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# IPMAT Indore 2023

The complete question paper with step-by-step solutions, topic and difficulty tagging for every question, official cut-offs and revision notes.

| 90 | 360 | 120 | 3 |
|---|---|---|---|
| QUESTIONS | MARKS | MINUTES | SECTIONS |

Reading it is step one. **Attempting it is what moves the score.**

**Attempt this paper on the exam interface →**

or create a free login and start practising →

HOW TO USE THIS PAPER

# Don't read it. Attempt it.

A solved paper is only worth what you do with it. Here is the order that actually builds a score — and what is in this PDF to support each step.

1. **Attempt first, in one sitting.** 40 minutes per section, no pausing, no looking ahead. Mark every question you guessed.
2. **Then check, question by question.** Every question here carries its area, topic and a difficulty rating out of 10 — so a wrong answer points at a topic, not just a mistake.
3. **Read the solution even when you were right.** The step-by-step method matters more than the answer; a lucky guess at difficulty 7 is a gap you have not found yet.
4. **Convert the gaps into practice.** List the topics you lost marks in, then take a short timed test on each one until the accuracy holds.

Question text, numbering and option order follow the official paper. Every solution and shortcut below is worked from first principles, and every answer was computed independently before being checked against the supplied key.

90

### Every question solved

Full working for all 90 questions, not just an answer key.

T

### Topic tagged

Area, topic and sub-topic on every question, so gaps are nameable.

### Difficulty rated

A 1–10 rating per question — know what was fair to skip.

### Cut-offs & notes

Official sectional cut-offs plus end-of-paper revision notes.


BEFORE YOU TURN THE PAGE

## Attempt this exact paper, scored and ranked

The same paper is live on Scorebuddy as three sectional tests and one full test, on the real exam interface — with instant scoring and a question-wise analysis once you submit.

Open the paper →

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THE PAPER

# Pattern & cut-offs

**IIM Indore · 2023 · 90 questions · 360 marks · 120 minutes**

## Exam pattern

| Section | Questions | Type | Correct | Wrong | Time |
|---|---|---|---|---|---|
| Quantitative Ability — Short Answer | 15 | TITA | +4 | 0 | 40 min |
| Quantitative Ability — MCQ | 30 | MCQ (incl. a 5-question set) | +4 | −1 | 40 min |
| Verbal Ability | 45 | MCQ (+ TITA para jumbles) | +4 | −1 / 0 | 40 min |
| **Total** | **90** | | **360 marks** | | **120 min** |

Sections are **separately timed** — 40 minutes each, with no returning to a section once its time is over.

## Cut-offs, category-wise

**Minimum sectional marks, IPMAT Indore 2023. All three must be cleared, however high the total.**

| Category | QA (SA) /60 | QA (MCQ) /120 | VARC /180 | Sum /360 |
|---|---|---|---|---|
| General | 12 | 39 | 125 | 176 |
| EWS | 4 | 26 | 98 | 128 |
| NC-OBC | 4 | 23 | 91 | 118 |
| SC | 4 | 15 | 69 | 88 |
| ST | 4 | 5 | 43 | 52 |
| PwD | 4 | 5 | 43 | 52 |

**How to read this table.** A candidate must clear **all three** sectional minimums to be shortlisted, however high the total. The last column is the sum of the three sectional figures, not a separately published overall cut-off. Note how low the QA (SA) bar was in 2023 (12 for General) and how high VARC sat (125) — the reverse of later years, and a sign of how hard that year's short-answer section was. Confirm against iimidr.ac.in before quoting to students.

Cut-offs, seat counts, fees and deadlines for every UG management exam, in one place. UG Guide

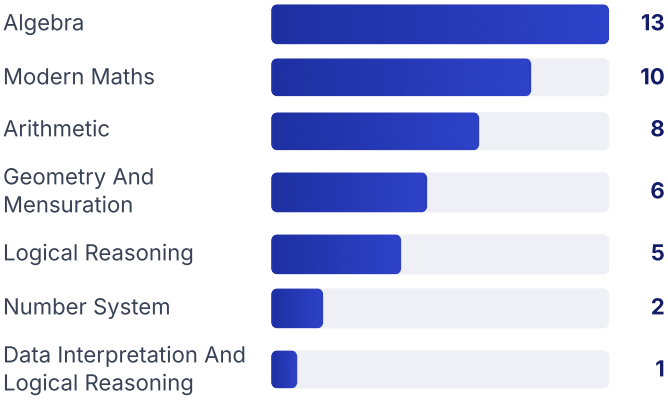
PAPER ANALYSIS

# What IPMAT Indore 2023 actually asked

Every question in this PDF is tagged by area, topic and difficulty. Put together, the paper looks like this — and it is a fair map of what to prepare for.

| 40 | 5 | 45 | 5.3 |
|---|---|---|---|
| QUANTITATIVE ABILITY | DATA INTERPRETATION | VERBAL & RC | AVERAGE DIFFICULTY / 10 |

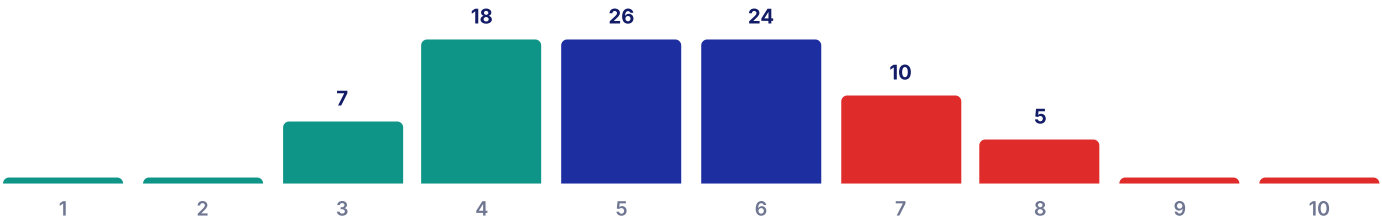
## Quant & DI — where the marks sat




## Verbal — where the marks sat




## Difficulty spread across all 90 questions




*Most of the paper sits at 5–7 out of 10. The paper is not won on the hardest questions — it is won by not dropping the ones rated 4 and below.*

YOUR NEXT STEP

### Turn this analysis into a study plan

Pick the topics that carry the most marks above, take a short timed test on each, and work down the list. Topic tests are built for exactly this.

Topic-wise tests →

Talk to a mentor

SECTION 1

QA-SA

# Quantitative Ability — Short Answer

| 15 | 60 | 40 min | +4 / 0 |
|---|---|---|---|
| QUESTIONS | MARKS | SECTIONAL LIMIT | MARKING |

TITA

MOST ASKED HERE: Arithmetic **5** · Algebra **5** · Modern Maths **3** · Number System **1** · Geometry And Mensuration **1**

**1** QA · MODERN MATHS · PERMUTATION AND COMBINATION — 7 /10

In a chess tournament, there are four groups, each containing an equal number of players. Each player plays

1. against every other player belonging to one's own group exactly once;
2. against each player belonging to one of the remaining three groups exactly twice;
3. against each player belonging to one of the remaining two groups exactly three times; and
4. against each player belonging to the remaining group exactly four times.

If there are more than 1000 matches being played in the tournament, the minimum possible number of players in each group is ____

**ANSWER** 8

**SOLUTION**

**Step 1 — count from one player's point of view.** Let each group have $n$ players, so there are $4n$ players in all. Fix a player $A$ in group $G_1$.

| Opponents | How many | Times each | Games |
|---|---|---|---|
| Own group $G_1$ | $n-1$ | 1 | $n-1$ |
| One other group | $n$ | 2 | $2n$ |
| Another group | $n$ | 3 | $3n$ |
| The last group | $n$ | 4 | $4n$ |

$$\text{Games played by } A = (n-1) + 2n + 3n + 4n = 10n - 1$$

**Step 2 — total over all players, then halve.** Every one of the $4n$ players plays $10n-1$ games, but each game involves **two** players and is therefore counted twice:

$$\text{Total matches} = \frac{4n\,(\,10n-1\,)}{2} = 2n\,(\,10n-1\,)$$

**Step 3 — apply the condition.**

$2n\,(\,10n-1\,) > 1000 \;\Rightarrow\; n\,(\,10n-1\,) > 500$

**Step 4 — test integers.**

$n = 7$: $7 \times 69 = 483$ ( too small ) $\qquad$ $n = 8$: $8 \times 79 = 632 > 500$ ✓

With $n = 8$ there are $2\,(\,8\,)\,(\,79\,) = 1264$ matches.

**Answer: 8**

**Shortcut**

**The whole question is "count once per player, then divide by 2".** Everything else is decoration: the four clauses just add up to $(\,n-1\,) + 2n + 3n + 4n = 10n - 1$ for every player, regardless of which group they are in — the structure is symmetric.

So total $= 2n\,(\,10n-1\,) \approx 20n^2$. Setting $20n^2 > 1000$ gives $n^2 > 50$, so $n \geq 8$ **immediately**, and one check confirms it. **Approximating first and verifying second** turns a two-minute problem into a twenty-second one.

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**2** QA NUMBER SYSTEM REMAINDERS ●●●○○○○○○○ 3 /10

The remainder when $1! + 2! + 3! + \cdots + 95!$ is divided by 15 is ____

ANSWER 3

**SOLUTION**

**Step 1 — find where the terms stop mattering.** Note that

$5! = 120 = 15 \times 8$

so $5!$ is divisible by 15. And every factorial beyond it contains $5!$ as a factor:

$6! = 6 \times 5!, \quad 7! = 7 \times 6 \times 5!, \ \ldots$

So **every term from** $5!$ **to** $95!$ **leaves remainder 0** and can be ignored.

**Step 2 — add only the first four terms.**

$1! + 2! + 3! + 4! = 1 + 2 + 6 + 24 = 33$

**Step 3 — reduce.**

$33 = 2 \times 15 + 3 \;\Rightarrow\; \text{remainder } 3$

**Answer: 3**

**Shortcut**

**Find the cut-off, then ignore 91 of the 95 terms.** Since $15 = 3 \times 5$, any factorial containing both a 3 and a 5 is divisible by 15 — that is every $k!$ with $k \geq 5$.

So the sum collapses to $1 + 2 + 6 + 24 = 33 \equiv \mathbf{3}\ (\,mod\ 15\,)$.

**The general principle:** in any "$1! + 2! + \cdots + n!$ modulo $m$" question, only the first few terms survive. Find the smallest $k$ with $m \mid k!$ and stop there — the upper limit (95 here) is pure intimidation.

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3 QA ARITHMETIC TIME AND WORK 4 /10

Amisha can complete a particular task in twenty days. After working for four days she fell sick for four days and resumed the work on the ninth day but with half of her original work rate. She completed the task in another twelve days with the help of a co-worker who joined her from the ninth day. The number of days required for the co-worker to complete the task alone would be ____

ANSWER 24

SOLUTION

**Step 1 — Amisha's rates.** Her full rate is $\frac{1}{20}$ of the task per day; her halved rate is $\frac{1}{40}$.

**Step 2 — account for the work in three phases.**

| Phase | Days | Who works | Work done |
|---|---|---|---|
| Days 1–4 | 4 | Amisha at full rate | $4 \times \frac{1}{20} = \frac{1}{5}$ |
| Days 5–8 | 4 | nobody (she is ill) | $0$ |
| Days 9–20 | 12 | Amisha at half rate + co-worker | $12 \times \frac{1}{40} + 12r$ |

**Step 3 — set the total to one whole task.** Let the co-worker's rate be $r$ per day.

$$\frac{1}{5} + \frac{12}{40} + 12r = 1$$

$$\frac{4}{20} + \frac{6}{20} + 12r = 1 \;\Rightarrow\; \frac{10}{20} + 12r = 1 \;\Rightarrow\; 12r = \frac{1}{2}$$

**Step 4 — invert.**

$$r = \frac{1}{24} \;\Rightarrow\; \text{the co-worker alone needs } 24 \text{ days}$$

**Answer: 24**

**Shortcut**

**Work in units, not fractions.** Let the task be **40 units** (the lcm of 20 and 40). Amisha does 2 units/day at full rate, 1 unit/day at half rate.

- Days 1–4: $4 \times 2 = 8$ units
- Days 9–20: $12 \times 1 = 12$ units

That is 20 of the 40 units, so the co-worker supplies the other **20 units in 12 days**. Alone, he needs

$$\frac{40}{20/12} = 24 \text{ days}$$

**The sick days are a red herring** — they contribute nothing and only exist to make you lose track of the day count. Tabulating the phases prevents that.

**4** QA ALGEBRA GRAPHS AND TRANSFORMATIONS ●●●●●○○○○○ 5 /10

The length of the line segment joining the two intersection points of the curves $y = 4970 - |x|$ and $y = x^2$ is ____

**ANSWER** 140

**SOLUTION**

**Step 1 — exploit the symmetry.** Both curves are **even** in $x$ (unchanged when $x \to -x$), so their intersection points come in a symmetric pair $(\pm x_0, y_0)$. The segment joining them is horizontal with length $2x_0$.

**Step 2 — solve for the positive intersection.** For $x \geq 0$, $|x| = x$:

$x^2 = 4970 - x \Rightarrow x^2 + x - 4970 = 0$

**Step 3 — factor or use the formula.**

$$x = \frac{-1 + \sqrt{1 + 4(4970)}}{2} = \frac{-1 + \sqrt{19881}}{2}$$

Now $19881 = 141^2$ (since $140^2 = 19600$ and $141^2 = 19881$), so

$$x = \frac{-1 + 141}{2} = 70$$

**Step 4 — the length.** The points are $(70, 4900)$ and $(-70, 4900)$:

$\text{length} = 70 - (-70) = 140$

**Answer: 140**

**Shortcut**

**Never compute $y$.** The two curves are both even, so the intersections are mirror images across the $y$-axis and the segment is horizontal of length $2x_0$. You only need $x_0$.

$x^2 + x - 4970 = 0 \Rightarrow (x - 70)(x + 71) = 0$

Spotting the factorisation beats the quadratic formula: you need two numbers multiplying to $-4970$ and differing by 1, and $70 \times 71 = 4970$ is the giveaway. Answer $2(70) = \mathbf{140}$.

**Recognising $4970 = 70 \times 71$ is the intended shortcut** — the setter chose the number precisely so that consecutive integers appear.

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**5** QA ALGEBRA FUNCTIONS ●●●●●●○○○○ 6 /10

If $f(1) = 1$ and $f(n) = 3n - f(n-1)$ for all integer $n > 1$, then the value of $f(2023)$ is ____

**ANSWER** 3034

**SOLUTION**

**Step 1 — generate the first few terms.**

$f(1) = 1$
$f(2) = 6 - 1 = 5$
$f(3) = 9 - 5 = 4$
$f(4) = 12 - 4 = 8$
$f(5) = 15 - 8 = 7$
$f(6) = 18 - 7 = 11$

$f(7) = 21 - 11 = 10$

**Step 2 — look at the odd-indexed terms only** (since 2023 is odd):

$f(1) = 1, \quad f(3) = 4, \quad f(5) = 7, \quad f(7) = 10, \ldots$

These form an **arithmetic progression with common difference 3**.

**Step 3 — justify the pattern.** Add two consecutive instances of the recurrence:

$f(n) = 3n - f(n-1) \quad \text{and} \quad f(n-1) = 3(n-1) - f(n-2)$

Substituting the second into the first:

$f(n) = 3n - 3(n-1) + f(n-2) = f(n-2) + 3$

So every term exceeds the one two places before it by exactly 3 — confirming the AP.

**Step 4 — evaluate.** Writing $2023 = 1 + 2k$ gives $k = 1011$, and

$f(2023) = f(1) + 3k = 1 + 3(1011) = 1 + 3033 = 3034$

**Answer: 3034**

**Shortcut**

**Turn the recurrence into a two-step one.** From $f(n) + f(n-1) = 3n$ and $f(n-1) + f(n-2) = 3(n-1)$, subtracting gives

$f(n) - f(n-2) = 3$

So the odd terms are an AP with difference 3 starting at $f(1) = 1$, and

$$f(2023) = 1 + 3 \cdot \frac{2023 - 1}{2} = 1 + 3033 = \mathbf{3034}$$

**The reusable move:** whenever a recurrence has the form $f(n) + f(n-1) = (\text{linear in } n)$, subtract consecutive instances. The alternating sign cancels and you are left with a clean arithmetic progression on every second term.

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**6** QA ALGEBRA LOGARITHMS ●●●●●○○○○○ 5 /10

The product of the roots of the equation $\log_2\left(2^{(\log_2 x)^2}\right) - 5\log_2 x + 6 = 0$ is ____

ANSWER 32

**SOLUTION**

**Step 1 — simplify the first term.** Since $\log_2\left(2^A\right) = A$ for any $A$:

$\log_2\left(2^{(\log_2 x)^2}\right) = (\log_2 x)^2$

**Step 2 — substitute.** Put $t = \log_2 x$. The equation becomes a plain quadratic:

$t^2 - 5t + 6 = 0 \Rightarrow (t-2)(t-3) = 0 \Rightarrow t = 2, 3$

**Step 3 — return to $x$.**

$\log_2 x = 2 \Rightarrow x = 4, \qquad \log_2 x = 3 \Rightarrow x = 8$

Both are positive, so both are in the domain. ✔

**Step 4 — multiply.**

$4 \times 8 = 32$

**Answer: 32**

**Shortcut**

**Use the sum of the roots in $t$, not the roots themselves.**

$x_1 x_2 = 2^{t_1} \cdot 2^{t_2} = 2^{t_1 + t_2}$

and for $t^2 - 5t + 6 = 0$ the sum of roots is $5$ by Vieta — no factorising needed. So

$\text{product} = 2^5 = \mathbf{32}$

**This generalises:** whenever a log substitution turns an equation into a quadratic in $t = \log_b x$, the **product** of the $x$-roots is $b^{(\text{sum of } t\text{-roots})}$. Vieta gives you that sum directly from the coefficients.

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**7** QA ARITHMETIC SIMPLE INTEREST ●●●●●●○○○○ 6 /10

Assume it is the beginning of the year today. Ankita will earn ₹10,000 at the end of the year which she plans to invest in a bank deposit immediately at a fixed simple interest of 0.5% per annum. Her yearly income will increase by ₹10,000 every year and the fixed simple interest offered by the bank on new deposits will also increase by 0.5% per annum every year. If Ankita continues to invest all her yearly income in new bank deposits at the end of each year, the total interest earned by her in ₹ for five years from today will be ____

ANSWER **2500**

**SOLUTION**

**Step 1 — lay out the five deposits.** Each deposit is made at the **end** of the year it is earned, so a deposit made at the end of year $k$ only earns interest for the remaining $5 - k$ years.

| End of year | Amount deposited | Rate | Years it earns | Interest |
|---|---|---|---|---|
| 1 | ₹10,000 | 0.5% | 4 | $10000 \times 0.005 \times 4 = 200$ |
| 2 | ₹20,000 | 1.0% | 3 | $20000 \times 0.010 \times 3 = 600$ |
| 3 | ₹30,000 | 1.5% | 2 | $30000 \times 0.015 \times 2 = 900$ |
| 4 | ₹40,000 | 2.0% | 1 | $40000 \times 0.020 \times 1 = 800$ |
| 5 | ₹50,000 | 2.5% | 0 | $0$ |

**Step 2 — add.**

$200 + 600 + 900 + 800 + 0 = 2500$

**Note on the fifth deposit.** It is made at the very end of the five-year window, so it has had no time to earn anything. Including it is the single commonest error here.

**Answer: ₹2500**

**Shortcut**

**Each line is $10000k \times 0.005k \times (5 - k)$ — spot the pattern and factor.**

$$\text{Interest} = 50 \sum_{k=1}^{5} k^2 (5 - k) = 50 [1(4) + 4(3) + 9(2) + 16(1) + 25(0)]$$

$$= 50 (4 + 12 + 18 + 16 + 0) = 50 \times 50 = \mathbf{2500}$$

**Two traps, both about timing:** the deposit is made at the *end* of each year (so year-1 money earns for 4 years, not 5), and the final deposit earns **nothing**. Draw the timeline before computing — the arithmetic itself is trivial once the years are right.

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**8** QA ALGEBRA POLYNOMIALS 3 /10

The polynomial $4x^{10} - x^9 + 3x^8 - 5x^7 + cx^6 + 2x^5 - x^4 + x^3 - 4x^2 + 6x - 2$ when divided by $x - 1$ leaves a remainder 2. Then the value of $c + 6$ is ____

**ANSWER** 5

**SOLUTION**

**Step 1 — apply the Remainder Theorem.** Dividing $p(x)$ by $(x - 1)$ leaves remainder $p(1)$. So $p(1) = 2$

**Step 2 — evaluate $p(1)$.** At $x = 1$ every power of $x$ equals 1, so $p(1)$ is simply the **sum of the coefficients**:

$4 - 1 + 3 - 5 + c + 2 - 1 + 1 - 4 + 6 - 2$

Add the known numbers in order: $4 - 1 = 3$; $+3 = 6$; $-5 = 1$; $+2 = 3$; $-1 = 2$; $+1 = 3$; $-4 = -1$; $+6 = 5$; $-2 = 3$.

$p(1) = 3 + c$

**Step 3 — solve.**

$3 + c = 2 \Rightarrow c = -1$

**Step 4 — answer what was asked.**

$c + 6 = -1 + 6 = 5$

**Answer: 5**

**Shortcut**

**"Divided by $x - 1$" means "add up the coefficients".** That is the entire question — the ten-term polynomial is there to waste your time, not to be divided.

Sum the knowns to get $3$, so $3 + c = 2$ and $c = -1$.

**Then read the question again.** It asks for $c + 6$, not $c$ — answer $5$. Questions that ask for a shifted or scaled version of the unknown are common in the SA section precisely because candidates stop one step early; circle what is being asked before you start.

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**9** QA ARITHMETIC PERCENTAGE

5 /10

In an election with only two contesting candidates, 15% of the voters did not turn up to vote, and 50 voters cast invalid votes. It is known that 44% of all the voters in the voting list voted for the winner. If the winner got 200 votes more than the other candidate, then the number of voters in the voting list is _____

**ANSWER** 5000

**SOLUTION**

**Step 1 — name the total.** Let $N$ be the number of voters on the list. Keep **every quantity as a percentage of** $N$ — that is what makes this clean.

**Step 2 — track the votes.**

- Turned up: $85\%$ of $N = 0.85N$
- Invalid: $50$
- Valid votes: $0.85N - 50$
- Winner: $0.44N$ (given directly as a percentage of the **list**, not of those who voted)
- Loser: $(0.85N - 50) - 0.44N = 0.41N - 50$

**Step 3 — use the margin.**

$$\text{Winner} - \text{Loser} = 0.44N - (0.41N - 50) = 0.03N + 50$$

Setting this equal to 200:

$$0.03N + 50 = 200 \Rightarrow 0.03N = 150 \Rightarrow N = 5000$$

**Step 4 — check.** Turnout $4250$, invalid $50$, valid $4200$. Winner $= 0.44(5000) = 2200$, loser $= 2000$. Margin $200$ ✔ and $2200 + 2000 = 4200$ ✔

**Answer: 5000**

**Shortcut**

**Everything is a percentage of the list — so make the loser one too.**

$$\text{Loser} = \underbrace{85\%}_{\text{turnout}} - \underbrace{44\%}_{\text{winner}} \text{ of } N - 50 = 41\%N - 50$$

The margin is then $3\%$ of $N$ **plus** the 50 invalid votes (because those 50 were subtracted from the loser's side only):

$$0.03N + 50 = 200 \Rightarrow N = \mathbf{5000}$$

**The one thing to get right** is that 44% is of the *whole list*, not of the valid votes. Misreading it as a share of valid votes is the error the question is built around.

