Avionics aptitude: study guide

Aviation, aerospace, air traffic, and airports · suite apt-076-avionics-aptitude · generated 2026-09-15T15:05:10.571Z

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> Answer keys and scoring logic stay server-side and are never included in any download or export.

How to use this guide

This file contains the whole study outline for this suite: every skill it draws on, the full lesson for each of those skills, worked examples, practice tips, a glossary, and where each piece of material comes from. Nothing here is a summary of a page you still have to visit.

1. Read the skills section end to end once, without timing yourself.
2. Work the guided practice mode for the suite, using the practice tips as a checklist.
3. Move to the mini-test only when guided practice feels unhurried.
4. Sit the full simulation last, once, in the conditions you expect on the day.

Practice attempts are stored on the device you used, never on an account. Exporting a result is the only way anything leaves that device.

Practice modes and durations

Practice modes for Avionics aptitude

Mode	Duration	What it is for
Guided practice	15 minutes	Untimed, with feedback after every item.
Mini-test	18 minutes	A short timed set for checking pace.
Full simulation	45 minutes	Full length and full time, in one sitting.

- Start guided practice: https://learn.novusstreamsolutions.com/aptitude/practice/new?bank=apt-076-avionics-aptitude&mode=guided
- Start mini-test: https://learn.novusstreamsolutions.com/aptitude/practice/new?bank=apt-076-avionics-aptitude&mode=mini
- Start full simulation: https://learn.novusstreamsolutions.com/aptitude/practice/new?bank=apt-076-avionics-aptitude&mode=full

Skills covered, in full

This suite draws on 5 skill constructs. Each one below carries its complete lesson.

Electrical reasoning

Basic circuits, current, voltage, resistance, symbols, and electrical troubleshooting.

Electrical reasoning is the ability to move confidently between volts, amps, ohms and watts on a circuit you can only see as a diagram, and to say what a fault would look like on a meter before you pick one up. It is the core construct in electrician and powerline apprenticeship entry tests, electronics and telecommunications technician screening, and military electrical batteries. On the job it is the difference between localising a break in three measurements and replacing three good parts. Everything you practise here stays on this device; there is no account and no upload.

What you should be able to do after this lesson:

1. Rearrange Ohm's law and the three power forms (P = VI, P = I x I x R, P = V x V / R) to solve for any unknown in a single-source circuit.
2. Compute total resistance for series and parallel combinations and predict what happens to supply current when a branch is added or removed.
3. Predict the meter readings a specific fault produces. Full supply across an open circuit, zero volts across a good component in a dead series string.
4. Identify the standard schematic symbols for cell, battery, fixed and variable resistor, lamp, fuse, switch, ammeter and voltmeter, and place each meter correctly.
5. Explain from the I x I x R term why doubling current quadruples conductor heating, and use that to reason about cable sizing and voltage drop.
6. Apply a transformer turns ratio in both directions (voltage down, current up) and say why a transformer does nothing on steady DC.

Worked examples and pitfalls

Ohm's law on real components: A 12 V battery feeds a 4 ohm heater element. Current is 12/4 = 3 A, and power is 12 x 3 = 36 W. Put the same element on 24 V and current becomes 6 A while power becomes 24 x 6 = 144 W: doubling the voltage quadruples the power, because both factors in P = VI doubled. Candidates who answer 72 W have doubled one factor and forgotten the other. The nastier version of this item uses lamps. On the same 230 V supply, which has the higher resistance, a 60 W lamp or a 100 W one? Since P = V x V / R, resistance is V x V / P: the 60 W lamp is 52,900/60 = 882 ohms and the 100 W lamp is 52,900/100 = 529 ohms. The more powerful lamp has the LOWER resistance and draws more current, which feels backwards to anyone who reads 'more powerful' as 'more of everything'. Fix the direction of the relationship once: at a fixed voltage, more power means less resistance.

Series and parallel: two rules, two consequences: Three 6 ohm resistors across an 18 V supply. In series the resistances add to 18 ohms, the current is 18/18 = 1 A and it is the same at every point in the loop, and each resistor drops 1 A x 6 ohms = 6 V. The three drops sum to the supply, 6 + 6 + 6 = 18 V, which is the check you should run every time. In parallel each resistor sees the full 18 V, so each branch carries 18/6 = 3 A, the supply delivers 9 A, and the equivalent resistance is 18/9 = 2 ohms. The same 6/3 the reciprocal rule gives. The consequences matter more than the arithmetic. Adding a parallel branch always lowers total resistance and raises total current, which is exactly why plugging a fourth appliance into one socket circuit trips the breaker. Two checks catch nearly every slip: parallel resistance is always less than the smallest branch, and the branch with the smallest resistance always carries the biggest current.

Fault-finding by what stays lit: Six identical lamps in series on 12 V drop 2 V each. Break one filament and the current has nowhere to go: all six go out, which is the old fairy-light string that fails completely for one

dead bulb. Finding the break is the counter-intuitive part. Across every good lamp your meter now reads 0 V, because no current is flowing to develop a drop, while across the broken one it reads the full 12 V. Candidates who expect the faulty component to read zero walk straight past it. Wire the same six in parallel instead and each lamp sees the full 12 V on its own branch, so a broken filament kills that lamp alone and the supply current merely drops by one sixth. That contrast is what makes a half-dead string diagnostic. If lamps 1 to 3 are lit and 4 to 6 are dead, they cannot be in series at all, because one break in a series loop kills every lamp; they are parallel branches hanging off a shared feed, and the fault is a break in that feed between position 3 and position 4. Probe the feed there rather than testing lamps: the last lit branch and the first dead one bracket the break.

