

ECE Aptitude Master Cheat Sheet

Indian Placement / OA → Research → Question Patterns → Priority → Formula → Shortcut → Fast Method → Practice → Revision

PRIORITY **MUST** master first **HIGH** high yield **MED** medium **LOW** only with spare time // EVIDENCE **VERIFIED** **REPORTED** **INFERRED** **UNKNOWN**

How to read this sheet. Everything here was derived from a **measured sample** of a real question bank, not from memory. Section §1 states exactly what was inspected and what was not, so you can judge the ranking rather than trust it. Every company-level claim carries an **evidence chip**: **VERIFIED** from an official source, **REPORTED** by candidates or preparation sites, **INFERRED** by me from adjacent evidence, **UNKNOWN** where the honest answer is that nobody has published it. **No company is claimed to ask a topic without a source.**

// §1 RESEARCH FINDINGS

1.1 What was actually retrieved **MUST**

Pages were fetched directly and parsed from raw HTML — question text, all four options, the answer key and the worked explanation — rather than read from search snippets. The parser was checked against the rendered pages before the run.

Section inspected	Topics	Pages	Questions
Quantitative Aptitude	35	157	766
Verbal Ability	19	115	551
Verbal Reasoning	16	104	491
Logical Reasoning	19	97	456
Data Interpretation	4	6	29
Total	93	479	2293

[VERIFIED] Integrity of the sample. All 2293 questions carried a machine-readable answer key (**0 missing**) and 2247 carried a full worked explanation. That is what makes the pattern counts below trustworthy: each question was classified from its own text, then checked against its own key.

1.2 What was not covered — read this before trusting any ranking **MUST**

This is a sample, not a census. Pagination was followed to a depth of **8 pages per topic**. **28 of the 93 topics hit that cap**, which means more questions exist in them than were read — among them *problems-on-trains*, *numbers*, *blood-relation-test*, *direction-sense-test*, *series-completion*, *data-sufficiency* and most verbal categories. Counts for those topics are therefore **floors, not totals**, and a topic's raw question count is **not** by itself evidence of exam frequency — it reflects how much the site chose to publish. Frequency claims below lean on the **pattern mix inside** a topic (which is stable across a sample) and on independent sources, not on bank size.

Data Interpretation is under-sampled (29 questions). Only a small part of that section was publicly reachable. DI guidance in §16 is therefore built on method, on the four chart types the section is organised around, and on external syllabus evidence — and is marked **INFERRED** where it goes beyond what was read.

1.3 The finding that changes what you should study **MUST**

The bank's two reasoning sections are **not** interchangeable, and this is the single most useful thing the scan turned up.

Section	What it actually contains	Use for an Indian OA?
Verbal Reasoning	Blood relations, direction sense, series completion, syllogism, seating, data sufficiency, Venn, dice, cubes	Yes — this is the Indian OA reasoning set
Logical Reasoning	Largely US-style: <i>artificial language</i> (17/17 questions), <i>matching definitions</i> (19/19), <i>analyzing arguments</i> (15/15), <i>essential part</i> , <i>making judgments</i>	Mostly no — except number/letter series and statement-conclusion

Consequence. Students commonly grind the whole "Logical Reasoning" tab and wonder why it does not show up in their OA. Take from it only **number series**, **letter series** and **statement-conclusion**; take your reasoning practice from the **Verbal Reasoning** set instead. **VERIFIED** by reading every question in both sections.

1.4 Pattern mix inside the high-yield topics **MUST**

Each question was assigned to a recurring pattern by a regex signature over its own text; **87%** classified, and the residue is listed rather than hidden. The point of the table is the **shape of the mix**, which is what you prepare against.

Topic	n	Dominant patterns (count)	Read this as
Trains	36	two trains cross each other 18 ; platform/bridge 12 ; pole/man 4	Half of all train questions are relative speed. Learn that first.
Time & Work	35	leave/join midway 7 ; efficiency ratio 7 ; basic combined 7 ; wages 4 ; men-days 4 ; alternate days 2	Flat mix — you need the whole topic, not one trick.
Pipes & Cisterns	20	two pipes fill 9 ; leak/emptying 8 ; opened later 3	A leak is just a negative rate. Two ideas cover it.

Topic	n	Dominant patterns (count)	Read this as
P & C	19	word letters incl. vowels-together 9 ; committee 5 ; plain arrangement 3	Half is one archetype: arrange the letters of a word.
Blood relations	39	coded relation 16 ; photograph 10 ; direct puzzle 10 ; introducing 3	Coded notation is the majority case.
Alligation	20	mix two grades 8 ; draw-off & replace 6 ; milk-water 5	Two formulas cover 19 of 20.
Direction sense	37	final facing 21 ; net displacement 14	One sketch answers both.
Profit & Loss	20	find gain% 6 ; CP of m = SP of n 2 ; SP doubled 2 ; cost up/SP fixed 2	Long tail — the base of the % is the whole game.
Percentage	20	marks/pass 6 ; x% of y = y% of x 4 ; reverse % 2	Reverse-% and base-choice dominate the errors.
HCF / LCM	35	same-remainder 4 ; given remainders 4 ; product/ratio 7 ; bells 2	Remainder-flavoured HCF is the exam favourite.
Series completion	38	number series 33 ; letter/alphanumeric 5	Number series is the one to drill.

1.5 Confidence in each headline claim

Claim	Confidence	Basis
Percentage, ratio, T&W, TSD, P&L are core placement topics	HIGH	Independent agreement of 4+ preparation sources and present in every company syllabus read
Relative speed dominates train questions	HIGH	Measured: 18/36 in the sample
Indian OA reasoning ≠ IndiaBIX "Logical Reasoning" tab	HIGH	Measured: every question in both sections read
Number system carries the largest single quant weight	MEDIUM	One source publishes 6% vs 2–3% for others; consistent with TI and Qualcomm syllabi naming it explicitly
Any specific company's exact section split	LOW–MEDIUM	Preparation sites and candidate reports; almost never on a company's own page — see §2
DI weight in ECE-company OAs	LOW	Under-sampled here; named by Intel-style numerical reasoning but not by TI/Qualcomm syllabi

1.6 An independent weightage cross-check **HIGH**

One preparation source publishes explicit topic weightings for placement tests. It is a single Tier-3 source and its absolute numbers should not be over-read, but its **ordering** is useful because it was produced independently of the bank scan — and the two broadly agree.

Block	Share	Its top topics
Quantitative	30%	Number system 6%, then algebra / averages & mixtures 3% each, then TSD, P&L, T&W, probability, ratio, percentage, mensuration at 2%
Reasoning & Verbal	38%	Fill in the blanks 6%, error spotting 4%, analogy 3%, synonyms/antonyms 3%, then blood relations, coding, directions, clocks/calendars, seating, series, para jumbles at 2%
Technical	32%	DSA 7%, pseudocode 5%, DBMS/OOP/OS 4% each

[TRAP] Do not read that table as gospel. It describes a **generic IT-services** blueprint. For ECE hardware roles the "technical 32%" is replaced by analog/digital/embedded core, and the verbal share is usually smaller — see §2. What survives translation is the **quant ordering**, which matches the bank scan.

// §2 THE ECE / SEMICONDUCTOR COMPANY PICTURE

Read this first. Semiconductor and embedded companies **do not publish test blueprints**. Almost everything below is Tier-3 (preparation sites) or Tier-4 (candidate reports), and both drift year to year, by campus and by business unit. Treat the **shape** as reliable and the **numbers** as indicative. Where two sources disagree, both readings are shown rather than averaged away.

2.1 Company matrix **MUST**

Quant / Reasoning / Verbal / DI = how much that block matters in the **screening** round for an ECE-facing role. "Diff" is the reported overall difficulty of the test.

Company / role	Quant	Reas	Verb	DI	Diff	Reported shape of the screen	Evidence
Texas Instruments Analog / Digital / Embedded	High	Med	Low	Low	Med-High	~20 aptitude Q common to all profiles (~20–30 min), then ~20 profile-specific technical Q. Aptitude reported as the section with negative marking ; ~11–12/20 cited as the cut. Named topics: TSD, T&W, probability, P&C, number theory, syllogisms.	REPORTED
Qualcomm HW / SW	High	Med	Low	Unk	Med-High	3 × 20 Q in 90 min: aptitude, basic programming, core (electronics option for ECE). –0.25 negative marking . Aptitude itself described as the easy section: ratio & proportion, percentages, TSD, number system.	REPORTED
Bosch (BGSW / Bosch Ltd)	High	High	High	Med	Med	One report: quant 14Q/20min + logical 14Q/14min + English 22Q/18min + core (embedded 25Q/30min). Another describes a 60-min MCQ block, or 100–120 min with coding for software/embedded. The two disagree — assume your campus differs. Topics: percentages, ratios, T&W, TSD, probability, series, puzzles, RC, grammar.	REPORTED
Honeywell	Med	High	High	Unk	Med	Reported 65 Q / 60 min, split ~30 aptitude + ~35 technical. Aptitude skews verbal and reasoning : comprehension, error spotting, vocabulary, arrangements, coding–decoding, syllogism, series, blood relations.	REPORTED
Intel	Med	Med	High	High	Med	Described as a general aptitude + verbal ability screen; numerical reasoning presented as graphs, charts and tables (i.e. DI) with fractions, %, ratios, averages, sequences. Verbal reported as the main filter: sentence correction + 250–400 word technical RC.	REPORTED
Micron	Med	Med	Low	Unk	Med	Reported ~34 Q / 80 min across aptitude, digital & logic design, C/DS, and memory fundamentals; no negative marking on MCQs , sectional cut-offs possible.	REPORTED
Microchip	Low	Low	Low	Unk	Med	One on-campus report: 51 Q / 60 min = aptitude only 10 , pseudocode 20, DBMS 17, testing 4. Aptitude is a small slice; the technical block decides it.	REPORTED
NXP	Low	Low	Low	Unk	Med-High	Reported ~65 MCQ / 60–90 min weighted to C output, OS, networking . Aptitude barely features in the reports.	REPORTED
Samsung SSIR / SRIB	High	High	High	Med	Med	Reported 60 Q / 60 min as 20 English + 20 logical + 20 quant, no negative marking ; a separate coding round is the real filter for SW roles.	REPORTED
Synopsys	Med	Med	Low	Unk	Med-High	Written round described as quant + logical + C/C++ + DS/algorithms + digital design.	REPORTED

Company / role	Quant	Reas	Verb	DI	Diff	Reported shape of the screen	Evidence
Cadence	Med	Med	Low	Unk	Med-High	Online assessment described as logical reasoning + numerical ability + CS core, plus ~20 MCQ and 2 coding questions.	REPORTED
NVIDIA / AMD (NCG hardware)	UNKNOWN					Public 2026 material describes roles and required skills (Verilog/SystemVerilog, RTL, assertions, verification) — not an aptitude blueprint. Several of these hire from resume + technical interview with no classical aptitude screen at all.	UNKNOWN
ARM	UNKNOWN					No aptitude–pattern source of acceptable quality was found. Absence of evidence, not evidence of absence.	UNKNOWN

The pattern across the matrix. For core–hardware roles aptitude is a **gate, not a differentiator**: it is 10–33% of the screen, it is usually the easier half, and it frequently carries the **only** negative marking. You do not win an ECE offer on aptitude — you lose one by missing the cut on a section you could have finished in 20 minutes. Budget your preparation accordingly: get reliably above the cut, then spend everything else on core and coding.

2.2 What follows from that, concretely **HIGH**

Accuracy > coverage	TI and Qualcomm both reportedly negative–mark the aptitude section while calling it the easy one. With 4 options, +1 and –0.25, your expected score on a guess is $E = 1.25p - 0.25$, so break–even is $p = 0.20$. A genuinely uniform guess ($p = 0.25$) is only +0.06 — positive, but razor–thin, and the distractors are built from the classic errors precisely to push you under 0.20. Eliminate first; see §2.7.
Speed matters most in the middle	~20 questions in 20–30 minutes is 60–90 s each. That is comfortable if you recognise the archetype in 5 s and slow only where the arithmetic is real.
Do not skip verbal	Intel, Honeywell, Bosch and Samsung all weight verbal/reasoning at least as heavily as quant. An ECE student who prepares quant only is optimising for the wrong half of several of these tests.
Check the marking scheme	Micron and Samsung are reported as no negative marking ; TI and Qualcomm as negative. That single fact changes your last–five–minutes strategy completely (§2.7.4).

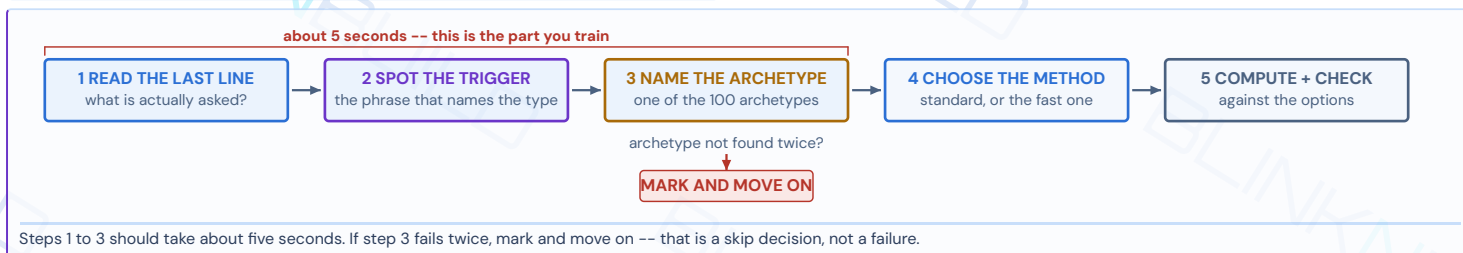
// §3 PREPARATION PRIORITY FOR AN ECE STUDENT

Derived from the pattern mix in §1.4, the independent weightage in §1.6, and the company syllabi in §2.1 — in that order. Ranked by **marks gained per hour of study**, not by how interesting the topic is.

Tier	Topics	Why here
TIER 1	Percentages · Ratio & Proportion · Averages · Time & Work (+ Pipes) · Time–Speed–Distance (+ Trains) · Profit & Loss · Number system (divisibility, unit digit, remainders, HCF/LCM)	Every item here is named by at least two of the syllabi read — TSD by three (TI, Qualcomm, Bosch) — and all sit at the top of the independent weightage. Averages and P&L rest more on that weightage source than on the company lists. Percentage and ratio thinking is then reused inside P&L, mixtures, DI and CI. Highest reuse per hour in the whole sheet.
TIER 2	Probability · Permutation & Combination · SI & CI · Mixtures/Alligation · Number & letter series · Blood relations · Direction sense · Coding–decoding · Syllogism · Data sufficiency	P&C and probability are explicitly named by TI and by VLSI–role reports. The reasoning set here is the Indian OA reasoning set from §1.3, and each item is a single–technique topic — cheap to learn, fast to answer.
TIER 3	Data Interpretation · Seating arrangement · Clocks · Calendars · Boats & streams · Partnership · Ages · Mensuration (area/volume) · Verbal: error spotting, sentence correction, para jumbles, RC	Real but company–dependent, DI and verbal jump to Tier 1 for Intel, Honeywell, Bosch and Samsung — if you are sitting one of those, promote them.
TIER 4	Races & games · Stocks & shares · True discount · Banker's discount · Logarithms · Heights & distances · Surds & indices · Chain rule · Cubes & dice · Analogies/classification	Present in the bank, thin in modern OAs. Several (true discount, banker's discount, stocks) are legacy banking–exam topics . Touch only if Tiers 1–3 are genuinely solid.

[FAST] If you only ever learn six things — the percentage multiplier, the work–rate reciprocal, relative speed, the ratio–scaling constant k , complement probability, and the fraction–percent table — you can attempt a large share of a typical ECE–company aptitude section. Everything else in this sheet is refinement on top of those six.