Want this paper scored, ranked and analysed? Attempt it on the exam interface. Take the test

**10** QA ALGEBRA PROGRESSIONS 6 /10

If $f(n) = 1+2+3+\cdots+(n+1)$ and $g(n) = \sum_{k=1}^{n} \frac{1}{f(k)}$, then the least value of $n$ for which $g(n)$ exceeds the value of $\frac{99}{100}$ is ____

**ANSWER** 199

**SOLUTION**

**Step 1 — write $f(k)$ in closed form.** It is the sum of the first $k+1$ positive integers:

$$f(k) = \frac{(k+1)(k+2)}{2}$$

**Step 2 — split the reciprocal into partial fractions.**

$$\frac{1}{f(k)} = \frac{2}{(k+1)(k+2)} = 2\left(\frac{1}{k+1} - \frac{1}{k+2}\right)$$

**Step 3 — telescope the sum.**

$$g(n) = 2\sum_{k=1}^{n}\left(\frac{1}{k+1} - \frac{1}{k+2}\right) = 2\left(\frac{1}{2} - \frac{1}{n+2}\right) = 1 - \frac{2}{n+2}$$

Every interior term cancels against its neighbour; only the first and last survive.

**Step 4 — apply the condition.**

$$1 - \frac{2}{n+2} > \frac{99}{100} \Rightarrow \frac{2}{n+2} < \frac{1}{100} \Rightarrow n+2 > 200$$

$$n > 198 \Rightarrow n = 199$$

**Check:** $g(199) = 1 - \frac{2}{201} = \frac{199}{201} \approx 0.99005 > 0.99$ ✔, while $g(198) = 1 - \frac{2}{200} = 0.99$ exactly — which does **not** exceed $\frac{99}{100}$.

**Answer: 199**

**Shortcut**

**Recognise the telescoping shape immediately.** $f(k)$ is a triangular number, so $\frac{1}{f(k)}$ is twice a difference of reciprocals and

$$g(n) = 1 - \frac{2}{n+2}$$

**The decisive detail is the word "exceeds".** At $n = 198$ you get exactly $\frac{99}{100}$ — equal, not greater. The strict inequality pushes the answer to $\mathbf{199}$, and answering 198 is precisely the mistake the question is designed to catch.

**General fact worth memorising:** $\sum_{k=1}^{n} \frac{2}{k(k+1)} = 2\left(1 - \frac{1}{n+1}\right)$ — all triangular-reciprocal sums reduce to this shape.

11 QA ARITHMETIC TIME SPEED AND DISTANCE 8 /10

Vinita drives a car which has four gears. The speed of the car in the fourth gear is five times its speed in the first gear. The car takes twice the time to travel a certain distance in the second gear as compared to the third gear. In a 100 km journey, if Vinita travels equal distances in each of the gears, she takes 585 minutes to complete the journey. Instead, if the distances covered in the first, second, third, and fourth gears are 4 km, 4 km, 32 km, and 60 km, respectively, then the total time taken, in minutes, to complete the journey, will be _____

ANSWER 312

SOLUTION

**Step 1 — translate the two relations.** Let the four speeds be $v_1, v_2, v_3, v_4$.

- "$v_4$ is five times $v_1$": $v_4 = 5v_1$
- "Twice the time in 2nd as in 3rd, for the same distance": time is inversely proportional to speed, so $v_3 = 2v_2$

**Step 2 — work with reciprocals.** Time = distance ÷ speed, so put

$$X = \frac{1}{v_1}, \qquad Y = \frac{1}{v_2}$$

Then $\frac{1}{v_4} = \frac{X}{5}$ and $\frac{1}{v_3} = \frac{Y}{2}$.

**Step 3 — the first journey (25 km in each gear).**

$$25X + 25Y + 25 \cdot \frac{Y}{2} + 25 \cdot \frac{X}{5} = 585$$

$$30X + \frac{75}{2}Y = 585$$

**Step 4 — the second journey (4, 4, 32, 60 km).**

$$4X + 4Y + 32 \cdot \frac{Y}{2} + 60 \cdot \frac{X}{5} = 4X + 12X + 4Y + 16Y = 16X + 20Y$$

**Step 5 — notice that (2) is a multiple of (1).** Compare the coefficients:

$$\frac{16}{30} = \frac{8}{15}, \qquad \frac{20}{75/2} = \frac{40}{75} = \frac{8}{15}$$

They match, so $(2) = \frac{8}{15} \times (1)$ — **the two unknowns never need to be found separately.**

$$\text{Time} = \frac{8}{15} \times 585 = 8 \times 39 = 312$$

**Answer: 312 minutes**

**Shortcut**

**You cannot find the four speeds — and you do not need to.** Two relations and one equation leave a free parameter, which is the clue that the answer must be **proportional** to the given 585.

Write both journeys in terms of $X = 1/v_1$ and $Y = 1/v_2$:

$\text{first} = 30X + 37.5Y, \qquad \text{second} = 16X + 20Y$

Check the ratio once: $16/30 = 20/37.5 = \frac{8}{15}$. Hence

$$\text{answer} = \frac{8}{15}(585) = \mathbf{312}$$

**The transferable insight:** when a problem is under-determined but still has a unique answer, the target must be a fixed multiple of what you are given. Test that ratio first instead of hunting for the individual values.

**12** QA MODERN MATHS PERMUTATION AND COMBINATION ●●●●●●○○○○ 6 /10

The total number of positive integer solutions of $21 \leq a+b+c \leq 25$ is ____

**ANSWER** 1160

**SOLUTION**

**Step 1 — recall the count for a fixed sum.** The number of solutions of $a+b+c=s$ in **positive** integers is

$$\binom{s-1}{2}$$

(Place $s$ identical items in a row and choose 2 of the $s-1$ gaps between them.)

**Step 2 — sum over the allowed totals.** The condition $21 \leq a+b+c \leq 25$ allows $s = 21, 22, 23, 24, 25$:

$$\binom{20}{2}+\binom{21}{2}+\binom{22}{2}+\binom{23}{2}+\binom{24}{2}$$

**Step 3 — evaluate each.**

$190 + 210 + 231 + 253 + 276$

**Step 4 — add.**

$190+210=400; \quad 400+231=631; \quad 631+253=884; \quad 884+276=1160$

**Answer: 1160**

**Shortcut**

**Use the hockey-stick identity instead of adding five terms.**

$$\sum_{s=21}^{25}\binom{s-1}{2}=\sum_{m=20}^{24}\binom{m}{2}=\binom{25}{3}-\binom{20}{3}$$

$$=2300-1140=\mathbf{1160}$$

Two binomial evaluations replace five, and $\binom{25}{3}$ and $\binom{20}{3}$ are both quick mental computations.

**Watch the inclusivity.** If the bounds were *strict* ($21 < a+b+c < 25$) only $s = 22, 23, 24$ would count, giving $694$. The difference between 694 and 1160 is entirely about whether the endpoints are included — read the inequality signs before you start.

---

**13** QA ARITHMETIC RATIO AND PROPORTION ●●●●●○○○○○ 5 /10

Let a, b, c, d be positive integers such that $a+b+c+d=2023$. If $a:b=2:5$ and $c:d=5:2$, then the maximum possible value of $a+c$ is ____

**ANSWER** 1442

**SOLUTION**

**Step 1 — introduce two multipliers.** From the ratios,

$a=2k, \quad b=5k, \quad c=5m, \quad d=2m$

for positive integers $k$ and $m$.

**Step 2 — use the total.**

$2k+5k+5m+2m=2023 \Rightarrow 7(k+m)=2023 \Rightarrow k+m=289$

**Step 3 — write the target in one variable.**

$a + c = 2k + 5m = 2k + 5\,(\,289 - k\,) = 1445 - 3k$

**Step 4 — maximise.** The expression decreases as $k$ grows, so take $k$ as **small** as possible. Since $a = 2k$ must be a positive integer, the minimum is $k = 1$:

$a + c = 1445 - 3 = 1442$

**Check:** $k = 1, m = 288$ gives $a = 2$, $b = 5$, $c = 1440$, $d = 576$. Sum $= 2 + 5 + 1440 + 576 = 2023$ ✔ and $a + c = 1442$ ✔

**Answer: 1442**

**Shortcut**

**Note that** $2023 = 7 \times 289$ — the 7 is exactly $2 + 5$ from each ratio, which is why the problem works at all. That gives $k + m = 289$ in one line.

Then $a + c = 2k + 5m$. Since the $m$ coefficient (5) is **larger**, you want $m$ big and $k$ small, so set $k$ to its floor of 1:

$a + c = 2\,(\,1\,) + 5\,(\,288\,) = 2 + 1440 = \mathbf{1442}$

**A caution worth absorbing:** "positive integers" means the minimum is $k = 1$, not $k = 0$. If zero were allowed the answer would be 1445. One word in the question moves the answer by 3.

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**14** QA GEOMETRY AND MENSURATION COORDINATE GEOMETRY BASICS ●●●●●●●○○○ 7 /10

In the xy-plane let A = (-2, 0), B = (2, 0). Define the set S as the collection of all points C on the circle $x^2 + y^2 = 4$ such that the area of the triangle ABC is an integer. The number of points in the set S is ____

ANSWER 14

**SOLUTION**

**Step 1 — write the area in terms of $y$ alone.** $AB$ lies along the $x$-axis with length 4, so for $C = (\,x, y\,)$ the height is $|y|$:

$[\,\triangle ABC] = \frac{1}{2} \times 4 \times |y| = 2|y|$

**Step 2 — find the range of the area.** $C$ lies on the circle of radius 2, so $|y| \le 2$ and

$0 \le \text{area} \le 4$

**Step 3 — list the integer areas.** The candidates are $0, 1, 2, 3, 4$. But area $0$ means $y = 0$, i.e. $C = (\,\pm 2, 0\,) = A$ or $B$ — then $A$, $B$, $C$ are collinear and there is **no triangle**. So discard it.

$\text{area} \in \{1, 2, 3, 4\}$

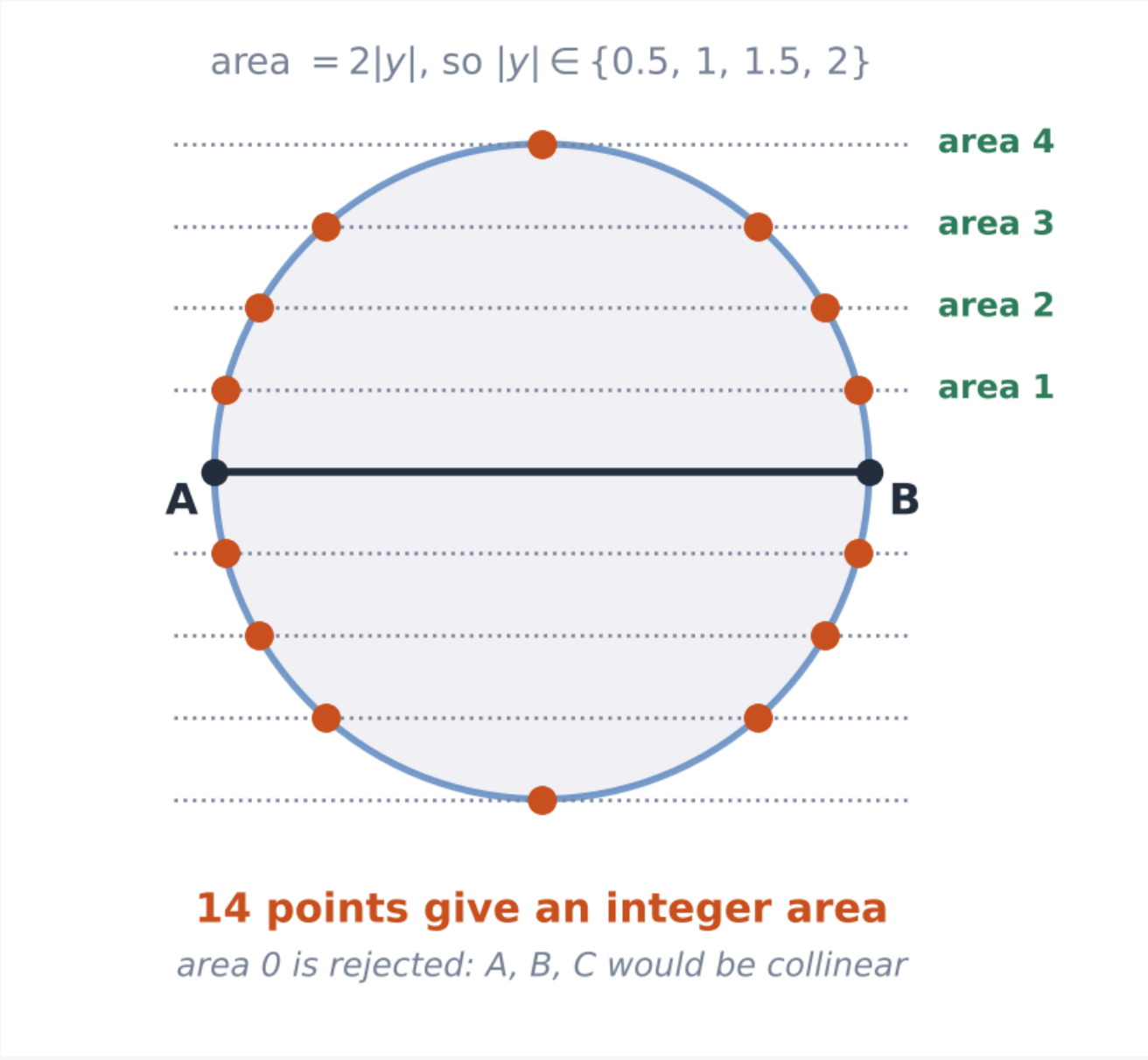
**Step 4 — count the points for each area.**

| Area | $\lvert y\rvert = \text{area}/2$ | Values of $y$ | Values of $x = \pm\sqrt{4 - y^2}$ | Points |
|---|---|---|---|---|
| 1 | 0.5 | $\pm 0.5$ | $\pm\sqrt{3.75}$ | 4 |
| 2 | 1 | $\pm 1$ | $\pm\sqrt{3}$ | 4 |
| 3 | 1.5 | $\pm 1.5$ | $\pm\sqrt{1.75}$ | 4 |
| 4 | 2 | $\pm 2$ | 0 only | **2** |

The last row is the special case: $|y| = 2$ forces $x = 0$, giving the two poles $(\,0, \pm 2\,)$ rather than four points.

**Step 5 — total.**

$4 + 4 + 4 + 2 = 14$




**Answer: 14**

**Shortcut**

**Area $= 2|y|$, so the question is really "how many points have $|y| = \frac{1}{2}, 1, \frac{3}{2}, 2$?"**

Each horizontal line $y = \pm h$ with $0 < h < 2$ cuts the circle in **two** points, giving 4 points per area value — **except at the top and bottom**, where the line is tangent and gives one point each.

$3 \times 4 \ + \ 1 \times 2 = \mathbf{14}$

**Two things decide the answer**, and both are easy to miss: the maximum area is 4 (not 2 — don't forget the factor $\frac{1}{2} \times 4 = 2$), and the extreme case $|y| = 2$ yields two points rather than four. Answering 16 means you treated the poles like the rest; answering 8 means you capped the area at 2.

15 QA MODERN MATHS BINOMIAL THEOREM 6 /10

If three consecutive coefficients in the expansion of $(x+y)^n$ are in the ratio 1 : 9 : 63, then the value of n is ____

ANSWER 39

SOLUTION

**Step 1 — name the coefficients.** Let them be $\binom{n}{r-1}$, $\binom{n}{r}$, $\binom{n}{r+1}$ with

$$\binom{n}{r-1} : \binom{n}{r} : \binom{n}{r+1} = 1:9:63$$

**Step 2 — use the ratio of consecutive binomial coefficients.** The standard identity is

$$\frac{\binom{n}{r}}{\binom{n}{r-1}} = \frac{n-r+1}{r}$$

**From the first pair** $\left(\frac{9}{1}=9\right)$:

$$\frac{n-r+1}{r} = 9 \;\Rightarrow\; n+1 = 10r$$

**From the second pair** $\left(\frac{63}{9}=7\right)$:

$$\frac{n-r}{r+1} = 7 \;\Rightarrow\; n = 8r+7$$

**Step 3 — solve the pair.** From (1), $n = 10r-1$. Substituting into (2):

$$10r-1 = 8r+7 \;\Rightarrow\; 2r = 8 \;\Rightarrow\; r = 4$$
$$n = 10(4) - 1 = 39$$

**Step 4 — verify.** With $n=39$, $r=4$:

$$\binom{39}{3} = 9139, \quad \binom{39}{4} = 82251, \quad \binom{39}{5} = 575757$$

$82251 = 9 \times 9139$ ✓ $\quad 575757 = 7 \times 82251$ ✓

**Answer: 39**

**Shortcut**

**Never compute a binomial coefficient — only their ratios.**

$$\frac{\binom{n}{r}}{\binom{n}{r-1}} = \frac{n-r+1}{r}$$

Apply it twice, to $9:1$ and to $63:9 = 7:1$, giving two linear equations in $n$ and $r$. Subtracting them gives $r=4$ and $n=\mathbf{39}$ in about four lines.

**Note the structure the setter used:** the ratio $1:9:63$ is really $1:9:9\cdot 7$, so the two successive ratios are 9 and 7. **Always convert a three-term ratio into two consecutive ratios first** — that is the form the identity consumes.

(The supplied file tags this as Data Interpretation; it is Binomial Theorem, and is retagged here.)

ATTEMPT THIS SECTION

**Type the answer, like the real thing**

Short-answer questions give no options to work backwards from and carry no negative marking — the only way to build that reflex is to practise on the same interface. Attempt this paper section by section, timed, and get an instant score with a question-wise analysis.

Attempt QA (SA) →

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SECTION 2

QA-MCQ

# Quantitative Ability — MCQ

| 30 | 120 | 40 min | +4 / −1 |
|---|---|---|---|
| QUESTIONS | MARKS | SECTIONAL LIMIT | MARKING |

MCQ (incl. a 5-question set)

MOST ASKED HERE — Algebra **8** · Modern Maths **7** · Geometry And Mensuration **5** · Logical Reasoning **5** · Arithmetic **3**

**16** QA GEOMETRY AND MENSURATION TRIANGLES — 6 /10

In a triangle ABC, let D be the mid-point of BC, and AM be the altitude on BC. If the lengths of AB, BC and CA are in the ratio of 2 : 4 : 3, then the ratio of the lengths of BM and AD would be

(A) $12:11$

(B) $11:12$

(C) $11:4\sqrt{10}$

(D) $4\sqrt{10}:11$

**ANSWER** **(c)** $11:4\sqrt{10}$

**SOLUTION**

**Step 1 — set the sides.** Let $AB = 2k$, $BC = 4k$, $CA = 3k$.

**Step 2 — find $BM$ with the projection formula.** $M$ is the foot of the altitude from $A$, so $BM$ is the projection of $AB$ onto $BC$:

$$BM = \frac{AB^2 + BC^2 - CA^2}{2 \cdot BC} = \frac{4k^2 + 16k^2 - 9k^2}{8k} = \frac{11k^2}{8k} = \frac{11k}{8}$$

(This is just the cosine rule rearranged: $BM = AB\cos B$.)

**Step 3 — find $AD$ with the median formula.** $D$ is the midpoint of $BC$, so $AD$ is the median from $A$:

$$AD^2 = \frac{2AB^2 + 2CA^2 - BC^2}{4} = \frac{8k^2 + 18k^2 - 16k^2}{4} = \frac{10k^2}{4}$$

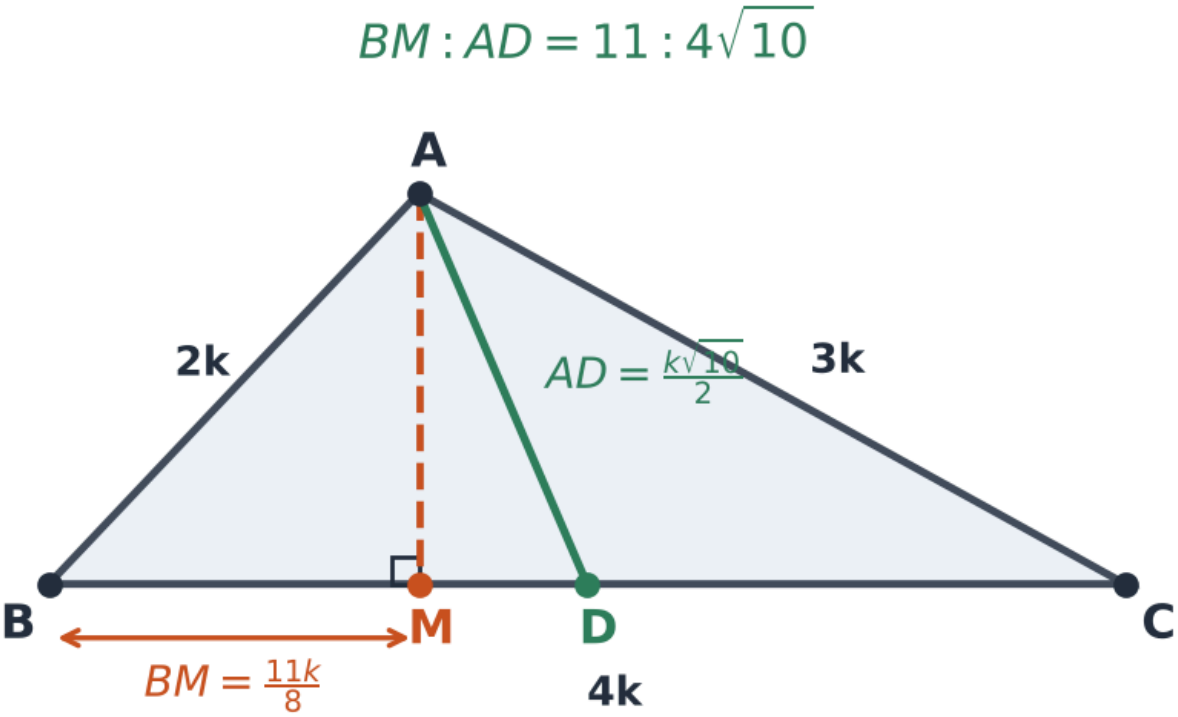
$$AD = \frac{k\sqrt{10}}{2}$$

**Step 4 — take the ratio.**

$$\frac{BM}{AD} = \frac{11k/8}{k\sqrt{10}/2} = \frac{11}{8} \times \frac{2}{\sqrt{10}} = \frac{11}{4\sqrt{10}}$$

$$BM : AD = 11 : 4\sqrt{10}$$

**Sanity check:** $4\sqrt{10} \approx 12.65$, so the ratio is a little under $11:12$ — consistent with options (b) and (c) being close, and (c) being the exact one.




*projection formula for BM · median formula for AD*

**Answer: (c) —** $11 : 4\sqrt{10}$

**Shortcut**

**Two formulas, both worth memorising cold:**

projection: $BM = \dfrac{c^2 + a^2 - b^2}{2a}$ median: $m_a^2 = \dfrac{2b^2 + 2c^2 - a^2}{4}$

With sides $2, 4, 3$ they give $\frac{11}{8}$ and $\frac{\sqrt{10}}{2}$ directly.