Voltage dividers, and where each meter belongs: A 2 kilohm and a 3 kilohm resistor in series across 10 V. Total 5 kilohms, current 10/5,000 = 2 mA, which is the same in both. The 3 kilohm resistor drops 0.002 x 3,000 = 6 V and the 2 kilohm drops 4 V, splitting the supply in the ratio of the resistances. The bigger resistor always takes the bigger share. Now the meters. An ammeter goes IN the current path, in series with the component, and is designed with a near-zero resistance so it barely disturbs the circuit. A voltmeter goes ACROSS the component, in parallel, and has a very high resistance for the same reason. Swap them and the consequences are asymmetric: a voltmeter placed in series reads almost the whole supply and the circuit stops working, while an ammeter placed straight across a battery is a near-zero resistance across a source: a deliberate short circuit, a blown fuse at best. That asymmetry is the point of the item.

Why cable size is an I x I x R question: A 2.5 kW heater on 230 V draws 2,500/230 = 10.9 A. Suppose the supply cable has 0.5 ohms of total loop resistance. The voltage lost in the cable is 10.9 x 0.5 = 5.4 V, and the heat dissipated in the cable itself is I x I x R = 10.9 x 10.9 x 0.5 = about 59 W: quietly warming a coiled extension lead. Fit a thicker conductor so the loop resistance halves to 0.25 ohms and both the drop and the heat halve. Double the current instead, to 21.7 A, and the drop doubles but the heat goes up FOURFOLD, to about 236 W, because the current appears twice. Candidates who treat cable loss as proportional to current under-estimate it badly. This squared term is the reason a partly uncoiled drum overheats, the reason long runs need a larger conductor for the same load, and the reason transmission networks push power at high voltage and low current.

Transformers: turns ratio, and why they ignore DC: An ideal transformer has 400 primary turns and 40 secondary turns, a 10:1 ratio, and sits on 230 V AC. The secondary voltage is 230 x 40/400 = 23 V. Power in equals power out in the ideal case, so if the secondary supplies 5 A into a load, the secondary is delivering 23 x 5 = 115 W and the primary must draw 115/230 = 0.5 A. Voltage steps down by the turns ratio, current steps up by the same ratio, and no power is created. Two traps. The first is multiplying rather than dividing, giving 2,300 V from a step-down winding. Always ask which winding has more turns before you touch the arithmetic. The second is the DC version of the question: connect that primary to a 24 V battery and the secondary produces nothing once the initial switch-on transient passes, because a steady current produces a steady flux and only a CHANGING flux induces a secondary voltage. Meanwhile the primary, with only its winding resistance to limit it, draws enough current to burn out. That is also why the mains figure quoted as 230 V is an RMS value, and why the waveform actually peaks near 230 x 1.414 = 325 V.

How to practise this skill

- Write the three Ohm's law rearrangements and the three power forms across the top of your rough paper before question one. Most electrical items are a single substitution away once the right form is already in front of you.
- Normalise units first: put everything into volts, amps and ohms, or knowingly pair milliamps with kilohms (which conveniently gives volts). Mixing milliamps with plain ohms produces an answer that is wrong by a factor of a thousand and looks fine.
- Test every parallel result against the smallest branch. If your combined resistance is bigger than the smallest resistor in the group, you have added instead of combined.

- Practise fault items by predicting the meter reading rather than naming the culprit: 'zero volts across each good lamp, full supply across the break' is what you will actually see, and it is what the answer options are built from.
- Drill the schematic symbols in short bursts until they are instant: cell versus battery, fixed versus variable resistor, fuse, normally-open versus normally-closed contacts, lamp, ammeter, voltmeter. These items carry full marks and cost seconds.
- Keep safe-working questions in a separate mental bucket from circuit questions. Isolate, lock off, prove dead, then re-prove the tester is the expected answer even when a cleverer electrical shortcut exists, and attempts you log stay on this device either way.

Glossary

Ohm's law: V = I x R. Voltage across a resistive component equals the current through it multiplied by its resistance; rearranged as I = V/R and R = V/I.

Potential difference: The energy transferred per unit charge between two points, measured in volts and always measured ACROSS a component rather than through it.

Current: The rate of charge flow, in amperes. It is identical at every point of a series path and divides between parallel branches in inverse proportion to their resistances.

Resistance: Opposition to current, in ohms. Series resistances add directly; a parallel combination is always smaller than its smallest member.

Power: The rate of energy conversion in watts, obtainable three ways: P = V x I, P = I x I x R when you know the current, and P = V x V / R when you know the voltage.

Short circuit: An unintended low-resistance path around a load. Current rises until something limits it, which is precisely the job a fuse or circuit breaker exists to do.

Open circuit: A break in the conducting path. Current is zero and, in a live circuit, the full supply voltage appears across the break, the reading that locates it.

Turns ratio: Primary turns divided by secondary turns in a transformer. Voltage divides by this ratio while current multiplies by it, so the power either side is nominally equal.

RMS value: The steady DC value that would deliver the same heating as a given AC waveform. For a sine wave the peak is about 1.414 times the RMS value.

Study this next

- Electrical reasoning skill hub: https://learn.novusstreamsolutions.com/aptitude/skills/electrical-reasoning
- Electrician apprenticeship suite: https://learn.novusstreamsolutions.com/aptitude/tests/electrician-apprenticeship
- Electronics technician suite: https://learn.novusstreamsolutions.com/aptitude/tests/electronics-technician
- Utilities, energy, mining and resources careers: https://learn.novusstreamsolutions.com/careers/families/utilities-energy-mining-and-resources
- Encyclopedia search: Ohm's law: https://learn.novusstreamsolutions.com/search?q=Ohm%27s%20law
- Electrical reasoning lesson on Novus Learn: https://learn.novusstreamsolutions.com/aptitude/skills/electrical-reasoning/lesson

Where this material comes from

- Circuit examples computed for Novus Learn from first principles using Ohm's law, the series and parallel resistance rules, and the ideal transformer relation.
- Terminology checked against the public Wikipedia articles 'Ohm's law', 'Series and parallel circuits', 'Electric power' and 'Transformer'. Definitions only; every value above is original.

- Novus Learn aptitude construct registry (catalog seed) for the construct scope and related suite mapping.
- Public educational framing only: not affiliated with any official exam board, publisher or employer. Safe-working guidance here is illustrative and never replaces a competent person or your local wiring rules.

