# Saville-style aptitude familiarization: study guide

Commercial assessment-provider familiarization · suite apt-356-saville-style-aptitude-familiarization · generated 2026-09-15T15:29:49.278Z

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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 Saville-style aptitude familiarization*

| 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-356-saville-style-aptitude-familiarization&mode=guided
- Start mini-test: https://learn.novusstreamsolutions.com/aptitude/practice/new?bank=apt-356-saville-style-aptitude-familiarization&mode=mini
- Start full simulation: https://learn.novusstreamsolutions.com/aptitude/practice/new?bank=apt-356-saville-style-aptitude-familiarization&mode=full

## Skills covered, in full

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

### Verbal reasoning

Drawing conclusions from written information without relying on outside assumptions.

Verbal reasoning is the discipline of answering strictly from a passage: deciding whether a statement is True, False, or Cannot Say on the evidence given, and refusing to import anything you happen to know about the topic. It is the workhorse construct in graduate and civil-service screening, banking and consulting sifts, and language-focused public-service batteries, where a passage about parcel volumes or grant conditions is followed by four statements to classify. The same discipline is what stops a contract review, a grant assessment or an incident summary from quietly acquiring facts nobody wrote down. 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. Classify a statement as True, False, or Cannot Say, and state in one sentence which words in the passage force the classification.
2. Explain the difference that costs the most marks: 'Cannot Say' means undetermined by the passage, while 'False' means contradicted by it.
3. Spot quantifier drift between passage and statement (all, some, most, only, none) and show why 'all A are B' never licenses 'all B are A'.
4. Refuse a causal upgrade: recognise when a passage reports co-occurrence or sequence and a statement claims cause.
5. Separate what a passage asserts from what it reports somebody else asserting, and classify statements about each correctly.
6. Do the small arithmetic hidden inside verbal items - percentage changes, fractions of a stated total - without leaving the passage for outside data.

### Worked examples and pitfalls

The three-way rule on one short passage: Passage: 'The Riverton depot handled 4,200 parcels in March, a 12 percent increase on February. A night shift was introduced in January; in March it processed 40 percent of the parcels the depot handled.' Now take four statements. (1) 'The depot handled 3,750 parcels in February.' February is March divided by 1.12: 4,200 / 1.12 = 3,750 exactly, so this is True - the passage determines it even though the number is not printed. (2) 'The night shift caused the March increase.' Cannot Say. The passage puts the night shift and the increase in the same depot in the same period; it never claims one produced the other, and it never denies it either. Most candidates mark this False, reasoning correctly that correlation is not causation but then choosing the wrong label: False is reserved for statements the passage contradicts. (3) 'The night shift processed more than 1,700 parcels in March.' Forty percent of 4,200 is 1,680, which is not more than 1,700, so this is False - contradicted by arithmetic on the passage's own figures. (4) 'The depot handled more parcels in March than in January.' Cannot Say: January is mentioned only as the month the shift started, and no January volume is given.

Quantifier drift and illicit conversion: Passage: 'All accredited suppliers submit quarterly audits. Some suppliers in the northern region are accredited.' Statement A: 'Some suppliers in the northern region submit quarterly audits.' True, and it is worth seeing why the chain holds: at least one northern supplier is accredited, and every accredited supplier submits, so at least one northern supplier submits. Statement B: 'Every supplier that submits quarterly audits is accredited.' This reverses the first sentence. 'All accredited suppliers submit' leaves the door wide open for unaccredited suppliers to submit as well - perhaps voluntarily, perhaps under another rule - so the answer is Cannot Say. Turning 'all A are B' into 'all B are A' is called illicit conversion and it is the single most productive trap in this format, because the reversed sentence sounds like a paraphrase. Statement C: 'No unaccredited supplier submits quarterly audits' is the same reversal wearing a negative coat, and it is Cannot Say for the same reason. Statement D: 'All northern suppliers submit quarterly audits' is also Cannot Say: 'some are accredited' says nothing about the rest.