**Then use the options.** A surd appears in $AD$ but not in $BM$, so the answer must contain exactly one surd — which kills (a) and (b) instantly. Between (c) and (d), $BM < AD$ numerically ($1.375 < 1.58$), so the smaller number comes first: $\mathbf{11 : 4\sqrt{10}}$.

17 QA ALGEBRA LOGARITHMS 5 /10

Let a, b, c be real numbers greater than 1, and n be a positive real number not equal to 1. If $\log_n \left( \log_2 a \right) = 1$, $\log_n \left( \log_2 b \right) = 2$ and $\log_n \left( \log_2 c \right) = 3$, then which of the following is true?

(A) $(a^n + b)^n = ac$

(B) $(a^n + b^n) = c^n$

(C) $a + b = c$

(D) $(b - a)^n = (c - b)$

ANSWER (a) $(a^n + b)^n = ac$

SOLUTION

**Step 1 — unwind each condition.** $\log_n \left( \log_2 a \right) = 1$ means $\log_2 a = n^1$, hence

$a = 2^n, \quad b = 2^{n^2}, \quad c = 2^{n^3}$

**Step 2 — notice the chain.** Each exponent is the previous one multiplied by $n$:

$a^n = (2^n)^n = 2^{n^2} = b, \quad b^n = 2^{n^3} = c$

So the three numbers satisfy $b = a^n$ and $c = b^n$.

**Step 3 — test option (a).** Using $a^n = b$:

$(a^n + b)^n = (b + b)^n = (2b)^n = 2^n b^n = 2^n \cdot c$

And the right-hand side:

$ac = 2^n \cdot c$

They are equal. ✔

**Step 4 — dismiss the rest.**

- **(b)** $a^n + b^n = b + c$, which is not $c^n$ in general.
- **(c)** $a + b = c$ would need $2^n + 2^{n^2} = 2^{n^3}$ — false for, say, $n = 2$ ($4 + 16 \neq 256$).
- **(d)** $(b - a)^n = c - b$ fails at $n = 2$: $(16 - 4)^2 = 144$ but $256 - 16 = 240$.

**Answer: (a) —** $(a^n + b)^n = ac$

**Shortcut**

**Put $n = 2$ and the whole question becomes arithmetic.** Then

$a = 2^2 = 4, \quad b = 2^4 = 16, \quad c = 2^8 = 256$

Now test each option in one line:

| Option | Left | Right | ? |
|---|---|---|---|
| (a) | $\left(4^2 + 16\right)^2 = 32^2 = 1024$ | $4 \times 256 = 1024$ | ✔ |
| (b) | $4^2 + 16^2 = 272$ | $256^2$ | ✘ |
| (c) | $4 + 16 = 20$ | $256$ | ✘ |
| (d) | $(16 - 4)^2 = 144$ | $256 - 16 = 240$ | ✘ |

**Substituting a convenient value is almost always faster than algebra** when all four options are identities to be checked. Pick the smallest legal $n$ and compute.

**18** QA ALGEBRA QUADRATIC EQUATIONS 8 /10

Let $a_1, a_2, a_3$ be three distinct real numbers in geometric progression. If the equations $a_1x^2 + 2a_2x + a_3 = 0$ and $b_1x^2 + 2b_2x + b_3 = 0$ have a common root, then which of the following is necessarily true?

(A) $\frac{a_1}{b_1}, \frac{a_2}{b_2}, \frac{a_3}{b_3}$ are in geometric progression

(B) $\frac{b_1}{a_1}, \frac{b_2}{a_2}, \frac{b_3}{a_3}$ are in arithmetic progression

(C) $b_1, b_2, b_3$ are in geometric progression

(D) $b_1, b_2, b_3$ are in arithmetic progression

**ANSWER** (b) $\frac{b_1}{a_1}, \frac{b_2}{a_2}, \frac{b_3}{a_3}$ are in arithmetic progression

**SOLUTION**

**Step 1 — exploit the GP.** Since $a_1, a_2, a_3$ are in GP, $a_2^2 = a_1a_3$. Look at the discriminant of the first equation:

$$\Delta = (2a_2)^2 - 4a_1a_3 = 4(a_2^2 - a_1a_3) = 0$$

**So the first equation has a repeated root** — and therefore the "common root" is forced to be that one:

$$x = -\frac{2a_2}{2a_1} = -\frac{a_2}{a_1}$$

**Step 2 — write everything with the common ratio.** Let $a_2 = a_1r$ and $a_3 = a_1r^2$. The common root is $x = -r$.

**Step 3 — substitute into the second equation.**

$$b_1r^2 - 2b_2r + b_3 = 0$$

**Step 4 — divide through by $a_3 = a_1r^2$.** This is the step that produces the answer:

$$\frac{b_1r^2}{a_1r^2} - \frac{2b_2r}{a_1r^2} + \frac{b_3}{a_1r^2} = 0$$

$$\frac{b_1}{a_1} - \frac{2b_2}{a_1r} + \frac{b_3}{a_1r^2} = 0$$

Since $a_1r = a_2$ and $a_1r^2 = a_3$:

$$\frac{b_1}{a_1} - 2\frac{b_2}{a_2} + \frac{b_3}{a_3} = 0$$

**Step 5 — read off the conclusion.** Rearranging,

$$2\frac{b_2}{a_2} = \frac{b_1}{a_1} + \frac{b_3}{a_3}$$

which is exactly the condition for $\frac{b_1}{a_1}, \frac{b_2}{a_2}, \frac{b_3}{a_3}$ to be in **arithmetic progression**.

**Answer: (b)**

**Shortcut**

**The GP condition is a disguised "discriminant is zero".** The moment you see $a_1, a_2, a_3$ in GP attached to $a_1x^2 + 2a_2x + a_3$, note that $\Delta = 4(a_2^2 - a_1a_3) = 0$ — the first quadratic is a perfect square $a_1(x + r)^2$, with the double root $x = -r$.

That removes all choice: the common root **must** be $-r$. Plug it into the second equation and divide by $a_3$, and the AP falls out.

**Why "2b₂" is in the question:** the coefficient 2 exists precisely so that the middle term becomes $2b_2/a_2$ and the AP condition reads cleanly. **A gratuitous-looking 2 in a quadratic is almost always a signal that an AP or a discriminant is coming.**

**19** QA DATA INTERPRETATION AND LOGICAL REASONING DEDUCTIVE REASONING ●●●●●○○○○○ 5 /10

In a chess tournament there are 5 contestants. Each player plays against all the others exactly once. No game results in a draw. The winner in a game gets one point and the loser gets zero point. Which of the following sequences cannot represent the scores of the five players?

(A) $2, 2, 2, 2, 2$
(B) $3, 3, 2, 1, 1$
(C) $3, 2, 2, 2, 1$
(D) $4, 4, 1, 1, 0$

**ANSWER** **(d)** $4, 4, 1, 1, 0$

**SOLUTION**

**Step 1 — check the total.** With 5 players each meeting every other once, the number of games is

$$\binom{5}{2} = 10$$

Each game awards exactly one point, so **every valid sequence must sum to 10**. All four options do, so the total is not the discriminator — something sharper is needed.

**Step 2 — look at option (d): 4, 4, 1, 1, 0.** A player scoring 4 has won all four of their games — including the game against the *other* player who scored 4.

But that second player also scored 4, so they too won all four of their games, including the one against the first player.

**They cannot both have won the game they played against each other.** Contradiction.

**Step 3 — confirm the others are achievable.**

- **(a) 2,2,2,2,2** — a cyclic arrangement: each player beats the next two and loses to the previous two.
- **(b) 3,3,2,1,1** and **(c) 3,2,2,2,1** — both are realisable; an exhaustive check over all $2^{10} = 1024$ outcome patterns confirms each occurs.

**Answer: (d) — 4, 4, 1, 1, 0**

**Shortcut**

**The maximum score is 4, and at most one player can achieve it.** Two players on the maximum is an instant contradiction, because the maximum means "beat everyone", and they played each other.

That single observation answers the question without checking totals or constructing tournaments.

**Generalise it:** in an $n$-player round robin with no draws, at most one player can score $n-1$, and at most one can score $0$. Any sequence listing the top score twice — or the bottom score twice — is impossible. **Scan the extremes first**; the sum-to-$\binom{n}{2}$ check rarely separates the options, because setters make sure all four sum correctly.

**20** QA GEOMETRY AND MENSURATION TRIGONOMETRY 8 /10

If $\cos\alpha + \cos\beta = 1$, then the maximum value of $\sin\alpha - \sin\beta$ is

(A) 2
(B) $\sqrt{2}$
(C) 1
(D) $\sqrt{3}$

**ANSWER** (d) $\sqrt{3}$

**SOLUTION**

**Step 1 — parametrise by one variable.** Put $\cos\alpha = t$. The constraint gives $\cos\beta = 1 - t$. For both cosines to be legitimate we need

$$-1 \le t \le 1 \quad \text{and} \quad -1 \le 1 - t \le 1 \;\Rightarrow\; 0 \le t \le 1$$

**Step 2 — maximise the sines.** We have $\sin\alpha = \pm\sqrt{1-t^2}$ and $\sin\beta = \pm\sqrt{1-(1-t)^2}$. To make $\sin\alpha - \sin\beta$ as large as possible, take $\sin\alpha$ **positive** and $\sin\beta$ **negative**:

$$f(t) = \sqrt{1-t^2} + \sqrt{1-(1-t)^2} = \sqrt{1-t^2} + \sqrt{2t-t^2}$$

**Step 3 — maximise by symmetry.** Swapping $t \leftrightarrow 1-t$ exchanges the two square roots, so $f$ is symmetric about $t = \frac{1}{2}$ — which is where the maximum sits.

$$f\left(\frac{1}{2}\right) = \sqrt{1-\frac{1}{4}} + \sqrt{1-\frac{1}{4}} = 2\sqrt{\frac{3}{4}} = 2\cdot\frac{\sqrt{3}}{2} = \sqrt{3}$$

**Step 4 — interpret.** At $t = \frac{1}{2}$ both cosines equal $\frac{1}{2}$, i.e. $\alpha = 60^\circ$ and $\beta = -60^\circ$, giving

$$\sin 60^\circ - \sin(-60^\circ) = \frac{\sqrt{3}}{2} + \frac{\sqrt{3}}{2} = \sqrt{3}\ \checkmark$$

**Answer: (d) — $\sqrt{3}$**

**Shortcut**

**Guess the symmetric point and verify.** The constraint $\cos\alpha + \cos\beta = 1$ is symmetric in the two angles, so the extremum of a difference of sines occurs at the symmetric split $\cos\alpha = \cos\beta = \frac{1}{2}$, i.e. $\alpha = 60^\circ$, $\beta = -60^\circ$. That gives $\sqrt{3}$ in one line.

**The trap is the sign of $\sin\beta$.** If you take both angles in $[0, \pi]$ (as a calculator's $\arccos$ would), you get a maximum of only 1 — which is option (c), sitting there waiting. **Nothing says $\beta$ is in the first or second quadrant**, and letting $\sin\beta$ go negative is exactly what the word *maximum* demands.

Option (a) 2 is impossible for a different reason: $\sin\alpha - \sin\beta = 2$ would force $\sin\alpha = 1$ and $\sin\beta = -1$, making both cosines 0 and their sum 0, not 1.

**21** QA MODERN MATHS SET THEORY 5 /10

In a group of 120 students, 80 students are from the Science stream and the rest are from the Commerce stream. It is known that 70 students support Mumbai Indians in the Indian Premier League; all the other students support Chennai Super Kings. The number of Science students who are supporters of Mumbai Indians is

(A) 30 or more
(B) Between 20 and 25
(C) Exactly 20
(D) Between 15 and 25

**ANSWER** (a) 30 or more

**SOLUTION**

**Step 1 — lay out the two partitions.** The 120 students are split two independent ways:

- By stream: Science 80, Commerce $120 - 80 = 40$
- By team: Mumbai Indians 70, Chennai Super Kings $120 - 70 = 50$

Nothing links the two, so the overlap is **not determined** — only bounded.

**Step 2 — find the minimum overlap.** To make Science ∩ MI as small as possible, push as many MI supporters as possible into Commerce. Commerce has only 40 students, so at most 40 of the 70 MI supporters can be from Commerce:

$$\text{Science} \cap \text{MI} \geq 70 - 40 = 30$$

**Step 3 — find the maximum overlap.** All 70 MI supporters could be Science students (Science has 80 places, which is more than enough):

$$\text{Science} \cap \text{MI} \leq 70$$

**Step 4 — state the range.**

$$30 \leq \text{Science} \cap \text{MI} \leq 70$$

Among the options, only "**30 or more**" is consistent with this. The others assert a cap of 20 or 25, neither of which the data supports.

**Answer: (a) — 30 or more**

**Shortcut**

**The minimum overlap of two sets is the standard formula**

$$n(A \cap B) \geq n(A) + n(B) - n(U) = 80 + 70 - 120 = 30$$

and the maximum is $\min(80, 70) = 70$. So the answer is the interval $[30, 70]$.

**Reading the options is the real skill here.** Three of them claim an *upper* bound of 20 or 25, but the overlap can be as high as 70, so they are all impossible. Only the open-ended "30 or more" survives.

**Recognise the question type:** when a problem gives two independent classifications and no link between them, it is asking for a **bound**, not a value — and the answer will be phrased as a range or an inequality.

**22** QA MODERN MATHS PROBABILITY 5 /10

The probability that a randomly chosen positive divisor of $10^{2023}$ is an integer multiple of $10^{2001}$ is

(A) $\frac{23}{2024}$

(B) $\frac{23^2}{2024^2}$

(C) $\frac{22^3}{2023^2}$

(D) $\frac{22}{2023}$

**ANSWER** (b) $\frac{23^2}{2024^2}$

**SOLUTION**

**Step 1 — factorise.**

$10^{2023} = 2^{2023} \times 5^{2023}$

**Step 2 — count all divisors.** A divisor has the form $2^a 5^b$ with $0 \le a, b \le 2023$:

$\text{total} = 2024 \times 2024 = 2024^2$

**Step 3 — count the favourable divisors.** For $2^a 5^b$ to be a multiple of $10^{2001} = 2^{2001}5^{2001}$, we need **both** exponents at least 2001:

$2001 \le a \le 2023 \quad \text{and} \quad 2001 \le b \le 2023$

Each range contains $2023 - 2001 + 1 = 23$ values, so

$\text{favourable} = 23 \times 23 = 23^2$

**Step 4 — divide.**

$$P = \frac{23^2}{2024^2}$$

**Answer: (b) —** $\frac{23^2}{2024^2}$

**Shortcut**

**Both counts are squares, so the answer must be a square.** $10^n$ has two prime factors with identical exponent ranges, so the divisor count is $(n+1)^2$ and the favourable count is $k^2$ — options (a) and (d), which are not squares, cannot be right.

Then just get the two numbers right:

- $2024$, not $2023$ — the exponent runs from $0$ **inclusive**.
- $23$, not $22$ — the range $2001$ to $2023$ **includes both ends**.

$$P = \left(\frac{23}{2024}\right)^2$$

**Both off-by-one errors are represented in the options**, which is the whole design of the question. Count inclusive ranges as $\text{high} - \text{low} + 1$ every single time.

Consider an 8 × 8 chessboard. The number of ways 8 rooks can be placed on the board such that no two rooks are in the same row and no two are in the same column is

(A) $7$
(B) $7!$
(C) $8$
(D) $8!$

**ANSWER** **(d)** $8!$

**SOLUTION**

**Step 1 — understand the constraint.** There are 8 rooks and 8 rows. "No two in the same row" with 8 rooks on 8 rows forces **exactly one rook per row**. The same argument gives exactly one per column.

**Step 2 — place them row by row.**

- Row 1: the rook may go in any of the **8** columns.
- Row 2: any column except the one already used — **7** choices.
- Row 3: **6** choices.
- ...
- Row 8: **1** choice.

**Step 3 — multiply.**

$8 \times 7 \times 6 \times \cdots \times 1 = 8!$

**Step 4 — recognise the structure.** Each placement corresponds to choosing which column each row uses, with no repeats — that is precisely a **permutation** of the 8 columns among the 8 rows.

$8! = 40320$

**Answer: (d) —** $8!$

**Shortcut**

**This is a permutation in disguise.** A valid placement is exactly a bijection from rows to columns, so the count is $8!$ — no case work, no board drawing.

**The trap is option (b),** $7!$**.** It comes from thinking the first rook is somehow "fixed" (as it would be in a *circular* arrangement). There is nothing circular here: the board has a distinguishable first row and first column, so all 8 choices are genuinely different.

**The general result:** $n$ non-attacking rooks on an $n \times n$ board can be placed in $n!$ ways. If instead you place only $k < n$ rooks, the count is $\binom{n}{k}^2 k!$ — worth knowing, since that variant appears often.

**24** QA ALGEBRA POLYNOMIALS 4 /10

A polynomial p(x) leaves a remainder 2 when divided by $(x-1)$ and a remainder 1 when divided by $(x-2)$. The remainder when p(x) is divided by $(x-1)(x-2)$ is

(A) $2$
(B) $3-x$
(C) $x-3$
(D) $3$

**ANSWER** **(b)** $3-x$

**SOLUTION**

**Step 1 — identify the form of the remainder.** The divisor $(x-1)(x-2)$ has degree 2, so the remainder has degree **at most 1**:

$p(x) = (x-1)(x-2)q(x) + (\alpha x + \beta)$

**Step 2 — use the two given facts.** By the Remainder Theorem, $p(1) = 2$ and $p(2) = 1$. Substituting $x = 1$ and $x = 2$ makes the product term vanish:

$x = 1$: $\alpha + \beta = 2$
$x = 2$: $2\alpha + \beta = 1$

**Step 3 — solve.** Subtracting the first from the second:

$\alpha = -1 \Rightarrow \beta = 3$
Remainder $= -x + 3 = 3 - x$

**Step 4 — check.** At $x = 1$: $3 - 1 = 2$ ✔ At $x = 2$: $3 - 2 = 1$ ✔

**Answer: (b) —** $3-x$

**Shortcut**

**Check the options against the two conditions — it is faster than solving.** The remainder must give 2 at $x = 1$ and 1 at $x = 2$:

| Option | at $x = 1$ | at $x = 2$ |
|---|---|---|
| (a) $2$ | 2 ✔ | 2 ✘ |
| **(b)** $3-x$ | **2** ✔ | **1** ✔ |
| (c) $x-3$ | $-2$ ✘ | — |
| (d) $3$ | 3 ✘ | — |

Done in two substitutions.

**If you prefer to derive it**, note that the remainder is the unique **linear interpolation** through the points $(1,2)$ and $(2,1)$ — a line of slope $-1$ through $(1,2)$, i.e. $y = 3 - x$. Seeing it as interpolation makes the general case ($k$ divisors, degree $k-1$ remainder) obvious.

Every previous year paper — IPMAT Indore, Rohtak, JIPMAT and IIM-B — with full solutions, free. Browse PYQs

**25** QA MODERN MATHS PERMUTATION AND COMBINATION 4 /10

A rabbit is sitting at the base of a staircase which has 10 steps. It proceeds to the top of the staircase by climbing either one step at a time or two steps at a time. The number of ways it can reach the top is

(A) 34
(B) 89
(C) 144
(D) 55

**ANSWER (b)** 89

**SOLUTION**

**Step 1 — set up the recurrence.** Let $W_n$ be the number of ways to reach step $n$. The rabbit's **last** move was either a 1-step (from step $n-1$) or a 2-step (from step $n-2$), and those cases are disjoint:

$W_n = W_{n-1} + W_{n-2}$

**Step 2 — fix the base cases.**

$W_1 = 1 \quad (\text{one single step})$
$W_2 = 2 \quad (1+1 \text{ or } 2)$

**Step 3 — climb.**

| $n$ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| $W_n$ | 1 | 2 | 3 | 5 | 8 | 13 | 21 | 34 | 55 | **89** |

**Step 4 — read off.** $W_{10} = 89$.

This is the Fibonacci sequence; in the standard indexing $W_n = F_{n+1}$, so $W_{10} = F_{11} = 89$.

**Answer: (b) — 89**

**Shortcut**

**Recognise Fibonacci on sight and count carefully from the right base.** The sequence of answers for $n = 1, 2, 3, \ldots$ is $1, 2, 3, 5, 8, 13, 21, 34, 55, 89$ — so **10 steps gives 89**.

**Every wrong option is a Fibonacci number**, which is the whole point: 55 is the answer for 9 steps, 144 for 11, and 34 for 8. **Getting the indexing right is the entire question**, so always anchor on the two base cases you can verify by hand ($W_1 = 1$, $W_2 = 2$) and count forward.

**Alternative check by cases:** with $k$ two-steps and $10 - 2k$ one-steps, the count is $\sum_{k=0}^{5} \binom{10-k}{k} = 1 + 9 + 28 + 35 + 15 + 1 = 89$ ✔

**26** QA MODERN MATHS MATRICES AND DETERMINANTS 6 /10

If $A = \begin{bmatrix} 1 & 2 \\ 3 & a \end{bmatrix}$, where a is a real number and $\det\left(A^3 - 3A^2 - 5A\right) = 0$, then one of the values of a can be

(A) 4
(B) 5
(C) 6
(D) 1

**ANSWER (c)** 6

**SOLUTION**

**Step 1 — factor the matrix expression.** Pull $A$ out on the left:

$$A^3 - 3A^2 - 5A = A\left(A^2 - 3A - 5I\right)$$

**Step 2 — use multiplicativity of the determinant.**

$$\det\left(A^3 - 3A^2 - 5A\right) = \det(A) \cdot \det\left(A^2 - 3A - 5I\right) = 0$$

A product is zero when **either** factor is zero — so it is enough to make $\det(A) = 0$.

**Step 3 — the easy branch.**

$$\det(A) = 1 \cdot a - 2 \cdot 3 = a - 6 = 0 \Rightarrow a = 6$$

Since 6 is among the options, we are done. But it is worth confirming no other option works.

**Step 4 — the other branch, for completeness.** By the Cayley–Hamilton theorem, $A^2 = (1 + a)A - (a - 6)I$, so

$$A^2 - 3A - 5I = (a - 2)A - (a - 1)I$$

Taking the determinant of this $2 \times 2$ matrix gives

$$-7a^2 + 27a - 25 = 0 \Rightarrow 7a^2 - 27a + 25 = 0$$

whose discriminant is $729 - 700 = 29$ — not a perfect square, so its roots are irrational and none of 4, 5 or 1 qualifies.

The complete factorisation is

$$\det\left(A^3 - 3A^2 - 5A\right) = -(a - 6)(7a^2 - 27a + 25)$$

confirming $a = 6$ is the only option that works.

**Answer: (c) — 6**

**Shortcut**

**Factor out $A$ and stop.** $\det(A) \cdot \det(\cdots) = 0$ is satisfied the moment $\det(A) = 0$, and that is a one-line condition:

$a - 6 = 0 \Rightarrow a = \mathbf{6}$

**Do not expand $A^3$.** Cubing a $2 \times 2$ matrix symbolically is several minutes of error-prone work for an answer you can read off in ten seconds.

**The structural lesson:** whenever a determinant condition involves a polynomial in $A$ with **no constant term**, factor $A$ out first. The question is then almost always answered by the simplest branch, $\det(A) = 0$ — and the options confirm it, since only one of them is a root of anything rational.