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Numerical reasoning

Arithmetic, fractions, percentages, ratios, rates, estimation, word problems, and number relationships.

Numerical reasoning is the ability to take a small set of supplied numbers (a price list, a staffing table, a fuel figure), and reach a defensible answer in around ninety seconds without a formula sheet. It is the most widely used quantitative section in graduate, management and public-sector screening, and it appears in banking, retail, armed forces and healthcare entry batteries alike. The arithmetic itself is deliberately ordinary: percentages, ratios, rates and averages. What is actually being measured is whether you pick the right operation quickly, keep the units straight, and answer the question that was asked rather than the one you started computing. Practice here is device-local: no account, and nothing leaves this device unless you export it.

What you should be able to do after this lesson:

1. Move between fractions, decimals, percentages and ratios on sight, and pick whichever form makes a given item fastest (12.5 percent as one eighth, 33.3 percent as one third).
2. Apply percentage change in both directions, including recovering an original figure from a post-increase total, and combine successive changes multiplicatively rather than by adding them.
3. Split a total in a stated ratio by counting parts first, and work backwards from a stated difference between two shares.
4. Solve rate problems (speed, unit price, consumption, combined work rates) by carrying units through every intermediate line so the units of the answer prove the method.
5. Produce a one-significant-figure estimate before computing, and use it to eliminate the distractors built from the common wrong operations.
6. Read a multi-step stem and name, in one sentence, the single quantity the final question asks for before touching the numbers.

Worked examples and pitfalls

Reverse percentages: the item most candidates get backwards: A subscription price rose by 15 percent and now stands at 57.50 pounds. What was it before? The correct move is to divide, not subtract: the new price is 115 percent of the old, so the old price is 57.50 / 1.15 = 50.00. Check it forwards: 15 percent of 50 is 7.50, and 50 + 7.50 = 57.50. The tempting wrong answer takes 15 percent of the NEW figure, 0.15 x 57.50 = 8.625, and reports 48.88. That distractor is always on the option list because it is what most people do under time pressure, and it is wrong by 2.25 percent, small enough to look plausible. The same asymmetry drives the successive-change item: a price that rises 20 percent and then falls 20 percent does not return to where it started. Multiply the factors: 1.20 x 0.80 = 0.96, a net fall of 4 percent. Starting at 500 pounds you get 600 then 480, not 500. Percentages compose by multiplication; they never add.

Ratio splits: count the parts before you divide: A 4,830 pound budget is split between three teams in the ratio 3:5:6. Add the parts first: 3 + 5 + 6 = 14. One part is 4,830 / 14 = 345. The shares are 3 x 345 = 1,035, 5 x 345 = 1,725 and 6 x 345 = 2,070, and they sum back to 4,830, which is the check you should always run. Two classic failures. The first is dividing by 3 because there are three teams. That gives 1,610 each and ignores the ratio entirely. The second is treating 5 as a fraction and computing five sixths or five fourteenths

of something other than the total. The more interesting version of this item gives you a difference instead of the total: 'the second team receives 690 pounds more than the first, what is the whole budget?' The difference between the shares is 5 - 3 = 2 parts, so one part is 690 / 2 = 345, and the budget is 14 x 345 = 4,830. Same number, reached from the other end, and the arithmetic is trivial once you have made the parts explicit.

Rates and units: 2 h 15 min is 2.25, not 2.15: A delivery van covers 174 km in 2 hours 15 minutes. Average speed is distance over time, and the time must be in hours: 15 minutes is 15/60 = 0.25 h, so 174 / 2.25 = 77.3 km/h. Type 2.15 into the calculator instead and you get 80.9 km/h: an error of roughly 4.7 percent that sits comfortably inside the plausible range and will match one of the options. Now extend it. The van consumes 8.6 litres per 100 km, so the trip needs 174 x 8.6 / 100 = 14.964 litres, and at 1.48 pounds per litre that is 14.964 x 1.48 = 22.15 pounds. Notice the units doing the work: (km) x (L / 100 km) leaves litres; (L) x (pounds / L) leaves pounds. If your intermediate line has km still attached at the end, you have divided when you should have multiplied. Write the unit next to every number and the method checks itself.

Unit pricing: normalise before you compare: Three pack sizes of the same fluid. Pack A: 750 ml for 3.60 pounds. Pack B: 2 litres for 9.40. Pack C: 1.5 litres for 7.20. Convert all three to price per litre. A: 3.60 / 0.75 = 4.80 per litre. B: 9.40 / 2 = 4.70. C: 7.20 / 1.5 = 4.80. So B is cheapest by 10p a litre, and A and C are identical despite looking like different deals. The 'bigger pack is cheaper' heuristic happens to hold here but is not a rule, and test writers know it. Half of these items are built specifically so the largest pack loses. Now add the multibuy that these questions love: pack A is on three-for-two. Three packs give 2.25 litres for the price of two, 7.20 pounds, which is 7.20 / 2.25 = 3.20 per litre and beats everything. The trap in the multibuy version is dividing by the number of packs paid for rather than the volume received.

Combined work rates: add rates, never times: Printer A completes a 3,000-page run in 50 minutes; printer B completes the same run in 75 minutes. Running together, how long? Convert to rates: A prints 3,000 / 50 = 60 pages per minute, B prints 3,000 / 75 = 40 pages per minute, and together they print 100 pages per minute, so the job takes 3,000 / 100 = 30 minutes. Verify by counting output: in 30 minutes A produces 1,800 pages and B produces 1,200, which is 3,000 exactly. The two wrong answers you will see on the option list are 62.5 minutes (the average of 50 and 75) and 125 minutes (the sum). Both are impossible on inspection: two machines working together must finish faster than the faster machine alone, so any answer above 50 minutes is wrong before you compute anything. The general form is 1 / (1/50 + 1/75), and it is worth being able to write that line directly, but the sanity bound catches the error faster than the algebra does.