Asserted versus reported: Passage: 'The committee's report claims that the scheme cut waiting times by a third. Two of the four regional boards have disputed that figure.' Statement A: 'The scheme cut waiting times by a third.' Cannot Say. What the passage asserts is that a report claims this; the claim's truth is never settled, and the dispute does not settle it either. Statement B: 'At least two regional boards disagree with the report's waiting-time figure.' True, and note 'at least' - the passage says two disputed it, and two of four disputing is consistent with 'at least two'. Statement C: 'All four regional boards accept the figure.' False, directly contradicted. Statement D: 'The report is wrong.' Cannot Say. This item type appears constantly in policy and diplomacy passages, where a paragraph stacks a claim, a source, and a reaction, and the reader has to keep three different truth-conditions apart. The reliable habit is to underline the reporting verb - claims, argues, estimates, alleges, projects - and remember that everything downstream of it belongs to the source, not to the passage.

Percentages are not symmetric: Passage: 'Membership fell from 8,000 to 6,000 over two years, then recovered by 25 percent in the third year.' Statement: 'Membership at the end of year three was higher than at the start.' The fall is 2,000 on a base of 8,000, which is 25 percent. The recovery is 25 percent of the new base: 6,000 x 1.25 = 7,500. That is below 8,000, so the statement is False. The trap is elegant, because a 25 percent fall followed by a 25 percent rise feels like it should cancel. It does not: to get back from 6,000 to 8,000 you need a 33.3 percent rise, since 2,000 / 6,000 = 0.333. Whenever a verbal item states a change as a percentage, write down what the percentage is a percentage of before you touch it. A related version supplies the recovery as an absolute number instead - 'recovered by 2,000 members' - which does return the total to 8,000, and candidates who answered the first version from memory get the second one wrong.

Verbal analogies: name the relation as a sentence: Item: 'ANTISEPTIC is to INFECTION as ___ is to ___.' Options: (a) vaccine : immunity, (b) insulation : heat loss, (c) medicine : illness, (d) bandage : wound. Write the stem relation as a full sentence first: 'An antiseptic is applied in order to prevent an infection from occurring.' Now test each option against that exact sentence. Option (a) runs the other way - a vaccine is given to produce immunity, not to prevent it. Option (c) is the right family but the wrong specificity: medicine typically treats an illness that has already started. Option (d) is applied after the wound exists. Option (b) fits precisely: insulation is applied in order to prevent heat loss from occurring. The general method is the same on the simpler item types. 'BOOK is to LIBRARY as PAINTING is to ___' has canvas (the material), artist (the maker), and gallery (the place a collection is kept and shown) among its options; all three are genuine relations to 'painting', and only the third matches the stem sentence. Options in analogy items are chosen to be true statements about the words, just not the stated relation.

Two premises with 'some' prove nothing: Argument: 'Some depot managers are qualified engineers. Some qualified engineers hold a rigging certificate. Therefore some depot managers hold a rigging certificate.' This is invalid, and the way to prove it is a counter-model rather than an argument. Let the depot managers be Ana and Ben; let the qualified engineers be Ben and Cara; let the certificate holders be Cara alone. Premise one holds: Ben is a manager and an engineer. Premise two holds: Cara is an engineer with the certificate. The conclusion fails: neither Ana nor Ben holds the certificate. Since a single consistent world makes both premises true and the conclusion false, the argument cannot be valid, so in a True / False / Cannot Say framing the conclusion is Cannot Say. Two premises that both begin 'some' never combine into a conclusion, because 'some' gives you an overlap without telling you where the overlap sits. Contrast a valid pair: 'All accredited labs are inspected annually. No inspected facility is exempt from the fee.' Every accredited lab is inspected, and no inspected facility is exempt, so no accredited lab is exempt - True.

## How to practise this skill

- Answer from the passage even when you know the subject. Candidates with a background in the topic score worse on verbal items than they expect, because their own knowledge quietly supplies the missing premise that turns a Cannot Say into a True.
- Run the two-worlds test on every candidate 'Cannot Say': can you imagine a world where all the passage's sentences hold and the statement is true, and another where they hold and it is false? If both, it is Cannot Say. If only the false world exists, it is False.
- Underline the quantifiers and hedges in the statement (all, some, only, most, may, must, likely) and find their counterparts in the passage. Roughly half of the wrong answers in this construct come from a single word swapped between the two.
- Budget about 25 to 30 seconds per statement rather than per passage, and read the passage once for structure before touching the statements. Re-reading the whole passage for each statement is what causes candidates to run out of time on the last set.
- Keep a wrong-answer log with one label per error: quantifier, causation, reported-versus-asserted, arithmetic, outside knowledge. A clear pattern almost always emerges within about forty items, and it is usually a single label.
- Work untimed until the three-way rule is automatic, then add the clock. Attempts are stored on this device only, so a slow first pass through a passage set costs you nothing but the time you spend on it.