Recognition speed beats calculation speed. In a 60–90 s budget, the arithmetic is rarely what costs you the question — choosing the wrong **setup** is. Train yourself to run this loop: **read the last line first** (what is actually asked), **spot the trigger phrase**, **name the archetype**, then compute. The wording below is taken from the phrasing that actually recurs in the sample.



4.1 Trigger phrase → archetype → first move **MUST**

If the wording says...	It is	First move
"increased by x%" / "reduced by x%"	Percentage multiplier	Multiply by $(1+x/100)$ or $(1-x/100)$. Never add.
"increased by x%, then decreased by y%"	Successive change	Multiply the two factors. Net $x-y-xy/100$.
"after spending / selling ... he has R left"	Reverse percentage	R is the surviving fraction. Divide, do not multiply.
"price rises x%; by how much must consumption fall"	Fixed-expenditure pair	$x/(100+x)$. Base changes from old price to new.
"A is x% more than B; B is what % less than A"	Asymmetric base	The two bases differ. $x/(100+x)$.
"cost price of m articles = selling price of n"	CP/SP article swap	Profit% = $(m-n)/n \times 100$.
"marked price" + "discount"	MP → SP → CP chain	Discount is on MP; profit is on CP. Two different bases.
"successive discounts of x% and y%"	Successive discount	Same as successive change: multiply factors.
"uses a false weight of 900 g"	Dishonest dealer	Gain% = $\text{error}/(\text{true}-\text{error}) \times 100$.
"together they complete in..."	Work rates add	Work in units : take LCM of the days as total work.
"A is twice as efficient as B"	Efficiency ratio	Efficiency 2:1 ⇒ time 1:2 . Invert.
"A leaves after 4 days" / "C joins"	Partial work	Subtract completed units, divide the rest by the new rate.
"they work on alternate days"	Cycle work	Find work per 2-day cycle , then handle the ragged tail separately.
"a leak empties it in..."	Negative rate	Subtract the leak's rate. Same algebra as work.
"paid Rs. X for the job; find C's share"	Wages by work done	Split in the ratio of work done , not of days taken.
"crosses a pole / a standing man / a tree"	Train length only	Distance = train length .
"crosses a platform / bridge / tunnel"	Train + structure	Distance = train + structure .
"two trains in opposite directions"	Relative speed sum	v_1+v_2 ; distance = sum of both lengths .
"two trains in the same direction"	Relative speed difference	v_1-v_2 ; distance = sum of both lengths .
"a man running along the platform"	Relative to a moving observer	Distance = train length only ; speed is relative.
"at 54 kmph excluding stoppages, 45 including"	Stoppage time	Lost distance / original speed, per hour.
"if he walks at 5 instead of 4 he covers 6 km more"	Same-time-or-distance pair	Equate the shared quantity, solve for one variable.
"goes at u, returns at v; average speed"	Harmonic mean	$2uv/(u+v)$. Never the plain average.
"downstream / upstream / still water"	Boats	$d=b+s$, $u=b-s$; so $b=(d+u)/2$, $s=(d-u)/2$.
"A beats B by 20 m" / "gives B a start"	Races	Equal time ; convert to a distance ratio.
"mixed in what ratio" + two prices and a mean	Alligation	Cross: $(\text{dear}-\text{mean}) : (\text{mean}-\text{cheap})$.
"x litres drawn off and replaced by water"	Replacement	$A(1-x/V)^n$ for the original liquid remaining.
"average changes when one is replaced"	Total-sum method	Work with sums : change in total = $n \times$ change in average.
"average of the innings rises by 3 after..."	Average shift	New score = new average + $n \times$ shift.

If the wording says...	It is	First move
"invests for 8 months, the other for 12"	Partnership	Ratio of capital × time .
"difference between CI and SI for 2 years"	Standard identity	$P(r/100)^2$. For 3 yr: $P(r/100)^2 (3+r/100)$.
"compounded half-yearly"	Rate/time rescale	Rate halves, periods double.
"in how many ways can the letters be arranged"	Word permutation	$n!/(repeats!)$.
"...so that the vowels always come together"	Glue-block	Glue vowels into one unit, arrange, then arrange inside the block.
"selection / committee / choose"	Combination	Order does not matter → $C(n,r)$.
"arrangement / seated / ranked / word formed"	Permutation	Order matters → $P(n,r)$.
"at least one"	Complement	$1 - P(\text{none})$. Almost always faster.
"neither red nor green"	Complement of a union	Count what is allowed, divide by total.
"drawn at random" + a bag	Combination probability	Favourable C over total C .
"greatest number that divides ... leaving the same remainder"	HCF of differences	Take differences of the numbers, then HCF.
"least number which when divided by ... leaves 3"	LCM + offset	$LCM \times k + 3$.
"bells toll together / lights flash together"	LCM	LCM of the intervals; add 1 for inclusive counting.
"unit digit of 7^{153} "	Cyclicity	Exponent mod 4 ; map onto the digit's cycle.
"remainder when ... divided by a prime"	Modular arithmetic	Reduce each factor mod n first , then multiply.
"the digits are interchanged"	Two-digit algebra	$10a+b$ and $10b+a$; difference is $9(a-b)$.
"A + B means A is the brother of B"	Coded relation	Decode right-to-left; draw a two-row tree.
"pointing to a photograph"	Self-reference relation	Anchor the speaker on the tree first.
"walks 3 km north, turns right..."	Direction sense	Sketch on axes; net displacement by Pythagoras.
"All A are B. Some B are C."	Syllogism	Venn. A conclusion must hold in every valid diagram.
"Statement + I / II; which is sufficient"	Data sufficiency	Answer can I solve it , never what is the value .
"angle between the hands at 3:40"	Clock angle	$ 30H - 5.5M $; if >180 , subtract from 360.
"what day was 15 August 1947"	Odd days	Count odd days from a known anchor.

[TRAP] The two words that flip an answer. "at least" means complement, not one case. "between" is usually exclusive of endpoints while "from...to" is inclusive — and inclusive counting (fence-posts) is one of the most common silent errors in the whole subject. Read them twice.

// §5 MENTAL MATHS — THE TABLES YOU MUST NOT COMPUTE

Why this page is first. In a 60–90 s budget, every fraction you convert by long division costs you ~10 s you did not have. The tables below are not "nice to know" — they are the difference between finishing the section and running out of time on question 15.

5.1 Fraction $\leftrightarrow$ percentage **MUST**

Learn this **both ways**. Reading 37.5% and thinking "3/8" is the single highest-value reflex in the whole subject — it turns a division into a multiplication.

1/n	%	1/n	%	Fraction	%
1/2	50	1/9	11.11	2/3	66.67
1/3	33.33	1/10	10	3/4	75
1/4	25	1/11	9.09	2/5	40
1/5	20	1/12	8.33	3/5	60
1/6	16.67	1/15	6.67	3/8	37.5
1/7	14.29	1/16	6.25	5/8	62.5
1/8	12.5	1/20	5	7/8	87.5
1/25	4	1/40	2.5	5/6	83.33

5.2 Squares, cubes and roots worth knowing cold **HIGH**

Squares 11–30	
11–15	121, 144, 169, 196, 225
16–20	256, 289, 324, 361, 400
21–25	441, 484, 529, 576, 625
26–30	676, 729, 784, 841, 900
Cubes and powers	
Cubes 1–12	1, 8, 27, 64, 125, 216, 343, 512, 729, 1000, 1331, 1728
2 ⁿ	2, 4, 8, 16, 32, 64, 128, 256, 512, 1024 , 2048, 4096
Useful roots	$\sqrt{2} \approx 1.414$, $\sqrt{3} \approx 1.732$, $\sqrt{5} \approx 2.236$, $\sqrt{7} \approx 2.646$

[FAST] Squaring anything ending in 5. $(10a+5)^2 = a(a+1) \times 100 + 25$. So $35^2 \rightarrow 3 \times 4 = 12 \rightarrow 1225$; $85^2 \rightarrow 8 \times 9 = 72 \rightarrow 7225$. Works instantly, every time.

[FAST] Squaring near a round number. $(a \pm b)^2 = a^2 \pm 2ab + b^2$. $98^2 = 10000 - 400 + 4 = 9604$. $103^2 = 10000 + 600 + 9 = 10609$.

5.3 Divisibility tests **MUST**

By	Test
2 / 5 / 10	last digit even / is 0 or 5 / is 0
3 / 9	digit sum divisible by 3 / by 9
4	last two digits divisible by 4
8	last three digits divisible by 8
6	divisible by 2 and 3
11	alternating digit sum (odd places – even places) divisible by 11
7	drop the last digit, subtract twice it: $343 \rightarrow 34 - 6 = 28 \checkmark$
12 / 15	by 3 and 4 / by 3 and 5

[TRAP] Composite tests need coprime factors. "Divisible by 4 and 6" does **not** prove divisibility by 24 — 12 passes both and fails 24. Split into coprime parts: $24 = 8 \times 3$.

5.4 Unit conversions that appear every time **MUST**

km/h $\rightarrow$ m/s : $\times 5/18$ m/s $\rightarrow$ km/h : $\times 18/5$			
WHEN every TSD, train, boat or race question that mixes units. EXAMPLE $72 \text{ km/h} = 72 \times 5/18 = 20 \text{ m/s}$. $15 \text{ m/s} = 15 \times 18/5 = 54 \text{ km/h}$. TRAP a train length is in metres and its speed in km/h — convert before you divide, not after.			
1 hour	3600 s	1 km	1000 m
1 quintal	100 kg	1 tonne	1000 kg
1 litre	1000 cm ³	1 m ³	1000 L
1 dozen	12	1 score	20

5.5 Approximation, done safely **HIGH**

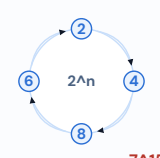
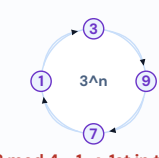
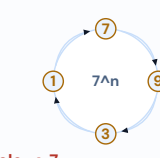
Compare the options BEFORE you divide	
"4386 is what percent of 20120?"	
options: 18% 22% 26% 30%	
$\downarrow$	
$4386/20120 \sim 4400/20000 = 22\%$	
options 4% apart $\rightarrow$ 1% rounding is safe options 0.5% apart $\rightarrow$ you must compute exactly	
Round toward each other	In a fraction, rounding numerator and denominator the same way keeps the error small: $4386/20120 \rightarrow 4400/20000$ is safe because both went up.
The 1% rule	Rounding a 4-digit number to 2 significant figures costs at most ~1%. Safe when the options are >2% apart, dangerous when they are not.
Check the gap first	Look at the options before deciding how precise to be. That one habit saves more time than any other on this page.

5.6 Percentage arithmetic without a calculator **HIGH**

Split it	17% of 400 = $10\% + 5\% + 2\% = 40 + 20 + 8 = 68$.
Reverse it	a% of b = b% of a. 16% of 25 is horrible; 25% of 16 = 4 is instant.
Use the fraction	37.5% of 64 = $3/8 \times 64 = 24$.
Chain multipliers	Up 20% then down 20% = $1.2 \times 0.8 = 0.96 = a \text{ 4% loss}$, not zero.

// §6 NUMBER SYSTEM

6.1 Unit digit and cyclicity **MUST**

Unit digit repeats with period 4 (or less)		
		
7¹⁵³: $153 \bmod 4 = 1 \rightarrow$ 1st in the cycle $\rightarrow 7$ if the remainder is 0, take the 4th (last) entry		

Last digit of base	Cycle	Length
0, 1, 5, 6	itself — always	1
4	4, 6	2
9	9, 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

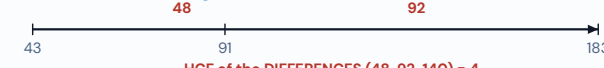
[FAST] Method. Take the exponent **mod 4**. Remainder 1,2,3 $\rightarrow$ that position in the cycle. Remainder 0 $\rightarrow$ the **last** entry. Unit digit of 2^{150} : $50 \bmod 4 = 2 \rightarrow$ second in (2,4,8,6) $\rightarrow 4$.

6.2 Remainders **HIGH**

reduce each factor mod n FIRST, then combine
WHEN any "remainder when ... is divided by ..." question. EXAMPLE remainder of 17×23 by 5: $17 \rightarrow 2$, $23 \rightarrow 3$, $2 \times 3 = 6 \rightarrow 1$. **TRAP** you may reduce before multiplying and adding — never before dividing.

Negative trick	Remainder of 3^{45} by 4: $3 \equiv -1$, so $(-1)^{45} = -1 \equiv 3$.
Fermat BONUS	If p is prime and a is not a multiple of p, $a^{(p-1)} \bmod p = 1$.

6.3 HCF and LCM **MUST**

The two remainder questions	
A. divides 43, 91, 183 leaving the SAME remainder	
HCF of the DIFFERENCES (48, 92, 140) = 4	
B. least number leaving 3 when divided by 6, 8, 15	
same remainder $\rightarrow$ HCF of differences. given remainder $\rightarrow$ LCM + offset.	

HCF(a, b) $\times$ LCM(a, b) = a $\times$ b
WHEN given three of the four quantities. Works only for **two** numbers. **TRAP** it is false for three or more numbers. Do not extend it.

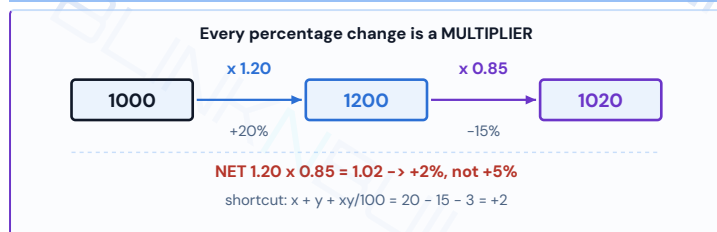
Same remainder in each case	HCF of the differences
Leaves remainders r1, r2, ...	HCF of (a-r1), (b-r2), ...
Least number leaving r by all of them	$\text{LCM} \times k + r$
Bells / lights / meet again	LCM of the intervals
Largest tile / equal groups	HCF of the dimensions
Fractions	$\text{HCF} = \text{HCF}(\text{num})/\text{LCM}(\text{den})$; $\text{LCM} = \text{LCM}(\text{num})/\text{HCF}(\text{den})$

[TRAP] HCF vs LCM in one line. HCF makes things **smaller and equal** (biggest tile, largest group size). LCM makes things **meet again** (bells, laps, cycles). If the answer must be smaller than the inputs it is HCF; if larger, LCM.

// §7 PERCENTAGES

Named explicitly in the Qualcomm, Bosch and Intel syllabi in §2 (TI's published list does not name it). It is also the topic everything else is built on — profit & loss, interest, mixtures and DI are all percentage questions wearing different clothes.

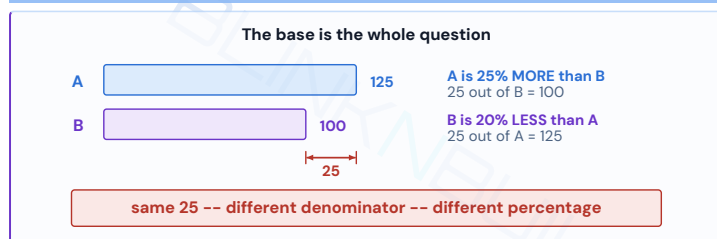
7.1 Everything is a multiplier **MUST**



increase by $x\%$: $\times (1 + x/100)$ decrease by $x\%$: $\times (1 - x/100)$
 WHEN always. Never add or subtract percentages of different bases. EXAMPLE $+20\%$ then $-15\% \rightarrow 1.20 \times 0.85 = 1.02$, a 2% net rise. TRAP $20 - 15 = 5$ is wrong. The second percentage is taken on the new value.

net of two successive changes = $x + y + xy/100$
 WHEN two successive changes; use signs (-15 for a fall). EXAMPLE $+20, -15 \rightarrow 20 - 15 - 3 = +2\%$. TRAP up $x\%$ then down $x\%$ is always a loss of $x^2/100$ percent — never zero.