Estimate first, then compute: killing distractors in ten seconds: 'A department spent 847,300 pounds in 2024. In 2025 the budget fell by 12.5 percent. What was the 2025 spend?' Options: 741,387.50 / 953,212.50 / 105,912.50 / 762,570. Estimate before anything else: 12.5 percent is exactly one eighth, one eighth of roughly 850,000 is roughly 106,000, so the answer is roughly 744,000. That single line eliminates three options. 953,212.50 applied the change upwards. 105,912.50 is the size of the reduction, not the resulting spend: the 'answered the wrong question' distractor, and the most commonly selected wrong option on items of this shape. 762,570 is a 10 percent cut, planted for anyone who misread the rate. Exact working: 847,300 x 7/8 = 5,931,100 / 8 = 741,387.50. Doing it as a fraction avoids the decimal multiplication altogether. Learn the fraction equivalents cold (12.5 percent is 1/8, 16.7 percent is 1/6, 37.5 percent is 3/8, 62.5 percent is 5/8) because a fraction turns most percentage items into one division.

How to practise this skill

- Memorise the fraction-to-percentage table up to eighths and twelfths. Almost every 'nasty' percentage on these tests is a clean fraction in disguise, and the fraction route is two or three times faster than decimal multiplication.
- Write the unit beside every intermediate number, including the ones you keep in your head. Most numerical errors on timed sections are unit errors, not arithmetic errors, and units are the only cheap way to catch them.

- Rehearse reverse percentages as their own drill until dividing by 1.15 feels more natural than subtracting 15 percent. It is a single, identifiable technique that accounts for a disproportionate share of lost marks.
- Before selecting, re-read the last clause of the stem out loud. 'By how much did it fall' and 'what was it after the fall' have different answers, and both are always on the option list.
- Keep an error log with four columns (misread the question, wrong operation, unit slip, arithmetic slip), and tally which one you actually commit. Three sessions is usually enough to show that one column dominates, and that is the column to train.
- Work untimed until your method is stable, then add the clock in stages: generous, then realistic, then 20 percent tighter than the real test. Attempts stay on this device, so a slow first pass costs nothing.

Glossary

Percentage point: The arithmetic difference between two percentages. A rate moving from 4 percent to 5 percent rises by one percentage point but by 25 percent in relative terms; questions specify which they want and the two answers are both on the option list.

Reverse percentage: Recovering an original amount from a figure that already includes a percentage change, by dividing by the multiplier (1.15 for a 15 percent rise, 0.88 for a 12 percent fall) rather than subtracting the percentage from the new figure.

Multiplier (decimal factor): The single number a quantity is multiplied by to apply a percentage change: 1.20 for plus 20 percent, 0.80 for minus 20 percent. Successive changes are handled by multiplying the factors, which is why plus 20 then minus 20 gives 0.96, not 1.

Ratio part: One unit of a ratio split. Dividing the total by the sum of the ratio terms gives the value of one part; every share and every difference between shares is then a whole number of parts.

Unit rate: A quantity expressed per one of something: price per litre, pages per minute, litres per 100 km. Comparisons are only valid once every option has been converted to the same unit rate.

Combined rate: The sum of two or more individual rates working simultaneously. Times cannot be added or averaged; only rates add, and the combined time is the total work divided by the combined rate.

Significant figure estimate: Rounding every input to one meaningful digit to get an approximate answer in a few seconds. Its purpose is not accuracy but elimination: it removes any option that is off by a factor or has the sign of the change wrong.

Distractor: A wrong option written deliberately to match a specific predictable error: subtracting instead of dividing, reporting the change instead of the result, averaging instead of combining rates. Recognising the pattern is often faster than recomputing.

Study this next

- Numerical reasoning skill hub: https://learn.novusstreamsolutions.com/aptitude/skills/numerical-reasoning
- Numerical reasoning practice in the Cognitive Skills Lab: https://learn.novusstreamsolutions.com/cognitive-skills/numerical-reasoning
- Data interpretation lesson: https://learn.novusstreamsolutions.com/aptitude/skills/data-interpretation/lesson
- Office numeracy suite: https://learn.novusstreamsolutions.com/aptitude/tests/office-numeracy
- Finance, accounting and insurance careers: https://learn.novusstreamsolutions.com/careers/families/finance-accounting-and-insurance
- Numerical reasoning lesson on Novus Learn: https://learn.novusstreamsolutions.com/aptitude/skills/numerical-reasoning/lesson

Where this material comes from

- All worked figures above were written and checked for Novus Learn. Every division, ratio split and rate calculation in this lesson was verified by recomputing it in the reverse direction.
- Conventions only (percentage point, unit rate, significant figures) cross-checked against standard public references such as the Wikipedia articles 'Percentage', 'Ratio' and 'Rate (mathematics)'. No item text is drawn from any published test.
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Data interpretation

Tables, charts, graphs, dashboards, trends, comparisons, and evidence-based conclusions.

Data interpretation is the discipline of getting a correct number out of a table, chart or dashboard that was not built to make your question easy, and of saying so when the data cannot answer it at all. It dominates graduate and analyst screening, and it is the section where strong arithmetic still fails, because the marks are lost in the header row, the axis scale and the wording of the question. The same skill is the daily work of anyone who reports on a management pack, a clinical audit or a stock ledger. Practice is stored on this device only; there is no account and nothing is uploaded unless you export it.

What you should be able to do after this lesson:

1. Read a value correctly out of a table or chart including its units multiplier, footnotes and any 'excludes' or 'provisional' qualifier attached to the row.
2. Compute share of total, percentage change and percentage-point change from the same pair of cells, identify which of the three a question is asking for, and separate a movement in a rate from a movement in the underlying count.
3. Work with index numbers relative to a base year, including why a change of five index points is almost never a five percent change.
4. Join two tables on a shared key and produce a normalised figure (per head, per unit, per thousand) rather than comparing raw totals.
5. Recognise chart presentation effects (truncated axes, dual axes, cumulative versus periodic series), and answer from the numbers rather than from the visual impression.
6. Apply the 'cannot say' discipline: state precisely which extra fact would be needed before the question becomes answerable.