## Glossary

Entailment: A statement is entailed by a passage when it cannot be false while every sentence of the passage is true. Entailment is the only thing that earns a 'True' in this format; being plausible, likely, or well known does not.

Cannot Say: The verdict for a statement the passage neither entails nor contradicts. It is a claim about the passage, not about the world, which is why a statement you know to be true in real life can still be Cannot Say.

Quantifier: A word fixing how much of a group a claim covers: all, most, some, few, none, only. Swapping one quantifier for another changes the logical content completely while barely changing how the sentence reads.

Illicit conversion: The invalid move from 'all A are B' to 'all B are A', or from 'if P then Q' to 'if Q then P'. It preserves the words and destroys the logic, which is why converted sentences make such effective wrong answers.

Counter-model: A concrete, consistent scenario in which the premises hold and the conclusion fails. Producing one is the fastest possible proof that an argument is invalid, and it takes two or three named individuals.

Hedge: A qualifier such as may, could, is expected to, or is associated with. A hedged sentence in a passage cannot support an unhedged statement, and an unhedged passage sentence is not weakened by a hedged statement.

Reporting verb: A verb such as claims, argues, estimates, or alleges that attributes the following content to a source. Everything downstream of it is the source's assertion, and the passage takes no position on it.

Analogy relation: The specific link between the two stem words in an analogy item - tool and user, item and container, action and purpose. Naming it as a full sentence before reading the options removes almost all of the guesswork.

## Study this next

- Verbal reasoning skill hub: https://learn.novusstreamsolutions.com/aptitude/skills/verbal-reasoning
- Practise the verbal reasoning bank:

https://learn.novusstreamsolutions.com/cognitive-skills/verbal-reasoning
- Critical thinking lesson: https://learn.novusstreamsolutions.com/aptitude/skills/critical-thinking/lesson
- Reading comprehension lesson: https://learn.novusstreamsolutions.com/aptitude/skills/reading-comprehension/lesson
- General civil-service aptitude suite: https://learn.novusstreamsolutions.com/aptitude/tests/general-civil-service-aptitude
- Verbal reasoning lesson on Novus Learn: https://learn.novusstreamsolutions.com/aptitude/skills/verbal-reasoning/lesson

## Where this material comes from

- Worked items written for Novus Learn. Every passage, statement set and figure above is original and invented for this lesson; no published or copyrighted test item is reproduced.
- Terminology follows standard, widely published usage in introductory logic and assessment writing - entailment, quantifier, illicit conversion, counter-model.
- 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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## 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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## Diagrammatic reasoning

Following transformations, flows, processes, systems, and rule diagrams.

Diagrammatic reasoning is the ability to execute a diagram: to run an input through a chain of operator boxes, trace a flowchart with a real value, follow a state machine through a sequence of events, or read a dependency network and say what slips if a task runs late. It appears in technology and engineering screening, business-analyst and process-improvement selection, and any battery that uses transformation-box items. It is also, of the abstract constructs, the one closest to daily work: an approval flow, a deployment pipeline and a fault-finding decision tree are all diagrams somebody has to execute correctly. Practice is device-local and nothing leaves this device unless you export it.

What you should be able to do after this lesson:

1. Apply a chain of defined operators to an ordered input in the correct sequence, and explain why reordering the operators changes the output.
2. Infer an unknown operator from input and output pairs, and identify when a single pair leaves several operators indistinguishable.
3. Trace a flowchart containing a loop and a decision node with a specific starting value, recording the state after every pass.
4. Read a process diagram with threshold decisions and resolve boundary cases correctly against the wording of each condition.
5. Follow a state machine through an input sequence and report both the final state and the number of times a given transition fired.

6. Compute the critical path of a small dependency network, work out the float on each other path, and predict the project impact of a specific delay.