7.2 The base is the whole question **MUST**



Statement	Formula	Example
A is $x\%$ more than B $\rightarrow$ B is $?\%$ less than A	$100x/(100+x)$	25% more $\rightarrow$ 20% less
A is $x\%$ less than B $\rightarrow$ B is $?\%$ more than A	$100x/(100-x)$	20% less $\rightarrow$ 25% more
Price up $x\%$, keep expenditure fixed	cut consumption by $100x/(100+x)$	$+25\% \rightarrow$ cut 20%
Price down $x\%$, keep expenditure fixed	raise consumption by $100x/(100-x)$	$-20\% \rightarrow$ buy 25% more

7.3 Reverse percentage **HIGH**

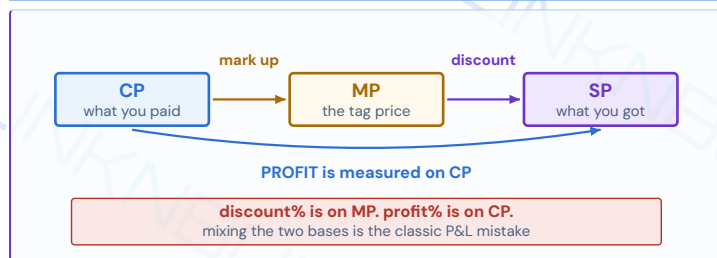
[FAST] Track what SURVIVES, not what goes. "He spends 30%, then 20% of the rest, and has Rs 2800 left." Surviving fraction = $0.70 \times 0.80 = 0.56$. Original = $2800/0.56 = \text{Rs } 5000$. Multiplying instead of dividing is the classic slip.

7.4 The recurring wordings **HIGH**

Marks / pass mark (6 of 20 in the sample)	"Scores 30%, fails by 20 marks; 45% is 25 marks more than pass." Set the total T: $0.45T - 25 = 0.30T + 20 \rightarrow 0.15T = 45 \rightarrow T = 300$, pass = 110.
$x\%$ of $y = y\%$ of x (4 of 20)	Always true. Use it to flip an ugly product into an easy one.
Population / depreciation	Compound growth: $P(1+r/100)^n$ — identical machinery to CI.
Election	Two candidates: winner% - loser% = margin%. With 100% split between two, a "wins bv m votes" gives $(2p-100)\%$ of total = m.

// §8 PROFIT, LOSS AND DISCOUNT

8.1 Three prices, two different bases **MUST**



profit% = $(SP - CP)/CP \times 100$ discount% = $(MP - SP)/MP \times 100$
 WHEN every P&L question. Note the denominators differ. TRAP computing profit on SP, or discount on CP. This single confusion causes most P&L errors.

SP = $CP \times (100 + p)/100$ CP = $SP \times 100/(100 + p)$
 WHEN converting between the two. Use a negative p for a loss. EXAMPLE sold at 1400 at 15% loss $\rightarrow$ CP = $1400 \times 100/85 = 1647.06$.

8.2 The archetypes that actually recur **MUST**

Pattern	Trigger	Method
CP of m = SP of n	"CP of 20 articles = SP of x articles"	profit% = $(m-n)/n \times 100$. If CP of 20 = SP of 16, profit = $4/16 = 25\%$.
SP doubled	"if SP is doubled the profit triples"	Let CP = 1, SP = 1+p. Then $2(1+p) - 1 = 3p \rightarrow p = 1 \rightarrow 100\%$.
Successive discount	"20% and then 10%"	$0.8 \times 0.9 = 0.72 \rightarrow$ single discount 28%, not 30%.
False weight	"sells at cost but uses a 900 g weight"	gain% = $\text{error}/(\text{true} - \text{error}) \times 100 = 100/900 = 11.11\%$.
Two items, equal SP	"one at $+x\%$, one at $-x\%$, same SP"	Always an overall LOSS of $x^2/100$ percent.
Items per rupee	"buys 6 per rupee, wants 20% gain"	Work in cost per item: sell $6/1.2 = 5$ per rupee.
Markup then discount	"marks up 40%, allows 25% off"	$1.40 \times 0.75 = 1.05 \rightarrow 5\%$ profit.

[TRAP] "Equal SP, equal but opposite percentages" is never break-even. Two articles sold at the same price, one at $+20\%$ and one at -20% , give a net 4% loss. The loss is on the bigger cost price, so it wins.

// §9 RATIO, PROPORTION AND PARTNERSHIP

9.1 Write it with k **MUST**

Always write a ratio as multiples of k incomes 3:4, expenses 5:7, each saves 400	
I	3k
E	5m
	4k
	7m
3k - 5m = 400 and 4k - 7m = 400 two unknowns, two equations $\rightarrow k = 800, m = 400$ [TRAP] two different ratios need two different constants	

[FAST] Never work with "3:4" directly. Write 3k and 4k. Every ratio question then becomes a linear equation, and the classic "add 5 to each and it becomes 4:5" question stops being confusing.

Chaining ratios	A:B = 2:3, B:C = 4:5 $\rightarrow$ scale B to a common 12: A:B:C = 8:12:15.
Direct proportion	More $\rightarrow$ more. $a/b = c/d$. Men and work done.
Inverse proportion	More $\rightarrow$ less. $a \times b = c \times d$. Men and days taken.
Chain rule	Set up $M1 \ D1 \ H1 / W1 = M2 \ D2 \ H2 / W2$ and cancel.
Mean proportional	between a and b is $\sqrt{ab}$.

[TRAP] Two ratios, two constants. If incomes are 3:4 and expenses 5:7, you need k and m — not one k. Reusing a single constant silently asserts that incomes and expenses scale together, which the question never said.

9.2 Partnership **MED**

profit share ratio = capital x time invested
 WHEN partners join or leave at different months. EXAMPLE A: 12000×12 , B: $16000 \times 8 \rightarrow 144000 : 128000 = 9 : 8$. TRAP using capital alone when the times differ — 9 of 19 sampled questions had unequal times.

// §10 AVERAGES

Replacement questions are about the TOTAL 8 men, average weight rises by 1.5 kg when one of 65 kg leaves	
TOTAL rises by $8 \times 1.5 = 12$ kg	new man weighs $65 + 12 = 77$ kg
change in total = n x change in average you never need the original average at all	
[TRAP] averages of averages are wrong unless the groups are equal	

change in TOTAL = n x change in average
 WHEN anyone joins, leaves or is replaced. EXAMPLE avg of 8 rises 1.5 when a 65 kg man leaves $\rightarrow$ new man = $65 + 12 = 77$ kg. TRAP hunting for the original average. You never need it.

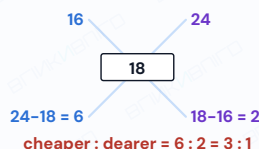
Weighted average	$(n1 \ a1 + n2 \ a2)/(n1 + n2)$. This is alligation in disguise.
First n naturals	average = $(n+1)/2$. First n odd numbers average n; first n even, n+1.

Consecutive numbers	average = the middle one (or the mean of the two middle ones).
Average speed	Equal distances $\rightarrow 2uv/(u+v)$. Equal times $\rightarrow (u+v)/2$. Read which.

[TRAP] You cannot average two averages. A class of 10 averaging 60 and a class of 40 averaging 80 gives **76**, not 70. Only equal group sizes let you take the plain mean.

// §11 MIXTURES AND ALLIGATION

Alligation: the cross gives a RATIO
rice at Rs 16 and Rs 24 mixed to sell at Rs 18



the quantity of the CHEAP one is the DEARER difference
results cross over -- this is the error that eats the topic

cheap : dear = (dear - mean) : (mean - cheap)

WHEN two grades combined to a known average — price, concentration, speed or marks.
TRAP the answers cross over. The quantity of the CHEAP item pairs with the DEAR difference.

after n replacements of x from V : original $x(1 - x/V)^n$

WHEN "x litres drawn off and replaced by water", repeated n times. EXAMPLE 8 L drawn from 40 L of milk, twice: $40(1-8/40)^2 = 40(0.8)^2 = 25.6$ L milk. TRAP the formula tracks the original liquid, not the added one. Subtract if asked for water.

[FAST] Alligation is not only for mixtures. Any weighted-average question — two interest rates, two speeds over equal distances, boys' and girls' average marks — is solved by the same cross in about 10 seconds.

// §12 SIMPLE AND COMPOUND INTEREST

Structurally identical to percentages: SI adds the same amount each year, CI multiplies. Every question below is one of those two sentences applied carefully.



difference after 2 years = $P(r/100)^2$
after 3 years = $P(r/100)^2(3 + r/100)$
half-yearly: halve the rate, double the periods

SI = $PRT / 100$ Amount = $P + SI$

WHEN interest is on the original principal only. EXAMPLE rate from SI:

$R = 100 \times SI / (P \times T)$ — 8 of 19 sampled SI questions asked exactly this. TRAP T must be in years. Nine months is 3/4, not 9.

$A = P(1 + r/100)^n$ CI = $A - P$

WHEN interest earns interest. 11 of 20 sampled CI questions were this plain form. TRAP quoting A when CI was asked, or the reverse. Read the last line.

CI - SI = $P(r/100)^2$ [2 years]

CI - SI = $P(r/100)^2(3 + r/100)$ [3 years]

WHEN "the difference between compound and simple interest is Rs D" — 6 of 20 sampled CI questions. EXAMPLE D = 60 at 10% for 2 yr $\rightarrow P = 60/(0.1)^2 = \text{Rs } 6000$. TRAP using the 2-year identity on a 3-year question.

12.1 The rest of the topic HIGH

Half-yearly / quarterly	Halve (or quarter) the rate and double (or quadruple) the periods. 10% for 1 year half-yearly is 5% for 2 periods $\rightarrow 10.25\%$ effective.
Sum doubles / trebles (SI)	Doubling means SI = P, so $RT = 100$. Trebling means SI = 2P, so $RT = 200$.
Doubling under CI	No neat identity — solve $(1+r/100)^n = 2$. At 10% it takes a little over 7 years.
Two parts at different rates	Let the parts be x and P-x, write both interests, equate to the given total.
Equal annual instalments	Each instalment is discounted back: $x/(1+r/100) + x/(1+r/100)^2 + \dots = P$.
Population / depreciation	The CI formula with a + or - sign. Depreciation is $P(1-r/100)^n$.

[TRAP] SI and CI are equal for the first year. They only diverge from year 2, which is exactly why the 2-year difference is a clean single term. If a question says "the interest for the first year is the same", that is a statement about nothing — it is always true.

// §13 TIME AND WORK

The flattest pattern mix of any topic sampled — 7 leave/join, 7 efficiency-ratio, 7 basic-combined, 4 wages, 4 men-days out of 35. There is no single trick; there is one model that handles all of them.

13.1 The LCM-units model MUST

Stop using fractions: make the job LCM units

A alone 12 days, B alone 18 days $\rightarrow \text{LCM}(12,18) = 36$ units

A	3 units/day	36 / 12
B	2 u/day	36 / 18
A+B	5 units/day	$\rightarrow 36/5 = 7.2$ d

rates ADD, times do NOT. a leak is simply a negative rate.

total work = LCM of the given days; rate = total / own days

WHEN every single work question. It removes fractions completely. EXAMPLE A 12 d, B 18 d $\rightarrow$ work 36; rates 3 and 2; together 5/day $\rightarrow 7.2$ days. TRAP adding times: 12 + 18 is meaningless. Only rates add.

13.2 Every archetype, in one table MUST

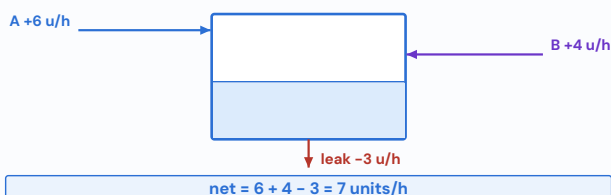
Pattern	Trigger	Method
Combined	"together they finish in"	Add rates. $1/T = 1/a + 1/b$, or LCM units.
Third person	"with the help of C they finish in"	C's rate = combined rate - (A + B).
Efficiency ratio	"A is 3x as efficient as B"	Efficiency 3:1 $\Rightarrow$ time 1:3. If A is 60 d faster: $3x - x = 60$.
Leave / join	"A leaves after 4 days"	Subtract the units done, divide the remainder by the new rate.
Alternate days	"they work on alternate days"	Work per 2-day cycle; count whole cycles, then finish the ragged tail by hand.
Every third day	"A works daily, all three every third day"	Work per 3-day cycle = 3A + B + C.
Wages	"paid Rs 3200 in total; C's share?"	Split by work done = rate $\times$ days worked.
Men-days	"12 men in 9 days working 6 h"	$M_1 D_1 H_1 / W_1 = M_2 D_2 H_2 / W_2$.

[TRAP] Efficiency and time are inverses. "A is twice as efficient as B" means A takes half the time. Students routinely write the time ratio as 2:1 and get every subsequent step wrong.

[FAST] Wages follow work, not days. If A and B finish in 6 and 8 days and share Rs 3200 for a 3-day job with C, compute each one's units contributed and split in that ratio. Splitting by days present is the classic error.

13.3 Pipes and cisterns HIGH

Two taps in, one leak out



A leak is a negative rate — that is the entire topic. 16 of the 20 sampled questions were "two pipes fill" or "a leak empties"; both are the work model with a sign. Net rate = inflows - outflows.

Fill time with a leak	Pipe fills in 6 h, leak empties in 12 h $\rightarrow$ net = $1/6 - 1/12 = 1/12 \rightarrow 12$ hours.
Pipe closed early	Work out what has been filled by the closing time, then divide the rest by the remaining rate.
Tank already part-full	Only the remaining fraction matters — do not restart from empty.

[TRAP] "Empties a full tank in 12 hours" is a rate, not a time to subtract. Convert to 1/12 per hour before combining.

// §14 TIME, SPEED AND DISTANCE

14.1 The core relation and its two traps MUST

Speed = Distance / Time km/h $\rightarrow$ m/s : $\times 5/18$

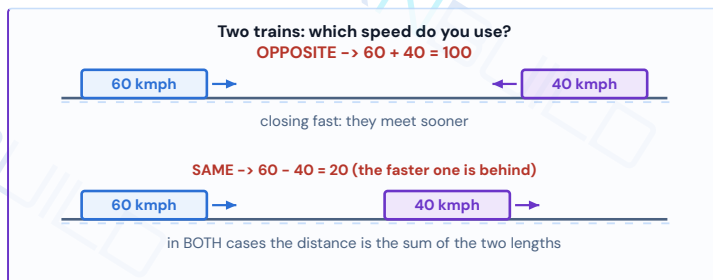
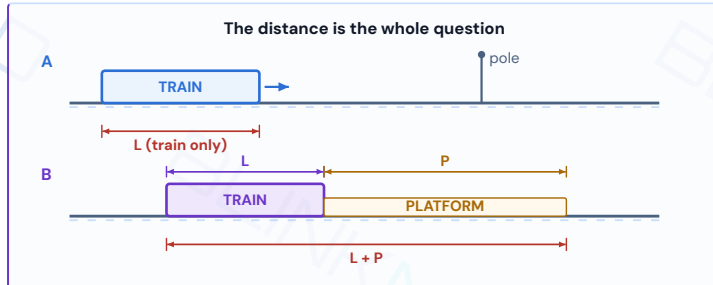
WHEN everything below. Fix units before anything else. TRAP mixing metres with km/h. Convert first.

average speed over EQUAL DISTANCES = $2uv/(u+v)$

WHEN "goes at u , returns at v " — the there-and-back question. EXAMPLE 60 up, 40 back → $2(60)(40)/100 = 48$ km/h, not 50. **TRAP** the plain average. It is only right when the times are equal, not the distances.

Same distance, two speeds	"At 10 km/h he is 20 km short of ..." Equate the shared quantity: $x/10 = (x+20)/14$.
Stoppages	54 km/h without stops, 45 with → loses 9 km per hour → $9/54 \times 60 = 10$ min stopped per hour.
Late / early	Difference in times = difference in lateness. Set up two D/S expressions and subtract.
Speed ratio → time ratio	Same distance ⇒ times are in the inverse ratio of speeds.