Worked examples and pitfalls

Read the header: (£000) changes every answer by a factor of a thousand: Table titled 'Regional revenue, year to March (£000)': North 1,240; South 986; East 1,455; West 719. Total = 1,240 + 986 + 1,455 + 719 = 4,400, so the business turned over 4,400 thousand pounds, that is 4.4 million. East's share is 1,455 / 4,400 = 33.1 percent. The whole set: North 28.2 percent, South 22.4, East 33.1, West 16.3, summing to 100. Two things go wrong here. The first is reading East's revenue as 1,455 pounds and then reporting a business with a total turnover of 4,400 pounds, which nobody notices because every option is scaled the same way, until the question asks for revenue in millions and only one option is right. The second is the comparison wording. East's share is (1,455 - 719) / 4,400 = 16.7 percentage points above West's, and East's revenue is (1,455 - 719) / 719 = 102 percent more than West's, that is slightly more than double. 'Sixteen point seven' and 'a hundred and two' both describe the same two cells honestly, and the question decides which one is correct.

Note that the percentage-point figure must be computed from the unrounded shares rather than by subtracting the rounded ones, or the last digit will not survive.

One pair of rows, three correct increases: A complaints table: 2023, 120,000 orders, complaint rate 4.0 percent; 2024, 150,000 orders, complaint rate 5.0 percent. Three defensible answers to 'how much did complaints increase?'. The rate rose by 1.0 percentage point. The rate rose by (5.0 - 4.0) / 4.0 = 25 percent in relative terms. And the count of complaints rose from 0.04 x 120,000 = 4,800 to 0.05 x 150,000 = 7,500, which is (7,500 - 4,800) / 4,800 = 56.25 percent. All three are arithmetically right; only one answers the question in front of you. The pattern to internalise is that a rate and a count move together only when the denominator is fixed, and here it is not. Order volume grew 25 percent as well. If the question is about customer experience, the rate is the honest figure; if it is about how many complaint handlers to hire, the count is. Test items usually ask for the one you would not have chosen.

Index numbers: five points is not five percent: A cost index with 2020 = 100 reads 104 in 2021, 111 in 2022 and 109 in 2023. From 2021 to 2023 the index rose 5 points, but the percentage change is 5 / 104 = 4.8 percent, because the base for the comparison is 104, not 100. From 2022 to 2023 it fell 2 points, which is -2 / 111 = -1.8 percent, and note that costs fell even though the index remains 9 percent above the 2020 base. A level and a change are different claims. The only comparison where points and percent coincide is against the base year itself: 2020 to 2023 is 100 to 109, exactly plus 9 percent. Watch also for a rebased series, where a table switches to 2022 = 100 partway down; the two segments cannot be compared directly without converting one of them, and an item that quietly rebases is testing whether you read the column heading.

Joining two tables: totals and per-head figures disagree on purpose: Table 1, headcount by site: Leeds 84, Derby 47, Bristol 129. Table 2, absence days recorded in the same period: Leeds 630, Derby 300, Bristol 903. 'Which site has the worst absence problem?' On raw totals Bristol is worst at 903 days. Normalise per head and the ranking changes: Leeds 630 / 84 = 7.50 days per employee, Bristol 903 / 129 = 7.00, Derby 300 / 47 = 6.38. Leeds is worst, Bristol is merely biggest. The organisation-wide figure is 1,833 / 260 = 7.05 days per head, which is a useful reference line: Leeds is above it, the other two below. The general rule is that any comparison between units of different size demands a denominator, and the denominator has to come from the other table. Items are built so the raw-total answer and the per-head answer are both on the option list, and so the site with the biggest total is never the site with the highest rate.

The truncated axis: measure the numbers, not the bars: A quarterly satisfaction chart with a y-axis running from 78 to 82 shows bars at 79.2, 79.8, 80.4 and 81.1. Visually the last bar looks several times taller than the first, because only the top 4 points of a 100-point scale are drawn. The actual movement is 81.1 - 79.2 = 1.9 points, which on the score's own scale is a relative rise of 1.9 / 79.2 = 2.4 percent. If the question asks 'by approximately what percentage did satisfaction improve', the answer is about 2 percent, and the distractor built from the bar heights will be something like 40 or 400 percent. Related presentation effects to check before answering: a dual-axis chart where two series use different scales and appear to cross meaningfully when they do not; a cumulative series, where a flattening line still means the total is growing, just more slowly; and a logarithmic axis, where equal vertical distances are equal ratios rather than equal amounts. In every case the defence is the same. Find the printed numbers, or read the gridline values, and compute.

Cannot say: revenue is not profit: A product table shows units sold and total revenue. Product P: 4,200 units, 71,400 pounds. Product Q: 1,800 units, 41,400 pounds. Average selling price is 71,400 / 4,200 = 17.00 for P and 41,400 / 1,800 = 23.00 for Q, so Q earns more per unit while P earns more in total. Now the statement to evaluate: 'P is more profitable than Q.' The correct response is cannot say. Profit needs cost, and the table has no cost column; a product with a 17 pound price and a 16 pound unit cost is less profitable than one priced at 23 with a cost of 9, and nothing here rules that out. Contrast with 'Q generated more revenue per unit than P', which the table fully supports and which is true. The habit worth building is to finish every cannot-say judgement with the missing input named out loud ('cannot say, because unit cost is not given') because that forces you to distinguish a genuinely unanswerable item from one you simply have not worked hard enough on.