### Worked examples and pitfalls

Running an operator chain, in order: Three operators act on an ordered list of four items. Triangle reverses the order of the whole list. Circle swaps the first two items. Square flips the colour of the last item between black and white. The input is: white circle, black square, white triangle, black star. Apply triangle, then circle, then square. After triangle the list is black star, white triangle, black square, white circle. After circle, which swaps the first two, it is white triangle, black star, black square, white circle. After square, which flips the last item, the white circle becomes a black circle, so the output is white triangle, black star, black square, black circle. Now change the order to square, then circle, then triangle. Square flips the last item of the ORIGINAL list, the black star, to a white star. Circle swaps the first two: black square, white circle, white triangle, white star. Triangle reverses: white star, white triangle, white circle, black square. Completely different, because square and triangle both act on positions and reversing the list changes which item is last. That is the whole lesson of operator items. The operators are not commutative, and a candidate who applies them in the order they find easiest will produce a legal-looking output that is wrong. Write the intermediate list after every box. The bookkeeping is the item.

Deducing an operator, and knowing when one example is not enough: You are shown two examples of an unlabelled operator. The list 1, 2, 3, 4 becomes 2, 1, 4, 3. The list A, B, C, D becomes B, A, D, C. The operator swaps items in adjacent pairs: positions one and two exchange, and positions three and four exchange. Test it on a third input, W, X, Y, Z, and it should give X, W, Z, Y. Now the honest caveat that these items are built on. Suppose you had only been shown a two-item example, 1, 2 becoming 2, 1. At least three different operators produce that: swap adjacent pairs, reverse the whole list, and rotate the list by one position. On a two-item list they are indistinguishable, and any answer you give is a guess dressed as a deduction. This is why transformation items normally supply at least two examples of each unknown operator, and why the productive move when you feel certain after one example is to ask what other operator would have produced the same result. Where a test does give you only one example, check the answer options: if two options are consistent with the example, the item is relying on some further constraint elsewhere in the diagram, and that constraint is where the answer lives.

Tracing a flowchart with a loop: A flowchart: START, read a whole number n, set a counter c to zero. Then the loop. Is n equal to 1? If yes, output c and STOP. If no, is n even? If yes, replace n with n divided by 2; if no, replace n with three times n plus one. Then add one to c and return to the top of the loop. Trace it with n equal to 6, writing the state after each pass: n is 6 and even so it becomes 3, c is 1. Three is odd so it becomes 10, c is 2. Ten becomes 5, c is 3. Five is odd so it becomes 16, c is 4. Sixteen becomes 8, c is 5. Eight becomes 4, c is 6. Four becomes 2, c is 7. Two becomes 1, c is 8. Now the top of the loop finds n equal to 1, and the output is 8. Three errors account for nearly all wrong answers here. Testing n even before testing n equal to 1 makes the loop run one pass too far. Incrementing c inside both branches as well as after them double-counts. And abandoning the trace once the value starts rising, six goes up to 10 and then to 16 before it comes down, leads people to assume they have made a mistake. Keep a two-column table of n and c, one row per pass, and the item becomes clerical rather than clever.

Threshold decisions, and the boundary that decides them: A purchase approval flow. A request arrives. First decision: is the amount 500 or less? If yes, the team lead approves and a purchase order is raised. If no, second decision: is the amount 5,000 or less? If yes, the department head approves, finance reviews, and a purchase order is raised. If no, a director approves, finance reviews, and a purchase order is raised. Now three requests. A request for 500.00 exactly takes the first yes branch, because the condition is 500 or less and 500 satisfies it: team lead only, no finance review. A request for 500.01 fails the first decision and passes the second: department head plus finance review. A request for 5,000.00 exactly passes the second decision, so it is also department head plus finance review: not the director. That last one is the item most candidates lose, because 5,000 reads as the top of the range and feels like it should trigger the higher tier. Read the operator, not the number. Or less, up to, and not exceeding include the boundary; under, below and more than exclude it. When a diagram uses a bare inequality symbol the same discipline applies, and if the diagram genuinely does not say, that ambiguity is itself the answer to a well-written question about process risk.