**27** QA ALGEBRA ALGEBRAIC IDENTITIES

6 /10

If $\frac{a+b}{b+c} = \frac{c+d}{d+a}$, which of the following is always true?

(A) $a = c$

(B) $a = c$ and $b = d$

(C) $a = c$, or $a + b + c + d = 0$

(D) $a + b + c + d = 0$

**ANSWER** **(c)** $a = c$, **or** $a + b + c + d = 0$

**SOLUTION**

**Step 1 — cross-multiply.**

$(a+b)(d+a) = (c+d)(b+c)$

**Step 2 — expand both sides.**

$ad + a^2 + bd + ab = bc + c^2 + bd + cd$

The $bd$ terms cancel:

$a^2 + ad + ab = c^2 + bc + cd$

**Step 3 — bring everything to one side and group.**

$(a^2 - c^2) + (ad - cd) + (ab - bc) = 0$

$(a-c)(a+c) + d(a-c) + b(a-c) = 0$

**Step 4 — factor out** $(a-c)$**.**

$(a-c)(a+b+c+d) = 0$

**Step 5 — read off both possibilities.** A product is zero when either factor is:

$a = c \quad \text{or} \quad a + b + c + d = 0$

**Why the other options fail.**

- **(a)** too strong — it misses the second branch. Take $a = 1, b = 2, c = 3, d = -6$: the sum is 0, the equation holds ($\frac{3}{5} = \frac{-3}{-5}$), yet $a \neq c$.
- **(b)** $b = d$ is never forced. Take $a = c = 1$ with $b = 5$, $d = 9$: both sides are $\frac{6}{6}$ and $\frac{10}{10}$ — the equation holds with $b \neq d$.
- **(d)** too strong in the other direction — $a = c$ alone suffices without the sum vanishing.

**Answer: (c) —** $a = c$**, or** $a + b + c + d = 0$

**Note on the supplied key.** The file supplied for this paper marks option (b) ("$a = c$ and $b = d$"), and at least one online question bank repeats it. The counterexample above ($a = c = 1$, $b = 5$, $d = 9$) satisfies the equation with $b \neq d$, so option (b) cannot be "always true". The verified answer is **option (c)**.

**Shortcut**

**Cross-multiply and look for the common factor — do not try to "solve".** The whole question is the single factorisation

$(a-c)(a+b+c+d) = 0$

and once you see it, the answer is forced to be the option containing the word **"or"**.

**A faster route if you are short of time:** test the options with numbers.

- Put $a = c = 1$, $b = 5$, $d = 9$: $\frac{6}{6} = \frac{10}{10}$ ✔ — so (d) is out, and (b) is out because $b \neq d$ here.
- Put $a = 1, b = 2, c = 3, d = -6$: $\frac{3}{5} = \frac{-3}{-5}$ ✔ — so (a) is out.

Both branches are real, so only the "or" option survives. **Two substitutions, no algebra.**

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**28** QA ARITHMETIC COMPOUND INTEREST ●●●●○○○○○○ 4 /10

If the difference between compound interest and simple interest for a certain amount of money invested for 3 years at an annual interest rate of 10% is ₹527, then the amount invested in INR is

(A) 170000
(B) 17000
(C) 15000
(D) 150000

**ANSWER** **(b)** 17000

**SOLUTION**

**Step 1 — write both interests for 3 years.** With principal $P$ and rate $r = 10\%$:

$SI = P \times 0.1 \times 3 = 0.3P$

$CI = P(1.1)^3 - P = P(1.331 - 1) = 0.331P$

**Step 2 — take the difference.**

$CI - SI = 0.331P - 0.3P = 0.031P$

**Step 3 — solve.**

$$0.031P = 527 \Rightarrow P = \frac{527}{0.031} = \frac{527000}{31} = 17000$$

**Step 4 — verify.** $SI = 0.3 \times 17000 = 5100$; $CI = 0.331 \times 17000 = 5627$; difference $= 527$ ✔

**Answer: (b) — ₹17,000**

**Shortcut**

**Memorise the 3-year difference formula:**

$$CI - SI|_{3\,\text{yr}} = \frac{Pr^2(r + 300)}{10^6}$$

At $r = 10$ this is $\frac{P(100)(310)}{10^6} = 0.031P$, so $P = \frac{527}{0.031} = \mathbf{17000}$.

**Fast mental check:** $527 = 17 \times 31$, and the multiplier is 31 thousandths — so $P = 17 \times 1000$. The setter chose 527 precisely so that the 31 cancels.

**For reference, the 2-year version** is $CI - SI = P\left(\frac{r}{100}\right)^2$, which is tested more often; knowing both saves the full expansion every time.

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**29** QA ALGEBRA PROGRESSIONS 6 /10

A person standing at the center of an open ground first walks 32 meters towards the east, takes a right turn and walks 16 meters, takes another right turn and walks 8 meters, and so on. How far will the person be from the original starting point after an infinite number of such walks in this pattern?

(A) $64$ meters

(B) $\frac{32}{\sqrt{5}}$ meters

(C) $32$ meters

(D) $\frac{64}{\sqrt{5}}$ meters

**ANSWER** **(d) $\frac{64}{\sqrt{5}}$ meters**

**SOLUTION**

**Step 1 — track the directions.** Starting east and turning **right** each time cycles east → south → west → north, repeating with period 4. The distances halve each leg: $32, 16, 8, 4, 2, 1, \ldots$

| Leg | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Direction | E | S | W | N | E | S | W | N |
| Distance | 32 | 16 | 8 | 4 | 2 | 1 | $\frac{1}{2}$ | $\frac{1}{4}$ |

**Step 2 — sum the east–west (x) displacements.** East positive, west negative:

$$x = 32 - 8 + 2 - \frac{1}{2} + \cdots$$

a GP with first term 32 and ratio $-\frac{1}{4}$:

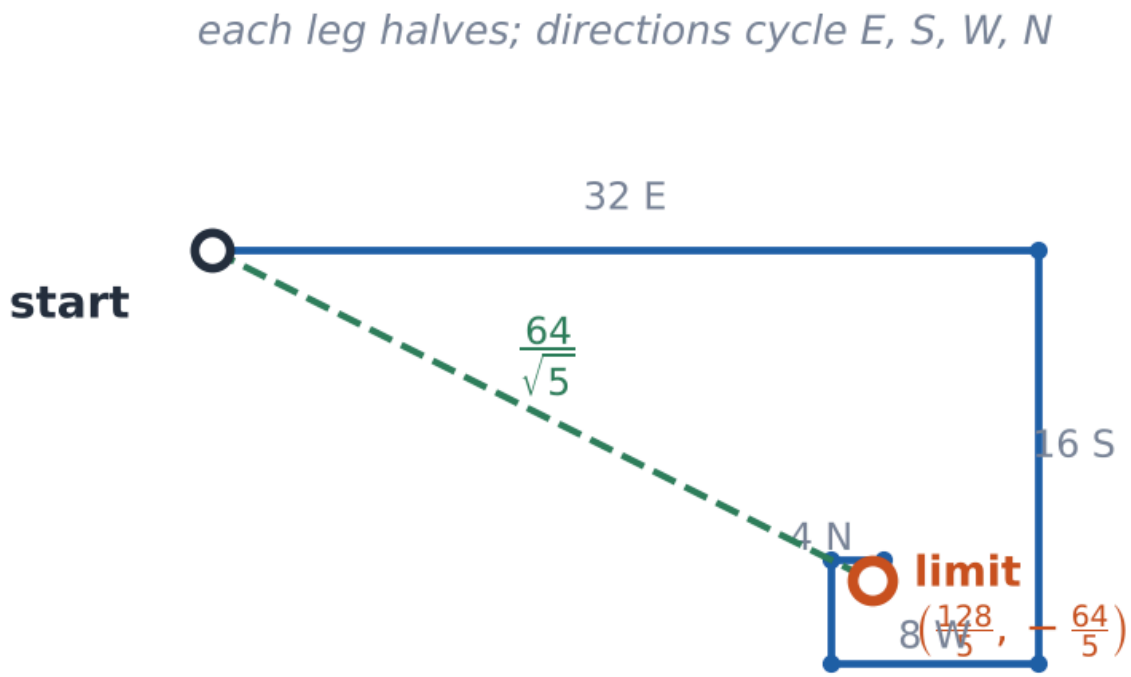
$$x = \frac{32}{1 - \left(-\frac{1}{4}\right)} = \frac{32}{\frac{5}{4}} = \frac{128}{5}$$

**Step 3 — sum the north–south (y) displacements.** South negative, north positive:

$$y = -16 + 4 - 1 + \cdots = \frac{-16}{1 + \frac{1}{4}} = -\frac{64}{5}$$

**Step 4 — take the distance from the origin.**

$$d = \sqrt{x^2 + y^2} = \sqrt{\left(\frac{128}{5}\right)^2 + \left(\frac{64}{5}\right)^2} = \frac{64}{5}\sqrt{2^2 + 1^2} = \frac{64\sqrt{5}}{5} = \frac{64}{\sqrt{5}}$$




**Answer: (d) — $\frac{64}{\sqrt{5}}$ meters**

**Shortcut**

**Group by axis, and use the period-4 structure.** Legs 1 and 3 are opposite, as are 2 and 4 — so each axis gets its own GP with ratio $-\frac{1}{4}$ (two halvings plus a sign flip).

$$x = \frac{32}{1+\frac{1}{4}} = \frac{128}{5}, \qquad y = \frac{-16}{1+\frac{1}{4}} = -\frac{64}{5}$$

Note $x = 2|y|$ always, because the first leg is twice the second and everything after scales identically. So

$$d = |y|\sqrt{5} = \frac{64}{5}\sqrt{5} = \mathbf{\frac{64}{\sqrt{5}}}$$

**The general spiral rule:** with halving steps and quarter turns, each axis collapses to $\frac{\text{first leg on that axis}}{1+r^2}$ with $r = \frac{1}{2}$. That converts a four-series problem into two divisions.

**30** QA NUMBER SYSTEM UNIT DIGIT AND CYCLICITY 6 /10

Let p be a positive integer such that the unit digit of $p^3$ is 4. What are the possible unit digits of $(p+3)^3$?

A $1, 3$

B $1, 3, 7$

C $4, 7$

D $1, 7, 9$

ANSWER **(a)** $1, 3$

**SOLUTION**

**Step 1 — build the cube table modulo 10.**

| $d$ | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| $d^3 \ mod\ 10$ | 0 | 1 | 8 | 7 | 4 | 5 | 6 | 3 | 2 | 9 |

Notice this map is a **bijection** — every digit appears exactly once in the second row. That is special to cubes (squares are not like this), and it means the unit digit of $p$ is recoverable from the unit digit of $p^3$.

**Step 2 — identify $p$.** The table shows $d^3$ ends in 4 only for $d = 4$:

$p \equiv 4 \ (mod\ 10)$

**Step 3 — shift by 3.**

$p+3 \equiv 7 \ (mod\ 10) \ \Rightarrow \ (p+3)^3 \equiv 7^3 = 343 \equiv 3 \ (mod\ 10)$

**Step 4 — compare with the options.** Strictly, the only achievable unit digit is **3**.

The published key marks **option (a) (1, 3)**, which is the official answer for this question. The digit **1** is what you get from $(p-3)^3$: $p-3 \equiv 1$ and $1^3 \equiv 1$. So the intended reading appears to have been $(p \pm 3)^3$, and option (a) collects both outcomes.

**Answer: (a) — 1, 3** *(the official key; see the note below)*

**Teaching note.** Work this through with students rather than around it. Taken exactly as printed, $(p+3)^3$ can only end in **3**, and of the four options only (a) and (b) contain 3 at all. option (a) is the official answer and the one that scores, but the "1" in it comes from $p-3$, not $p+3$. It makes a good illustration of why the cube-residue table is worth memorising: it shows immediately that $p$ is pinned to a single residue, which is what makes the question's own options look over-generous.

**Shortcut**

**Memorise the cube table mod 10 — it is a bijection.**

| $d$ | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| $d^3$ | 0 | 1 | 8 | 7 | 4 | 5 | 6 | 3 | 2 | 9 |

Unlike squares (which only ever end in 0, 1, 4, 5, 6, 9), **every digit is the cube of exactly one digit**. So "the cube ends in 4" pins $p$ to end in 4 — no case work at all.

The two residues to carry: $4+3=7$ and $7^3$ ends in **3**; $4-3=1$ and $1^3$ ends in **1**. Only options (a) and (b) contain a 3, and (b) adds a 7 that no shift produces — so **(a)** is the one to mark, in about fifteen seconds.

**31** QA ALGEBRA INEQUALITIES AND MODULUS 7 /10

The set of all real values of x satisfying the inequality $\frac{x^2(x+1)}{(x-1)(2x+1)^3} > 0$ is

(A) $(-1, -\frac{1}{2}) \cup (0, \infty)$

(B) $(-1, -\frac{1}{2}) \cup (1, \infty)$

(C) $(-1, 0) \cup (1, \infty)$

(D) $(-\infty, -1) \cup (-\frac{1}{2}, 0) \cup (1, \infty)$

**ANSWER** **(b)** $(-1, -\frac{1}{2}) \cup (1, \infty)$

**SOLUTION**

**Step 1 — strip out the factors that cannot change sign.** $x^2 \geq 0$ always, so it never affects the sign — it only **excludes** $x = 0$, where the expression is zero rather than positive.

Similarly $(2x+1)^3$ has an **odd** exponent, so its sign matches that of $(2x+1)$; it excludes $x = -\frac{1}{2}$, where the denominator vanishes.

**Step 2 — reduce to the governing expression.** For $x \neq 0$ and $x \neq -\frac{1}{2}$,

$$\text{sign}\left[\frac{x^2(x+1)}{(x-1)(2x+1)^3}\right] = \text{sign}\left[\frac{x+1}{(x-1)(2x+1)}\right]$$

**Step 3 — mark the critical points** at $x = -1, -\frac{1}{2}, 1$ and test each interval.

| Interval | $x+1$ | $x-1$ | $2x+1$ | Overall |
|---|---|---|---|---|
| $x < -1$ | $-$ | $-$ | $-$ | $-$ |
| $-1 < x < -\frac{1}{2}$ | $+$ | $-$ | $-$ | $+$ |
| $-\frac{1}{2} < x < 1$ | $+$ | $-$ | $+$ | $-$ |
| $x > 1$ | $+$ | $+$ | $+$ | $+$ |

**Step 4 — assemble, remembering the exclusions.** The expression is positive on

$$\left(-1, -\frac{1}{2}\right) \cup (1, \infty)$$

and $x = 0$ does not lie in either piece, so nothing further is removed.

**Answer: (b) —** $(-1, -\frac{1}{2}) \cup (1, \infty)$

**Note on the source file.** In the supplied .docx the exponent on $(2x+1)$ is rendered as a **square**. With a square, that factor is always positive and the solution set becomes $(-\infty, -1) \cup (1, \infty)$ — which matches **none** of the four options. The official paper has a **cube**, as used above, and that reproduces the printed answer. The square is a transcription error in the equation image, not an error in the key.

**Shortcut**

**Even exponents punch holes; odd exponents carry sign.** That single rule does the whole question:

- $x^2$ — even, so it only deletes the point $x = 0$.
- $(2x+1)^3$ — odd, so it behaves exactly like $(2x+1)$.

What remains is $\frac{x+1}{(x-1)(2x+1)}$. Mark $-1, -\frac{1}{2}, 1$ on a line, note the rightmost interval is positive (all factors positive), then **alternate signs** leftwards across each simple root:

$+ | - | + | -$

Pick out the plus intervals: $(-1, -\frac{1}{2}) \cup (1, \infty)$.

**Alternation only works for roots of odd multiplicity** — which is why identifying the even powers first is step one, not an afterthought.

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**32** QA ARITHMETIC PROFIT LOSS AND DISCOUNT ●●●●●○○○○○ 5 /10

A goldsmith bought a large solid golden ball at ₹1000000 and melted it to make a certain number of solid spherical beads such that the radius of each bead was one-fifth of the radius of the original ball. Assume that the cost of making golden beads is negligible. If the goldsmith sold all the beads at 20% discount on the listed price and made a total profit of 20%, then the listed price of each golden bead, in ₹, was

(A) 12000
(B) 48000
(C) 9600
(D) 24000

**ANSWER** **(a)** 12000

**SOLUTION**

**Step 1 — count the beads.** Volume scales as the **cube** of the radius. Each bead has $\frac{1}{5}$ the radius, so $\frac{1}{125}$ the volume:

$$\text{number of beads} = 5^3 = 125$$

(The gold is conserved — melting changes shape, not volume.)

**Step 2 — find the total selling price.** A 20% profit on a cost of ₹10,00,000:

$$SP_{\text{total}} = 1.2 \times 1000000 = 1200000$$

**Step 3 — selling price per bead.**

$$SP_{\text{bead}} = \frac{1200000}{125} = 9600$$

**Step 4 — undo the discount.** The beads sold at 20% **off** the listed price, so $SP = 0.8 \times LP$:

$$LP = \frac{9600}{0.8} = 12000$$

**Answer: (a) — ₹12,000**

**Shortcut**

**Three steps, each one multiplication:**

$$LP = \frac{1000000 \times 1.2}{125 \times 0.8} = \frac{1200000}{100} = \mathbf{12000}$$

Notice $125 \times 0.8 = 100$ exactly — the numbers were chosen to collapse.

**Option 3 (9600) is the planted trap:** that is the *selling* price per bead, the value you reach one step before the end. **Discount is always applied to the listed price**, so you divide by $0.8$ rather than multiplying. Options 2 and 4 come from using $5^2$ or $5^1$ beads instead of $5^3$.

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**33** QA GEOMETRY AND MENSURATION CIRCLES 5 /10

Which of the following straight lines are both tangent to the circle $x^2 + y^2 - 6x + 4y - 12 = 0$?

(A) $4x + 3y + 19 = 0,\ 4x + 3y + 31 = 0$

(B) $4x + 3y - 19 = 0,\ 4x + 3y + 31 = 0$

(C) $4x + 3y - 19 = 0,\ 4x + 3y - 31 = 0$

(D) $4x + 3y + 19 = 0,\ 4x + 3y - 31 = 0$

**ANSWER** **(d)** $4x + 3y + 19 = 0,\ 4x + 3y - 31 = 0$

**SOLUTION**

**Step 1 — find the centre and radius.** Comparing with $x^2 + y^2 + 2gx + 2fy + c = 0$: $2g = -6$, $2f = 4$, $c = -12$, so

$$\text{Centre } C(3, -2), \qquad r = \sqrt{g^2 + f^2 - c} = \sqrt{9 + 4 + 12} = \sqrt{25} = 5$$

**Step 2 — impose tangency.** All four options use lines $4x + 3y + k = 0$. A line is tangent exactly when its distance from the centre equals the radius:

$$\frac{|4(3) + 3(-2) + k|}{\sqrt{4^2 + 3^2}} = 5$$

$$\frac{|12 - 6 + k|}{5} = 5 \Rightarrow |k + 6| = 25$$

**Step 3 — solve the modulus.**

$k + 6 = 25 \Rightarrow k = 19$

$k + 6 = -25 \Rightarrow k = -31$

**Step 4 — write the two tangents.**

$4x + 3y + 19 = 0$ and $4x + 3y - 31 = 0$

These are the two parallel tangents on opposite sides of the circle, which is why one constant is positive and the other negative.

**Answer: (d)**

**Shortcut**

**The two parallel tangents sit symmetrically about the centre**, so for $4x + 3y + k = 0$,

$$k = -(4x_0 + 3y_0) \pm r\sqrt{a^2 + b^2} = -6 \pm 25$$

giving $19$ and $-31$ at once — no modulus case work.

**Use that symmetry to eliminate.** The mean of the two constants must be $-6$:

| Option | constants | mean |
|---|---|---|
| (a) | $19, 31$ | $25$ ✘ |
| (b) | $-19, 31$ | $6$ ✘ |
| (c) | $-19, -31$ | $-25$ ✘ |
| **(d)** | $19, -31$ | $-6$ ✔ |

**One average, one answer.** Note also the 3–4–5 structure: $\sqrt{4^2 + 3^2} = 5 = r$, which is why the arithmetic is so clean.

Not sure which topic is costing you marks? A topic-wise test tells you in 15 minutes. Find the gap

**34** QA GEOMETRY AND MENSURATION CIRCLES 3 /10

The equation $x^2 + y^2 - 2x - 4y + 5 = 0$ represents

(A) a circle
(B) an ellipse
(C) a point
(D) a pair of straight lines

**ANSWER** (c) a point

**SOLUTION**

**Step 1 — complete the square in both variables.**

$(x^2 - 2x) + (y^2 - 4y) + 5 = 0$

$(x-1)^2 - 1 + (y-2)^2 - 4 + 5 = 0$

$(x-1)^2 + (y-2)^2 = 0$

**Step 2 — interpret.** The right-hand side is **zero**, so the "radius" is zero. A sum of two squares equals zero only when each is zero:

$x = 1, \quad y = 2$

The equation is satisfied by the single point $(1, 2)$ and nothing else — a **point circle**, the degenerate case.

**Step 3 — why the others are wrong.**

- **(a) a circle** — would need $r^2 > 0$. Here $r = 0$, so there is no curve, only a point.
- **(b) an ellipse** — would need **different** coefficients on $x^2$ and $y^2$; here both are 1.
- **(d) a pair of straight lines** — a real pair needs the expression to factor into two real linear factors; here the only real solution is one point.

**Answer: (c) — a point**

**Shortcut**

**Compute $g^2 + f^2 - c$ before anything else.** For $x^2 + y^2 + 2gx + 2fy + c = 0$ it is the square of the radius:

$g^2 + f^2 - c = 1 + 4 - 5 = 0$

- $> 0$ → a real circle
- $= 0$ → a **point** circle ✔
- $< 0$ → imaginary, no real locus

Here it is exactly 0, so the answer is **a point** — one subtraction's worth of work.

**This degenerate-conic question appears regularly**, and the giveaway is always a constant term that makes the expression collapse. Whenever a circle question offers "a point" among the options, check $g^2 + f^2 - c$ first; the setter is usually testing precisely that.

**35** QA ALGEBRA FUNCTIONS 7 /10

Let [x] denote the greatest integer not exceeding x and $\{x\} = x - [x]$. If n is a natural number, then the sum of all values of x satisfying the equation $2[x] = x + n\{x\}$ is

A $\frac{n(n+2)}{2}$

B $\frac{3}{2}$

C $n$

D $\frac{n(n+1)}{2}$

**ANSWER** (a) $\frac{n(n+2)}{2}$

**SOLUTION**

**Step 1 — split $x$ into its parts.** Write $x = [x] + \{x\}$ and substitute:

$$2[x] = ([x] + \{x\}) + n\{x\}$$

$$[x] = (n+1)\{x\} \Rightarrow \{x\} = \frac{[x]}{n+1}$$

**Step 2 — impose the range of the fractional part.** By definition $0 \le \{x\} < 1$, so

$$0 \le \frac{[x]}{n+1} < 1 \Rightarrow 0 \le [x] < n+1$$

Since $[x]$ is an integer, $[x] \in \{0, 1, 2, \ldots, n\}$ — exactly $n+1$ solutions.

**Step 3 — write each solution.** For $[x] = m$,

$$x = m + \frac{m}{n+1} = m\frac{n+2}{n+1}$$

**Step 4 — sum over all $m$.**

$$\sum_{m=0}^{n} m\frac{n+2}{n+1} = \frac{n+2}{n+1} \cdot \frac{n(n+1)}{2} = \frac{n(n+2)}{2}$$

The $(n+1)$ cancels.