How to practise this skill

- Read the title, the units line, the row and column headers and any footnote before you look at a single value. Roughly the first fifteen seconds of an item should contain no arithmetic at all, and that fifteen seconds is what prevents the thousand-fold and percentage-point errors.
- For every item, write down which of the three quantities is wanted (share of total, relative change, or change in percentage points), before computing. Most wrong answers on this construct are correct arithmetic applied to the wrong quantity.
- Whenever two groups differ in size, ask what the denominator should be. If a question compares sites, teams, countries or periods of unequal length and you have not divided by something, you are almost certainly answering the wrong question.
- Practise the cannot-say items separately and force yourself to name the missing variable each time. Candidates who train only on computational items reliably over-answer inference statements under time pressure.
- Do not redraw or re-scale charts in your head. Locate the gridline values or the data labels, and if neither exists, interpolate between two labelled gridlines and state the bound rather than guessing a point value.
- Time yourself per item rather than per section. Data interpretation sets share a stimulus, so the first item costs the reading time and the rest should be fast; if item four takes as long as item one, you did not build a mental map of the table.

Glossary

Units multiplier: A scaling note in a table title or column header, such as (£000), (millions) or (per 1,000 population). It applies to every value in scope and is the single most common source of order-of-magnitude errors.

Index number: A series rescaled so a chosen base period equals 100. Changes between two non-base periods must be divided by the earlier value, so a movement in index points is not a percentage change except when measured from the base.

Rebasing: Restating an index against a new base period. Segments of a series with different bases cannot be compared directly, and a table that rebases partway down is testing whether you read the headings.

Truncated axis: A chart whose value axis does not start at zero, which exaggerates the apparent size of differences between bars or points. Legitimate for showing small movements in a large quantity, misleading if read as area or height.

Cumulative series: A line showing a running total rather than each period's value. It can only go up or stay flat, so a flattening cumulative line means the periodic figure is falling, not that the total is.

Weighted average: An average in which each value is multiplied by the size of the group it represents. Averaging two group percentages directly is only correct when the groups are the same size, which in these tables they rarely are.

Normalisation: Dividing a raw figure by an exposure measure (headcount, units sold, population, days open), so groups of different size can be compared. The denominator usually lives in a second table.

Cannot say: The verdict when a statement is neither supported nor contradicted by the data supplied. A correct cannot-say answer can always be defended by naming the specific missing variable.

Study this next

- Data interpretation skill hub: https://learn.novusstreamsolutions.com/aptitude/skills/data-interpretation
- Data interpretation practice in the Cognitive Skills Lab: https://learn.novusstreamsolutions.com/cognitive-skills/data-interpretation
- Numerical reasoning lesson: https://learn.novusstreamsolutions.com/aptitude/skills/numerical-reasoning/lesson

- Financial data interpretation suite: https://learn.novusstreamsolutions.com/aptitude/tests/financial-data-interpretation
- Scientific data interpretation suite: https://learn.novusstreamsolutions.com/aptitude/tests/scientific-data-interpretation
- Data interpretation lesson on Novus Learn: https://learn.novusstreamsolutions.com/aptitude/skills/data-interpretation/lesson

Where this material comes from

- Every table, index series and chart described above was constructed for Novus Learn, and each figure was verified by recomputing the totals and the reverse calculation.
- Definitions of index numbers, rebasing and weighted averages cross-checked against standard public references such as the Wikipedia articles 'Index (economics)' and 'Weighted arithmetic mean'. Terminology only; no data or item text is taken from any source.
- Novus Learn aptitude construct registry (catalog seed) for construct scope and suite mapping.
- Public educational framing only: not affiliated with any official exam board, publisher or employer, and no copyrighted test item is reproduced.

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Critical thinking

Evaluating evidence, assumptions, arguments, credibility, and alternative explanations.

Critical thinking assessments ask you to take an argument apart: what is being concluded, what it rests on, what evidence would settle it, and whether a proposed conclusion actually follows. Published critical-thinking batteries typically run five task types - inference, recognition of assumptions, deduction, interpretation, and evaluation of arguments - and they are deliberately built so that agreeing with a conclusion and judging the argument as strong come apart. The construct is heavily weighted in policy analysis, audit, legal, investigative and graduate selection, and it is the same skill that stops a plausible chart from turning into a bad decision. Practice stays on this device; there is no account and nothing is uploaded unless you export it.

What you should be able to do after this lesson:

1. State an argument's conclusion in your own words before evaluating it, and identify which sentences are premises and which are background.
2. Use the negation test to separate a required assumption from a statement that would merely strengthen the argument.
3. Distinguish validity from truth, and identify affirming the consequent as distinct from the valid modus tollens form.
4. Compute a posterior probability on a screening example and explain why the rate of true positives among all positives is far lower than intuition suggests.
5. Generate at least two alternative explanations - selection, reverse causation, a common third factor - for any claimed causal effect, and name the comparison that would rule them out.
6. Judge argument strength on relevance and directness rather than on agreement, including marking arguments you personally reject as strong.

Worked examples and pitfalls

The negation test finds assumptions; nothing else does: Argument: 'The council should fit bin sensors across the district. In the trial depot they cut collection trips by a fifth.' Candidate assumption A: 'The trial depot's waste pattern is broadly representative of the rest of the district.' Negate it - suppose the trial depot is nothing

like the rest of the district - and the argument collapses, because a result that does not transfer supports nothing about the district. So A is a required assumption. Candidate assumption B: 'Bin sensors are the cheapest available technology for this purpose.' Negate it - suppose they are the most expensive - and the argument still stands as given, since it argued from a reduction in trips, not from cost. B is not required; it would strengthen a cost-based argument that was never made. Candidate C: 'Fewer collection trips reduce total operating cost.' Negate it and the recommendation loses its point, so C is required too, even though the argument never mentions cost. That last case is the one candidates miss, because the required assumption is what bridges the evidence to the recommendation, and bridging assumptions are by definition unstated. The failure mode across this whole item type is picking statements that support the conclusion instead of statements the argument cannot survive without.