A state machine, and why two coins buy one pass: A turnstile has two states, Locked and Unlocked, and accepts two inputs, coin and push. From Locked, a coin moves it to Unlocked and a push leaves it Locked. From Unlocked, a push moves it to Locked and lets one person through, while a coin leaves it Unlocked. Start in Locked and run the input sequence push, coin, coin, push, push, coin. Step through it. Push in Locked: still Locked, nobody through. Coin: Unlocked. Coin again: still Unlocked: the second coin buys nothing, because the state was already Unlocked and the transition from Unlocked on a coin loops back to Unlocked. Push: Locked, one person through. Push again: still Locked, nobody through. Coin: Unlocked. Final state is Unlocked, and exactly one person passed. The two questions a state-machine item asks are the final state and the count of some transition, and the second is where the marks go. Candidates count coins and answer two, because in the real world two coins ought to buy two entries; the diagram says otherwise, and the diagram is the authority. The general habit is to write the state after every single input in a single row, including the inputs that change nothing, since a transition that loops back to the same state is exactly the one a rushed trace silently drops.

Critical path, float, and which delay actually costs you: A small project. Task A takes 3 days and starts immediately. Task B takes 4 days and follows A. Task C takes 2 days and also follows A. Task D takes 5 days and follows B. Task E takes 6 days and follows C. Task F takes 1 day and cannot start until both D and E are finished. Two routes run from start to finish. A, B, D, F totals 3 plus 4 plus 5 plus 1, which is 13 days. A, C, E, F totals 3 plus 2 plus 6 plus 1, which is 12 days. The project takes 13 days and the critical path is A, B, D, F. The other route has one day of float: it can absorb a single day of delay without moving the finish date, because F still has to wait for D. Now the question these items are built around. Task E slips by two days. Does the project slip? The C-E route becomes 3 plus 2 plus 8 plus 1, which is 14 days, and 14 is greater than 13, so the project finishes one day late. The first day of slip was absorbed by the float and the second was not. The trap answers are no delay, from assuming that a non-critical task is free, and two days, from assuming the delay passes straight through. Float is the buffer, and only the delay beyond it reaches the finish date. Note too that the critical path has now moved to A, C, E, F, which is why the path must be recomputed after any change rather than assumed to be fixed.

## How to practise this skill

- Write the intermediate result after every operator box. Diagrammatic items are lost to bookkeeping far more often than to misunderstanding, and an unwritten intermediate state is an unverifiable one.
- Never assume operators commute. If the diagram routes an input through boxes in a particular order, apply them in that order even when a different order looks tidier, because position-based operators interact.
- Trace loops in a two-column table, one row per pass, with the loop variable and the counter side by side. Then check the exit condition is tested where the diagram tests it, not where it feels natural.
- Circle every threshold word in a decision diamond and decide explicitly whether the boundary value is inside or outside before you evaluate any case. Or less and under are different diagrams.
- On state machines, record the state after every input including the ones that change nothing. Self-loops are the transitions rushed traces drop, and they are usually what the counting question is about.
- Recompute the critical path after applying any delay rather than assuming it stays where it was. Attempts are recorded on this device only, so run a network twice with different delays and watch the path move.

## Glossary

Operator box: A labelled transformation applied to an input as it passes through a diagram. Operators are generally non-commutative, so the routing order changes the output.

Decision node: A diamond in a flowchart carrying a condition with two or more labelled exits. The wording of the condition decides which branch a boundary value takes.

Loop: A path in a flowchart that returns to an earlier node. Correct tracing depends on where the exit condition is tested relative to where the variables are updated.

State machine: A diagram of states and labelled transitions between them. The current state plus the next input fully determine what happens, and nothing else in the item does.

Self-loop: A transition that returns a state to itself, such as inserting a coin into an already unlocked turnstile. It consumes the input but changes nothing, and it is the most commonly dropped step in a trace.

Critical path: The longest chain of dependent tasks through a network. Its length is the shortest possible project duration, and any delay on it delays the whole project.

Float (slack): The amount by which a non-critical task can slip before it affects the finish date. Delay beyond the float passes through to the project, and consuming the float can move the critical path.

Swimlane: A horizontal or vertical band in a process diagram assigning each step to a role or team. Handoffs between lanes are where process items usually locate the question.

