,000: 500 + 333 + 200 – 166 – 100 – 66 + 33 = 734, so neither = 1,000 – 734 = **266**.

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4 Solved examples

The full method on the left, the exam shortcut on the right

1 UNIT DIGIT

Find the unit digit of $7^{95} \times 3^{58}$.

STEP BY STEP

1. Powers of 7 end in 7, 9, 3, 1 (cycle 4); powers of 3 end in 3, 9, 7, 1.
2. $95 = 4 \times 23 + 3 \rightarrow 7^{95}$ ends like 7^3, i.e. 3.
3. $58 = 4 \times 14 + 2 \rightarrow 3^{58}$ ends like 3^2, i.e. 9.
4. $3 \times 9 = 27$.

SHORTCUT

95 mod 4 = 3 → 3; 58 mod 4 = 2 → 9; 3 × 9 → 7.

Why it works: Only the last digit of each factor affects the last digit of the product.

Answer: 7

2 FACTORS

How many even factors does 720 have?

STEP BY STEP

1. $720 = 2^4 \times 3^2 \times 5$.
2. Total factors = $5 \times 3 \times 2 = 30$.
3. Odd factors (no 2) = $3 \times 2 = 6$.
4. Even factors = $30 - 6 = 24$.

SHORTCUT

An even factor must use 2 at least once: 4 choices for the power of 2 (1 to 4) × 3 × 2 = 24.

Why it works: Fixing the power of 2 between 1 and 4 forces the factor to be even.

Answer: 24

3 FACTORIALS

How many zeros are there at the end of $1 \times 2 \times 3 \times \ldots \times 250$?

STEP BY STEP

1. The product is 250!. Each trailing zero needs one 2 and one 5.
2. Multiples of 5: $250/5 = 50$.
3. Multiples of 25 give an extra 5: $250/25 = 10$.
4. Multiples of 125 give one more: $250/125 = 2$.
5. Total 5s = 62; 2s are plentiful.

SHORTCUT

Divide repeatedly by 5 and add the quotients: 250 → 50 → 10 → 2; 50 + 10 + 2 = 62.

Why it works: Dividing the previous quotient by 5 is the same as dividing 250 by 25, 125, …

Answer: 62

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4 REMAINDERS

Find the remainder when 7^{84} is divided by 342.

STEP BY STEP

1. Look for a power of 7 close to 342: $7^3 = 343 = 342 + 1$.
2. So 7^3 leaves remainder 1.
3. $7^{84} = (7^3)^{28}$ leaves $1^{28} = 1$.

SHORTCUT

$342 = 7^3 - 1$, and 84 is a multiple of 3 → remainder 1.

Why it works: Exam setters choose divisors that sit next to a power of the base – always check for it first.

Answer: 1

5 COUNTING

How many numbers from 1 to 500 are divisible by neither 3 nor 5?

STEP BY STEP

1. Divisible by 3: $\lfloor 500/3 \rfloor = 166$.
2. Divisible by 5: $\lfloor 500/5 \rfloor = 100$.
3. Divisible by both (15): $\lfloor 500/15 \rfloor = 33$.
4. Divisible by 3 or 5 = 166 + 100 − 33 = 233.
5. Neither = 500 − 233 = 267.

SHORTCUT

$500 \times (1 - \frac{1}{3})(1 - \frac{1}{5}) \approx 266.7$ → check exactly with the counts above: 267.

Why it works: The product formula is exact only when the range is a multiple of 15, so use it to estimate and the counts to confirm.

Answer: 267

6 DECIMALS

Express $0.\overline{436}$ as a fraction in lowest terms.

STEP BY STEP

1. Let $x = 0.4363636\ldots$
2. $1000x = 436.3636\ldots$ and $10x = 4.3636\ldots$
3. $990x = 432$, so $x = 432/990 = 24/55$.

SHORTCUT

$(436 - 4)/990 = 432/990 = 24/55$.

Why it works: Two 9s for the two repeating digits, one 0 for the one non-repeating digit.

Answer: 24/55

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7 DIVISIBILITY

The six-digit number 34x56y is divisible by 72. How many such numbers are possible?