14.2 Trains — half of them are relative speed **MUST**

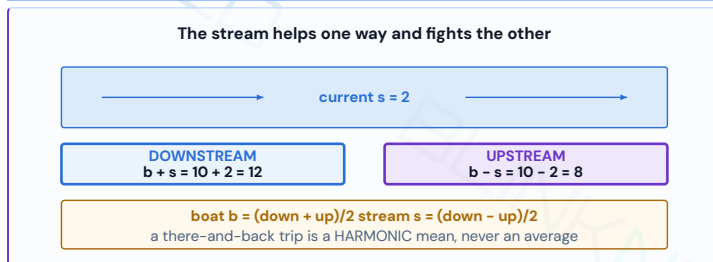


Situation	Distance covered	Speed used
Crosses a pole / tree / standing man	L (train only)	own speed
Crosses a platform / bridge / tunnel	L + P	own speed
Crosses a man walking	L	relative ($\pm$ his speed)
Two trains, opposite directions	L1 + L2	$v1 + v2$
Two trains, same direction	L1 + L2	$v1 - v2$

[FAST] The two-train ratio result. If two trains cross a pole in a and b seconds and cross each other (opposite) in t , then $v1/v2 = (t - b)/(a - t)$. It turns a three-equation problem into one line.

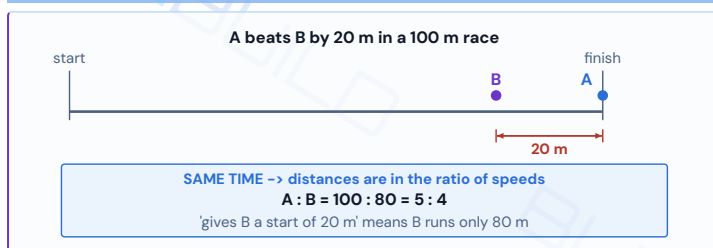
[TRAP] The distance is the sum of BOTH lengths. In every two-train crossing — same direction or opposite — the distance is $L1 + L2$. Only the **speed** changes between the two cases.

14.3 Boats and streams **HIGH**



down = $b + s$, up = $b - s \Rightarrow b = (\text{down} + \text{up})/2$, $s = (\text{down} - \text{up})/2$
 WHEN 18 of the 20 sampled questions ask for b or s from a pair of timings. **TRAP** a there-and-back average speed is $2uv/(u+v)$ — never b .

14.4 Races **MED**



"A beats B by 20 m" in a 100 m race Same time; A:B distances = 100:80 → speeds **5:4**.

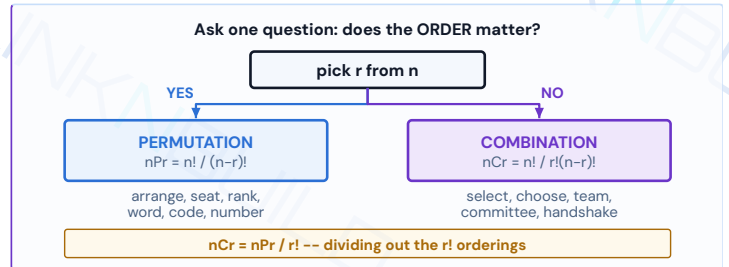
"A gives B a start of 20 m"	B runs only 80 m while A runs 100.
"A beats B by 5 seconds"	Same distance; convert via B's speed to a distance first.
"In a game of 100, A can give B 20 points"	When A scores 100, B scores 80 .

[TRAP] Chaining two race results. "A gives B 10 m and C 28 m in 100 m; what can B give C?" Work in ratios: $B:C = (90/100) \div (72/100)$ inverted carefully — B runs 90 when C runs 72, so over 100 for B, C runs 80 → B gives C **20 m**. Do not subtract $28 - 10$.

// §15 PERMUTATION, COMBINATION AND PROBABILITY

Explicitly named in the TI syllabus and in VLSI-role reports (§2). Also the topic where a single wrong reflex — permutation where a combination was wanted — costs the whole question.

15.1 One decision decides everything **MUST**



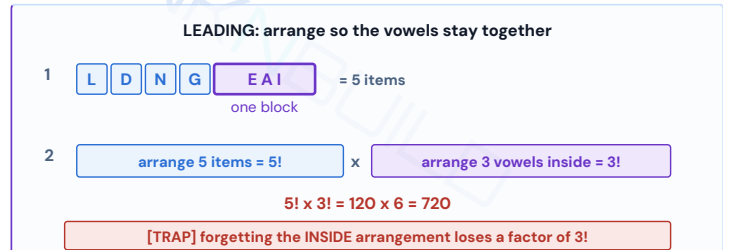
$nPr = n!/(n-r)!$ $nCr = n!/(r!(n-r)!)$ $nCr = nC(n-r)$
 WHEN P if the order matters (arrange, seat, rank, form a number); C if it does not (select, choose, committee). EXAMPLE $8C3 = 56$, $8P3 = 336$ — a factor of $3! = 6$ apart. **TRAP** "in how many ways can a team of 3 be **chosen and arranged**" is C then P, not one of them.

Handy values

$4! = 24$	$5! = 120$	$6! = 720$	$7! = 5040$
$nC1 = n$	$nC2 = n(n-1)/2$	$nC0 = nCn = 1$	$8! = 40320$

15.2 The word-arrangement archetype **MUST**

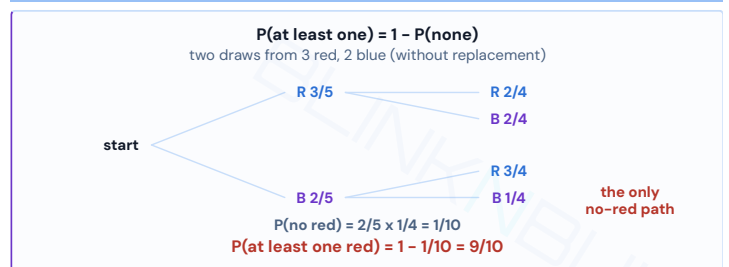
9 of the 19 sampled P&C questions were this. Learn it and you have half the topic.



Pattern	Trigger	Method
Plain word	"arrange the letters of MOBILE"	$n! = 6! = 720$.
Repeated letters	"letters of BANANA"	$n!/(p! q!) = 6!/(3!2!) = 60$.
Group together	"vowels always come together"	Glue into one block: $(n-k+1)! \times k!$.
Never together	"vowels never together"	Total - together. Do not count directly.
Fixed positions	"begins with a vowel"	Fill the constrained slot first, then the rest.
Circular	"seated round a table"	$(n-1)!$; if reflections are the same (a garland), $(n-1)!/2$.
Committee with a condition	"at least 2 women"	Sum the allowed cases, or total - disallowed.
Handshakes / lines	"every pair shakes hands"	$nC2 = n(n-1)/2$. Diagonals of an n-gon: $nC2 - n$.

[TRAP] "Together" needs TWO factorials. Glue the block **and** arrange inside it. Forgetting the inside arrangement loses a factor of $k!$ — and the wrong value is usually one of the options.

15.3 Probability **MUST**



P = favourable / total **P(at least one) = 1 - P(none)**
WHEN "at least", "at most", "neither" — the complement is almost always fewer cases. **TRAP** forgetting that "without replacement" shrinks the denominator on the second draw.

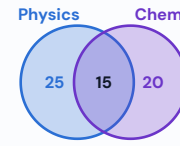
Setup	Total	Worth memorising
One die	6	$P(\text{prime}) = 3/6$; $P(>4) = 2/6$
Two dice	36	sum 7 → 6 ways (most likely); sum 9 → 4; doubles → 6
Pack of cards	52	26 red, 13 per suit, 12 face , 4 aces, 4 of each rank
n coins	2^n	exactly r heads → $nCr/2^n$
Balls from a bag	C(total, k)	favourable = product of the per-colour C's

P(A or B) = P(A) + P(B) - P(A and B)
WHEN the two events can overlap — "a multiple of 3 or 5". **EXAMPLE** tickets 1–20: $6 + 4 - 1$ (the 15) = 9 → **9/20**. **TRAP** adding without subtracting the overlap. **Only for mutually exclusive events is the overlap zero.**

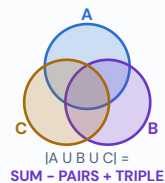
[TRAP] Independent is not the same as mutually exclusive. Mutually exclusive means they cannot both happen ($P(A \text{ and } B) = 0$). Independent means one does not affect the other ($P(A \text{ and } B) = P(A)P(B)$). Two mutually exclusive events with non-zero probability are **never** independent.

15.4 Set counting **HIGH**

Fill the **OVERLAP** first, then work outward



40 do Physics, 35 do Chem,
 15 do both → **total = 60**



$|A \cup B \cup C| = \text{SUM} - \text{PAIRS} + \text{TRIPLE}$

[TRAP] '25 do Physics' usually means 25 in **TOTAL**, not 25 only-Physics

$$|A \cup B| = |A| + |B| - |A \cap B|$$

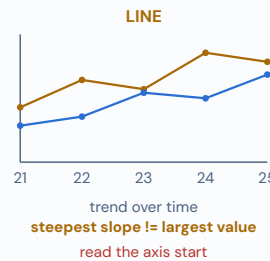
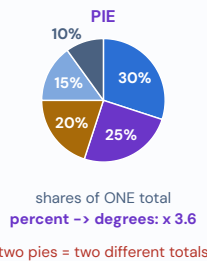
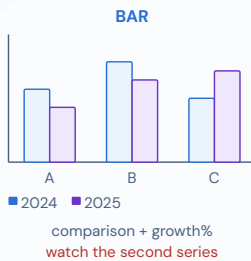
$$|A \cup B \cup C| = \text{SUM} - (\text{all three pairs}) + |A \cap B \cap C|$$

WHEN "how many study at least one", "how many study neither". **EXAMPLE** neither = **Total - |A ∪ B|**. **TRAP** "40 study Physics" almost always means **40 in total**, including those who also do Chemistry — not 40 who do only Physics.

// §16 DATA INTERPRETATION

Evidence note. DI was the thinnest part of the scan (29 questions reachable). This section is therefore built on **method** plus the external syllabus evidence in §2 — where Intel-style numerical reasoning is explicitly described as graphs, charts and tables. Treat the workflow as **VERIFIED** practice and the weighting as **INFERRED**.

The four DI formats -- read the **QUESTION** before the chart



	Q1	Q2	Q3
P	12	18	15
Q	20	14	22
R	16	19	11

most data, least drawing
usually the FASTEST DI set
 only add the cells you need

In every format: find the required cells, estimate, and check the options before doing exact arithmetic.

The four formats and what each is really testing. A DI set is not a maths test -- it is a reading test with arithmetic attached.

16.1 The workflow that saves the most time **MUST**

1. Read the question first	Never study the chart before you know what is asked. Most of the data is decoration.
2. Locate only the cells you need	Usually two or three numbers out of twenty.
3. Check the option spread	Far apart → estimate. Close together → compute exactly. Decide before calculating.
4. Prefer ratios to totals	"Which branch grew most?" is a comparison of ratios — you rarely need the totals at all.
5. Reuse the total	In a pie or a share question, compute the total once and keep it for the whole set.
6. Verify against the options	If your answer is not an option, you have almost certainly used the wrong row.

16.2 DI arithmetic you should not derive **HIGH**

Percentage change	$\frac{(\text{new} - \text{old})}{\text{old}} \times 100$ — base is always the old value
Percent → pie degrees	$\times 3.6$ (and degrees → percent: $\div 3.6$)
Share of total	$\frac{\text{part}}{\text{total}} \times 100$
Average over n years	sum of the n values $\div n$ — watch for a missing year
Ratio of two bars	read both, divide; do not convert to absolute units first

[TRAP] Four things DI sets do on purpose. (1) A y-axis that does not start at zero, making a small change look huge. (2) Two pie charts with **different totals** — percentages are not comparable directly. (3) Units in the caption ("figures in lakhs") that change the answer's magnitude. (4) A question about *percentage* growth answered with *absolute* growth, or the reverse.

// §17 LOGICAL REASONING — THE SET INDIAN OAS ACTUALLY USE

Take this list, not the other one. Per §1.3, the reasoning that shows up in Indian placement tests is the **verbal-reasoning** family below. The US-style categories (artificial language, matching definitions, analyzing arguments) are a large part of the bank and almost none of the exam.

17.1 Series — the highest-frequency reasoning item **MUST**

33 of 38 sampled series questions were number series. Run this checklist in order; the first three catch most of them.

Check	Signature	Example
1. First difference	constant or itself a simple series	3, 7, 11, 15 (+4)
2. Second difference	differences of differences constant	2, 5, 10, 17, 26 (+3, +5, +7)
3. Ratio	constant multiplier	3, 6, 12, 24 ($\times 2$)
4. Changing multiplier	$\times 2, \times 3, \times 4 \dots$	1, 2, 6, 24, 120
5. Squares / cubes $\pm k$	near a perfect power	2, 5, 10, 17 (n^2+1)
6. Alternating	two interleaved series	1, 10, 3, 12, 5, 14
7. Sum of previous two	Fibonacci-like	1, 1, 2, 3, 5, 8
8. Primes / factorials	the sequence itself is famous	2, 3, 5, 7, 11

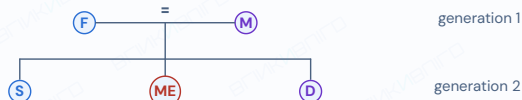
[FAST] Letter series: write the positions. A=1 ... Z=26. Convert to numbers, apply the checklist, convert back. Guessing at letters is slow; arithmetic on positions is not. Learn the anchors: **E=5, J=10, O=15, T=20, Y=25**.

17.2 Coding – decoding **HIGH**

Type	Trigger	Method
Letter shift	"CAT is DBU"	Constant shift; check every letter before committing.
Reverse-alphabet	A↔Z, B↔Y	Position 27 - n .
Number coding	"MOBILE is 341567"	Match by letter position across two given words.
Substitution	"sky is blue, blue is water"	Build a dictionary; answer the question's word, not the real one.
Symbol/condition	"if A + B means ..."	Translate the operators first, then evaluate left to right.

17.3 Blood relations **MUST**

Draw the tree, never argue it in your head



3 rules that solve almost every one

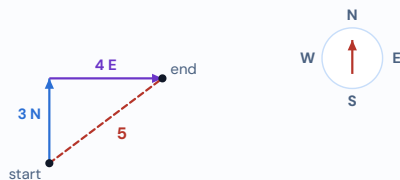
- 1 same row = siblings or spouse; a row below = child
- 2 decode a coded chain RIGHT to LEFT
- 3 gender is only what the words state -- never assume

[FAST] Decode a coded chain from the RIGHT. In "P + Q × R", start at R and walk left. Draw a two-row tree with generations, mark + male and - female only where stated, and never infer gender from a name or a role word like "doctor".

"Pointing to a photograph"	Anchor the speaker on the tree first; every relation is stated relative to them.
"His mother's only son"	That is himself . The commonest single trick in the topic.
"My father's only daughter"	Herself, if the speaker is female — check the speaker's stated gender.
Maternal vs paternal	Mother's side vs father's side. Uncles and aunts differ by side; the question usually cares.

17.4 Direction sense **HIGH**

3 km N, 4 km E: how far from the start?



displacement = $\sqrt{3^2 + 4^2} = 5$ -- not $3 + 4 = 7$
'how far' means straight-line distance; 'how much walked' means 7

"How far from the start"	Straight-line displacement → Pythagoras . Net north/south and net east/west are the two legs.
"How far did he walk"	Sum of all the segments. A different question with a different answer.
"Which direction is he facing"	Track only the turns. Each right turn is +90° clockwise, each left -90°.
Shadow questions	Morning sun in the east → shadows fall west . Evening, the reverse. At noon there is effectively none.