## Study this next

- Diagrammatic reasoning skill hub: https://learn.novusstreamsolutions.com/aptitude/skills/diagrammatic-reasoning
- Diagrammatic reasoning practice bank: https://learn.novusstreamsolutions.com/cognitive-skills/diagrammatic-reasoning
- Abstract reasoning lesson: https://learn.novusstreamsolutions.com/aptitude/skills/abstract-reasoning/lesson
- Business analyst suite: https://learn.novusstreamsolutions.com/aptitude/tests/business-analyst
- Troubleshooting and fault finding suite: https://learn.novusstreamsolutions.com/aptitude/tests/troubleshooting-and-fault-finding
- Diagrammatic reasoning lesson on Novus Learn: https://learn.novusstreamsolutions.com/aptitude/skills/diagrammatic-reasoning/lesson

## Where this material comes from

- Every operator chain, flowchart trace, state sequence and network above was constructed and executed by hand for Novus Learn. The loop example follows the Collatz rule, a standard public teaching example, and the trace from n equal to 6 was checked step by step.
- Terminology checked against the public Wikipedia articles 'Flowchart', 'Finite-state machine', 'Critical path method' and 'Float (project management)'. Definitions only; all diagrams described are 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, and no copyrighted test item is reproduced.

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

## Abstract reasoning

Inferring rules from shapes, symbols, matrices, and non-verbal patterns.

Abstract reasoning is rule-finding stripped of language and content: you are given shapes, shading, counts and positions, and asked which rule generates them. Because nothing in the item depends on vocabulary or schooling, it is one of the most widely used constructs in graduate screening, general aptitude batteries and matrix-style tests, and it is the section candidates most often describe as unfair. Usually because they were searching for one rule where the figure encodes three independent ones. The skill is systematic attribute scanning, not flashes of insight. Practice 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. Scan a figure against a fixed attribute checklist (count, shape, size, shading, orientation, position, line style, symmetry) instead of searching for a rule at random.
2. Read a three-by-three matrix along rows and columns separately and combine two independent progressions to produce the missing cell.
3. Distinguish the three combination rules that look alike on paper (union, intersection and exclusive-or superposition) by testing each against a complete row.
4. Track several attributes cycling at different periods within one sequence, and predict a frame that no single attribute determines.
5. Tell a rotation from a reflection by checking whether the clockwise order of three marked features is preserved or reversed.
6. Use the answer options as evidence, eliminating on one attribute at a time rather than judging each option as a whole.

## Worked examples and pitfalls

A matrix where the rule is arithmetic on side counts: A three-by-three grid of polygons. The top row runs triangle, square, pentagon. The middle row runs square, pentagon, hexagon. The bottom row runs pentagon, hexagon, and an empty cell. Count sides rather than naming shapes and the structure appears immediately: 3, 4, 5 across the top; 4, 5, 6 across the middle; 5, 6, and the answer across the bottom. Sides increase by one along each row AND by one down each column, so the missing figure has seven sides: a heptagon. Writing the numbers into the cells is the whole technique, and it generalises: whenever a matrix contains countable things, replace every cell with its count before you look for anything else, because a numeric grid makes a progression visible that shapes hide. The distractor set on an item like this is instructive. It will contain a hexagon (correct rule, one step short), an octagon (right idea, overshot), a heptagon with the wrong shading, and a heptagon rotated. Three of those four are only wrong on a second attribute, which is why the answer must be checked on every attribute before you commit rather than on the one that solved the puzzle.

Union, intersection and exclusive-or look identical until you test them: Many matrices build the third cell of each row by combining the first two. Take a row where cell one contains a dot in the top-left corner and a cross in the centre, and cell two contains a cross in the centre and a dot in the bottom-right corner. Cell three contains a dot in the top-left and a dot in the bottom-right, with no cross. That is exclusive-or superposition: elements present in exactly one of the two inputs survive, and elements present in both cancel. If cell three had contained both dots AND the cross, the rule would be union. Everything from both inputs is kept. If it had contained only the cross, the rule would be intersection: only what appears in both survives. All three rules produce plausible-looking figures, so guessing from one row is unreliable. The reliable procedure is to identify a row where the two inputs share at least one element and differ in at least one other, because that is the only configuration where union, intersection and exclusive-or give three different answers. Confirm the rule there, then apply it to the row with the missing cell. Items in this family also hide a fourth variant, where shared elements survive but change colour; catching that one requires checking shading as a separate attribute rather than treating a black cross and a white cross as the same object.