Base rates: 90 percent accurate, 15 percent right: A production line runs an automated defect test. Defects occur in 1 percent of units. The test flags 90 percent of genuinely defective units, and wrongly flags 5 percent of good units. A unit has just been flagged - how likely is it to be defective? Work in whole units rather than probabilities. Take 10,000 units: 100 are defective and 9,900 are good. Of the 100 defective, the test flags 90. Of the 9,900 good, it wrongly flags 5 percent, which is 495. Total flags: 90 + 495 = 585. Of those, 90 are genuine, so the answer is 90 / 585 = 15.4 percent. Better than the 1 percent base rate, and nowhere near the 90 percent that intuition offers. The error has a name - confusing the probability of a flag given a defect with the probability of a defect given a flag - and it has a practical consequence: the rework queue has to be sized for 585 units a batch, not 100, and 495 of the 585 units sitting in it are perfectly good. Whenever a test, screening rule or model accuracy figure appears in an item, ask how many of the negatives there are, because with a rare condition the false positives from a large clean population swamp the true positives from a small affected one.

Three alternative explanations, and the comparison that settles it: Claim: 'Employees who attended the optional resilience workshop took 30 percent fewer sick days last year, so the workshop works.' Alternative one, selection: attendance was optional, so the people who signed up may have been the healthier and more engaged to begin with, and would have taken fewer sick days regardless. Alternative two, reverse direction: employees who were frequently unwell were the least able to attend a full-day workshop, so illness determined attendance rather than the other way round. Alternative three, a common third factor: the workshop ran on Thursday afternoons at head office, so attendance largely tracks being an office-based rather than shift-based worker, and shift workers take more sick leave for reasons that have nothing to do with resilience training. What would settle it: randomly assigning the offer to half the workforce and comparing the two groups. Failing that, the cheapest useful check already exists in the payroll data - compare attendees' and non-attendees' sick days in the year before the workshop. If attendees were already 30 percent lower, selection is doing the entire job. The habit worth building is to name the comparison group before you accept any before-and-after number.

Deduction: affirming the consequent versus modus tollens: Rule: 'If an invoice is over 10,000 euro, it requires two signatures.' Argument A: 'This invoice has two signatures, therefore it is over 10,000 euro.' Invalid - this is affirming the consequent. The rule makes two signatures necessary for large invoices; it says nothing that prevents a cautious manager from double-signing a 400 euro invoice, so a two-signature invoice of any size is consistent with the rule. Argument B: 'This invoice has only one signature, therefore it is not over 10,000 euro.' Valid - this is modus tollens, denying the consequent to deny the antecedent, and it holds assuming the rule was followed. Argument C: 'This invoice is not over 10,000 euro, therefore it does not have two signatures.' Invalid again, denying the antecedent. Two further points that deduction items test directly. First, validity is about form alone: 'All banks close on Sundays; Riverton Mutual is a bank; therefore Riverton Mutual closes on Sundays' is perfectly valid even if the first premise is false, and a valid argument with a false premise can deliver a false conclusion. Second, in these items you must accept the premises as given even when you know them to be untrue, because the question is whether the conclusion follows, not whether it is true.

Interpretation: what a survey figure does and does not license: Data: all 1,200 employees of a firm were surveyed. 62 percent said they would accept a four-day week at 90 percent pay. Of those who said yes, 71 percent were under 35. Conclusion one: 'A majority of this firm's employees would accept the trade.' This follows - 62 percent of a complete census of the firm is a majority, and the conclusion is properly limited to this firm. Conclusion two: 'A majority of the firm's under-35 employees would accept the trade.' This does not follow, and the arithmetic shows why. Sixty-two percent of 1,200 is 744 accepters, and 71 percent of 744 is about 528 accepters aged under 35. That is the composition of the accepters, not the acceptance rate within the under-35 group, and without knowing how many under-35s the firm employs the rate is undetermined: if there are 900, the rate is 528 / 900 = 59 percent; if there are 600, it is 88 percent; if there were 1,100 the rate would be below half. Conclusion three: 'The firm should move to a four-day week.' This does not follow either - a stated preference about pay says nothing about output, shift cover, customer hours or cost. Notice that conclusion two is the base-rate error from the screening example, wearing survey clothing.

Strong and weak arguments on the same question: Question: should the agency publish raw inspection scores for every site? Strong argument for: 'In the neighbouring authority, publication was followed by a measurable fall in repeat violations, which is the stated aim of the inspection regime.' It is directly about this decision, it addresses the regime's own objective, and it offers evidence - and if true it would change your view. Weak argument for: 'Yes, because transparency is always good.' Sweeping, unsupported, and it would apply identically to publishing anything at all, which is the tell. Strong argument against: 'Raw scores omit the severity weighting, so a site with one critical failure can rank above a site with six minor ones, and a member of the public cannot see the difference.' Specific, mechanistic, directly about the proposal, and it would change your view. Weak argument against: 'No, because businesses will object.' It may be true and it may matter politically, but it does not bear on whether publication achieves the regime's aim, and no evidence is offered. Two tests separate strong from weak: is the argument about the exact question asked, and would accepting it change the decision? Note that you can hold a firm personal view on publication and still be required to mark the argument on the other side as the strong one - that split is what the item type is measuring.

How to practise this skill

- Negate every candidate assumption out loud. If the argument survives the negation, it was never an assumption, however supportive it sounds. This single habit converts the assumption item type from guesswork into a mechanical check.
- Write the conclusion in your own words before reading any option. Half of the wrong answers on inference and evaluation items are responses to a conclusion the argument never reached.
- Ask 'percentage of what?' on every percentage in the stimulus and reconstruct the denominator in whole units. Base-rate and composition errors both dissolve the moment you write out counts instead of rates.
- Deliberately practise marking arguments you disagree with as strong and arguments you agree with as weak. Assessments in this construct are built to catch agreement masquerading as evaluation, and the effect is largest on politically loaded stimuli.
- For any causal claim, write two alternatives - selection and a third factor - and name the comparison group that would rule them out, before you decide whether the evidence supports the claim.
- Log wrong answers by task type rather than by topic: inference, assumption, deduction, interpretation, evaluation. Candidates are rarely weak across all five, and the profile tells you where the next hour of practice belongs.