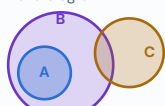
[TRAP] "Turns right" is relative to the walker, not the page. If he is walking south, a right turn takes him **west**. Redraw the arrow each time rather than assuming right means east.

17.5 Syllogisms **HIGH**

All A are B. Some B are C.

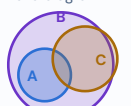
Does 'Some A are C' follow?

valid diagram 1



A and C do NOT meet

valid diagram 2



here they DO meet

one diagram where it fails → it does NOT follow
'some' never guarantees an overlap with a subset

The rule	A conclusion follows only if it is true in every diagram consistent with the statements. One counter-diagram kills it.
All A are B	A sits inside B. Does not give "All B are A".
Some A are B	They overlap. Also implies Some B are A .
No A are B	Disjoint. Implies No B are A .
Either / or	When two conclusions are individually uncertain but jointly exhaustive, the answer is "either follows".

[TRAP] Never use real-world knowledge. "All cats are dogs" must be accepted as given. The moment you reason about actual cats, you are answering a different question.

17.6 Data sufficiency **HIGH**

The one rule. You are asked **whether** the question can be answered, never what the answer is. The moment you find a unique value, stop — computing it wastes the time this format was designed to save you.

Test I alone	Cover statement II completely. Unique answer?
--------------	---

Test II alone	Cover statement I. Unique answer?
Only then, both	Combine only if each failed on its own.
"Not sufficient"	Means two different answers are possible. Find the second one to be sure.

[TRAP] Carrying information across. When testing statement I, you must genuinely forget statement II. This leak is the single most common data-sufficiency error.

17.7 Seating and puzzles **MED**

Fix ONE person, then everything is relative



facing the **CENTRE**:
clockwise = to your **LEFT**

facing **OUTWARD**:
clockwise = to your **RIGHT**

n people in a circle:
(n-1)! arrangements

[TRAP] 'left of' flips when they face outward -- always mark it

Fix one person	In a circle there is no absolute position. Place the most-constrained person first, then work outward.
Mark the facing	Facing the centre: clockwise is to a person's left . Facing outward: clockwise is to their right .
Use negatives	"C is not next to A" removes options. Cross out rather than guessing.
Linear rows	State which way the row faces before placing anyone.

17.8 Clocks and calendars **MED**

The hour hand moves too



angle = $|30H - 5.5M|$

H = 3, M = 20

$|90 - 110| = 20$ deg

if > 180, take $360 - x$

hour hand: 0.5 deg/min

minute hand: 6 deg/min

[TRAP] at 3:20 the hour hand has left the 3 -- it is not 0 deg

angle = $|30H - 5.5M|$ (if > 180, use $360 - \text{angle}$)
WHEN any "angle between the hands" question. EXAMPLE 3:40 → $|90 - 220| = 130^\circ$. **TRAP** assuming the hour hand sits exactly on the hour. It has moved 0.5° per minute.

Hands coincide	22 times in 24 hours (11 per 12 h) — every 65 5/11 minutes.
Hands opposite	22 times in 24 hours.
Right angle	44 times in 24 hours.
Odd days	Ordinary year 1 , leap year 2 , 100 yr 5 , 400 yr 0 .
Leap year	Divisible by 4, except centuries not divisible by 400. 1900 was not a leap year; 2000 was.
Day codes	0 = Sunday, 1 = Monday, ... 6 = Saturday.

[TRAP] The hands coincide 11 times in 12 hours, not 12. Between 11 and 1 o'clock there is only one coincidence, not two. The same -1 applies to the opposite and right-angle counts.

// §18 VERBAL ABILITY

Do not skip this. Intel, Honeywell, Bosch and Samsung all weight verbal at least as heavily as quant (§2.1) — and one source rates *fill in the blanks* and *error spotting* as the two single largest line items in the whole reasoning-plus-verbal block. For an ECE student this is usually the cheapest section to improve.

18.1 Error spotting — run this checklist **HIGH**

Subject-verb agreement	Find the real subject. "The list of items is long." Words between subject and verb are noise.
Tense consistency	One time frame per sentence unless the meaning demands otherwise.
Preposition	Fixed pairs: <i>discuss</i> (no "about"), <i>comprises</i> (no "of"), <i>married to</i> , <i>capable of</i> , <i>superior to</i> .
Article	<i>a</i> before a consonant sound (a university), <i>an</i> before a vowel sound (an hour).
Pronoun	Does every pronoun have exactly one possible antecedent?
Parallelism	Items in a list must share a form: "reading, writing and speaking ".
Comparison	"than any other boy"; compare like with like.
Modifier placement	An opening phrase must attach to the subject that follows it.

[FAST] "No error" is a real option and it is under-chosen. If you have run the eight checks and nothing fires, pick it. Candidates lose marks by inventing an error to justify the time spent.

18.2 Para jumbles HIGH

Find the opener	It introduces a noun in full, never with "it", "this", "such" or "these".
Chain the pronouns	A sentence starting "It was ..." must follow the one naming the thing.
Use connectors	<i>However, therefore, moreover</i> each demand a specific kind of predecessor.
Mandatory pairs	Lock two sentences that must be adjacent, then test the options — often only one survives.
Check the options	You rarely need the full order. Fixing the first sentence usually eliminates two options immediately.

18.3 Reading comprehension HIGH

Skim, then read the questions	Get structure and tone first. Detail questions send you back anyway.
Answer from the passage only	The most tempting wrong option is the one that is true in the world but absent from the text.
Watch the qualifiers	Options with <i>always, never, all, only</i> are usually too strong to be supported.
Tone questions	Most technical passages are <i>neutral</i> or <i>analytical</i> — rarely <i>critical</i> or <i>humorous</i> .
Do it last	Highest time cost per mark of anything in a verbal section.

[FAST] Vocabulary you cannot cram in a week. When a synonym or antonym is unknown, use **word roots and prefixes**: *bene-* good, *mal-* bad, *a-/an-* without, *circum-* around, *-phobia* fear, *-cracy* rule, *mis-* wrong, *anti-* against. Then eliminate on sentiment: if the sentence is positive, a negative-sounding option is unlikely.

// §19 THE 100 QUESTION ARCHETYPES

Pattern → Trigger → Method. Not 100 questions — 100 **shapes**. The archetypes marked with a count were measured in the sample (§1.4); the rest are the recurring shapes the scan surfaced without a clean signature. If you can name the archetype in five seconds, the arithmetic is the easy part.

#	Pattern	Trigger wording	Method
1	Basic percentage	"what percent of"	part/whole × 100
2	Percentage increase	"increased by x%"	$\times (1+x/100)$
3	Percentage decrease	"reduced by x%"	$\times (1-x/100)$
4	Successive change	"then decreased by y%"	multiply factors; $x+y+xy/100$
5	Reverse percentage (2)	"he has Rs R left"	divide by the surviving fraction
6	Asymmetric base	"A is x% more than B"	$100x/(100+x)$ the other way
7	Price-consumption	"expenditure unchanged"	$100x/(100+x)$ cut
8	Marks / pass mark (6)	"fails by 20 marks"	set total T, two expressions
9	x% of y = y% of x (4)	"A = x% of y, B = y% of x"	equal — always
10	Election margin	"wins by m votes"	$(2p-100)\%$ of total = m
11	Population growth	"grows x% each year"	$P(1+r/100)^n$
12	Find gain% (6)	"gain percent"	$(SP-CP)/CP \times 100$
13	CP of m = SP of n (2)	"CP of 20 = SP of 16"	$(m-n)/n \times 100$
14	SP doubled (2)	"profit triples"	algebra on $CP = 1$
15	Cost up, SP fixed (2)	"cost rises 25%"	recompute profit on new CP
16	Items per rupee (2)	"6 toffees per rupee"	work in cost per item
17	Successive discount	"20% then 10%"	$0.8 \times 0.9 = 0.72$
18	Markup then discount	"marks up 40%, gives 25% off"	1.4×0.75
19	False weight	"uses a 900 g weight"	error/(true-error)
20	Equal SP ±x%	"one at +20%, one at -20%"	always a loss of $x^2/100$
21	Break-even	"neither profit nor loss"	$SP = CP$
22	Basic ratio (8)	"in the ratio 3:4"	write 3k, 4k
23	Ratio changed (6)	"if 5 is added to each"	$(3k+5)/(4k+5) = \text{new}$
24	Divide a sum (3)	"divided among A, B, C"	total/(sum of parts) × part
25	Chained ratio (2)	"A:B and B:C"	scale B to a common value
26	Mean proportional	"third proportional to"	$\sqrt{(ab)}$, or $a:b = b:c$
27	Partnership, equal time (10)	"invest 12000 and 16000"	capital ratio
28	Partnership, unequal time (9)	"B joins after 4 months"	capital × time
29	Basic average (7)	"average of"	sum/n
30	Replacement (3)	"a new man replaces"	$\Delta \text{total} = n \times \Delta \text{average}$
31	Average age (4)	"average age of the family"	work with total ages

#	Pattern	Trigger wording	Method
32	First n naturals (4)	"average of first 20"	$(n+1)/2$
33	Wrong reading	"was misread as"	correct the total, re-divide
34	Innings average	"raises his average by 3"	$\text{new} = \text{avg} + n \times \text{shift}$
35	Weighted average	"boys and girls averages"	alligation cross
36	Mix two grades (8)	"mixed to sell at"	$(\text{dear}-\text{mean})/(\text{mean}-\text{cheap})$
37	Draw off & replace (6)	"drawn off and replaced"	$A(1-x/V)^n$
38	Milk-water ratio (5)	"ratio of milk to water"	track each component separately
39	Find SI rate (8)	"rate percent per annum"	$R = 100 \times SI/(P \times T)$
40	Two parts lent (2)	"divided into two parts"	x and (P-x); equate interests
41	Sum doubles itself	"doubles in 8 years"	$SI = P \Rightarrow RT = 100$
42	Basic CI (11)	"compound interest on"	$P(1+r/100)^n - P$
43	CI - SI (6)	"difference between CI and SI"	$2 \text{ yr: } P(r/100)^2$
44	Half-yearly (3)	"compounded half-yearly"	$r/2, 2n$
45	Installments	"equal annual installments"	discount each to present value
46	Combined work (7)	"together they finish"	LCM units; add rates
47	Efficiency ratio (7)	"twice as efficient"	invert to get time ratio
48	Leave / join (7)	"A leaves after 4 days"	subtract units, re-divide
49	Wages share (4)	"C's share of Rs 3200"	ratio of work done
50	Men-days-hours (4)	"12 men, 6 hours a day"	$M_1D_1H_1/W_1 = M_2D_2H_2/W_2$
51	Alternate days (2)	"on alternate days"	work per 2-day cycle
52	Remaining fraction	"what fraction is left"	$1 - (\text{rate} \times \text{days})$
53	Two pipes fill (9)	"two pipes fill in"	add rates
54	Leak (8)	"a leak empties it in"	subtract the leak rate
55	Pipe closed early (3)	"closed after 3 minutes"	split the timeline
56	Basic S=D/T (10)	"speed of the car"	convert units first
57	Two speeds, one route (3)	"instead of 10, at 14"	equate the shared quantity
58	Stoppages (2)	"including stoppages"	lost distance / speed
59	There-and-back average (2)	"returns at"	$2uv/(u+v)$
60	Late / early	"reaches 10 min late"	difference of two D/S
61	Meeting point	"towards each other"	relative speed = sum
62	Train crosses pole (4)	"crosses a pole"	distance = L
63	Train crosses platform (12)	"crosses a platform"	distance = L + P
64	Two trains crossing (18)	"cross each other"	L_1+L_2 over $v_1 \pm v_2$
65	Train vs walking man	"a man running along"	distance = L, speed relative
66	Pole-times ratio	"cross a man in 27 s and 17 s"	$v_1/v_2 = (t-b)/(a-t)$
67	Boat speed (9)	"speed in still water"	$(\text{down}+\text{up})/2$
68	Stream speed (9)	"speed of the stream"	$(\text{down}-\text{up})/2$
69	Beats by distance (10)	"A beats B by 20 m"	equal time → distance ratio
70	Gives a start (3)	"gives B a start of"	B runs less
71	Game of points (3)	"in a game of 100"	same ratio logic
72	Divisibility (9)	"completely divisible by"	digit tests; coprime split
73	Unit digit (2)	"unit digit of 7^{153} "	exponent mod 4
74	Remainder (2)	"remainder when divided"	reduce factors first
75	Primes (5)	"which is a prime"	test to $\sqrt{n}$ only
76	Same remainder (4)	"leaving the same remainder"	HCF of differences
77	Given remainders (4)	"leaves 3 and 5"	HCF of (a-r)
78	LCM + offset	"least number leaving 3"	$LCM \times k + 3$
79	HCF×LCM (7)	"product of the numbers"	$= a \times b$, two numbers only
80	Bells toll (2)	"toll together"	LCM of intervals
81	Digits interchanged (8)	"digits are reversed"	$10a+b$ vs $10b+a$
82	Ages ratio (6)	"ratio will be 3:4"	$(a+t)/(b+t) = \text{ratio}$
83	Father-son ages (9)	"father is 3 times as old"	two equations, two ages
84	Word arrangement (3)	"letters of the word"	$n!/(\text{repeats!})$
85	Vowels together (9)	"vowels always come together"	glue block: $(n-k+1)! \times k!$
86	Committee (5)	"a group of 3 from"	nCr , sum the cases

#	Pattern	Trigger wording	Method
87	Handshakes	"every pair shakes hands"	$nC2$
88	Circular arrangement	"round a table"	$(n-1)!$
89	Balls from a bag (2)	"two balls drawn"	$C(\text{fav})/C(\text{total})$
90	Cards (4)	"from a pack of 52"	know the 52 breakdown
91	Dice (4)	"two dice are thrown"	36 outcomes; count
92	At least / at most (2)	"at least one"	$1 - P(\text{none})$
93	Neither / complement (4)	"neither red nor green"	count what is allowed
94	Union of events (4)	"a multiple of 3 or 5"	$P(A)+P(B)-P(A \cap B)$
95	Number series (33)	"what comes next"	differences $\rightarrow$ ratios $\rightarrow$ powers
96	Coded relation (16)	"A + B means"	decode right to left; draw the tree
97	Photograph relation (10)	"pointing to a photograph"	anchor the speaker
98	Facing direction (21)	"which direction is he facing"	track turns only
99	Net displacement (14)	"how far from the start"	Pythagoras on the two legs
100	Data sufficiency	"I alone / II alone"	answer can I, never what

Counts in italics are the number of questions matching that archetype in the sampled bank (§1.4). They are floors for the 28 topics that hit the page cap, and they measure the bank, not any one company's paper.

// §20 THE 50 THINGS TO MEMORISE

Every entry here is something you should be able to write down without thinking. Nothing on this list is derivable fast enough under exam conditions.