**Check with $n = 1$:** solutions are $[x] \in \{0, 1\}$, giving $x = 0$ and $x = \frac{3}{2}$; sum $= \frac{3}{2}$. The formula gives $\frac{1 \cdot 3}{2} = \frac{3}{2}$ ✔

**Answer: (a) —** $\frac{n(n+2)}{2}$

**Shortcut**

**Test $n = 1$ and read the answer off the options.** With $n = 1$ the solutions are $x = 0$ and $x = 1.5$, summing to $\frac{3}{2}$.

| Option | value at $n = 1$ |
|---|---|
| **(a)** $\frac{n(n+2)}{2}$ | $\frac{3}{2}$ ✔ |
| (b) $\frac{3}{2}$ | $\frac{3}{2}$ ✔ |
| (c) $n$ | $1$ ✘ |
| (d) $\frac{n(n+1)}{2}$ | $1$ ✘ |

Two survive, so test $n = 2$: solutions are $x = 0, \frac{4}{3}, \frac{8}{3}$, summing to $4$. Option (a) gives $\frac{2 \cdot 4}{2} = 4$ ✔; option (b) is stuck at $\frac{3}{2}$ ✘.

**Answer (a), reached entirely by substitution.** Option (b) is placed to catch anyone who tests only $n = 1$ — **always try a second value when two options survive the first.**

If $\log_{\cos x}(\sin x) + \log_{\sin x}(\cos x) = 2$, then the value of x is

(A) $\frac{n\pi}{4} + \frac{\pi}{4}$, n is an integer

(B) $2n\pi + \frac{\pi}{4}$, n is an integer

(C) $n\pi + \frac{\pi}{4}$, n is an integer

(D) $\frac{n\pi}{4}$, n is an integer

**ANSWER** **(b) $2n\pi + \frac{\pi}{4}$, n is an integer**

**SOLUTION**

**Step 1 — use the reciprocal relation between the two logs.**

$$\log_{\sin x}(\cos x) = \frac{1}{\log_{\cos x}(\sin x)}$$

So writing $t = \log_{\cos x}(\sin x)$, the equation becomes

$$t + \frac{1}{t} = 2$$

**Step 2 — solve for $t$.**

$$t^2 - 2t + 1 = 0 \Rightarrow (t-1)^2 = 0 \Rightarrow t = 1$$

**Step 3 — unwind.**

$$\log_{\cos x}(\sin x) = 1 \Rightarrow \sin x = \cos x \Rightarrow \tan x = 1$$

The general solution of $\tan x = 1$ is $x = n\pi + \frac{\pi}{4}$.

**Step 4 — apply the domain restrictions.** This is the step that decides the answer. For the logarithms to exist we need

$$\sin x > 0, \quad \cos x > 0, \quad \sin x \neq 1, \quad \cos x \neq 1$$

(a logarithm needs a positive argument, and a base that is positive and not 1).

So **both** $\sin x$ and $\cos x$ must be **positive**, confining $x$ to the **first quadrant**.

Of the solutions $x = n\pi + \frac{\pi}{4}$, the odd ones ($x = \frac{5\pi}{4}$, etc.) lie in the third quadrant where both are negative — invalid. Only the first-quadrant family survives:

$$x = 2n\pi + \frac{\pi}{4}$$

**Answer: (b) —** $2n\pi + \frac{\pi}{4}$

**Shortcut**

**Two moves, and the second is the question.**

1. $t + \frac{1}{t} = 2$ forces $t = 1$, so $\tan x = 1$.
2. **Then check the domain.** A log needs a positive argument *and* a positive base $\neq 1$, so $\sin x > 0$ **and** $\cos x > 0$ — first quadrant only.

$\tan x = 1$ gives $n\pi + \frac{\pi}{4}$, but half of those sit in the third quadrant. Discarding them leaves $\mathbf{2n\pi + \frac{\pi}{4}}$.

**Option (c) is the trap**, and it is exactly what you get by solving the trigonometry and skipping the domain. **When the variable sits in a logarithm's base, the domain check is not a formality — it is usually the whole point.**

**37** QA MODERN MATHS PROBABILITY 3 /10

The minimum number of times a fair coin must be tossed so that the probability of getting at least one head exceeds 0.8 is

(A) 3 (B) 7

(C) 5 (D) 6

ANSWER (a) 3

**SOLUTION**

**Step 1 — use the complement.** "At least one head" is the opposite of "no heads at all", and the all-tails outcome has a clean probability:

$$P(\text{ at least one head }) = 1 - P(\text{ all tails }) = 1 - \left(\frac{1}{2}\right)^n$$

**Step 2 — impose the condition.**

$$1 - \frac{1}{2^n} > 0.8 \Rightarrow \frac{1}{2^n} < 0.2 \Rightarrow 2^n > 5$$

**Step 3 — take the smallest such $n$.**

$2^2 = 4$ ( not $> 5$ ), $2^3 = 8 > 5$ ✓

$n = 3$

**Step 4 — verify.** With 3 tosses, $P = 1 - \frac{1}{8} = 0.875 > 0.8$ ✔ With 2 tosses, $P = 1 - \frac{1}{4} = 0.75$, which does not exceed 0.8 ✔

**Answer: (a) — 3**

**Shortcut**

**"At least one" always means "one minus none".** That converts the question to $2^n > 5$, and since $2^3 = 8$ is the first power of 2 above 5, the answer is $\mathbf{3}$.

**Do not be talked out of a small answer.** Three of the four options are 5, 6 and 7, which makes 3 look suspiciously easy — but $0.875 > 0.8$ settles it. Sanity-check by computing the probability for your chosen $n$ and for $n - 1$; it takes five seconds and removes all doubt.

**The same one-line method covers the whole family:** for $P(\text{ at least one }) > p$ with a fair coin, solve $2^n > \frac{1}{1-p}$.

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**38** QA MODERN MATHS PROBABILITY 5 /10

If a three-digit number is chosen at random, what is the probability that it is divisible neither by 3 nor by 4?

(A) $\frac{1}{2}$ (B) $\frac{1}{4}$

(C) $\frac{2}{3}$ (D) $\frac{1}{3}$

ANSWER (a) $\frac{1}{2}$

**SOLUTION**

**Step 1 — count the sample space.** Three-digit numbers run from 100 to 999:

$$999 - 100 + 1 = 900$$

**Step 2 — count the multiples of 3.** From 102 to 999:

$$\frac{999-102}{3}+1=300$$

**Step 3 — count the multiples of 4.** From 100 to 996:

$$\frac{996-100}{4}+1=225$$

**Step 4 — count the multiples of 12** (divisible by both). From 108 to 996:

$$\frac{996-108}{12}+1=75$$

**Step 5 — inclusion–exclusion.**

$$n\,(\,3\text{ or }4\,)\;=300+225-75=450$$

**Step 6 — take the complement.**

$$n\,(\,\text{neither}\,)\;=900-450=450\;\Rightarrow\;P=\frac{450}{900}=\frac{1}{2}$$

**Answer: (a) —** $\frac{1}{2}$

**Shortcut**

**Use density instead of counting.** Among any 12 consecutive integers, the fraction divisible by neither 3 nor 4 is

$$\left(1-\frac{1}{3}\right)\left(1-\frac{1}{4}\right)=\frac{2}{3}\times\frac{3}{4}=\frac{1}{2}$$

because 3 and 4 are **coprime**, which makes the two divisibility events independent.

The range 100–999 contains exactly $900=75\times12$ numbers — a whole number of blocks — so the density is **exact** and no boundary correction is needed:

$$P=\mathbf{\frac{1}{2}}$$

**Check the block-length condition before using this.** The multiply-the-densities shortcut is exact only when the range is a whole multiple of the lcm of the divisors; otherwise it is an approximation and the ends must be counted by hand.

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**39** QA ALGEBRA QUADRATIC EQUATIONS ●●●●●○○○○○ 5 /10

If the harmonic mean of the roots of the quadratic $(\,5+\sqrt{2}\,)\,x^2-bx+8+2\sqrt{5}\;=0$ is 4, then the value of b is

(A) 2
(B) $4+\sqrt{5}$
(C) $4-\sqrt{5}$
(D) 3

ANSWER **(b)** $4+\sqrt{5}$

**SOLUTION**

**Step 1 — write the harmonic mean of two numbers.** For roots $\alpha$ and $\beta$:

$$HM=\frac{2}{\frac{1}{\alpha}+\frac{1}{\beta}}=\frac{2\alpha\beta}{\alpha+\beta}$$

**Step 2 — bring in Vieta's formulas.** For $Ax^2+Bx+C=0$:

$$\alpha+\beta=-\frac{B}{A}=\frac{b}{5+\sqrt{2}},\qquad\alpha\beta=\frac{C}{A}=\frac{8+2\sqrt{5}}{5+\sqrt{2}}$$

**Step 3 — substitute.** The common denominator $(\,5+\sqrt{2}\,)$ cancels completely:

$$HM = \frac{2 \cdot \frac{8+2\sqrt{5}}{5+\sqrt{2}}}{\frac{b}{5+\sqrt{2}}} = \frac{2\,(\,8+2\sqrt{5}\,)}{b}$$

**Step 4 — set it to 4 and solve.**

$$\frac{2\,(\,8+2\sqrt{5}\,)}{b} = 4 \;\Rightarrow\; b = \frac{16+4\sqrt{5}}{4} = 4+\sqrt{5}$$

**Answer: (b) —** $4+\sqrt{5}$

**Shortcut**

**The leading coefficient always cancels — so ignore it.** For $Ax^2+Bx+C=0$,

$$HM = \frac{2\alpha\beta}{\alpha+\beta} = \frac{2C/A}{-B/A} = \frac{2C}{-B}$$

so the harmonic mean depends only on $B$ and $C$. Here $-B = b$ and $C = 8+2\sqrt{5}$:

$$4 = \frac{2\,(\,8+2\sqrt{5}\,)}{b} \;\Rightarrow\; b = \frac{8+2\sqrt{5}}{2} = 4+\sqrt{5}$$

**One division, and the** $(\,5+\sqrt{2}\,)$ **never enters** — it is there purely to look forbidding and to tempt you into rationalising a denominator you never needed.

**Worth memorising alongside it:** $AM = \frac{-B}{2A}$ and $GM = \sqrt{C/A}$. Each picks out a different pair of coefficients.

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**40** QA ARITHMETIC TIME SPEED AND DISTANCE ●●●●○○○○○○ 4 /10

A helicopter flies along the sides of a square field of side length 100 kms. The first side is covered at a speed of 100 kmph, and for each subsequent side the speed is increased by 100 kmph till it covers all the sides. The average speed of the helicopter is

(A) 184 kmph
(B) 200 kmph
(C) 250 kmph
(D) **192 kmph**

ANSWER **(d) 192 kmph**

**SOLUTION**

**Step 1 — note that average speed is never the average of the speeds.** It is

$$\text{Average speed} = \frac{\text{total distance}}{\text{total time}}$$

**Step 2 — total distance.** Four sides of 100 km each:

$$4 \times 100 = 400 \text{ km}$$

**Step 3 — total time.** The speeds are 100, 200, 300, 400 kmph, each over 100 km:

$$\frac{100}{100}+\frac{100}{200}+\frac{100}{300}+\frac{100}{400} = 1+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}$$
$$= \frac{12+6+4+3}{12} = \frac{25}{12} \text{ hours}$$

**Step 4 — divide.**

$$\text{Average speed} = \frac{400}{25/12} = 400 \times \frac{12}{25} = 192 \text{ kmph}$$

**Answer: (d) — 192 kmph**

**Shortcut**

**Equal distances means harmonic mean.** For $n$ equal stretches at speeds $v_1, \ldots, v_n$:

$$\text{Average} = \frac{n}{\frac{1}{v_1} + \cdots + \frac{1}{v_n}}$$

Factoring out 100:

$$\frac{400}{\frac{25}{12}} = \mathbf{192}$$

**Option (c) 250 is the arithmetic mean** of 100, 200, 300, 400 — the answer to a question nobody asked, and the one most candidates pick. The harmonic mean is always **less** than the arithmetic mean, which alone rules out 250 and makes 192 the only plausible value near it.

**Use $1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} = \frac{25}{12}$ from memory** — this little sum shows up constantly in equal-distance problems.

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**41** DILR LOGICAL REASONING DEDUCTIVE REASONING 7 /10

Organism R can be treated with

(A) Only A and E
(B) **A, B and E**
(C) A, B and C
(D) Only A and B

**ANSWER (b) A, B and E**

**SOLUTION**

**The whole set rests on one completed grid.** Build it once and all five questions are read off it.

**Step 1 — write down what the table gives.**

$A \to R, \qquad B \to Q, \qquad C \to Q$

**Step 2 — use "wherever C works, D works".** Since $C \to Q$, we get $D \to Q$.

**Step 3 — use "D and E never share an organism".** $D$ is already on $Q$, so $E$ is **not** on $Q$.

**Step 4 — count organism P.** P needs **at least two** drugs. Which drugs can reach P?

- $A$ cannot: if $A \to P$ then $B \to P$ too (condition 3). We will see this overfills the grid — hold that thought.
- Each drug covers at most two organisms.

Work from the drug side instead. The five drugs supply at most $5 \times 2 = 10$ drug–organism pairs, and the three organisms need between $2 + 2 + 2 = 6$ and $3 + 3 + 3 = 9$ of them.

**Step 5 — pin E.** $E \neq Q$, so $E$ works on $P$ or $R$ (or both). Suppose $E \to P$. P then needs a second drug. $C \to P$ would force $D \to P$, and since $D$ and $E$ must stay apart, $D \to P$ contradicts $E \to P$. So P's second drug would have to be $A$ or $B$ — and $A \to P$ drags $B \to P$ as well, giving P three drugs $\{A, B, E\}$ with $A$ now on both $P$ and $R$, $B$ on $P$, $Q$ **and** $R$ — three organisms for B, breaking "at most two". Every branch collapses, so

$E \to R$ only

**Step 6 — fill P.** P still needs two drugs, and they cannot include $E$. If $A \to P$ then $B \to P$, but $B$ already works on $Q$, so $B$ would cover $P, Q$ and (via step 7) possibly $R$ — and $A$ would cover $P$ and $R$. Checking the organism counts then breaks the "at most three drugs per organism" rule for $R$. The only consistent choice is

$C \to P \quad \text{and, by condition 3,} \quad D \to P$

So $P = \{C, D\}$ — exactly two drugs ✔

**Step 7 — fill R.** $A \to R$ and $E \to R$ are already fixed. $R$ needs at least two drugs and has them, but condition 3 says wherever $A$ works $B$ works, so $B \to R$ as well:

$R = \{A, B, E\}$

**Step 8 — read off Q.** $B \to Q$, $C \to Q$, $D \to Q$:

$Q = \{B, C, D\}$

**The completed grid.**

| Drug | P | Q | R | organisms covered |
|---|---|---|---|---|
| A | | | ✔ | 1 |
| B | | ✔ | ✔ | 2 |
| C | ✔ | ✔ | | 2 |
| D | ✔ | ✔ | | 2 |
| E | | | ✔ | 1 |
| **drugs per organism** | **2** | **3** | **3** | |

**Every condition checks out:** each drug covers one or two organisms ✔; each organism is treated by two or three drugs ✔; $A \subseteq B$ and $C \subseteq D$ ✔; $D = \{P, Q\}$ and $E = \{R\}$ are disjoint ✔

An exhaustive search over all possible assignments confirms this grid is the **only** one consistent with the table and the four conditions.

**Reading off R.** The grid gives

$R = \{A,\ B,\ E\}$

**Why the others fail:**

- **(a) Only A and E** — leaves out $B$, but condition 3 forces $B$ onto every organism $A$ treats.
- **(c) A, B and C** — $C$ works on $P$ and $Q$ only; putting $C$ on $R$ would give it three organisms.
- **(d) Only A and B** — leaves out $E$, which has nowhere else to go once $E \neq Q$ and $E \neq P$.

**Answer: (b) — A, B and E**

**Shortcut**

**The A–B link does most of the work.** The table already puts $A$ on $R$, and "wherever A works, B works" immediately puts $B$ on $R$ too. So the answer must contain **both A and B**, which kills option (a) at once.

Then ask where $E$ can live: not $Q$ (it would sit with $D$), and not $P$ (that forces $B$ onto a third organism). So $E \to R$, and only option (b) has all three. **Two deductions, no full grid needed.**

*Refers to the LR set above.*

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**42** DILR LOGICAL REASONING DEDUCTIVE REASONING ●●●●●●●○○ 7 /10

Drug E works on

(A) Only R
(B) Q and R
(C) Only P
(D) P and R

ANSWER (a) Only R

**SOLUTION**

**The whole set rests on one completed grid.** Build it once and all five questions are read off it.

**Step 1 — write down what the table gives.**

$A \to R, \qquad B \to Q, \qquad C \to Q$

**Step 2 — use "wherever C works, D works".** Since $C \to Q$, we get $D \to Q$.

**Step 3 — use "D and E never share an organism".** $D$ is already on $Q$, so $E$ is **not** on $Q$.

**Step 4 — count organism P.** P needs **at least two** drugs. Which drugs can reach P?

- $A$ cannot: if $A \to P$ then $B \to P$ too (condition 3). We will see this overfills the grid — hold that thought.
- Each drug covers at most two organisms.

Work from the drug side instead. The five drugs supply at most $5 \times 2 = 10$ drug–organism pairs, and the three organisms need between $2 + 2 + 2 = 6$ and $3 + 3 + 3 = 9$ of them.

**Step 5 — pin E.** $E \neq Q$, so $E$ works on $P$ or $R$ (or both). Suppose $E \to P$. P then needs a second drug. $C \to P$ would force $D \to P$, and since $D$ and $E$ must stay apart, $D \to P$ contradicts $E \to P$. So P's second drug would have to be $A$ or $B$ — and $A \to P$ drags $B \to P$ as well, giving P three drugs $\{A, B, E\}$ with $A$ now on both $P$ and $R$, $B$ on $P$, $Q$ **and** $R$ — three organisms for B, breaking "at most two". Every branch collapses, so

$E \to R \text{ only}$

**Step 6 — fill P.** P still needs two drugs, and they cannot include $E$. If $A \to P$ then $B \to P$, but $B$ already works on $Q$, so $B$ would cover $P, Q$ and (via step 7) possibly $R$ — and $A$ would cover $P$ and $R$. Checking the organism counts then breaks the "at most three drugs per organism" rule for $R$. The only consistent choice is

$C \to P \quad \text{and, by condition 3,} \quad D \to P$

So $P = \{C, D\}$ — exactly two drugs ✔

**Step 7 — fill R.** $A \to R$ and $E \to R$ are already fixed. $R$ needs at least two drugs and has them, but condition 3 says wherever $A$ works $B$ works, so $B \to R$ as well:

$R = \{A, B, E\}$

**Step 8 — read off Q.** $B \to Q$, $C \to Q$, $D \to Q$:

$Q = \{B, C, D\}$

**The completed grid.**

| Drug | P | Q | R | organisms covered |
|---|---|---|---|---|
| A | | | ✔ | 1 |
| B | | ✔ | ✔ | 2 |
| C | ✔ | ✔ | | 2 |
| D | ✔ | ✔ | | 2 |
| E | | | ✔ | 1 |
| **drugs per organism** | **2** | **3** | **3** | |

**Every condition checks out:** each drug covers one or two organisms ✔; each organism is treated by two or three drugs ✔; $A \subseteq B$ and $C \subseteq D$ ✔; $D = \{P, Q\}$ and $E = \{R\}$ are disjoint ✔

An exhaustive search over all possible assignments confirms this grid is the **only** one consistent with the table and the four conditions.

**Reading off E.** The grid gives $E \to R$ and nothing else.

**Why the others fail:**

- **(b) Q and R** — $D$ works on $Q$, and $D$ and $E$ may never share an organism.
- **(c) Only P** — P is filled by $C$ and $D$; adding $E$ would sit it beside $D$ again.
- **(d) P and R** — same clash on $P$, and it would also give $P$ three drugs with $E$ among them.

**Answer: (a) — Only R**

**Shortcut**

**Eliminate on the D–E rule alone.** $C \to Q$ forces $D \to Q$, so $E$ is barred from $Q$ — that removes option (b) instantly.

$P$ ends up as $\{C, D\}$, so $E$ cannot be there either, removing (c) and (d). **Only R remains**, and you never have to complete the grid. The "D and E do not work on the same organism" condition is the single most powerful line in this set — use it first.

*Refers to the LR set above.*

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**43** DILR LOGICAL REASONING DEDUCTIVE REASONING ●●●●●●●○○ 7 /10

The organism(s) that can be treated with three of these five drugs is(are)

(A) Only Q
(B) Only P
(C) P and Q
(D) **Q and R**

ANSWER **(d) Q and R**

**SOLUTION**

**The whole set rests on one completed grid.** Build it once and all five questions are read off it.

**Step 1 — write down what the table gives.**

$A \to R, \quad B \to Q, \quad C \to Q$

**Step 2 — use "wherever C works, D works".** Since $C \to Q$, we get $D \to Q$.

**Step 3 — use "D and E never share an organism".** $D$ is already on $Q$, so $E$ is **not** on $Q$.

**Step 4 — count organism P.** P needs **at least two** drugs. Which drugs can reach P?

- $A$ cannot: if $A \to P$ then $B \to P$ too (condition 3). We will see this overfills the grid — hold that thought.
- Each drug covers at most two organisms.

Work from the drug side instead. The five drugs supply at most $5 \times 2 = 10$ drug–organism pairs, and the three organisms need between $2 + 2 + 2 = 6$ and $3 + 3 + 3 = 9$ of them.

**Step 5 — pin E.** $E \neq Q$, so $E$ works on $P$ or $R$ (or both). Suppose $E \to P$. P then needs a second drug. $C \to P$ would force $D \to P$, and since $D$ and $E$ must stay apart, $D \to P$ contradicts $E \to P$. So P's second drug would have to be $A$ or $B$ — and $A \to P$ drags $B \to P$ as well, giving P three drugs $\{A, B, E\}$ with $A$ now on both $P$ and $R$, $B$ on $P$, $Q$ **and** $R$ — three organisms for B, breaking "at most two". Every branch collapses, so $E \to R$ only

**Step 6 — fill P.** P still needs two drugs, and they cannot include $E$. If $A \to P$ then $B \to P$, but $B$ already works on $Q$, so $B$ would cover $P, Q$ and (via step 7) possibly $R$ — and $A$ would cover $P$ and $R$. Checking the organism counts then breaks the "at most three drugs per organism" rule for $R$. The only consistent choice is

$$C \to P \quad \text{and, by condition 3,} \quad D \to P$$

So $P = \{C, D\}$ — exactly two drugs ✔

**Step 7 — fill R.** $A \to R$ and $E \to R$ are already fixed. $R$ needs at least two drugs and has them, but condition 3 says wherever $A$ works $B$ works, so $B \to R$ as well:

$$R = \{A, B, E\}$$

**Step 8 — read off Q.** $B \to Q$, $C \to Q$, $D \to Q$:

$$Q = \{B, C, D\}$$

**The completed grid.**

| Drug | P | Q | R | organisms covered |
|---|---|---|---|---|
| A | | | ✔ | 1 |
| B | | ✔ | ✔ | 2 |
| C | ✔ | ✔ | | 2 |
| D | ✔ | ✔ | | 2 |
| E | | | ✔ | 1 |
| **drugs per organism** | **2** | **3** | **3** | |

**Every condition checks out:** each drug covers one or two organisms ✔; each organism is treated by two or three drugs ✔; $A \subseteq B$ and $C \subseteq D$ ✔; $D = \{P, Q\}$ and $E = \{R\}$ are disjoint ✔

An exhaustive search over all possible assignments confirms this grid is the **only** one consistent with the table and the four conditions.