Glossary

Conclusion: The claim an argument is trying to establish. It is not always last, is often signalled by therefore, so, or should, and locating it correctly determines every subsequent judgement about the argument.

Assumption: An unstated premise the argument requires in order to work. Identified by negation: negate it

and a genuine assumption brings the argument down, while a merely helpful statement leaves it standing.

Validity and soundness: An argument is valid when the conclusion cannot be false while the premises are true, which is a property of form alone. It is sound when it is valid and the premises are actually true.

Affirming the consequent: The invalid pattern 'if P then Q; Q; therefore P'. It is the most common deductive distractor because it differs from the valid modus tollens form by only the position of a negation.

Base rate: How common something is in the population before any test or evidence is applied. Ignoring it makes accurate-sounding tests appear far more informative than they are when the condition is rare.

Confounder: A third factor associated with both the supposed cause and the outcome, capable of producing the entire observed relationship on its own. Ruled out by randomisation or by an explicit comparison group.

Selection effect: A difference between groups created by how people entered them rather than by the treatment under study. Optional programmes and voluntary surveys are where it appears most often.

Falsifiability: The property of a claim that some observation could show it to be wrong. A claim compatible with every possible result carries no information, which is why 'what would change your mind?' is a diagnostic question.

Study this next

- Critical thinking skill hub: https://learn.novusstreamsolutions.com/aptitude/skills/critical-thinking
- Practise the critical thinking bank: https://learn.novusstreamsolutions.com/cognitive-skills/critical-thinking
- Verbal reasoning lesson: https://learn.novusstreamsolutions.com/aptitude/skills/verbal-reasoning/lesson
- Government audit suite: https://learn.novusstreamsolutions.com/aptitude/tests/government-audit
- Investigator and detective reasoning suite: https://learn.novusstreamsolutions.com/aptitude/tests/investigator-and-detective-reasoning
- Critical thinking lesson on Novus Learn: https://learn.novusstreamsolutions.com/aptitude/skills/critical-thinking/lesson

Where this material comes from

- Worked items written for Novus Learn. The arguments, survey figures, defect-test numbers and evaluation options above are original and invented for this lesson; no published or copyrighted test item is reproduced.
- The five task types named in the summary - inference, assumption, deduction, interpretation, evaluation of arguments - describe a structure used publicly across several critical-thinking assessments; no affiliation with any publisher is claimed or implied.
- Terminology follows standard, widely published usage in introductory logic and research methods - validity, soundness, affirming the consequent, base rate, confounder, selection effect.
- Novus Learn aptitude construct registry (catalog seed) for the construct scope and the suite mapping shown in the related links.
- Public educational framing only - not affiliated with any official exam board, publisher or employer.

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Situational judgment

Evaluating workplace responses against role-relevant principles.

Learn a repeatable way to compare workplace responses: establish the facts, identify duties and risks, respect role boundaries, then choose a proportionate first action. This is educational preparation, not an official scoring guide.

What you should be able to do after this lesson:

1. Separate facts stated in a scenario from assumptions that the scenario does not support.
2. Rank response options by immediate risk, policy or role obligations, proportionality, and follow-through.
3. Explain why a strong first action is better than passive, punitive, or unauthorized alternatives.

Worked examples and pitfalls

Worked scenario: an unverified safety concern: A colleague reports a possible equipment fault while a deadline is approaching. First distinguish the known fact, the report, from the unverified cause. A strong response protects people and affected work, checks the concern through the right channel, tells the relevant lead, and records what was done. Ignoring the report underreacts; shutting down unrelated work or accusing someone before checking the facts overreacts.

Method: facts, duties, risks, response: Write four short notes before ranking options: what is known, who may be affected, which duty or boundary applies, and what safe next step is available now. Prefer an action that addresses the immediate issue and creates useful follow-through. Do not reward an option merely because it sounds decisive.

How to practise this skill

- Answer the question asked: best first action, worst action, or complete response are different tasks.
- Check whether an option acts within the person's authority and escalates only as far as the risk requires.
- When two options look reasonable, prefer the one that gathers missing facts and communicates ownership.

Glossary

Proportionality: Matching the urgency and scope of a response to the evidence, likely impact, and authority available.

Role boundary: The limit of what a person may decide or do without approval, specialist help, or escalation.

Follow-through: Confirming ownership, recording the decision, and checking that the issue was actually resolved.

Study this next

- Situational judgement test: https://learn.novusstreamsolutions.com/search?q=Situational%20judgement%20test
- Workplace ethics: https://learn.novusstreamsolutions.com/search?q=Workplace%20ethics
- Decision-making: https://learn.novusstreamsolutions.com/search?q=Decision-making
- Situational judgment lesson on Novus Learn: https://learn.novusstreamsolutions.com/aptitude/skills/situational-judgement/lesson

Where this material comes from

- Novus Learn original situational-judgment suite scenarios and published construct mapping.
- Novus educational framework: facts, duties, risks, role boundaries, proportional action, and follow-through.

> Educational preparation only. Novus Learn does not administer official exams and does not guarantee scores or hiring outcomes.

Recommended preparation

- Build electrical reasoning: https://learn.novusstreamsolutions.com/aptitude/skills/electrical-reasoning/lesson
- Build numerical reasoning: https://learn.novusstreamsolutions.com/aptitude/skills/numerical-reasoning/lesson
- Practice data interpretation: https://learn.novusstreamsolutions.com/aptitude/skills/data-interpretation/lesson

Answer keys, scoring and privacy

> Answer keys and scoring logic stay server-side and are never included in any download or export.

Formal suite answer keys and scoring logic stay on the server and are not part of any download, in any format. Downloadable keys exist only for the open, untimed practice material (the practice packs on the puzzles, cognitive-skills and reasoning practice lab pages), where the answers are already public teaching content.

Novus Learn needs no account. Your practice history lives in this browser's storage on this device, and is sent to a server only if you create an account and switch on backup. This file contains no attempt, session or result link, so it is safe to share.