#	Fact
1	Increase by $x\%$: $\times (1 + x/100)$. Decrease: $\times (1 - x/100)$.
2	Two successive changes: $\times x + y + xy/100$.
3	Up $x\%$ then down $x\%$ is a net loss of $x^2/100$ percent.
4	A is $x\%$ more than B $\Rightarrow$ B is $100x/(100+x)\%$ less than A.
5	A is $x\%$ less than B $\Rightarrow$ B is $100x/(100-x)\%$ more than A.
6	$a\% \text{ of } b = b\% \text{ of } a$.
7	Profit% is on CP; discount% is on MP.
8	$SP = CP(100+p)/100$, $CP = SP \times 100/(100+p)$.
9	CP of $m =$ SP of $n \Rightarrow$ profit $(m-n)/n \times 100$.
10	False weight gain% = $\text{error}/(\text{true}-\text{error}) \times 100$.
11	Two items, same SP, $\pm x\% \Rightarrow$ net loss $x^2/100\%$.
12	$SI = PRT/100$.
13	$CI \text{ amount} = P(1 + r/100)^n$.
14	CI - SI for 2 years = $P(r/100)^2$.
15	CI - SI for 3 years = $P(r/100)^2(3 + r/100)$.
16	Half-yearly: rate $r/2$, periods $2n$. Quarterly: $r/4$, $4n$.
17	A sum doubles under SI when $RT = 100$.
18	Work: total = LCM of the days; rates add, times do not.
19	Efficiency ratio is the inverse of the time ratio.
20	A leak is a negative rate; net = inflow - outflow.
21	Wages split in the ratio of work done .
22	$M1 \ D1 \ H1 / W1 = M2 \ D2 \ H2 / W2$.
23	$\text{km/h} \rightarrow \text{m/s}: \times 5/18$; $\text{m/s} \rightarrow \text{km/h}: \times 18/5$.
24	Average speed over equal distances = $2uv/(u+v)$.
25	Same distance $\Rightarrow$ times are in the inverse ratio of speeds.
26	Pole/man $\rightarrow$ distance = L. Platform/bridge $\rightarrow L + P$.
27	Two trains: opposite $\rightarrow v1+v2$; same $\rightarrow v1-v2$; distance always $L1+L2$.
28	Boats: $b = (d+u)/2$, $s = (d-u)/2$.
29	Races: "beats by 20 m" $\Rightarrow$ equal time $\Rightarrow$ distance ratio.
30	Alligation: cheap : dear = (dear-mean) : (mean-cheap) .
31	Replacement: original remaining = $A(1 - x/V)^n$.
32	$\Delta_{\text{total}} = n \times \Delta_{\text{average}}$.
33	Average of the first n naturals = $(n+1)/2$.
34	Partnership share = capital $\times$ time .
35	HCF $\times$ LCM = product — two numbers only.
36	Same remainder $\rightarrow$ HCF of the differences .
37	Least number leaving $r \rightarrow$ LCM$\times k + r$.
38	Unit-digit cycles: 2—(2,4,8,6), 3—(3,9,7,1), 7—(7,9,3,1), 8—(8,4,2,6); take exponent mod 4 .
39	Digits 0,1,5,6 keep their unit digit at every power.
40	Divisibility by 7: drop the last digit, subtract twice it.

#	Fact
41	Divisibility by 11: alternating digit sum.
42	$nPr = n!/(n-r)!$, $nCr = n!/(r!(n-r)!)$, $nCr = nPr/r!$.
43	Word with repeats: $n!/(p!q!)$. Circular: $(n-1)!$.
44	"Together" $\rightarrow$ glue: $(n-k+1)! \times k!$.
45	P(at least one) = 1 - P(none) .
46	P(A or B) = P(A) + P(B) - P(A and B) .
47	Two dice: 36 outcomes; sum 7 is the most likely (6 ways).
48	Cards: 52 = 26 red, 4 suits of 13, 12 face , 4 aces.
49	Clock angle = $ 30H - 5.5M $; hands coincide 22$\times$/day , right angle 44$\times$.
50	Odd days: ordinary year 1, leap 2, 100 yr 5, 400 yr 0; leap = +4 except centuries not +400.

// §21 THE 50 SHORTCUTS

Method $\rightarrow$ when it helps $\rightarrow$ where it breaks. Nothing here is a gimmick; each one is either exact or has its assumption stated.

#	Shortcut — and its limit
1	Back-solve from the options. Try option B or C first (they are usually the middle values). <i>Limit:</i> useless when options are expressions.
2	Plug in 100. For any percentage chain, assume the start is 100. <i>Limit:</i> not when an absolute value is asked.
3	Plug in the LCM. For work and pipes, assume the job is the LCM of the days. <i>Exact.</i>
4	Plug in 1. For "CP of $m =$ SP of n ", set CP = 1 per article. <i>Exact.</i>
5	Use fractions, not decimals. 37.5% $\rightarrow$ 3/8 turns division into multiplication.
6	Flip the percentage. 16% of 25 = 25% of 16 = 4.
7	Split the percentage. 17% = 10% + 5% + 2%.
8	Chain multipliers instead of adding percentages. <i>Exact.</i>
9	$x^2/100$ rule for "up then down by the same $x\%$ ". <i>Exact.</i>
10	Ratio constant k. Turns every ratio into a linear equation. <i>Exact.</i>
11	Two ratios $\rightarrow$ two constants (k and m). <i>Exact, and necessary.</i>
12	Scale ratios to a common middle term to chain A:B and B:C.
13	Alligation for any weighted average — marks, rates, speeds, not just mixtures.
14	Total-sum method for averages: never recover the original average.
15	Deviation method. Average of 62, 65, 68, 71: take 65 as base $\rightarrow (-3+0+3+6)/4 = 1.5 \rightarrow 66.5$.
16	Harmonic mean for there-and-back speeds. <i>Limit:</i> only for equal distances.
17	Relative speed collapses two moving objects to one. <i>Exact.</i>
18	Pole-time ratio: $v1/v2 = (t-b)/(a-t)$. <i>Limit:</i> opposite directions.
19	Convert units first , always. Saves more marks than any trick.
20	Difference of squares: $a^2 - b^2 = (a+b)(a-b)$. $97^2 - 3^2 = 100 \times 94$.
21	Squares ending in 5: $a(a+1) 25$.
22	Square near a round number: $(a \pm b)^2$ expansion.
23	Multiply by 11: add adjacent digits. $43 \times 11 \rightarrow 4 (4+3) 3 = 473$.
24	Multiply by 5: halve, then $\times 10$. By 25: quarter, then $\times 100$.
25	Multiply by 9: $\times 10$ minus itself.
26	Unit-digit filter. Compute only the last digit and eliminate options. <i>Limit:</i> only when the options' last digits differ.
27	Digit-sum (mod 9) check on a long multiplication.
28	Reduce mod n before multiplying in remainder questions. <i>Exact.</i>
29	Negative remainders. $3 \equiv -1 \pmod{4}$ makes 3^{45} trivial.
30	Test primality only to $\sqrt{n}$.
31	Coprime split for divisibility: $24 = 8 \times 3$, not 4×6 .
32	HCF of differences for same-remainder questions. <i>Exact.</i>
33	Complement counting: "at least one" $\rightarrow 1 - P(\text{none})$. <i>Exact.</i>
34	Total minus disallowed for "never together" arrangements. <i>Exact.</i>
35	$nCr = nC(n-r)$: compute $20C18$ as $20C2$.
36	Cancel factorials before multiplying. $10!/8! = 90$, never expand.
37	Fix one seat in circular arrangements $\rightarrow (n-1)!$.
38	Estimate when options are $>2\%$ apart; compute exactly when they are not.
39	Round numerator and denominator the same way to keep the error small.
40	Compare ratios by cross-multiplying , not by dividing both.
41	Compute a DI total once and reuse it across the set.
42	Percent $\rightarrow$ pie degrees: $\times 3.6$. <i>Exact.</i>
43	Read the DI question before the chart. Most of the data is decoration.
44	Letter series $\rightarrow$ positions. Anchors E=5, J=10, O=15, T=20, Y=25.
45	Series checklist in order: differences, second differences, ratios, powers, alternating.
46	Decode blood relations right to left , drawing as you go.
47	Direction sense: net N-S and net E-W, then Pythagoras. <i>Exact.</i>
48	Syllogism: hunt for ONE counter-diagram . Faster than proving it holds.
49	Data sufficiency: stop at "yes it is determined". Never finish the arithmetic.

#	Shortcut — and its limit
50	Eliminate on sentiment in vocabulary: match the option's polarity to the sentence's.

// §22 THE 50 TRAPS

Read this page last, the night before. Distractor options in a well-built OA are constructed from these exact mistakes — which is why a wrong answer so often appears in the list. Each row is **trap** → **correct mental model**.

The mistake	The correct model
× Adding successive percentages	✓ Multiply the factors; net = $x+y+xy/100$
× Up 20% then down 20% returns to the start	✓ It is a 4% loss — always $x^2/100$
× "25% more" and "25% less" are inverses	✓ Different bases: 25% more → 20% less
× Multiplying in a reverse-percentage question	✓ Divide by the surviving fraction
× Taking profit% on SP	✓ Profit is always on CP
× Taking discount% on CP	✓ Discount is always on MP
× Two items at $\pm x\%$ with equal SP break even	✓ Always a net loss of $x^2/100$ percent
× Adding two successive discounts	✓ 20% and 10% is 28%, not 30%
× Using CI formula where interest is simple	✓ Read whether it compounds; they differ from year 2
× Forgetting to halve the rate for half-yearly	✓ $r/2$ and $2n$ together
× Applying the CI-SI 2-year formula to 3 years	✓ 3 years needs the $(3 + r/100)$ factor
× Adding times in work problems	✓ Only rates add
× Time ratio = efficiency ratio	✓ They are inverses
× Splitting wages by days present	✓ Split by work actually done
× Treating a leak's time as something to subtract	✓ Convert to a rate first, then subtract
× Counting alternate-day work as a smooth average	✓ Work per cycle, then handle the tail explicitly
× Mixing metres with km/h	✓ Convert with 5/18 before dividing
× Averaging two speeds for a round trip	✓ Harmonic mean $2uv/(u+v)$
× Using train length alone for a platform	✓ Platform question → $L + P$
× Using L1 only when two trains cross	✓ Always $L1 + L2$
× Adding speeds for same-direction trains	✓ Subtract; add only for opposite directions
× Ignoring a walking man's own speed	✓ Use relative speed, but distance stays L
× Confusing downstream with still-water speed	✓ $b = (d+u)/2$, not d
× Subtracting race margins directly	✓ Chain them as ratios
× "Gives a start of 20 m" means he runs 120 m	✓ It means the other runs only 80 m
× Crossing the allegation answers over	✓ Cheap quantity pairs with the DEARER difference
× Applying the replacement formula to the added liquid	✓ It tracks the ORIGINAL liquid
× Averaging two averages of unequal groups	✓ Weight by group size
× Hunting for the original average in a replacement	✓ $\Delta_{\text{total}} = n \times \Delta_{\text{average}}$ is enough
× Using capital alone in partnership	✓ Capital $\times$ time when the months differ
× Reusing one constant for two different ratios	✓ Two ratios need k and m
× Extending HCF $\times$ LCM = product to three numbers	✓ True for two numbers only
× Using HCF where the answer must be larger	✓ Bigger than the inputs → LCM
× Forgetting the "+1" in inclusive counting	✓ Fence-posts: from a to b inclusive is $b-a+1$
× Divisible by 4 and 6 $\Rightarrow$ divisible by 24	✓ Split into coprime factors: 8×3
× Taking cyclicity remainder 0 as position 0	✓ Remainder 0 → the LAST entry in the cycle
× Reducing mod n before a division	✓ Only valid for $+$, $-$ and $\times$
× Permutation where a selection was asked	✓ Order matters? P . Otherwise C
× Gluing a block but not arranging inside it	✓ Multiply by $k!$ as well
× Counting "never together" directly	✓ Total minus together
× Using $n!$ for a circular arrangement	✓ $(n-1)!$
× Adding $P(A)$ and $P(B)$ when they overlap	✓ Subtract $P(A \text{ and } B)$

The mistake	The correct model
× Treating mutually exclusive as independent	✓ They are opposites, not synonyms
× Keeping the denominator fixed without replacement	✓ It shrinks on the second draw
× Enumerating cases for "at least one"	✓ Complement: $1 - P(\text{none})$
× Reading "40 study Physics" as Physics-only	✓ It normally includes the overlap
× Assuming the hour hand sits on the hour	✓ It moves 0.5° per minute
× Counting 12 hand-coincidences per 12 hours	✓ 11 — and 22 per day
× Treating 1900 as a leap year	✓ Centuries need $\div 400$; 1900 was not, 2000 was
× Turning "right" relative to the page	✓ Turns are relative to the walker's facing

Five reasoning traps that are not arithmetic at all. (1) Using real-world knowledge in a syllogism instead of the stated premises. (2) Carrying statement II's information into your test of statement I in data sufficiency. (3) Assuming gender from a name or a job word in a blood-relation question. (4) Forgetting that "facing outward" flips left and right in a circular arrangement. (5) Answering "how far did he walk" when the question asked "how far is he from the start".

[FAST] The 20-second self-audit. Before you commit an answer, ask three things: Did I answer what was asked? (distance vs displacement, profit vs profit%, value vs percentage). Are my units consistent? Is the base of my percentage the one the question named? Those three questions catch most of the fifty rows above.

// §23 THE ERROR LOG

Keep this while practising. After two weeks the pattern in the **Error** column tells you what to revise far better than any syllabus does — and repeated entries of the same kind should set your revision order.

Question / source	Topic	What I actually did wrong	The correct idea	How I stop it next time
e.g. trains #12	TSD	used L only for a platform	distance = $L + P$	underline the object being crossed

Classify every error into one of three kinds, because they need different fixes. **CONCEPT** — you did not know the method: restudy the section. **EXECUTION** — you knew it and slipped: slow down by 5 seconds, do not restudy. **READING** — you answered a question that was not asked: use the 20-second self-audit above. Most candidates misdiagnose execution errors as concept errors and waste days re-reading theory they already know.

// §24 PRACTICE — MEDIUM TO HARD

These are written for this sheet, not copied. Each one is chosen to teach a **distinct** archetype from §19 at OA difficulty, and each is deliberately harder than the average bank question — an easy question teaches you nothing you did not already have. Target times assume you have already recognised the archetype.

Q1 **MEDIUM** The price of sugar rises by 25%. By what percent must a family cut consumption so that its sugar bill is unchanged? 45 s

ANSWER / FAST 20%. Fixed expenditure $\Rightarrow$ cut = $100x/(100+x) = 2500/125 = 20$.

WHY Expenditure = price $\times$ quantity. Price $\times 1.25$, so quantity must be $\times 1/1.25 = 0.8$.

TRAP Answering 25%. The reduction is measured against the **new** price, a bigger base.

Q2 **HARD** A shopkeeper marks his goods 40% above cost and then allows a discount. If he still made a 12% profit, what discount did he give? 60 s

ANSWER / FAST 20%. $1.40 \times (1-d) = 1.12 \Rightarrow 1-d = 0.8$.

WHY Chain the multipliers from CP: markup on CP, discount on MP, result compared to CP.

TRAP Subtracting $40 - 12 = 28\%$. The two percentages sit on different bases.

Q3 **HARD** A sells to B at 20% profit, B sells to C at 25% profit, and C pays Rs 1800. What did A pay? 60 s

ANSWER / FAST Rs 1200. $1800/(1.20 \times 1.25) = 1800/1.5$.

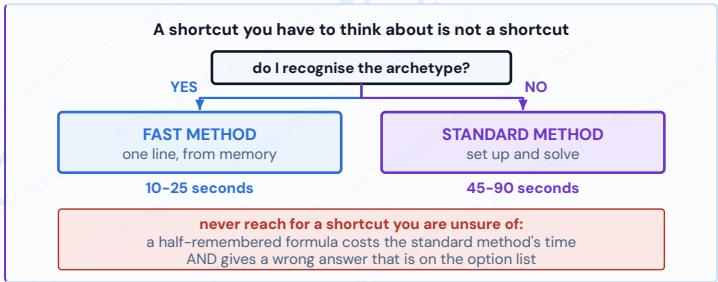
WHY Successive profits chain multiplicatively along the sale path; divide to walk backwards.

TRAP Taking 45% off 1800. Also: each profit is on *that seller's* cost, not on A's.