Three attributes on three different clocks: A six-frame sequence. Frame 1: an arrow pointing up, unshaded, with one internal bar. Frame 2: arrow pointing right, shaded, two bars. Frame 3: arrow pointing down, unshaded, three bars. Frame 4: arrow pointing left, shaded, one bar. Frame 5: arrow pointing up, unshaded, two bars. What is frame 6? Take the attributes one at a time. Direction rotates ninety degrees clockwise every frame, a cycle of four, so after up comes right. Shading alternates, a cycle of two, so after unshaded comes shaded. The bar count runs 1, 2, 3, 1, 2, a cycle of three, so after two comes three. Frame 6 is a right-pointing shaded arrow with three bars. The reason this item defeats people is that the whole figure does not repeat until frame 13: the individual attributes come back round every four, two and three frames, but they only come back into phase together after twelve, so the sequence as printed looks like it has no period at all. Treat each attribute as an independent counter with its own cycle length and the difficulty evaporates. The practical habit is to rule three columns on your paper (direction, shading, count) fill them in for every given frame, and extend each column separately before you look at a single answer option.

Odd one out, where the obvious difference is the decoy: Five figures. (a) A square with one diagonal drawn. (b) A triangle with a line from the apex to the base. (c) A pentagon with a line joining two non-adjacent vertices. (d) A hexagon with two lines crossing inside it. (e) A circle with a chord. Which is the odd one out? The difference that jumps out is that (e) is curved and the others are straight-edged, and that is the decoy. It is a real difference, but it is not the one the item is built on. Count enclosed regions instead. Figures (a), (b), (c) and (e) are each divided into exactly two regions by a single line. Figure (d) has two crossing lines and is divided into more than two. The rule is region count, and (d) is the answer. Odd-one-out items reliably plant a salient irrelevant difference (one figure is the only curved one, or the only shaded one, or the only one with a right angle), and hide the operative rule in something countable. The defence is procedural: before choosing, write the value of at least three attributes for all five figures, for example number of enclosed regions, number of straight edges, number of line intersections. The correct answer is the figure that stands alone on exactly one row of that table while the others agree, and if two rows both isolate a figure, the item is ambiguous and you should prefer the countable rule over the categorical one.

Rotation or reflection, settled by clockwise order: A flag-like figure carries three distinguishable marks: a red band, a blue band and a yellow band, which read red, blue, yellow going clockwise around its centre. You are shown a candidate answer figure that also has three bands. Is it a rotation of the original or a reflection of it? Rotating a flat figure in the plane never changes the clockwise order of its features, so any genuine rotation still reads red, blue, yellow clockwise, from whatever starting point you choose. A mirror reflection reverses that order, so a reflected figure reads red, yellow, blue clockwise. Read the cyclic order and the question is answered without imagining any motion at all. This matters because reflections are the standard trap in rotation items: the reflected option looks exactly as plausible as the rotated one, and no amount of mental turning will produce it. The same test works on letters, no rotation of R in the plane produces a backwards R, and on three-dimensional figures, where the equivalent check is whether a right-handed set of three edges at a corner stays right-handed. Note the one honest caveat: a figure with a mirror line of its own is unchanged by reflection, so this test only decides the question for asymmetric figures, which is exactly why item writers use asymmetric ones.

Two dots on the perimeter, moving at different rates: A three-by-three grid where only the eight perimeter cells are used. Number them clockwise starting at the top-left corner: 0 top-left, 1 top-middle, 2 top-right, 3 right-middle, 4 bottom-right, 5 bottom-middle, 6 bottom-left, 7 left-middle. Frame 1 has both dots at cell 0. Frame 2 has one dot at cell 2 and the other at cell 7. Frame 3 has them at cells 4 and 6. Frame 4 has them at cells 6 and 5. What is frame 5? Track them separately. The first dot goes 0, 2, 4, 6, two cells clockwise each frame, so it lands on 8, which wraps to cell 0, the top-left corner. The second goes 0, 7, 6, 5, one cell anticlockwise each frame, so it lands on cell 4, the bottom-right corner. Frame 5 has one dot top-left and one bottom-right. Two counting errors dominate this family. The first is treating the perimeter as nine positions because the grid has nine cells; the centre is not on the path and the perimeter is a loop of eight. The second is assuming both markers share a direction or a speed, which is precisely the assumption the item is testing. When markers move at different rates, the frames where they coincide or sit adjacent are coincidences of the arithmetic, not part of the rule, and reading meaning into them is how a solvable item becomes impossible.