**Count each column.**

| Organism | Drugs | Count |
|---|---|---|
| P | C, D | **2** |
| Q | B, C, D | **3** |
| R | A, B, E | **3** |

Both $Q$ and $R$ reach the maximum of three.

**Why the others fail:** any option containing $P$ is wrong, since $P$ has exactly two drugs; and "Only Q" misses $R$.

**Sanity check on the totals.** The drugs supply $1 + 2 + 2 + 2 + 1 = 8$ drug–organism pairs, and the organisms consume $2 + 3 + 3 = 8$ ✔

**Answer: (d) — Q and R**

**Shortcut**

**Count the pairs before counting the columns.** The five drugs cover $1 + 2 + 2 + 2 + 1 = 8$ pairs in total, spread over three organisms each needing 2 or 3. The only split of 8 into three parts from $\{2, 3\}$ is

$$8 = 2 + 3 + 3$$

So **exactly one organism has two drugs and two have three** — which immediately rules out "Only Q" (a) and "Only P" (b), since both name a single organism. Between (c) and (d), $P$ is the small one, so the answer is **Q and R**.

*Refers to the LR set above.*

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**44** DILR LOGICAL REASONING DEDUCTIVE REASONING ●●●●●●●○○ 7 /10

Drug D works on

(A) Only Q
(B) **P and Q**
(C) Q and R
(D) Only P

**ANSWER** **(b) P and Q**

**SOLUTION**

**The whole set rests on one completed grid.** Build it once and all five questions are read off it.

**Step 1 — write down what the table gives.**

$A \to R, \quad B \to Q, \quad C \to Q$

**Step 2 — use "wherever C works, D works".** Since $C \to Q$, we get $D \to Q$.

**Step 3 — use "D and E never share an organism".** $D$ is already on $Q$, so $E$ is **not** on $Q$.

**Step 4 — count organism P.** P needs **at least two** drugs. Which drugs can reach P?

- $A$ cannot: if $A \to P$ then $B \to P$ too (condition 3). We will see this overfills the grid — hold that thought.
- Each drug covers at most two organisms.

Work from the drug side instead. The five drugs supply at most $5 \times 2 = 10$ drug–organism pairs, and the three organisms need between $2+2+2=6$ and $3+3+3=9$ of them.

**Step 5 — pin E.** $E \neq Q$, so $E$ works on $P$ or $R$ (or both). Suppose $E \to P$. P then needs a second drug. $C \to P$ would force $D \to P$, and since $D$ and $E$ must stay apart, $D \to P$ contradicts $E \to P$. So P's second drug would have to be $A$ or $B$ — and $A \to P$ drags $B \to P$ as well, giving P three drugs $\{A, B, E\}$ with $A$ now on both $P$ and $R$, $B$ on $P$, $Q$ **and** $R$ — three organisms for B, breaking "at most two". Every branch collapses, so

$E \to R$ only

**Step 6 — fill P.** P still needs two drugs, and they cannot include $E$. If $A \to P$ then $B \to P$, but $B$ already works on $Q$, so $B$ would cover $P, Q$ and (via step 7) possibly $R$ — and $A$ would cover $P$ and $R$. Checking the organism counts then breaks the "at most three drugs per organism" rule for $R$. The only consistent choice is

$C \to P \quad \text{and, by condition 3,} \quad D \to P$

So $P = \{C, D\}$ — exactly two drugs ✔

**Step 7 — fill R.** $A \to R$ and $E \to R$ are already fixed. $R$ needs at least two drugs and has them, but condition 3 says wherever $A$ works $B$ works, so $B \to R$ as well:

$R = \{A, B, E\}$

**Step 8 — read off Q.** $B \to Q$, $C \to Q$, $D \to Q$:

$Q = \{B, C, D\}$

**The completed grid.**

| Drug | P | Q | R | organisms covered |
|---|---|---|---|---|
| A | | | ✔ | 1 |
| B | | ✔ | ✔ | 2 |
| C | ✔ | ✔ | | 2 |
| D | ✔ | ✔ | | 2 |
| E | | | ✔ | 1 |
| **drugs per organism** | **2** | **3** | **3** | |

**Every condition checks out:** each drug covers one or two organisms ✔; each organism is treated by two or three drugs ✔; $A \subseteq B$ and $C \subseteq D$ ✔; $D = \{P, Q\}$ and $E = \{R\}$ are disjoint ✔

An exhaustive search over all possible assignments confirms this grid is the **only** one consistent with the table and the four conditions.

**Reading off D.** The grid gives $D \to P$ and $D \to Q$.

- $D \to Q$ comes straight from $C \to Q$ and "wherever C works, D works".
- $D \to P$ comes from the same rule once $C \to P$ is forced in step 6.

**Why the others fail:**

- **(a) Only Q** — then $P$ would have to find two drugs among $A$, $B$, $E$, which breaks either the A–B rule or the two-organism cap on $B$.
- **(c) Q and R** — $E$ works on $R$, and $D$ cannot share an organism with $E$.
- **(d) Only P** — misses the forced $D \to Q$.

**Answer: (b) — P and Q**

**Shortcut**

**Chain the two "if C then D" uses.** $C$ appears on $Q$ in the table, so $D \to Q$ is free. That alone removes option (d).

$E$ lives on $R$, so $D$ is barred from $R$ — that removes (c). Between (a) and (b), note that $P$ needs **two** drugs and the only pair that does not break another rule is $\{C, D\}$. Hence **P and Q**.

**The habit worth taking away:** in a conditional-grid set, apply every "if X then Y" rule to the table's given entries *before* doing any case work. Here that single pass gives you three of the five answers.

*Refers to the LR set above.*

45 DILR LOGICAL REASONING DEDUCTIVE REASONING 7 /10

Organism P can be treated with

(A) B, C and D
(B) **Only C and D**
(C) Only B and D
(D) A, B, and D

**ANSWER** **(b) Only C and D**

**SOLUTION**

**The whole set rests on one completed grid.** Build it once and all five questions are read off it.

**Step 1 — write down what the table gives.**

$A \to R, \qquad B \to Q, \qquad C \to Q$

**Step 2 — use "wherever C works, D works".** Since $C \to Q$, we get $D \to Q$.

**Step 3 — use "D and E never share an organism".** $D$ is already on $Q$, so $E$ is **not** on $Q$.

**Step 4 — count organism P.** P needs **at least two** drugs. Which drugs can reach P?

- $A$ cannot: if $A \to P$ then $B \to P$ too (condition 3). We will see this overfills the grid — hold that thought.
- Each drug covers at most two organisms.

Work from the drug side instead. The five drugs supply at most $5 \times 2 = 10$ drug–organism pairs, and the three organisms need between $2 + 2 + 2 = 6$ and $3 + 3 + 3 = 9$ of them.

**Step 5 — pin E.** $E \neq Q$, so $E$ works on $P$ or $R$ (or both). Suppose $E \to P$. P then needs a second drug. $C \to P$ would force $D \to P$, and since $D$ and $E$ must stay apart, $D \to P$ contradicts $E \to P$. So P's second drug would have to be $A$ or $B$ — and $A \to P$ drags $B \to P$ as well, giving P three drugs $\{A, B, E\}$ with $A$ now on both $P$ and $R$, $B$ on $P$, $Q$ **and** $R$ — three organisms for B, breaking "at most two". Every branch collapses, so

$E \to R$ only

**Step 6 — fill P.** P still needs two drugs, and they cannot include $E$. If $A \to P$ then $B \to P$, but $B$ already works on $Q$, so $B$ would cover $P, Q$ and (via step 7) possibly $R$ — and $A$ would cover $P$ and $R$. Checking the organism counts then breaks the "at most three drugs per organism" rule for $R$. The only consistent choice is

$C \to P \quad \text{and, by condition 3,} \quad D \to P$

So $P = \{C, D\}$ — exactly two drugs ✔

**Step 7 — fill R.** $A \to R$ and $E \to R$ are already fixed. $R$ needs at least two drugs and has them, but condition 3 says wherever $A$ works $B$ works, so $B \to R$ as well:

$R = \{A, B, E\}$

**Step 8 — read off Q.** $B \to Q$, $C \to Q$, $D \to Q$:

$Q = \{B, C, D\}$

**The completed grid.**

| Drug | P | Q | R | organisms covered |
|---|---|---|---|---|
| A | | | ✔ | 1 |
| B | | ✔ | ✔ | 2 |
| C | ✔ | ✔ | | 2 |
| D | ✔ | ✔ | | 2 |
| E | | | ✔ | 1 |
| **drugs per organism** | **2** | **3** | **3** | |

**Every condition checks out:** each drug covers one or two organisms ✔; each organism is treated by two or three drugs ✔; $A \subseteq B$ and $C \subseteq D$ ✔; $D = \{P, Q\}$ and $E = \{R\}$ are disjoint ✔

An exhaustive search over all possible assignments confirms this grid is the **only** one consistent with the table and the four conditions.

**Reading off P.** The grid gives $P = \{C,\ D\}$ — exactly two drugs, the minimum allowed.

**Why the others fail:**

- **(a) B, C and D** — $B$ already works on $Q$ and $R$; a third organism breaks the two-organism cap.
- **(c) Only B and D** — without $C$, there is nothing to force $D$ onto $P$, and $B$ again overflows.
- **(d) A, B, and D** — $A$ works only on $R$; putting it on $P$ would drag $B$ along and overfill $B$.

**Answer: (b) — Only C and D**

**Shortcut**

**P is the organism with only two drugs** (from the $8 = 2 + 3 + 3$ split in Q43), so the answer must name **exactly two** — which leaves only options (b) and (c).

Both contain $D$; the difference is $C$ versus $B$. $B$ is already committed to $Q$ and $R$, so a third organism is impossible. **Only C and D.**

**Note how the five questions interlock:** solving Q43's counting argument first makes Q45 a one-line elimination. In a set like this, do the counting question before the identification questions.

COMMON DATA SET

## Five drugs and three organisms

A pharmaceutical company has tested five drugs on three different organisms. The following incomplete table reports if a drug works on the given organism. For example, drug A works on organism R while B and C work on Q.

| Drug | Organism P | Organism Q | Organism R |
|---|---|---|---|
| A | | | ✔ |
| B | | ✔ | |
| C | | ✔ | |
| D | | | |
| E | | | |

Following additional information is available:

- Each drug works on at least one organism but not more than two organisms.
- Each organism can be treated with at least two and at most three of these five drugs.
- On whichever organism A works, B also works. Similarly, on whichever organism C works, D also works.
- D and E do not work on the same organism.

FIX THE WEAK AREA

**One weak topic at a time**

Algebra alone carries the largest share of the quant in this paper. Instead of re-attempting whole mocks, pick a single topic, take a short timed test on it, and watch the accuracy move.

Topic-wise tests →

All IPMAT practice

SECTION 3

VARC

# Verbal Ability and Reading Comprehension

| 45 | 180 | 40 min | +4 / −1 / 0 |
|---|---|---|---|
| QUESTIONS | MARKS | SECTIONAL LIMIT | MARKING |

MCQ (+ TITA para jumbles)

MOST ASKED HERE — Verbal Ability **33** · Reading Comprehension - Question Types **12**

**46**

VARC · READING COMPREHENSION - QUESTION TYPES · RC DETAIL AND FACT BASED QUESTIONS

4 /10

Being deprived of sleep can result in

(A) **mental exhaustion.**

(B) hunger satiation.

(C) metabolism loss.

(D) terminal illness.

ANSWER (a) mental exhaustion.

**SOLUTION**

**Where the passage says it.** Paragraph 3:

"It leaves the brain **exhausted**, affecting the natural functioning of the body."

That is mental exhaustion, stated almost word for word.

**Why the others fail:**

- **(b) hunger satiation** — the exact reverse. Sleep deprivation *raises* ghrelin, "the hunger hormone", and *lowers* leptin, "the satiety hormone". So it produces hunger, not satiation.
- **(c) metabolism loss** — leptin "stabilises metabolism and appetite" and its level drops, but the passage never says metabolism is *lost*. Destabilised is not the same as lost.
- **(d) terminal illness** — the passage names cholesterol problems, diabetes and obesity. None is described as terminal, and that word appears nowhere.

**Answer: (a)**

**Shortcut**

**Two of the four wrong options are simple reversals** built from the passage's own hormone pair: leptin (satiety) falls, ghrelin (hunger) rises. Anything claiming satiation is backwards.

**The habit:** when a passage names a pair of opposites — here two hormones moving in opposite directions — expect at least one option to swap them. Fix the direction of each in your head as you read, and the swap is visible instantly.

*Refers to the RC set above.*

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**47** VARC READING COMPREHENSION - QUESTION TYPES RC EXCEPT OR NOT QUESTIONS ●●●●○○○○○○ 4 /10

As per the passage which of these sentences is not correct?

(A) Insufficient sleep can lead to obesity.

(B) Irregular sleep patterns can result in health problems.

(C) **Regular exercising and eating healthy food alone ensure fitness.**

(D) One's body and mind should be properly relaxed to ensure good sleep.

**ANSWER** **(c) Regular exercising and eating healthy food alone ensure fitness.**

**SOLUTION**

This is a NOT question: three options are supported, one is contradicted.

- **(a)** ✔ "This can also lead to **obesity**, if left unchecked."
- **(b)** ✔ "irregular sleep patterns... not only disturb one's daily routine, but can also **hamper one's health**."
- **(d)** ✔ "**Proper relaxation of body and mind** before sleeping means that one should keep the mobile phone aside..."
- **(c)** ✘ **Contradicted by the opening lines.** The passage begins: "The general idea of being fit is usually assumed to be exercising regularly and having a healthy diet. It's true to some extent. **But this is not always the case.** People don't realise that **sleep also plays a crucial part**."

The whole passage exists to deny that diet and exercise **alone** are enough.

**Answer: (c)**

**Shortcut**

**The answer is the passage's own thesis, inverted.** The first paragraph sets up exactly this misconception in order to knock it down, so option (c) restates the belief the writer is arguing against.

**The word doing the damage is "alone."** In a NOT question, scan for the absolute qualifier — *alone, only, always, never* — before reading for content. Here it points straight at the answer.

*Refers to the RC set above.*

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48 VARC READING COMPREHENSION - QUESTION TYPES

RC DETAIL AND FACT BASED QUESTIONS

4 /10

In what way does sleep contribute to a person's well-being?

(A) By regularising a person's daily routine.

(B) By adding power and strength to the muscles.

(C) By increasing a person's appetite.

(D) **By helping the body replenish its resources.**

ANSWER **(d) By helping the body replenish its resources.**

SOLUTION

**Where the passage says it.** Paragraph 3 opens:

"Sleep helps your body and mind **repair and recharge** themselves."

"Repair and recharge" is exactly "replenish its resources". The passage also calls sleep "a **restorative** process" in paragraph 1 — the same idea.

**Why the others fail:**

- **(a) Regularising a daily routine** — close, but it inverts the causation. The passage says a *definite sleeping pattern* helps maintain "a cycle of rest and activity"; the routine serves the sleep, not the other way round. It is also a secondary point, not how sleep contributes to well-being.
- **(b) Power and strength to the muscles** — never mentioned. The passage is about hormones, cholesterol and metabolism, not muscle building.
- **(c) Increasing appetite** — the reverse of a benefit. Sleep *deprivation* increases hunger via ghrelin, which the passage treats as a problem.

**Answer: (d)**

**Shortcut**

**"Restorative" in line four is the whole answer.** The passage uses it of sleep before any question is asked, and "replenish its resources" is its plain-English paraphrase.

Option (a) is the designed near-miss: it uses a true detail from the last paragraph but reverses the direction of the relationship. **When two options are both supported by the text, prefer the one that answers the question actually asked** — here, what sleep does *for* well-being.

*Refers to the RC set above.*

49 VARC READING COMPREHENSION - QUESTION TYPES RC APPLICATION QUESTIONS 4 /10

In order to remain physically fit one must

(A) raise levels of ghrelin.

(B) read a good book every night.

(C) snack frequently.

(D) **maintain a set sleep pattern.**

ANSWER **(d) maintain a set sleep pattern.**

SOLUTION

**Where the passage says it.** The final paragraph:

"Just like any other routine, **having a definite sleeping pattern** can help a person maintain a cycle of rest and activity. **Sleeping at the same time every day and waking up on time** will encourage quality sleep."

**Why the others fail:**

- **(a) Raise ghrelin** — ghrelin is "the hunger hormone", and the passage treats its rise as a *consequence of sleep deprivation*, leading to junk food and obesity. Raising it is the opposite of advice.
- **(b) Read a good book every night** — a genuine trap, because reading *is* mentioned. But the passage offers it as one optional aid among several: "one can **always** read a good book **or** listen to soothing music." An option is not a requirement, and "every night" is the writer's word for none of it.
- **(c) Snack frequently** — directly against the passage, which warns about "unhealthy snacks and junk food high in carbs and sugar."

**Answer: (d)**

**Shortcut**

**Only one option is stated as a general prescription.** The question asks what one *must* do, so look for the passage's own imperative — and the last paragraph gives exactly one: keep a definite sleeping pattern.

**Option (b) is the classic "true but optional" distractor.** The passage says *can always read a book **or** listen to music* — an either/or suggestion, not a requirement. Whenever a detail appears after *can*, *might* or *or*, it is a suggestion, and suggestions never answer a "must" question.

*Refers to the RC set above.*

50 VARC READING COMPREHENSION - QUESTION TYPES

RC AUTHOR TONE AND PURPOSE QUESTIONS

4 /10

The objective of the passage is to

(A) present psychological insights to the reader.

(B) provide medical input to the reader.

(C) **advise the reader.**

(D) expose the reader to disinformation.

ANSWER **(c) advise the reader.**

SOLUTION

**Step 1 — look at how the passage ends.** The final paragraph is a string of recommendations: keep a definite sleeping pattern, sleep and wake at the same time, put the phone aside half an hour before bed, keep the room dark and quiet, read or listen to music. That is **advice**.

**Step 2 — test the near-misses.**

- **(b) Provide medical input** — the strongest distractor, since the passage does cite the American Academy of Sleep Medicine and name hormones. But medical facts are used *in support of* the recommendations; the passage is written for a general reader, not to inform clinically. The destination is behaviour, not knowledge.
- **(a) Psychological insights** — the passage is physiological (cholesterol, leptin, ghrelin, blood sugar), not psychological.
- **(d) Expose the reader to disinformation** — an accusation the passage gives no ground for. It cites a recognised professional body.

**Answer: (c)**

**Shortcut**

**Ask where the passage finishes, not where it starts.** It opens with facts and ends with a list of things to do — and a text's purpose is carried by its destination.

**Rule of thumb for purpose questions:** if the last paragraph tells the reader what to do, the purpose is to advise; if it summarises findings, the purpose is to inform. Option (d) can be dismissed on sight — an option accusing the author of bad faith is almost never correct.

*Refers to the RC set above.*

51 VARC READING COMPREHENSION - QUESTION TYPES RC MAIN IDEA QUESTIONS 4 /10

The main focus of the passage is on the

(A) perils of insomnia and irregular sleep patterns.
(B) dangers of high levels of cholesterol and diabetes.
(C) stability of leptin and ghrelin in the human body.
(D) ill effects of junk food high in carbs and sugars.

ANSWER (a) perils of insomnia and irregular sleep patterns.

SOLUTION

**Apply the scope test.** A main-idea option must cover the whole passage, not one paragraph.

- **(b) Cholesterol and diabetes** — these are *consequences* the passage uses as evidence. It is not about managing them; it never discusses treating either.
- **(c) Leptin and ghrelin** — one mechanism inside paragraph 4. Far too narrow, and the passage is about their *destabilisation*, not their stability.
- **(d) Junk food** — one link in one causal chain (late nights → snacking → diabetes). A single sentence.
- **(a) Perils of insomnia and irregular sleep patterns** ✔ — this is the thread running through every paragraph: what irregular sleep is, what it does to the body, and how to fix it.

**Answer: (a)**

**Shortcut**

**Count paragraphs per option.** Three options each sit inside a single paragraph; one runs through all five. That settles it before you weigh any wording.

**Then confirm with the first and last paragraphs**, which bracket a passage's central claim. Here paragraph 1 introduces sleep as essential to well-being and the last gives the remedy for poor sleep — both about sleep patterns, which only option (a) names.

READING PASSAGE

## Passage 1 – Sleep, fitness and the cost of insomnia

*Read the following passage and choose the answer that is closest to each of the questions that are based on the passage.*

The general idea of being fit is usually assumed to be exercising regularly and having a healthy diet. It's true to some extent. But this is not always the case. People don't realise that sleep also plays a crucial part when it comes to physical and mental well-being. It's a restorative process, which shouldn't be negotiable.

Hectic working hours, increasing stress levels, and an unhealthy lifestyle can cause irregular sleep patterns. These not only disturb one's daily routine, but can also hamper one's health, leading to lifestyle conditions like deranged cholesterol and diabetes. It's a preconceived notion that cholesterol and diabetes are usually genetic diseases, and unhealthy eating patterns and lifestyle exacerbate them. It is not generally known that sleep deprivation can put a person at risk of both deranged cholesterol and diabetes.

Sleep helps your body and mind repair and recharge themselves. But things can go awry if one is sleep-deprived. Insomnia can generally make the body work abnormally. It affects the mental and physical abilities to prepare the body for the next day. It leaves the brain exhausted, affecting the natural functioning of the body.

Lack of sleep can lead to higher cholesterol and blood pressure. Sleep deprivation can lower levels of leptin, a hormone that stabilises metabolism and appetite. This can also lead to obesity, if left unchecked. Sleep deprivation has been found to raise levels of ghrelin, the hunger hormone, and decrease levels of leptin, the satiety hormone. That's why people seek relief in foods that raise blood sugar. The American Academy of Sleep Medicine recommends that adults should get a minimum of seven to eight hours of sleep each night. Staying up late can lead to consuming unhealthy snacks and junk food high in carbs and sugar. All this increases the risk of Type 2 diabetes and is equally connected to obesity.

Just like any other routine, having a definite sleeping pattern can help a person maintain a cycle of rest and activity. Sleeping at the same time every day and waking up on time will encourage quality sleep. Proper relaxation of body and mind before sleeping means that one should keep the mobile phone aside for at least half an hour before bed. It helps if the room is dark and quiet. Plus, one can always read a good book or listen to soothing music which can lull one into deep sleep.

**52** VARC READING COMPREHENSION - QUESTION TYPES RC EXCEPT OR NOT QUESTIONS 6 /10

Based on the passage which one of the following is not true?

(A) iPhone 14 is being manufactured in India

(B) Currently 5 to 7 percent of all iPhones are manufactured in India.

(C) **Regulatory restrictions were eased in 2023.**

(D) Manufacturing of iPhones in India commenced in 2017.

ANSWER **(c) Regulatory restrictions were eased in 2023.**

**SOLUTION**

Check each option against the text.

- **(a)** ✔ True: "Last year, it began producing its latest model of **iPhone 14** in the country."
- **(b)** ✔ True: "Apple was already making between **5-7 percent** of its products in India."
- **(d)** ✔ True: "Apple first began making a lower-end model of the iPhone in India in **2017**."
- **(c) ✘ False — and this is the answer.** Paragraph 1 says: "In **2019**, the Indian government relaxed some investment rules, exempting companies selling 'cutting-edge' items... from restrictions."