Q4 MEDIUM Two articles are sold at Rs 960 each, one at 20% profit and one at 20% loss. What is the overall result? ANSWER / FAST Loss of Rs 80 (4%). Straight from $x^2/100 = 4\%$ on the total SP. WHY CPs are $960/1.2 = 800$ and $960/0.8 = 1200$, total 2000 against 1920 received. TRAP Concluding "no profit no loss". The loss-making article had the larger cost price.	Q15 HARD From 40 litres of pure milk, 8 litres are drawn and replaced with water. This is done twice. How much milk remains? ANSWER / FAST 25.6 L. $40(1 - 8/40)^2 = 40(0.8)^2$. WHY Each operation removes the same fraction of whatever milk is present, so the effect compounds. TRAP Subtracting 8 twice to get 24 L; the second draw removes a mixture, not pure milk.
Q5 HARD A and B can do a job in 12 and 18 days. They start together but A leaves 3 days before completion. How long did the job take? ANSWER / FAST 9 days. Work 36 units; rates 3 and 2. If total is T, A works T-3: $3(T-3) + 2T = 36 \Rightarrow 5T = 45$. WHY "Leaves 3 days before the end" means B alone covers the last 3 days — write A's time as T-3, not as a separate phase. TRAP Reading it as "A leaves after 3 days". Opposite meaning, different answer.	Q16 MEDIUM The average weight of 8 people rises by 2.5 kg when a new person replaces one weighing 56 kg. What does the new person weigh? ANSWER / FAST 76 kg. Total rises by $8 \times 2.5 = 20 \Rightarrow 56 + 20$. WHY Only the change in the total matters; the original average is irrelevant. TRAP Trying to find the original average first — it is not given and not needed.
Q6 MEDIUM A is thrice as efficient as B and finishes a job 40 days sooner. How long do they take together? ANSWER / FAST 15 days. Times are 1:3, so $3x - x = 40 \Rightarrow x = 20$; A 20, B 60; together $1/20 + 1/60 = 1/15$. WHY Efficiency 3:1 inverts to a time ratio of 1:3. TRAP Writing the time ratio as 3:1 — the single most common work-topic error.	Q17 HARD A, B and C start a business with Rs 20000, Rs 15000 and Rs 12000. B withdraws after 6 months and C after 9. If the year's profit is Rs 21900, find A's share. ANSWER / FAST Rs 12000. Ratios $20 \times 12 : 15 \times 6 : 12 \times 9 = 240 : 90 : 108 \Rightarrow 40:15:18 (+6)$; A = $21900 \times 40/73 = 300 \times 40$. WHY Partnership shares go by capital $\times$ months actually invested. TRAP Using 20:15:12. The unequal months are the whole point.
Q7 HARD Two pipes fill a tank in 20 and 30 minutes; a waste pipe empties it in 15 minutes. All three are opened on an empty tank. What happens? ANSWER / FAST It fills in 60 minutes. LCM 60: rates +3, +2, -4 $\Rightarrow$ net +1 per minute. WHY A leak is simply a negative rate; net rate then divides the total work. TRAP Assuming a waste pipe always wins, or subtracting times (20+30-15).	Q18 MEDIUM The difference between CI and SI on a sum for 2 years at 10% p.a. is Rs 60. Find the sum. ANSWER / FAST Rs 6000. $P(r/100)^2 = 60 \Rightarrow P(0.01) = 60$. WHY Over two years the only difference is the interest earned on year 1's interest. TRAP Using the 3-year formula, or dividing by r/100 only once.
Q8 HARD A train 240 m long passes a pole in 12 s. How long to pass a platform 360 m long? ANSWER / FAST 30 s. Speed = $240/12 = 20$ m/s; distance now 600 m $\Rightarrow 600/20$. WHY The pole gives you the speed for free, because there the distance is exactly the train's length. TRAP Using 360 m alone, or forgetting that the answer needs L + P.	Q19 HARD What is the unit digit of $7^{95} \times 3^{58}$? ANSWER / FAST 7. $95 \bmod 4 = 3 \Rightarrow 7^{95}$ ends in 3; $58 \bmod 4 = 2 \Rightarrow 3^{58}$ ends in 9; $3 \times 9 = 27$. WHY Unit digits cycle with period 4; only the last digits of the factors matter to the product's last digit. TRAP Mapping remainder 0 to the first entry instead of the last.
Q9 HARD Two trains, 150 m and 100 m long, run in opposite directions at 54 and 36 km/h. How long do they take to cross each other? ANSWER / FAST 10 s. Relative 90 km/h = 25 m/s; distance 250 m. WHY Opposite directions add speeds; the distance is both lengths. TRAP Converting after dividing, or using only one length.	Q20 HARD Find the greatest number that divides 43, 91 and 183 leaving the same remainder in each case. ANSWER / FAST 4. Differences 48, 92, 140 $\Rightarrow$ HCF = 4. WHY If $a \equiv b \pmod{d}$ then d divides $a - b$, so the unknown remainder cancels out of the differences. TRAP Taking the HCF of 43, 91 and 183 themselves, which is 1.
Q10 HARD Two trains cross a standing man in 27 s and 17 s and cross each other, running opposite, in 23 s. Find the ratio of their speeds. ANSWER / FAST 3:2. $v_1/v_2 = (t-b)/(a-t) = (23-17)/(27-23) = 6/4$. WHY $L_1 = v_1a$ and $L_2 = v_2b$; substituting into $(L_1+L_2)/(v_1+v_2) = t$ rearranges to that ratio. TRAP Trying to find the actual speeds. Only the ratio is determined.	Q21 MEDIUM In how many ways can the letters of ARRANGE be arranged so that the two R's are never together? ANSWER / FAST 900. Total $7!/(2!2!) = 1260$; with the R's glued $6!/2! = 360$; $1260 - 360$. WHY "Never together" is always cheaper as total minus together. TRAP Forgetting the A's repeat too — both 2!'s are needed.
Q11 MEDIUM A boat goes 30 km downstream in 2 h and returns in 3 h. Find the boat's and stream's speeds. ANSWER / FAST 12.5 and 2.5 km/h. down = 15, up = 10 $\Rightarrow b = 12.5, s = 2.5$. WHY b is the mean of the two effective speeds; s is half their difference. TRAP Averaging the two times, or reporting 15 as the boat's speed.	Q22 HARD A bag has 4 red and 5 blue balls. Three are drawn at random. What is the probability that at least one is red? ANSWER / FAST 37/42. $1 - C(5,3)/C(9,3) = 1 - 10/84$. WHY "None red" is a single term; "at least one" would be three. TRAP Computing 1 red + 2 red + 3 red and slipping on one term.
Q12 HARD A man rows to a place 48 km away and back in 14 hours. He finds he can row 4 km downstream in the same time as 3 km upstream. Find the stream's speed. ANSWER / FAST 1 km/h. Down:up speeds = 4:3, so times $48/4k + 48/3k = 14 \Rightarrow 12/k + 16/k = 14 \Rightarrow k = 2$; down 8, up 6 $\Rightarrow s = 1$. WHY "Same time for 4 km down and 3 km up" is a statement about the speed ratio, not the speeds. TRAP Treating 4 and 3 as speeds.	Q23 MEDIUM In a group of 60 students, 35 play cricket, 30 play football and 15 play both. How many play neither? ANSWER / FAST 10. $A \cup B = 35 + 30 - 15 = 50$; $60 - 50$. WHY Inclusion-exclusion, then subtract from the universe. TRAP Reading 35 as cricket-only. It includes the 15.
Q13 MEDIUM In a 100 m race A beats B by 10 m, and in the same race A beats C by 28 m. By how much can B beat C? ANSWER / FAST 20 m. When B runs 90, C runs 72; scale to 100: C runs 80. WHY All three distances are covered in the same time, so they are in a fixed ratio. TRAP $28 - 10 = 18$. Margins are ratios, not differences.	Q24 HARD What is the angle between the hands of a clock at 4:20? ANSWER / FAST 10°. $30(4) - 5.5(20) = 120 - 110$. WHY The hour hand has already moved 10° past the 4, and the minute hand sits exactly on the 4. TRAP Answering 0° because both hands "point at the 4".
Q14 MEDIUM In what ratio must rice at Rs 32/kg be mixed with rice at Rs 44/kg so the mixture is worth Rs 38.40/kg? ANSWER / FAST 7:8. Cross: $(44 - 38.4) : (38.4 - 32) = 5.6 : 6.4$. WHY Alligation gives the ratio of quantities as the inverse ratio of the distances from the mean. TRAP Reporting 8:7. The cheap quantity pairs with the dearer difference.	Q25 MEDIUM A man walks 4 km north, 3 km east, then 8 km south. How far is he from the start, and in which direction? ANSWER / FAST 5 km, south-east. Net 4 km south, 3 km east $\Rightarrow \sqrt{(16+9)}$. WHY Cancel the opposing legs first, then apply Pythagoras to the two net components. TRAP Adding $4 + 3 + 8 = 15$ — that answers "how far did he walk", a different question.

Q26 HARD	The ratio of two numbers is 3:4. If 8 is added to each, the ratio becomes 4:5. Find the numbers.	60 s
ANSWER / FAST	24 and 32. $(3k+8)/(4k+8) = 4/5 \Rightarrow 15k + 40 = 16k + 32 \Rightarrow k = 8$.	
WHY	The constant k converts a ratio statement into one linear equation.	
TRAP	Adding 8 to the ratio terms rather than to the actual numbers.	

// §25 STANDARD METHOD VS FAST METHOD



R2 **HARD** If A + B means A is the son of B, A - B means A is the wife of B, and A × B means A is the brother of B, how is P related to S in P × Q + R - S?

45 s

ANSWER / FAST P is the son of S. Right to left: R is the wife of S; Q is the son of R (so of S too); P is the brother of Q — so P is also S's son.

WHY Each operator links only its two neighbours, so chaining from the right builds the tree one consistent link at a time.

TRAP Reading left to right, which attaches P to the wrong person entirely.

R3 **MEDIUM** A man walks 5 km east, turns right and walks 5 km, turns right and walks 5 km, then turns left and walks 3 km. Which direction is he facing?

40 s

ANSWER / FAST South. East →(right) south →(right) west →(left) south.

WHY Only the turns matter; every distance in the question is irrelevant to what he is facing. Facing west, your left hand points south.

TRAP Letting the distances distract you, and turning relative to the page instead of the walker.

R4 **HARD** Statements: All engineers are graduates. Some graduates are managers. Conclusion: Some engineers are managers. Does it follow?

45 s

ANSWER / FAST No. Draw the managers overlapping the graduates **outside** the engineers — a legal diagram in which no engineer is a manager.

WHY A conclusion must hold in every consistent diagram, not merely be possible in one.

TRAP Accepting it because it sounds plausible, or because it is true of real engineers.

R5 **MEDIUM** Data sufficiency. What is the two-digit number? (I) The sum of its digits is 9. (II) The difference between the number and the number formed by reversing its digits is 27.

40 s

ANSWER / FAST Both together, but neither alone. (I) allows 18, 27, 36... (II) gives a-b = 3, also many. Together: a+b = 9 and a-b = 3 → a = 6, b = 3 → **63** — unique, so **both together are sufficient**.

WHY Test each alone first; only then combine. The reversal difference is always **9(a-b)**.

TRAP Concluding "insufficient" after finding each statement alone fails, without testing the combination.

26.3 Verbal **HIGH**

V1 **MEDIUM** Spot the error: "The list of approved candidates (a)/ have been sent (b)/ to the department head (c)/ no error (d)."

25 s

ANSWER / FAST (b). The subject is *list* (singular), so it must be **has** been sent.

WHY Strip the prepositional phrase "of approved candidates" and the subject is obvious.

TRAP Agreeing the verb with the nearest noun, *candidates*. This is the single most common error-spotting trap.

V2 **MEDIUM** Fill the blank: "The results were not consistent ____ the hypothesis."

25 s

ANSWER / FAST with. Fixed pairing: *consistent with*.

WHY Preposition questions test collocation, not meaning; there is nothing to reason out.

TRAP Choosing to by analogy with "similar to".

V3 **HARD** Para jumble. (1) This makes them ideal for real-time control. (2) FPGAs contain arrays of configurable logic. (3) Unlike processors, they execute operations in parallel. (4) Their latency is therefore both low and predictable.

45 s

ANSWER / FAST 2 – 3 – 4 – 1. (2) introduces FPGAs in full; (3) contrasts; (4) draws the consequence with "therefore"; (1) closes with "This".

WHY The opener is the only sentence that names its subject without a back-reference.

TRAP Starting with (1) or (4) — "This" and "therefore" both require a predecessor.

26.4 Calculation drill **HIGH**

Pure arithmetic under time. The point is to notice which of these you do by **pattern** and which by **calculation** — the first column should feel automatic.

By pattern (target <10 s)	Answer	By calculation (target <25 s)	Answer
35 ²	1225	17% of 450	76.5
98 ²	9604	1 – (0.8 × 0.85)	0.32
37.5% of 64	24	Average of 62, 65, 68, 71	66.5
16% of 25	4	2 × 60 × 40 / 100	48
72 km/h in m/s	20	LCM(12, 18, 24)	72
Unit digit of 3 ¹⁰¹	3	HCF(48, 92, 140)	4
9C2	36	7!/(3! 2!)	420
Is 1729 divisible by 7?	yes	Angle at 4:20	10°

// §27 EXAM STRATEGY

27.1 Three passes, never one **MUST**

Three passes, not one -- the cheapest marks are always left behind by a single linear sweep

PASS 1	sweep for INSTANT questions	recognise + answer in under 30 s	aim: 50–60% of the paper
PASS 2	the ones you KNOW but that take work	set up, compute, verify	aim: most of the rest
PASS 3	long, multi-step or unfamiliar	only if the clock allows	guess policy decides the rest

A question you cannot name in 5 seconds is a PASS-3 question. Marking it and moving on is a decision, not a defeat.

The single most common way to lose marks in an aptitude section is to meet a hard question at number 4 and spend four minutes on it while eleven easy ones sit unread at the back.

27.2 Speed and accuracy **HIGH**

Recognition speed > calculation speed. Two candidates who both know every formula can differ by 30% on score purely on how fast they classify. Practise **naming** archetypes from question stems — read 40 stems and say the archetype aloud without solving any of them. It is the highest-return 20 minutes in your preparation.

Accuracy first, then speed	Get to ~90% accuracy untimed before you start timing. Speed built on a shaky method just produces wrong answers faster.
Time per question is an average, not a budget	20 questions in 20 minutes does not mean 60 s each. It means 30 s on twelve and 100 s on eight.
Write the setup	One line: "36 units, rates 3 and 2". Mental-only setups are where sign errors live.
Never re-derive a \$20 fact	If you are deriving 5/18 during the test, that is a preparation failure showing up as a time failure.

27.3 The skip rule **MUST**

Skip on RECOGNITION failure, not on difficulty. If you cannot name the archetype within about 5 seconds, mark it and move. If you *can* name it but the arithmetic looks long, that is a pass-2 question, not a skip. Deciding this in advance is what stops you sinking four minutes into one mark.

Skip immediately Unrecognised archetype; a long puzzle with 5+ constraints; a DI set whose table you have not parsed in 20 s.

Defer to pass 2 Recognised but multi-step: CI instalments, alternate-day work, chained races.

Never skip	Anything on the §20 memorise list. Those should be near-instant.
Come back once	Give a deferred question one more attempt, not three. If it fails twice, it is a guess candidate.

27.4 Negative marking **MUST**

Should you guess? E = 1.25p – 0.25		
4 options, +1 right, –0.25 wrong → break-even at p = 0.20		
eliminated		
none (p = 1/4)	→ MARGINAL	E = +0.06
one (p = 1/3)	→ GUESS	E = +0.17
two (p = 1/2)	→ ALWAYS GUESS	E = +0.375
the catch: distractors are BUILT from the classic errors,		
so a 'random' guess is often below p = 0.2. eliminate first.		

Scheme	Rule	Last five minutes
No negative marking (reported: Micron, Samsung)	There is no such thing as a question you should leave blank.	Fill every remaining bubble, even at random.
-0.25 per wrong (reported: TI, Qualcomm)	Break-even is $p = 0.20$. Guess when you have eliminated at least one option; think hard before a blind guess.	Answer everything you narrowed to 2–3 options; leave the untouched ones blank.
Unknown scheme	Assume there is a penalty. Ask the invigilator or read the instruction page — it takes 15 seconds.	Behave as for -0.25 until you know otherwise.
Sectional cut-offs (reported: Micron)	A brilliant quant score does not rescue a failed verbal section.	Spend your last minutes on your weakest section, not your best.