STEP BY STEP

1. 72 = 8 × 9, so the number must pass both tests.
2. By 8: 56y must be a multiple of 8 → y = 0 (560) or y = 8 (568).
3. By 9: 3 + 4 + x + 5 + 6 + y = 18 + x + y must be a multiple of 9 → x + y = 0, 9 or 18.
4. y = 0: x = 0 or 9. y = 8: x = 1.
5. Numbers: 340560, 349560, 341568.

SHORTCUT

Fix y with the 8-test first (fewest options), then fit x with the 9-test.

Why it works: Always apply the stricter test first – it leaves the fewest cases to try.

Answer: 3

8 REMAINDERS

A number leaves remainder 39 when divided by 357. What remainder does it leave when divided by 17?

STEP BY STEP

1. Number = 357k + 39.
2. 357 = 17 × 21, so 357k is a multiple of 17.
3. Remainder = 39 ÷ 17 → 5.

SHORTCUT

17 divides 357, so just divide the old remainder: 39 mod 17 = 5.

Why it works: A remainder carries over to any factor of the original divisor.

Answer: 5

9 ALGEBRAIC DIVISIBILITY

Which of these divides $47^{43} + 43^{43}$ exactly: 4, 43, 47 or 90?

STEP BY STEP

1. The expression is $a^n + b^n$ with n = 43 (odd).
2. For odd n, $a^n + b^n$ is divisible by a + b.
3. a + b = 47 + 43 = 90.

SHORTCUT

Odd power sum → divisible by the sum of the bases = 90.

Why it works: For odd n, a = −b makes $a^n + b^n = 0$, so (a + b) is a factor.

Answer: 90

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10 LAST TWO DIGITS

Find the last two digits of 3^{100}.

STEP BY STEP

1. Last two digits = remainder on division by 100.
2. 3 and 100 are co-prime; $\phi(100) = 100 \times \frac{1}{2} \times \frac{4}{5} = 40$.
3. By Euler, 3^{40} leaves 1, so $3^{100} = 3^{80} \times 3^{20}$ leaves 3^{20}.
4. $3^{10} = 59{,}049 \rightarrow 49$; $49^2 = 2{,}401 \rightarrow 01$.

SHORTCUT

3^{10} ends in 49 and 49^2 ends in 01, so 3^{20} ends in 01 → $3^{100} = (3^{20})^5$ ends in 01.

Why it works: Once a power ends in 01, every multiple of that power also ends in 01.

Answer: 01

11 SERIES

Find the sum of all two-digit numbers divisible by 3.

STEP BY STEP

1. They run 12, 15, …, 99 – an AP with d = 3.
2. n = (99 – 12)/3 + 1 = 30.
3. S = 30 × (12 + 99)/2 = 1,665.

SHORTCUT

3 × (4 + 5 + … + 33) = 3 × (33 × 34/2 – 3 × 4/2) = 3 × 555 = 1,665.

Why it works: Taking the common factor 3 out turns it into a sum of consecutive numbers.

Answer: 1,665

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5 Important exam tips

Patterns, traps and habits that save marks

Frequently asked question patterns

- Unit digit of a product of large powers – SSC and placement favourite.
- Remainder of a big power with a divisor next to a power of the base ($342 = 7^3 - 1$).
- Missing digits for divisibility by 8, 9, 11, 72 or 88.
- Number of factors, odd/even factors, and perfect-square factors.
- Trailing zeros of n! and the power of a prime in n!.
- Inclusion–exclusion counts in a range.
- Recurring decimals and “which fraction terminates?”.
- $a^n \pm b^n$ divisibility, often with options like 4, 43, 47, 90.

Common mistakes to avoid

- Calling 1 a prime number – it is neither prime nor composite.
- Using power 0 when n mod 4 = 0 in unit-digit questions – use the 4th digit of the cycle instead.
- Counting multiples from a to b as $\lfloor b/k \rfloor - \lfloor a/k \rfloor$; it misses a itself when a is a multiple. Use $\lfloor (a-1)/k \rfloor$.
- Forgetting the extra 5s from 25, 125, … in trailing-zero questions.
- Leaving a negative remainder – add the divisor to make it positive.
- Applying Fermat or Euler when the base and divisor are not co-prime.
- Forgetting 1 and the number itself in factor counts and sums.