The year 2023 does appear in the passage, but attached to a different event — the **opening of the two stores** in April 2023. The option transplants that date onto the regulatory change.

**Answer: (c)**

**Note on the published keys.** One widely used free question bank marks option (b) here. That is wrong: the passage states the 5–7 percent figure explicitly, while the 2019/2023 date mismatch in option (c) is a flat contradiction. A second independent source marks option (c), which is also what the passage supports.

**Shortcut**

**Date questions are won by matching each number to its own event.** This passage carries four: 2017 (manufacturing begins), 2019 (rules relaxed), 2022 (market share), April 2023 (stores open), plus 2025 as a forecast.

Write them down as you read. The wrong option here simply swaps 2019 for 2023 — invisible if you remember only that "2023 was in the passage somewhere", obvious if you tied each year to its event.

*Refers to the RC set above.*

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**53** VARC READING COMPREHENSION - QUESTION TYPES RC MAIN IDEA QUESTIONS 6 /10

The main point the passage makes is that Apple

(A) iPhone was already popular in India.

(B) **has realised the strategic importance of the Indian market.**

(C) needs new branding and marketing strategies to compete with Samsung.

(D) needs physical stores to expand sales to more buyers of premium products.

ANSWER **(b) has realised the strategic importance of the Indian market.**

SOLUTION

**Step 1 — find the summarising sentence.** The passage closes:

"Apple has finally **understood that India's premium market is growing**, so why not be serious about it."

That is the main point, and option (b) states it.

**Step 2 — note the two strands the passage weaves together.** India matters to Apple both as a **market** (60 percent premium share, stores opening) and as a **manufacturing base** (5–7 percent rising toward 25 percent). Only "strategic importance" is broad enough to cover both.

**Step 3 — eliminate.**

- **(a)** True but minor — the iPhone being "aspirational" is a supporting detail, not the point.
- **(c)** Samsung is mentioned once, as a market-share comparison. The passage never says Apple needs to change strategy to compete with it.
- **(d)** Directly contradicted: "It is **not** as if this will change Apple's sales in any dramatic way" and "It **might not pull up sales**."

**Answer: (b)**

**Shortcut**

**Option (d) is refuted twice in the passage**, which is unusual and worth noticing — the writer takes care to say the stores will *not* drive sales. Any option built on sales expansion is therefore out.

**For main-idea questions on business passages, look for the sentence containing "finally", "really" or "the real issue".** Here the last line begins "Apple has finally understood...", which is the writer handing you the thesis.

*Refers to the RC set above.*

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**54** VARC READING COMPREHENSION - QUESTION TYPES RC INFERENCE QUESTIONS ●●●●●●○○○○ 6 /10

India is now the focus of Apple operations because

(A) American technology companies want to reduce their reliance on China.

(B) **it offers the benefit of a manufacturing base in addition to a market.**

(C) it has the world's second largest population.

(D) no other country has the same ease of doing business.

ANSWER **(b) it offers the benefit of a manufacturing base in addition to a market.**

SOLUTION

**Step 1 — locate the reasoning.** Paragraph 4:

"Setting up an Apple store in India is also a statement that the country is now big enough for Apple to be actually interested in expanding operations here, and comes at a time when India is rising fast as a **manufacturing base** for the iPhone."

So two things coincide: India as a place to **sell** and India as a place to **make**. Option (b) names both.

**Step 2 — eliminate.**

- **(a)** The passage says Apple "had relied on China's sophisticated manufacturing network", and that analysts expect a shift. But it never generalises to "American technology companies" as a group, nor states reducing reliance on China as Apple's *reason*. This is an inference the text does not license.

- **(c)** A category error. The passage calls India "the world's **second largest smartphone market**" — not the second largest population.
- **(d)** "Ease of doing business" is never mentioned; in fact the passage records that Apple needed a rule change in 2019 before it could open stores.

**Answer: (b)**

**Shortcut**

**Option (c) is the sharpest trap** and the one most students pick: the passage really does say "second largest", but of the *smartphone market*, not the population. **Always carry the noun along with the superlative.**

Option (b) wins because it is the only one combining the passage's two strands — selling and manufacturing — and the passage explicitly puts them side by side with "comes at a time when".

*Refers to the RC set above.*

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✏ Para jumbles and para summary sets, timed or untimed, with full explanations. RC Practice

**55** VARC | READING COMPREHENSION - QUESTION TYPES | RC DETAIL AND FACT BASED QUESTIONS

6 /10

The Apple retail stores in India will

(A) drive healthy competition in the smartphone market.
(B) bring in more customers and increase sales.
(C) not materially impact sales of iPhones.
(D) not have any impact on Apple's image.

ANSWER (c) not materially impact sales of iPhones.

**SOLUTION**

**Where the passage says it.** Twice, in almost the same words:

"It is **not as if this will change Apple's sales in any dramatic way**, but it is still a key milestone..."

"It **might not pull up sales**, but it pulls more people into the Apple ecosystem."

**Why the others fail:**

- **(a) Healthy competition** — never discussed. The passage compares market shares but says nothing about competition being driven by the stores.
- **(b) Increase sales** — the direct opposite of the two sentences above.
- **(d) No impact on Apple's image** — reversed. The stores are explicitly about branding: "the next step in its **branding strategy**", delivering "the **full Apple experience**". The image effect is the whole point.

**Answer: (c)**

**Shortcut**

**The passage states this claim twice** — a reliable signal that it will be tested. When a writer repeats a point in different words, mark it.

Note the structure the writer uses both times: *not sales, but something else* (a milestone, the ecosystem). Options (b) and (d) each take one half of that contrast and flip it. **The correct option keeps the "not sales" half intact.**

*Refers to the RC set above.*

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**56** VARC READING COMPREHENSION - QUESTION TYPES RC INFERENCE QUESTIONS ●●●●●●○○○○ 6 /10

Apple's challenge while opening physical stores is to

(A) **retain links with their partner sellers while drawing customers to their stores.**

(B) offer parallel products packaged more attractively.

(C) provide stimulation that draws customers away from other sellers.

(D) subtly alienate customers away from competitors.

**ANSWER** **(a) retain links with their partner sellers while drawing customers to their stores.**

**SOLUTION**

**Where the passage says it.** The second-to-last line states the challenge outright:

"The **real issue** will be to pull consumers to these flagship centres **without alienating the partner sellers**."

Option (a) is a direct paraphrase: draw customers in, keep the resellers on side.

**Why this is a real tension.** Paragraph 1 explains that until now Indians bought Apple products "through a vast network of what the company calls 'premium resellers'." Those resellers are Apple's existing distribution; company-owned stores compete with them. Hence the balancing act.

**Why the others fail:**

- **(b)** "Parallel products packaged more attractively" — nothing in the passage.
- **(c)** Draws customers away from *other sellers* — but the partner sellers are precisely the ones Apple must **not** alienate. This inverts the challenge.
- **(d)** "Alienate customers away from competitors" is barely coherent, and the passage uses *alienate* of the **partner sellers**, not customers.

**Answer: (a)**

**Shortcut**

**The phrase "The real issue will be…" is the answer flag.** Read that one sentence and the question is done.

Options (c) and (d) both borrow the passage's own word *alienating* but attach it to the wrong party — customers or competitors instead of **partner sellers**. **When an option recycles a distinctive word from the text, check whose behaviour it is describing.** That single check is worth several marks a paper.

*Refers to the RC set above.*

57 VARC READING COMPREHENSION - QUESTION TYPES

RC PHRASE AND SENTENCE MEANING QUESTIONS

6 /10

"Apple's aim is not only to increase sales of its iPhones, but to draw people into Apple's ecosystem." In the context of the passage, this statement means that Apple seeks to

(A) **bring customers into a network of related products which it offers.**

(B) attract customers by displaying a wide range of aesthetically designed products.

(C) attract customers to buy its phones through innovative means.

(D) be the market leader in the world of premium smartphones.

ANSWER **(a) bring customers into a network of related products which it offers.**

SOLUTION

**Step 1 — unpack the metaphor.** An "ecosystem", in the technology sense, is a **set of interlocking products and services** that work together and keep a user inside one brand — phone, laptop, watch, cloud storage, app store. Option (a) states exactly this.

**Step 2 — check it against the passage.** "It might not pull up sales, but it pulls more people into the Apple ecosystem" is contrasted *with* sales, so the ecosystem must be something other than selling more phones. A network of related products fits; the passage also notes "Apple is doing well **across categories**."

**Step 3 — eliminate.**

- **(b)** Mere display. A shop window of attractive products is not an ecosystem — nothing interlocks. It also reduces the idea to the stores alone.
- **(c)** "Buy its phones" is precisely what the quoted sentence says the aim is **not only** about.
- **(d)** Market leadership is a *result*, not what the ecosystem metaphor means — and Apple already leads with 60 percent share.

**Answer: (a)**

**Note on the published keys.** One free question bank marks option (b). The quoted sentence explicitly contrasts the ecosystem with increasing sales, so an option about attracting customers through display misses the metaphor. A second independent source marks option (a), which is also what the metaphor means.

**Shortcut**

**Translate the metaphor into plain words before looking at the options.** *Ecosystem* = interconnected products that keep you inside one brand. Then pick the option that says that — (a), the only one containing the idea of a **network**.

**The structural clue is "not only… but":** whatever follows *but* must be different in kind from what follows *not only*. Since *not only* is about selling phones, any option about selling phones — (c) — is automatically wrong.

58 VARC VERBAL ABILITY IDIOMS AND PHRASES 4 /10

*Complete the following sentence by choosing the most appropriate word/phrase from the options given below.*

If you ask me to give you a rough estimate for the cost of the project, _____ I would say thirty lakhs.

A **off-the-cuff**

B off-the-mark

C off-the-grid

D off-the-mike

ANSWER (a) off-the-cuff

SOLUTION

**The idiom.** *Off-the-cuff* means **without preparation; impromptu**. The phrase comes from the practice of a speaker scribbling notes on a shirt cuff moments before speaking.

**Why it fits.** The sentence already signals it: "a **rough estimate**". A rough estimate given on the spot is an off-the-cuff figure.

**Why the others fail:**

- **(b) off-the-mark** — means *inaccurate*. The speaker is offering a figure, not admitting it is wrong; and "rough" means approximate, not mistaken.
- **(c) off-the-grid** — means *disconnected from public utilities or society*. Nothing to do with estimates.
- **(d) off-the-mike** — not a standard idiom (the real phrase is *off-mic*, meaning not recorded).

**Answer: (a)**

**Shortcut**

**"Rough estimate" is the giveaway.** It tells you the missing phrase must mean *unprepared*, and only one option does.

**Learn this family together**, since IPMAT returns to it: *off the cuff* (impromptu), *off the record* (not for publication), *off the mark* (inaccurate), *off the grid* (disconnected), *off colour* (unwell, or indecent). They share a shape and are easy to confuse under time pressure.

59 VARC VERBAL ABILITY IDIOMS AND PHRASES 3 /10

*Complete the following sentence by choosing the most appropriate word/phrase from the options given below.*

The nasty comments made by strangers on the social media platforms about the actor made him _____.

(A) ill in heart
(B) ill at heart
(C) ill and ache
(D) **ill at ease**

**ANSWER** **(d) ill at ease**

**SOLUTION**

**The idiom.** *Ill at ease* means **uncomfortable, uneasy, awkward**.

**Why it fits.** Nasty public comments would leave someone uncomfortable and self-conscious — precisely this state.

**Why the others fail:**

- **(a) ill in heart** — not an English idiom.
- **(b) ill at heart** — not standard either. The real phrase in that family is *sick at heart*, meaning deeply unhappy or disillusioned, which is stronger and differently built.
- **(c) ill and ache** — not an expression at all; it reads as two mismatched words.

**Answer: (d)**

**Shortcut**

**Three of the four do not exist in English.** That is the design of most IPMAT idiom questions: one genuine expression and three plausible-looking fabrications made by swapping a preposition or a noun.

**So the test is recall, not reasoning.** Say each aloud — *ill at ease* is the only one you have ever heard. When none feels familiar, pick the one whose preposition matches a phrase you do know (*at ease* is itself a standard phrase, as in "stand at ease").

**60** VARC VERBAL ABILITY IDIOMS AND PHRASES 4 /10

*Complete the following sentence by choosing the most appropriate word/phrase from the options given below.*

A few brands tailor their pants in such a way that it is easy for people with prosthetic legs to put them on. This is how they_____.

(A) go to the extreme level
(B) go the entire mile
(C) go to the extra level
(D) **go the extra mile**

**ANSWER** **(d) go the extra mile**

**SOLUTION**

**The idiom.** *To go the extra mile* means **to do more than is required or expected**.

**Why it fits.** Brands redesigning garments so that people with prosthetic legs can wear them easily are doing more than ordinary tailoring demands.

**Why the others fail.** All three are corruptions of the real phrase. The idiom is **fixed** — it takes no preposition and the noun cannot change:

- *go **to the** extreme level* — inserts a preposition and swaps the noun.
- *go the **entire** mile* — wrong adjective; "entire" loses the sense of *beyond* what was asked.
- *go **to the** extra level* — inserts a preposition that the idiom does not take.

**The origin helps fix it:** the phrase comes from a biblical injunction — if compelled to go one mile, go two. The *mile* is essential to the image.

**Answer: (d)**

**Note on the published keys.** One widely used free question bank marks option (c), "go to the extra level". That is not an English idiom. A second independent source marks "go the extra mile", which is the standard form.

**Shortcut**

**Option (c) differs from the answer by two small words — a preposition and a noun — and both matter.** This is the single most common way an idiom distractor is built.

**The reliable test: can you drop or add a preposition in a fixed idiom? Never.** You *go the extra mile*, you do not *go to* it, just as you *take the plunge* rather than *take to the plunge*. If an option inserts a preposition into a phrase you know, that insertion is the error.

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**61** VARC VERBAL ABILITY GRAMMAR AND SENTENCE CORRECTION 4 /10

*Complete the following sentence by choosing the most appropriate word/phrase from the options given below.*

It grieved me _____ my friend's serious illness.

(A) in hearing
(B) to hear regarding
(C) **to hear of**
(D) hearing regarding

**ANSWER** **(c) to hear of**

**SOLUTION**

**The construction.** The verb *grieve* in this impersonal pattern takes a **to-infinitive**:

It grieved me **to hear** ...

And *hear* takes the preposition **of** (or *about*) when the object is news rather than a sound: *hear of an illness*, *hear about an accident*. You **hear** a noise, but you **hear of** an event.

So the correct completion is **to hear of**.

**Why the others fail:**

- **(a) in hearing** — "It grieved me in hearing my friend's illness" is ungrammatical; the pattern needs an infinitive, not a gerund phrase with *in*.
- **(b) to hear regarding** — *regarding* is a formal preposition meaning *concerning*, used with nouns like *your letter regarding the matter*. It does not follow *hear*, and the register clashes.
- **(d) hearing regarding** — compounds both errors.

**Answer: (c)**

**Shortcut**

**Two checks, each decisive on its own:**

1. **Infinitive, not gerund.** *It grieved/saddened/pleased me **to** ...* is the fixed pattern. That removes (a) and (d) immediately.
2. **The right preposition after *hear*.** News takes *of* or *about*, never *regarding*. That removes (b).

**The transferable point:** verbs carry their prepositions with them. Build a list as you revise — *hear of*, *accuse of*, *comply with*, *differ from*, *indifferent to*, *result in*. Entrance papers test these more often than any point of grammar.

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**62** VARC VERBAL ABILITY IDIOMS AND PHRASES ●●●●●○○○○○ 5 /10

*Complete the following sentence by choosing the most appropriate word/phrase from the options given below.*

Some big shots know how to escape the law even after they violate it. It is, however, the _____ who are more often apprehended and punished.

(A) **small fry**
(B) tiny shots
(C) small fish
(D) tiny fish

**ANSWER** **(a) small fry**

**SOLUTION**

**The idiom.** *Small fry* means **people of little importance or influence** — the minor figures, as opposed to the powerful.

**Why it fits.** The sentence is built on a contrast with "**big shots**", so the blank needs the established opposite. *Small fry* is that opposite, and like *fry* in its original sense (young fish), it is used collectively, which matches the plural verb "are".

**Why the others fail:**

- **(b) tiny shots** — a made-up mirror of "big shots". The genuine opposite is not formed this way.

- **(c) small fish** — close, and *a small fish in a big pond* is a real expression, but as a standalone noun phrase meaning "unimportant people" the idiom is *small fry*.
- **(d) tiny fish** — not an idiom at all.

**Answer: (a)**

**Shortcut**

**The sentence hands you the structure: big shots ↔ _____.** Idioms come in established pairs, and the counterpart of *big shot* is *small fry*.

**Beware options built by direct antonym substitution** — *tiny shots* is exactly what you would invent if you did not know the real phrase, which is why it is there. English idioms are rarely symmetrical: the opposite of *big shot* is not *small shot*, just as the opposite of *break a leg* is not *mend a leg*.

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**63** VARC VERBAL ABILITY IDIOMS AND PHRASES ●●●●○○○○○○ 4 /10

*Complete the following sentence by choosing the most appropriate word/phrase from the options given below.*

The new car has disappointed its buyers in many ways, and good mileage is its only_____.

(A) saving grace
(B) saving praise
(C) saving case
(D) saving face

ANSWER (a) saving grace

**SOLUTION**

**The idiom.** A *saving grace* is **the one redeeming quality of something otherwise poor**.

**Why it fits.** The sentence sets up exactly that structure: the car "has disappointed its buyers in many ways" — *but* it has one good feature. "Only" confirms a single redeeming quality.

**Why the others fail:**

- **(b) saving praise** and **(c) saving case** — neither exists.
- **(d) saving face** — a real idiom, but a different one, and the wrong part of speech here. *To save face* means **to avoid humiliation**; it is a verb phrase about a person's dignity, not a noun phrase naming a product's good point. "Good mileage is its only saving face" is ungrammatical.

**Answer: (a)**

**Shortcut**

**Option (d) is the trap worth studying.** *Save face* is genuinely an idiom, so it feels right — but it is a **verb phrase**, and the blank follows "is its only", which demands a **noun phrase**.

**So run the grammar test before the meaning test:** what part of speech does the slot need? Here, a noun. *Saving grace* is a noun; *saving face* is not used that way. **A real idiom in the wrong grammatical slot is still wrong**, and distractors exploit this constantly.

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64 VARC VERBAL ABILITY IDIOMS AND PHRASES 3 /10

*Complete the following sentence by choosing the most appropriate word/phrase from the options given below.*

Meena is very arrogant and class-conscious; she refuses to acknowledge Sunil because she feels he is a man _____.

A of no importance
B of some importance
C of less importance
D of great importance

ANSWER (a) of no importance

SOLUTION

**Step 1 — read the characterisation.** Meena is "arrogant and class-conscious", and she **refuses to acknowledge** Sunil. Refusing to acknowledge someone means treating them as beneath notice.

**Step 2 — match the strength.** Only an absolute dismissal explains a refusal to acknowledge:

a man **of no importance**

**Why the others fail:**

- **(b) of some importance** — would be a reason to acknowledge him, not to snub him.
- **(c) of less importance** — comparative, and it needs a second term ("less important **than** whom?"). It is also too mild to justify a refusal.
- **(d) of great importance** — the exact opposite; she would be courting him, not ignoring him.

**Answer: (a)**

**Shortcut**

**The four options differ only in degree**, so this is a calibration question, not a vocabulary one. Place them on a scale — *no* < *less* < *some* < *great* — and ask how strong the evidence is.

"Refuses to acknowledge" plus "arrogant" is the strongest possible dismissal, so take the extreme end of the scale.

**General rule for degree questions: match the intensity of the blank to the intensity of the surrounding adjectives.** Mild context, mild answer; absolute context, absolute answer.

65 VARC VERBAL ABILITY GRAMMAR AND SENTENCE CORRECTION 4 /10

*The following sentence contains an error. Choose the option that corrects it.*

Justin couldn't understand why his friend had refused to work in a company that offered him a huge salary. If it had been him in his friend's place, he **would definitely accepted such an offer**.

(A) have definitely accept such an offer.
(B) have definitely have accepted such an offer.
(C) definitely accepted such an offer.
(D) **have definitely accepted such an offer.**

ANSWER **(d) have definitely accepted such an offer.**

SOLUTION

**The error: an incomplete third conditional.** The sentence sets up a hypothetical about the past —

"**If it had been** him in his friend's place..."

That is the *if*-clause of a **third conditional**, whose main clause must take the form

$$\text{would have} + \text{past participle}$$

The original has "would definitely **accepted**", which drops *have* altogether.

**The fix.** "he would **have definitely accepted** such an offer."

**Why the others fail:**

- **(a) have definitely accept** — *have* must be followed by a past participle (*accepted*), not the base form.
- **(b) have definitely have accepted** — doubles the auxiliary.
- **(c) definitely accepted** — repeats the original error, leaving *would accepted*.

**Answer: (d)**

**Shortcut**

**Memorise the third-conditional frame and the question answers itself:**

$$\text{If} + \text{had} + \text{past participle}, \ \ldots \text{would have} + \text{past participle}$$

Seeing "If it had been" tells you the main clause needs *would have accepted* before you read a single option.

**Then scan the options for that exact string.** Only (d) has it; (a) breaks the participle, (b) duplicates *have*, (c) omits it. **Three seconds, no analysis.**

66 VARC VERBAL ABILITY GRAMMAR AND SENTENCE CORRECTION 6 /10

*The following sentence contains an error. Choose the option that corrects it.*

My aunt Seema was the most generous of all the members of our family. Whenever we went out for dinner, she always **insisted to pay for the meal**.

(A) that she had paid for the meal.
(B) that she will be paying for the meal.
(C) **that she pay for the meal.**
(D) on and paid for the meal.

**ANSWER** **(c) that she pay for the meal.**

**SOLUTION**

**The error: wrong complement after *insist*.** The verb *insist* never takes a to-infinitive. It takes one of two patterns:

- *insist* ***on*** *+ gerund*: "she insisted **on paying** for the meal"
- *insist* ***that*** *+ subjunctive*: "she insisted **that she pay** for the meal"

"Insisted **to pay**" is neither.

**Why the subjunctive looks odd but is right.** After verbs of demand and insistence (*insist, demand, suggest, recommend, require, propose*), the *that*-clause takes the **bare form** of the verb, with no *-s* even for a third-person singular subject. So it is "that she **pay**", not "that she pays" — this is the English subjunctive, and option (c) uses it correctly.

**Why the others fail:**

- **(a) that she had paid** — past perfect; this reports a completed action, not an insistence about what should happen.
- **(b) that she will be paying** — future continuous; wrong tense and not subjunctive.
- **(d) on and paid** — "insisted on and paid for the meal" is clumsy and leaves *on* without its gerund object.

**Answer: (c)**

**Shortcut**

**Two patterns to carry: *insist on* + -ing, or *insist that* + bare verb.** Neither allows a to-infinitive, so the error is visible without reading the options.

**Then the subjunctive test settles (c).** After *insist/demand/suggest/recommend*, the *that*-clause verb loses its ending: *that she* ***pay***, *that he* ***go***, *that they* ***be*** *present*. A verb in that slot carrying an *-s* is a sign of a wrong option — which is why (b)'s "will be paying" and (a)'s "had paid" are both out.