[TRAP] The eliminated-option illusion. "I narrowed it to two" is only worth +0.375 if you genuinely eliminated two. Distractors are built from the classic errors in §22, so the option you "eliminated" may be the right one and the one you kept may be your own mistake, printed. Eliminate on a **reason** you can state, not on a feeling.

// §28 REVISION PLANS

Four plans by time available. All are built on the §3 tier order — Tier 1 before anything else, always.

28.1 Seven days **MUST**

Day	Concepts	Practice
DAY 1	§5 mental maths (fraction table, squares, 5/18), §6 number system: divisibility, unit digit, remainders, HCF/LCM	30 questions, untimed. Build the fraction table from memory twice.
DAY 2	§7 percentages, §8 profit/loss/discount — the multiplier view and the base rule	35 questions. Log every base error in §23.
DAY 3	§9 ratio & partnership, §10 averages, §11 alligation	30 questions. Do 10 with alligation only.
DAY 4	§13 time & work + pipes (LCM units), §14.1 TSD basics	30 questions, first 10 timed at 60 s.
DAY 5	§14.2–14.4 trains, boats, races; §12 SI & CI recap	30 questions. Drill the pole-vs-platform distinction until automatic.
DAY 6	§15 P&C and probability, §16 DI workflow	25 questions + 2 full DI sets under time.
DAY 7	§17 reasoning set, §18 verbal checklists	One full mock under exam conditions , then §22 traps and your own error log.

28.2 Three days **HIGH**

DAY 1	Tier 1 quant. Mental maths tables → percentages → profit/loss → ratio → averages. 40 questions.
DAY 2	The rest of Tier 1 + Tier 2. Work & pipes → TSD & trains → number system → probability/P&C. 40 questions.
DAY 3	Reasoning + mixed timed practice. Series, blood relations, directions, syllogism, data sufficiency (morning). One timed mixed set + §20/§22 (evening).

28.3 One day **HIGH**

MORNING	§20 50 things to memorise — write them out, do not just read. Then §4 recognition table twice.
MIDDAY	Percentages, profit/loss, ratio, averages, work, TSD/trains — formula boxes only , no theory. 5 questions each = 30 questions.
AFTERNOON	§17 reasoning: number series, blood relations, directions, syllogism, data sufficiency. 20 questions.
EVENING	§24 practice set, timed. Then §22 traps. Do not start a new topic after this point.

28.4 Three hours before the OA **MUST**

0:00–0:40	§20 the 50 facts, and §5.1 the fraction→percent table. Write both out from memory.
0:40–1:20	§4 recognition table — cover the right column and name the method for each trigger.
1:20–2:20	§24 practice set under time. Mark what you miss; do not fix it by studying, fix it by re-reading the trap.
2:20–2:50	§22 the 50 traps, slowly.
2:50–3:00	§27.4 marking rules for your paper. Decide your guessing policy now, not during the test.

Do not learn anything new in the last three hours. A half-learned method is worse than none: it feels usable, costs 90 seconds, and produces a distractor. Revise only what you already know.

28.5 The last 60 minutes **MUST**

Conversions	1/5 and 18/5. The fraction→percent table. Squares to 30.
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Percentage	Multiplier form; successive $x+y+xy/100$; $x^2/100$ for up-then-down; reverse % divides.
P&L	Profit on CP, discount on MP.
Work	LCM units; rates add; efficiency inverts time; leak is negative.
Speed	Pole = L, platform = L+P; opposite adds, same subtracts; $2uv/(u+v)$.
Boats	$b = (d+u)/2$, $s = (d-u)/2$.
Mixtures	Alligation cross; $A(1-x/V)^n$.
Averages	$\Delta_{\text{total}} = n \times \Delta_{\text{average}}$.
Interest	CI-SI (2 yr) = $P(r/100)^2$; half-yearly halves r and doubles n .
Counting	Order matters → P; else C. Glue block needs $k!$ too.
Probability	At least one → $1 - P(\text{none})$. Union subtracts the overlap.
Numbers	Unit-digit cycles mod 4; same remainder → HCF of differences.
Reasoning	Series checklist; decode relations right-to-left; Pythagoras for displacement; one counter-diagram kills a syllogism; data sufficiency answers <i>can I</i> .
Clock	$ 30H - 5.5M $.
Strategy	Three passes. Skip on recognition failure. Know your marking scheme.

// §29 THE FORMULA WALL

Everything worth carrying, on one spread. If a formula is not here, it did not earn its place.

Area	Formulas
Percentage	change: $x(1 \pm x/100)$ · successive: $x+y+xy/100$ · up-then-down $x\%$: loss $x^2/100$ · $x\%$ more → $100x/(100+x)$ % less · $x\%$ less → $100x/(100-x)$ % more · $a\%$ of $b = b\%$ of a
Profit & loss	$p\% = (SP-CP)/CP \times 100$ · $SP = CP(100+p)/100$ · $d\% = (MP-SP)/MP \times 100$ · CP of $m = SP$ of $n \rightarrow (m-n)/n \times 100$ · false weight: $\text{error}/(\text{true-error}) \times 100$ · equal SP $\pm x\%$: loss $x^2/100$
Interest	$SI = PRT/100$ · $A = P(1+r/100)^n$ · CI-SI (2 yr) = $P(r/100)^2 \cdot (3 \text{ yr}) = P(r/100)^2(3+r/100)$ · half-yearly: $r/2$, $2n$ · SI doubles when $RT=100$
Ratio	write a_k, b_k · chain by scaling the common term · direct $a/b=c/d$ · inverse $ab=cd$ · mean proportional $\sqrt{ab}$ · partnership $\text{capital} \times \text{time}$
Average	sum/n · $\Delta_{\text{total}} = n \times \Delta_{\text{average}}$ · first n naturals $(n+1)/2$ · weighted $(n_1a_1+n_2a_2)/(n_1+n_2)$
Mixtures	alligation $\text{cheap:dear} = (\text{dear-mean}) : (\text{mean-cheap})$ · replacement $A(1-x/V)^n$
Work	total = LCM of days · rates add · $1/T = 1/a + 1/b$ · efficiency inverts time · leak = negative rate · $M1D1H1/W1 = M2D2H2/W2$ · wages by work done
Speed	$S = D/T$ · km/h → m/s · $\times 5/18$ · equal distances $2uv/(u+v)$ · equal times $(u+v)/2$ · same distance → times inverse to speeds
Trains	pole/man = L · platform = L+P · opposite v_1+v_2 · same v_1-v_2 · distance always L_1+L_2 · pole-times ratio $v_1/v_2 = (t-b)/(a-t)$
Boats	$d = b+s$, $u = b-s$ · $b = (d+u)/2$ · $s = (d-u)/2$
Races	"beats by" → equal time → distance ratio · "gives a start of x " → the other runs $(D-x)$
Numbers	$HCF \times LCM = ab$ (two numbers) · same remainder → HCF of differences · given remainders → $HCF(a-r)$ · least leaving $r \rightarrow LCM \times k + r$ · unit digit: exponent mod 4 · two-digit: $10a+b$, reversal difference $9(a-b)$
Counting	$nPr = n!/(n-r)!$ · $nCr = n!/(r!(n-r)!)$ · $nCr = nPr/r!$ · repeats $n!/(p!q!)$ · together $(n-k+1)! \times k!$ · circular $(n-1)!$ · handshakes $nC2$
Probability	fav/total · $P(\text{at least one}) = 1 - P(\text{none})$ · $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ · independent $P(A)P(B)$ · dice 36, cards 52 (12 face)
Sets	$ A \cup B = A + B - A \cap B $ · three sets: $\text{SUM} - \text{PAIRS} + \text{TRIPLE}$ · neither = Total - $ A \cup B $
DI	% change $(\text{new-old})/\text{old} \times 100$ · percent→degrees $\times 3.6$ · share $\text{part}/\text{total} \times 100$
Clock / calendar	angle $ 30H - 5.5M $ · coincide/opposite $22 \times$ a day, right angle $44 \times$ · odd days: year 1, leap 2, 100 yr 5, 400 yr 0
Mensuration	rect lb , $2(l+b)$ · circle πr^2 , $2\pi r$ · triangle $\frac{1}{2}bh$ · cuboid lbh , $2(lb+bh+hl)$ · cylinder $\pi r^2 h$, curved $2\pi rh$ · sphere $4/3\pi r^3$, $4\pi r^2$

// §30 FIVE QUESTIONS FOR EVERY CONCEPT

Before you call a topic "done", check you can answer all five for it. If you cannot answer 3, you have knowledge but not speed; if you cannot answer 4, you will lose the marks to a distractor.

1	What type of question is this? (§4, §19)
2	What formula or concept applies? (§29)
3	What is the fastest reliable method? (§21)
4	What trap is set here? (§22)
5	Can I do it under time pressure? (§24, §27)

// §31 RESEARCH SOURCES

Tier 1 official · Tier 2 original question bank · Tier 3 reputable preparation resources · Tier 4 candidate reports. Pages were retrieved and parsed directly; the bank scan ran on 2026-09-06.

Tier	Source and what it supplied	Reference
2	IndiaBIX — the primary evidence base. 2293 questions across 93 topics and 479 pages, parsed from raw HTML with options, answer keys and explanations. Supplied every frequency and archetype count in §1.4 and §1.9, and the §1.3 finding about the two reasoning sections.	indiabix.com/aptitude/, /logical-reasoning/, /verbal-reasoning/, /verbal-ability/, /data-interpretation/
3	FacePrep — TI test pattern, sections, per-profile syllabi, aptitude topic list, negative marking, CGPA cut-off; Bosch two-format description and its explicit caveat that no Bosch-official blueprint exists; Intel recruitment structure.	faceprep.in/article/texas-instruments-placement-papers..., /bosch-recruitment-and-interview-process-2026/
3	Hitbullseye — Qualcomm 3×20 structure, 90 minutes, -0.25 marking, aptitude topics.	cpt.hitbullseye.com/Qualcomm/Qualcomm-Test-Pattern.php
3	Talent Battle — Bosch sectional split (quant 14/20 min, logical 14/14, English 22/18, core blocks).	talentbattle.in/bosch/syllabus-pattern
3	LearnTheta — the independent topic-weightage table cross-checked in §1.6.	learntheta.com/aptitude-syllabus-placement/
3	PrepInsta — aptitude topic taxonomy used to sanity-check the bank's coverage.	prepinsta.com/complete-a-aptitude-preparation/
4	GeeksforGeeks interview experiences — TI (20 aptitude Q / 30 min, Hirepro, reported topics); Microchip (51 Q / 60 min, aptitude only 10); NXP (~65 MCQ weighted to C/OS/networking); Samsung SSIR/SRIB (20+20+20, no negative marking).	geeksforgeeks.org/interview-experiences/...
4	Assessfy / VLSI community write-ups — Micron pattern (~34 Q / 80 min, no negative marking, sectional cut-offs); VLSI-role aptitude emphasis on P&C, probability, puzzles, remainder theorem and directions.	assessfy.com/placement/micron (403 on direct fetch — used via search result text only), vlsi4freeshers.com
—	NVIDIA, AMD, Intel, ARM official careers pages — consulted; they describe roles and required skills , not aptitude blueprints. This is why those rows in §2.1 are marked UNKNOWN rather than filled in.	nvidia.com/en-in/about-nvidia/university-recruiting/

What this sheet does not claim. It does not claim to have read the whole of any site (§1.2 states the 8-page cap and the 28 topics that hit it). It does not claim any company's current paper — patterns drift by year, campus and business unit, and several sources for the same company disagree. It does not convert a candidate anecdote into a company policy. Where the honest answer was "nobody has published this", the matrix says **UNKNOWN**.

Use it like this. §3 tells you what to study first. §4 and §19 train the recognition that actually decides your score. §29 is the night-before page. §22 the morning-of page. And §2's real message is worth repeating: for an ECE hardware role, aptitude is a **gate** — clear it efficiently, then put your remaining hours into core electronics and coding, which is where these offers are actually won.

Reproducing or extending this research. The method was: discover the category index → fetch each topic page → follow the numbered pagination links → parse `bix-td-qt.txt`, `bix-td-option-val`, the `jq-hdnakq` answer key and `bix-ans-description` → classify each question by a regex signature over its own text → report what stayed unclassified. Raising the 8-page cap would deepen the 28 capped topics; the pattern **mix** within a topic was stable well before the cap, which is why the ranking is quoted with more confidence than the raw counts.

// §32 RAPID REVISION MAP

One line per section: what it is for, and the single thing to carry away. Use it to find a page fast, and as a last-pass self-test — if you cannot state the takeaway before reading it, that is the section to revisit.

§	Section	The one thing to take away
1	Research findings	2293 questions, 93 topics, 479 pages — a sample , and 28 topics hit the cap

§	Section	The one thing to take away
2	Company picture	Aptitude is a gate , 10–33% of the screen, and often the only negatively marked part
3	Preparation priority	Tier 1 first: %, ratio, averages, work, TSD, P&L, number system
4	Question recognition	Trigger phrase → archetype → method, in about five seconds
5	Mental maths	Fraction→percent both ways; 5/18; squares to 30
6	Number system	Exponent mod 4 for unit digits; same remainder → HCF of differences
7	Percentages	Every change is a multiplier; the base decides the answer
8	Profit & loss	Profit on CP, discount on MP — two different denominators
9	Ratio & partnership	Write a_k, b_k ; two ratios need two constants; share = capital × time
10	Averages	$\Delta_{total} = n \times \Delta_{average}$; never average two averages
11	Mixtures	Alligation cross; the answers cross over; $A(1-x/V)^n$
12	SI & CI	SI adds, CI multiplies; CI-SI over 2 years is $P(r/100)^2$
13	Time & work	LCM units; rates add; efficiency inverts time; a leak is negative
14	Speed, trains, boats	Pole = L, platform = L+P; opposite adds, same subtracts
15	P&C and probability	Order matters → P, else C; "at least one" → complement
16	Data interpretation	Read the question first; check the option gap before calculating
17	Logical reasoning	Use the verbal-reasoning set, not the US-style logical tab
18	Verbal ability	Eight-check error spotting; find the opener in para jumbles
19	100 archetypes	Pattern → trigger → method; recognition is the skill
20	50 to memorise	Nothing here is derivable fast enough under exam conditions
21	50 shortcuts	Each one states where it breaks — three are two-item only
22	50 traps	Distractors are built from exactly these mistakes
23	Error log	Classify errors as CONCEPT, EXECUTION or READING — different fixes
24	Practice (quant)	26 medium-to-hard cards, each a distinct archetype
25	Standard vs fast	A shortcut you have to think about is not a shortcut
26	Practice (other)	DI, reasoning, verbal and a pattern-vs-calculation drill
27	Exam strategy	Three passes; skip on recognition failure; know your marking scheme
28	Revision plans	7-day, 3-day, 1-day, 3-hour and 60-minute versions
29	Formula wall	The night-before page
30	Five questions	Type, formula, fastest method, trap, under time
31	Sources	Evidence tiers, and what this sheet does not claim

The 15-item self-test. Say each of these out loud before the exam. Any you hesitate on is tomorrow's revision list. (1) km/h to m/s. (2) Net of two successive percentage changes. (3) Up $x\%$ then down $x\%$. (4) Which base carries profit, which carries discount. (5) How to turn a work problem into units. (6) Efficiency ratio versus time ratio. (7) Distance when a train crosses a platform. (8) Relative speed, both directions. (9) Boat and stream from downstream and upstream. (10) The alligation cross, and which side pairs with which. (11) Change in total versus change in average. (12) CI minus SI over two years. (13) Permutation or combination, and how you decide. (14) "At least one". (15) The clock-angle formula.

[FAST] The last thing to read before you close this sheet. You will not be beaten by the hardest question on the paper — almost nobody gets those, and they are worth the same one mark as the easiest. You will be beaten by a question that **looked** simple: a percentage on the wrong base, a train length left out, an "at least one" counted forwards. Slow down by five seconds on the questions that feel too easy, and move on from the ones you cannot name. That is the whole strategy.