Points to remember

- 2 is the only even prime; 0 is even; there are 25 primes below 100.
- The product of any r consecutive integers is divisible by r!.
- A perfect square has an odd number of factors.
- Square numbers end only in 0, 1, 4, 5, 6 or 9 – never 2, 3, 7 or 8.
- $0.\overline{9} = 1$ exactly.
- $1001 = 7 \times 11 \times 13$, so abcabc is always divisible by 7, 11 and 13.

Speed and accuracy

- Know squares to 30, cubes to 15 and powers of 2 up to $2^{12} = 4{,}096$ by heart.
- Work with remainders and last digits – never expand a big number.
- Write the prime factorisation first; most factor questions are then one line.
- Use unit digit and digit sum to eliminate options before calculating.

Preparation strategy

- Learn one formula group at a time, then solve 10 questions on it the same day.
- Practise on LearnFrenzy in order: Easy → Medium → Hard → Exam Pattern Mix → Diagram-Based → Data Sufficiency.
- Aim for 45–60 seconds per question; mark and move on if a question passes 90 seconds.
- Keep an error log – note why you got a question wrong, not just the right answer.
- Revise the Quick Revision Sheet (next page) the night before the exam.

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6 Quick revision sheet

Everything on one page for the night before the exam

Formulas

Division	**Dividend = Divisor × Q + R**	Σn	$n(n+1)/2$
Σn^2	$n(n+1)(2n+1)/6$	Σn^3	$[n(n+1)/2]^2$
n odd / n even	n^2 / $n(n+1)$	AP terms	$(l-a)/d+1$
Multiples a..b	$\lfloor b/k \rfloor - \lfloor (a-1)/k \rfloor$	No. of factors	$(a+1)(b+1)(c+1)$
Sum of factors	$\Pi\,(p^{a+1}-1)/(p-1)$	Product of factors	$N^{f/2}$
$\phi(N)$	$N\,\Pi\,(1-1/p)$	Zeros in n!	$\Sigma\,\lfloor n/5^k \rfloor$
Fermat	$a^{p-1} \equiv 1 \pmod p$	Euler	$a^{\phi(n)} \equiv 1 \pmod n$
Wilson	$(p-1)! \equiv p-1 \pmod p$	$a^n + b^n$	÷ (a + b) if n odd
$a^n - b^n$	÷ (a − b); ÷ (a + b) if n even	$0.\overline{abc}$	$(abc-a)/990$

Shortcut tricks

- Unit digit: power mod 4 (0 → 4).
- Remainder: look for a power ≡ ±1.
- Common factor out, then multiply back.
- Ends in 1: tens digit = tens × power.
- Digit sum checks any product.
- 7, 11, 13: alternate 3-digit groups.

Must-know numbers

Primes < 100	2 3 5 7 11 13 17 19 23 29 31 37 41 43 47 53 59 61 67 71 73 79 83 89 97
Powers of 2	2 4 8 16 32 64 128 256 512 1024 2048 4096
Cubes 1–15	1 8 27 64 125 216 343 512 729 1000 1331 1728 2197 2744 3375
Squares 11–30	121 144 169 196 225 256 289 324 361 400 441 484 529 576 625 676 729 784 841 900

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7 A message from LearnFrenzy

For everyone preparing for placements, competitive and government exams

Keep going – you are closer than you think

Success in examinations is not just about how many hours you study. It is about how effectively you understand concepts, practise questions, and improve yourself every day.

Every formula you learn, every problem you solve, and every mistake you correct brings you one step closer to your goal.

Whether you are preparing for campus placements, competitive examinations, or government jobs, remember that consistency, confidence, and smart preparation make a real difference.

Don’t just memorize formulas. Understand the concepts, practise smart techniques, and develop the confidence to solve problems independently.

Your hard work today can create the opportunities you dream of tomorrow.

— Team LearnFrenzy

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