## How to practise this skill

- Keep a written attribute checklist beside you until it is automatic: count, shape, size, shading, orientation, position, line style, symmetry. Scanning a fixed list is faster than free-associating, and it is what separates candidates who finish the section from those who stall on item four.
- Replace every countable cell with a number before looking for a rule. A matrix of shapes is hard to read; the same matrix written as 3, 4, 5 over 4, 5, 6 solves itself.
- Read matrices along rows and down columns as two separate passes. A large share of items encode one progression in each direction, and a rule that only works across rows is usually half the answer.
- Use the options as data. Sort them by one attribute, discard the group that cannot be right, then sort the survivors by the next. Eliminating on single attributes is far more reliable under time pressure than judging whole figures.
- Check the cyclic order of three features before accepting any rotation option, and remember that a reflected asymmetric figure can never be produced by turning the original in the plane.
- Practise untimed until you can state the rule in one sentence for every item you answer, including the ones you got right by feel. Attempts are stored on this device only, so an unhurried pass where you narrate each rule aloud costs nothing and is what actually builds the scanning habit.

## Glossary

Attribute: A single independently varying property of a figure, such as shading, count or orientation. Most difficult items vary three or more attributes at once, each on its own cycle.

Matrix item: A grid of figures, usually three by three, with one cell missing. Rules typically run along rows, down columns, or both at once.

Superposition: A rule that builds one figure by combining two others. The three common variants keep the union of elements, the intersection, or the elements appearing in exactly one input.

Exclusive-or rule: The superposition variant in which elements common to both inputs cancel and only the unshared elements survive. Distinguished from union and intersection by testing a row whose inputs both share and differ in elements.

Distractor: An incorrect answer option built to match the correct one on the attribute that solved the item while differing on another. It is why a figure must be checked on every attribute before selection.

Chirality: The handedness of an asymmetric figure. Rotation preserves it and reflection reverses it, so the clockwise order of three marked features tells the two transformations apart.

Cycle length: The number of frames after which an attribute repeats. When several attributes have different cycle lengths, the whole figure only repeats after their least common multiple.

Enclosed region: An area fully bounded by lines within a figure. It is one of the most common hidden rules in odd-one-out items because it is countable and visually unobtrusive.

## Study this next

- Abstract reasoning skill hub: https://learn.novusstreamsolutions.com/aptitude/skills/abstract-reasoning
- Abstract reasoning practice bank: https://learn.novusstreamsolutions.com/cognitive-skills/abstract-reasoning
- Inductive reasoning lesson: https://learn.novusstreamsolutions.com/aptitude/skills/inductive-reasoning/lesson
- Diagrammatic reasoning lesson: https://learn.novusstreamsolutions.com/aptitude/skills/diagrammatic-reasoning/lesson
- General academic aptitude suite: https://learn.novusstreamsolutions.com/aptitude/tests/general-academic-aptitude
- Abstract reasoning lesson on Novus Learn:

https://learn.novusstreamsolutions.com/aptitude/skills/abstract-reasoning/lesson

### Where this material comes from

- Every figure, matrix and sequence described above was constructed and verified for Novus Learn. Side counts, superposition outcomes, attribute cycle lengths and perimeter positions were each checked by hand.
- Matrix-style non-verbal items are a long-established public assessment format; this lesson describes the format in general terms and reproduces no item from any published test.
- Terminology checked against the public Wikipedia articles 'Chirality', 'Exclusive or' and 'Least common multiple'. Definitions only.
- Novus Learn aptitude construct registry (catalog seed) for the construct scope and related suite mapping.
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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.
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## Recommended preparation

- Practice verbal reasoning: https://learn.novusstreamsolutions.com/aptitude/skills/verbal-reasoning/lesson
- Practice numerical reasoning: https://learn.novusstreamsolutions.com/aptitude/skills/numerical-reasoning/lesson
- Strengthen diagrammatic reasoning: https://learn.novusstreamsolutions.com/aptitude/skills/diagrammatic-reasoning/lesson

## Answer keys, scoring and privacy

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

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