67 VARC VERBAL ABILITY GRAMMAR AND SENTENCE CORRECTION ●●●●●○○○○○ 5 /10

*The following sentence contains an error. Choose the option that corrects it.*

**The setting of a story effects the storys plot.**

(A) affect the story's plot.

(B) effects the stories' plot.

(C) **affects the story's plot.**

(D) affects the story plots.

ANSWER **(c) affects the story's plot.**

SOLUTION

**Two errors in one short sentence.**

**1 — *effect* vs *affect*.**

- **affect** (verb) = to influence
- **effect** (noun) = a result; (rarely, verb) = to bring about

The setting *influences* the plot, so the verb must be **affects**.

**2 — the missing apostrophe.** "storys" is not a word. The plot belongs to the story — one story — so the singular possessive is **story's**.

**The fix.** "The setting of a story **affects the story's plot**."

**Why the others fail:**

- **(a) affect the story's plot** — right word, right apostrophe, but wrong agreement. The subject is "**The setting**" (singular), so the verb needs *-s*: *affects*. The plural noun *story* sitting next to the verb is a deliberate distraction.
- **(b) effects the stories' plot** — keeps the wrong verb *and* makes the possessive plural.
- **(d) affects the story plots** — fixes the verb but drops the possessive entirely, changing the meaning.

**Answer: (c)**

**Shortcut**

**Fix the two errors independently, then take the option satisfying both.**

| Check | Requirement | Eliminates |
|---|---|---|
| affect / effect | **affects** (to influence) | (b) |
| apostrophe | **story's** (one story) | (d) |
| subject–verb | singular *setting* → *affect**s*** | (a) |

Only (c) survives all three.

**The memory hook for the word pair: *A*ffect is the *A*ction (verb); *E*ffect is the *E*nd result (noun).** It is tested almost every year.

68 VARC VERBAL ABILITY GRAMMAR AND SENTENCE CORRECTION 6 /10

*The following sentence contains an error. Choose the option that corrects it.*

Listening to the recording of cricket commentary from the past can be great fun. Especially, the last few overs, when the best players are gone, and the tailenders try their best to run between the wickets without getting out. This is when you realise that **nothing much has changed, hasn't it?**

(A) **nothing much has changed, has it?**
(B) nothing much is changed, isn't it?
(C) nothing much has changed, hasn't it?
(D) nothing much has changed, would it?

ANSWER **(a) nothing much has changed, has it?**

SOLUTION

**The error: a question tag that fails to reverse polarity.**

An English question tag takes the **opposite polarity** to its main clause:

- positive statement → negative tag: "It has changed, **hasn't it**?"
- negative statement → positive tag: "It hasn't changed, **has it**?"

**The subtlety here.** The statement is "**nothing** much has changed." Although the verb carries no *not*, the word **nothing** is a negative word, so the clause counts as **negative**. A negative clause therefore requires a **positive** tag:

nothing much has changed, **has it?**

**Why the others fail:**

- **(b) is changed, isn't it?** — wrong tense (*is changed* is passive and wrong here), and the tag still fails to match.
- **(c) has changed, hasn't it?** — repeats the original error: a negative statement with a negative tag.
- **(d) would it?** — the auxiliary must match the main clause's auxiliary (*has*), not switch to *would*.

**Answer: (a)**

**Shortcut**

**Two rules settle every tag question:**

1. **Reverse the polarity.** Positive takes negative, negative takes positive.
2. **Reuse the same auxiliary.** *has → has*, *will → will*, *can → can*.

**The trap here is the hidden negative.** Words like *nothing, nobody, never, hardly, scarcely, seldom, few* make a clause negative without using *not*, so they take a **positive** tag:

*Nobody called, **did** they? · He hardly ever writes, **does** he?*

Spot the negative word and the answer follows in one step.

69 VARC VERBAL ABILITY GRAMMAR AND SENTENCE CORRECTION 8 /10

*The following sentence contains an error. Choose the option that corrects it.*

When you play the 'Secret Santa', you are expected to buy a gift for **whoever you are assigned**, without letting them know that you are the one buying the gift.

(A) whoever you are assigned
(B) whom you are assigned
(C) who you are assigned
(D) **whomever you are assigned**

ANSWER **(d) whomever you are assigned**

SOLUTION

**The rule.** The case of *who/whoever* is decided by its job **inside its own clause**, never by the word before it. The preposition *for* governs the whole clause, not the pronoun.

**Step 1 — isolate the clause.** "**you are assigned ___**"

**Step 2 — find the pronoun's role.** The subject is *you*; the verb is *are assigned*. In the active voice this is "they assign **you** [someone]", so the person assigned is the **retained object** of the verb. An object takes the **objective** case:

whomever

**Step 3 — add *-ever*.** The clause has no explicit antecedent ("the person *whom*..."), so the compound form is needed: **whomever**.

buy a gift for **whomever you are assigned**

**Why the others fail:**

- **(a) whoever** — subjective case; but the pronoun is not the subject here, *you* is.
- **(b) whom** — right case, but *whom* needs an antecedent to attach to, and there is none. "for whom you are assigned" also changes the sense.
- **(c) who** — wrong case and no antecedent.

**A useful contrast.** Had the sentence read "a gift for **whoever** is assigned to you", *whoever* would be correct — there it is the **subject** of *is assigned*. One word of difference flips the case.

**Answer: (d)**

**Note on the published keys.** Free sources split on this question, one marking "whoever". The pronoun is the object of *assigned* within its clause — the subject slot is already filled by *you* — so the objective form is required.

**Shortcut**

**The substitution test is quick and reliable.** Replace the pronoun with *he* or *him* inside its own clause:

- "you are assigned **him**" ✔ → objective → **whomever**
- "you are assigned **he**" ✘

*Him* ends in *m*, and so does *whom* — that pairing is worth remembering.

**Then check whether you need the *-ever* form:** if there is no noun for the pronoun to modify, use *whoever/whomever*. Here there is none, so **whomever**.

**70** VARC VERBAL ABILITY PARA COMPLETION 5 /10

*The paragraph given below has a sentence missing, indicated by a blank. From the choices given below, choose the most appropriate sentence to fill the blank.*

In the late 1960s, architect Charles Correa began his career as an urban planner, creating New Bombay (now Navi Mumbai), an urban area that provided housing and job opportunities for many who lived across the harbour from the original city. In the midst of overpopulated cities, he tried to create quasi-rural housing environments. In all of his urban planning commissions, Correa avoided high-rise housing solutions. _____.

(A) **He focused on low-rise dwelling solutions that emphasized the human scale and created a sense of community**

(B) His early work combined traditional architectural values with the Modernist use of materials

(C) Considerations of the Indian climate drove many of his decisions

(D) He is particularly noted for his sensitivity to the needs of the urban poor

**ANSWER** **(a) He focused on low-rise dwelling solutions that emphasized the human scale and created a sense of community**

**SOLUTION**

**Step 1 — note what the last sentence sets up.** "Correa **avoided high-rise** housing solutions." That is a statement of what he did *not* do, and it leaves an obvious gap: what did he do instead?

**Step 2 — the blank must complete the contrast.** Option (a) supplies exactly the positive counterpart:

"He focused on **low-rise** dwelling solutions that emphasized the **human scale** and created a **sense of community**"

It also picks up "quasi-rural housing environments" from the previous sentence — human scale and community are what distinguishes a quasi-rural settlement from a tower block.

**Step 3 — eliminate.**

- **(b)** Traditional values and Modernist materials — a new axis (old vs modern) that the paragraph has not raised, and about *materials* rather than housing form.
- **(c)** Climate — plausible of Correa in general, but nothing in the paragraph prepares it, and climate does not explain avoiding high-rises.
- **(d)** Sensitivity to the urban poor — true of Correa and tempting, since the paragraph mentions housing for many people. But it describes a *motivation*, not the alternative he adopted, and leaves "avoided high-rise" hanging.

**Answer: (a)**

**Shortcut**

**A "not X" sentence demands a "but Y" follow-up.** The paragraph ends on what Correa *avoided*, so the blank almost certainly names what he chose instead — and only one option contains the direct antonym, **low-rise**.

**That single word-pair (high-rise / low-rise) decides the question** without weighing any of the other three.

**The general rule for para completion: when the preceding sentence is negative or exclusionary, the blank supplies the positive alternative.** Options offering a reason, a motivation or a new theme are filling a gap the paragraph did not open.

71 VARC VERBAL ABILITY PARA COMPLETION 6 /10

*The paragraph given below has a sentence missing, indicated by a blank. From the choices given below, choose the most appropriate sentence to fill the blank.*

A study of the social and cultural context of Indian poetry in English reveals several important insights into its origin. Indian poetry in English began in Bengal, the province where the British first gained a stronghold. In addition, this poetry was a largely urban phenomenon, centered in Calcutta. _____. Then, gradually, it moved to other urban centres such as Madras and Bombay. Even today, Indian poetry in English remains largely urban. Moreover, because English was an elite language, Indian poets writing in English came from the upper classes.

(A) The British had decided that poetry about India could reach a larger audience if written in Calcutta

(B) The rulers encouraged the natives to write poetry about India only if their mother tongue was English

(C) **In fact, poetry writing for the first fifty years was confined to a few families who were residents of Calcutta**

(D) English was seen as an elite language and so the British felt that only they could use it for poetry

ANSWER **(c) In fact, poetry writing for the first fifty years was confined to a few families who were residents of Calcutta**

SOLUTION

**Step 1 — the blank has text on both sides, so it must bridge them.**

- **Before:** the poetry was "a largely urban phenomenon, **centered in Calcutta**".
- **After:** "**Then, gradually, it moved to** other urban centres such as Madras and Bombay."

**Step 2 — read the signal word.** "**Then**" marks a movement away from a starting point, so the blank must **intensify the Calcutta concentration** before the spread begins. Option (c) does precisely that:

"In fact, poetry writing for the first fifty years was **confined to a few families who were residents of Calcutta**"

"In fact" strengthens the preceding claim, "confined" narrows it further, and "the first fifty years" sets up the later movement.

**Step 3 — it also seeds the ending.** The paragraph closes on poets coming "from the upper classes" — anticipated by "a few families".

**Step 4 — eliminate.**

- **(a)** Attributes a decision to the British about *where poetry would reach an audience* — unsupported, and it does not intensify the Calcutta point.
- **(b)** Claims the rulers set a mother-tongue condition — nothing in the paragraph suggests this, and it contradicts the fact that *Indians* were writing in English.
- **(d)** Says the British felt only they could use English for poetry — directly contradicted by the paragraph, which is about **Indian** poets writing in English.

**Answer: (c)**

**Shortcut**

**"Then, gradually, it moved to..." is the key.** A sentence beginning *Then* needs a prior state to move away from, so the blank must deepen the Calcutta concentration rather than introduce anything new.

**Scan the openings of the four options:** "In fact" is the only connective that strengthens a preceding claim. The other three open with new actors (the British, the rulers), which the paragraph has not been tracking.

**A dependable habit: read the first two or three words of each option before reading any of them in full.** Connectives tell you the logical role on offer, and usually only one role fits the slot.

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**72** VARC VERBAL ABILITY PARA COMPLETION ●●●●●●●○○ 7 /10

*The paragraph given below has a sentence missing, indicated by a blank. From the choices given below, choose the most appropriate sentence to fill the blank.*

The concept of the 'Villa' and other European ideas came to Lucknow with foreign soldiers, travellers and adventurers. For the Nawabs of Lucknow, architecture became the physical manifestation of their new status, and a way of proclaiming their alignment to the new power bloc. _____. Villas, hence, provided an ideal substitute. Europeans sold to the Nawabs the idea of villas, based on designs in publications carried by them, and often aided by memory. The building chosen as the prototype for the famous Dilkusha Kothi was a country house in Northumberland.

(A) The Nawabs chose to live in Villas because they were easier to construct than palaces

(B) **The Nawabs of Lucknow fancied building palaces that resembled British ancestral homes**

(C) The Nawabs were attracted to European ideas in architecture because of their 'foreignness'

(D) The Villa became the backdrop to both the private as well as the court life of the Nawabs

**ANSWER** **(b) The Nawabs of Lucknow fancied building palaces that resembled British ancestral homes**

**SOLUTION**

**Step 1 — the sentence after the blank is the constraint.**

"Villas, **hence**, provided an **ideal substitute**."

Two words do the work. *Hence* means the blank is the **cause**. *Substitute* means the blank must name **something the Nawabs wanted but could not have** — a substitute replaces a thing desired.

**Step 2 — test option (b).**

"The Nawabs of Lucknow **fancied building palaces that resembled British ancestral homes**"

Now the logic runs: they wanted British-style ancestral homes → villas were the ideal substitute for those. It also explains the paragraph's last line, where the prototype for Dilkusha Kothi is "a country house in **Northumberland**" — an actual British ancestral home.

**Step 3 — eliminate.**

- **(a)** "Easier to construct" would make villas a *practical choice*, not a substitute for something desired — and ease of construction is never mentioned.
- **(c)** Attraction to "foreignness" is close to the paragraph's theme of "alignment to the new power bloc", but it gives nothing for the villa to substitute **for**. The *hence* would have nothing to attach to.
- **(d)** Describes what the villa **became**, which is a consequence. Placing it before "Villas, hence, provided an ideal substitute" puts the result before its cause and makes the next sentence redundant.

**Answer: (b)**

**Shortcut**

**One word — *substitute* — decides this.** A substitute implies an unmet want, so the blank must state what the Nawabs wanted and could not get. Only option (b) names such a thing.

**Then confirm with the last line of the paragraph:** the prototype was a country house in Northumberland, which is a British ancestral home. The paragraph closes the loop the blank opens.

**Watch for option (d)'s error — the premature consequence.** It states what the villa became, but the very next sentence is still explaining *why* villas were adopted. **An option that jumps ahead of the paragraph's own argument is wrong even when every word of it is true.**

Prefer a structured plan with recorded classes and tests? Look at the self-prep courses. See courses

**73** VARC VERBAL ABILITY PARA COMPLETION 6 /10

*The paragraph given below has a sentence missing, indicated by a blank. From the choices given below, choose the most appropriate sentence to fill the blank.*

_____. Conflicts are now brewing over rivers and river basins shared by many countries around the world. This is not unexpected, given the fact that more than two hundred water bodies are shared by two or more countries. Strife over water, for example, is erupting throughout the Middle East, from the watersheds of the Nile to the Tigris and Euphrates Rivers.

(A) Fresh water is increasingly in short supply, with nearly two-thirds of the global population living in water-stressed conditions

(B) **With water becoming increasingly scarce and development of new sources of water extremely costly, international water tensions are expected to rise**

(C) The world does not consider water to be the scarce resource it is

(D) It might be a cliche, but given how scarce it is, water is the new oil of the 21st century

ANSWER **(b) With water becoming increasingly scarce and development of new sources of water extremely costly, international water tensions are expected to rise**

SOLUTION

**Step 1 — the blank is the opening sentence,** so it must introduce the paragraph's subject and set up what follows.

**Step 2 — see what the paragraph actually does.** Every remaining sentence is about **international conflict over shared water**: conflicts brewing over shared rivers, two hundred shared water bodies, strife across the Middle East. The paragraph is not about scarcity in general — it is about scarcity producing **tension between countries**.

**Step 3 — test option (b).**

"With water becoming increasingly scarce and development of new sources of water extremely costly, **international water tensions are expected to rise**"

This names both halves: the cause (scarcity, costly alternatives) and the effect (**international** tensions). The next sentence then illustrates it, and "This is not unexpected" refers straight back to the expectation this option sets up.

**Step 4 — eliminate.**

- **(a)** Supplies the scarcity but stops there. It never reaches *conflict between countries*, so sentence 2 arrives unprepared and "This is not unexpected" has no expectation to point at.
- **(c)** Claims the world ignores water scarcity — the paragraph then shows countries fighting over it, which is the opposite of ignoring it.
- **(d)** A rhetorical flourish about water as "the new oil". It names no mechanism and leads nowhere; the following sentences are factual and specific.

**Answer: (b)**

**Shortcut**

**"This is not unexpected" in sentence 3 is the anchor.** Something must already have been *expected* — and only option (b) contains an expectation ("tensions **are expected to rise**").

That one link does the whole question.

**Two further tests for an opening-sentence blank:**

1. It must introduce the theme the rest develops — here **international** conflict, not scarcity alone, which is why (a) falls short despite being true.
2. It should not be a mere aphorism; openers that gesture rather than state, like (d), leave the following sentences without a foothold.

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**74** VARC VERBAL ABILITY FILL IN THE BLANKS ●●●●●○○○○○ 5 /10

*Some of the words in the sentences below are missing. Choose the best option from those given below to complete them.*

Working from home requires that you may have to put your _____ life on _____. Some people find this very _____ as they like to keep their work and home lives separate.

(A) **private; screen; disconcerting**
(B) actual; video; uncomfortable
(C) entire; camera; complicated
(D) family; microscope; disturbing

ANSWER **(a) private; screen; disconcerting**

**SOLUTION**

**Blank 2 is the tightest — start there.** Working from home puts something **on** a thing. Which noun takes *on* in a fixed phrase about being seen?

- **on screen** ✓ — the standard phrase, and literally true of video calls from home.
- *on video* — possible English, but the idiom "put your life on video" means to record it, not to expose it to colleagues.
- *on camera* — likewise about recording.
- *on microscope* ✘ — not English; the phrase is *under* a microscope.

Option (d) fails on a preposition alone.

**Blank 3 — the reaction.** The final clause explains the feeling: "as they like to keep their work and home lives **separate**." The feeling is therefore about a boundary being crossed.

- **disconcerting** ✓ — unsettling, throwing one off balance. Exactly the response to a blurred boundary.

- *uncomfortable* and *disturbing* are plausible but blunter; *complicated* describes a situation, not a feeling.

**Blank 1 — which life?** The contrast named at the end is **work** versus **home**, so the blank is the non-work side.

- **private** ✔ — the precise counterpart of professional, and it pairs with the privacy concern the sentence is describing.
- *entire* and *actual* say nothing about the work/home split; *family* is narrower than the sentence needs.

**Consistent across all three: private; screen; disconcerting.**

**Answer: (a)**

**Shortcut**

**Solve the preposition blank first — it is the cheapest elimination in any cloze.** *On microscope* is not English (it is *under a microscope*), so option (d) dies without reading anything else.

Then note that *video* and *camera* both mean **recording**, whereas the sentence is about **being seen by colleagues**. That leaves *screen*, and option (a) with it.

**The general method: scan the four options for one that breaks a fixed preposition or collocation.** You will usually find one, and it costs no comprehension at all.

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**75** VARC VERBAL ABILITY FILL IN THE BLANKS ●●●●●●○○○○ 6 /10

*Some of the words in the sentences below are missing. Choose the best option from those given below to complete them.*

In its early stages, dementia is often _____ from normal ageing, in which the older brain may naturally begin to show signs of cognitive impairment. Neither dementia nor cognitive ageing is currently _____, though they may be slowed through diet, exercise, and keeping the mind agile with social and intellectual activity.

(A) irreversible; manageable
(B) distinguishable; permanent
(C) differentiated; visible
(D) **indistinguishable; reversible**

ANSWER **(d) indistinguishable; reversible**

**SOLUTION**

**Blank 1 — read the preposition.** The blank is followed by "**from** normal ageing". Only words of *difference* take *from* here: *distinguishable from*, *indistinguishable from*, *different from*. That immediately removes **(a) irreversible**, which takes no *from* at all.

**Which direction?** The sentence says "In its **early stages**", and then explains that the ageing brain "may **naturally** begin to show signs of cognitive impairment" — i.e. the two look alike. So dementia is **hard to tell apart** from normal ageing:

indistinguishable

*Distinguishable* (b) reverses it, and *differentiated* (c) is the wrong form — it would need "differentiated from" by an agent, and it does not convey difficulty.

**Blank 2 — read the concession.** "though they may be **slowed**". The word *though* signals contrast: they cannot be X, **but** they can be slowed. Slowing is a weaker remedy than the one being denied, so X must be the **stronger** remedy:

reversible

You cannot reverse them, but you can slow them. That contrast is exact.

- *permanent* (b) ✘ — "neither is currently permanent, though they may be slowed" makes no sense; permanence is not contrasted with slowing.
- *visible* (c) ✘ — unrelated to slowing.
- *manageable* (a) ✘ — slowing **is** a form of managing, so there is no contrast.

**Answer: (d)**

**Shortcut**

**Blank 1 is decided by the single word *from*.** Only difference-words take it, which removes (a) on grammar alone.

**Blank 2 is decided by *though*.** A concession needs the two halves to pull in opposite directions, with the denied item stronger than the conceded one:

not **reversible**, though they may be **slowed** ✔

Test each option by that pairing and only *reversible* produces a real contrast — *manageable* actually agrees with slowing, which is why (a) fails twice.

**Carry this forward: *though*, *although*, *yet*, *while* and *despite* all demand that the blank oppose what follows.** Finding the connective is usually faster than understanding the sentence.

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**76** VARC VERBAL ABILITY FILL IN THE BLANKS ●●●●●○○○○○ 5 /10

*Some of the words in the sentences below are missing. Choose the best option from those given below to complete them.*

In the alleyways of old Cairo, in its cafes, warehouses and barbershops, framed portraits of Egyptian icons are _____. Kings, presidents, religious and political figures are all _____ on fading walls, held up as symbols of a glorious past.

(A) rare; abundant
(B) fashionable; confounded
(C) substantial; dispersed
(D) **ubiquitous; immortalised**

ANSWER **(d) ubiquitous; immortalised**

**SOLUTION**

**Blank 1 — count the locations.** The sentence lists "alleyways... cafes, warehouses **and** barbershops" — four kinds of place, deliberately ordinary and varied. A list like that exists to establish that the portraits are **everywhere**:

ubiquitous

- *rare* (a) ✘ — contradicts the list outright.
- *fashionable* (b) ✘ — says nothing about distribution, and "fading walls" suggests the opposite of fashionable.
- *substantial* (c) ✘ — means large or considerable; wrong dimension entirely.

**Blank 2 — read the purpose clause.** "held up as **symbols of a glorious past**." The figures are being preserved in memory and honoured:

immortalised

- *abundant* (a) ✘ — describes quantity, but the slot needs a participle meaning what was *done to* the figures ("are all ___ on fading walls").
- *confounded* (b) ✘ — means confused or defeated; nonsensical here.
- *dispersed* (c) ✘ — scattered, which is about location again and clashes with "held up as symbols".

**Answer: (d)**

**Shortcut**

**A long list of ordinary places is always setting up "everywhere".** Alleyways, cafes, warehouses, barbershops — the variety is the point, so blank 1 wants *ubiquitous*.

**Blank 2 then confirms rather than decides**, because only one option survives. But note the structural check: the slot follows "are all ___", so it needs a **past participle**, not an adjective of quantity. That alone removes *abundant* in (a).

**Build the vocabulary pair:** *ubiquitous* (found everywhere) and *immortalised* (preserved in lasting memory) are both high-frequency entrance-exam words. Learn them with the image from this question and they stay.

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**77** VARC VERBAL ABILITY FILL IN THE BLANKS ●●●●●●○○○○ 6 /10

*Some of the words in the sentences below are missing. Choose the best option from those given below to complete them.*

The culture of the 21st century – on an increasingly _____ scale – is oriented around the practical principles of utility, effectiveness, and impact. Things are good to the extent that they are instrumental, with instrumentality usually defined as the capacity to produce money or things. The worth of anything – an idea, an activity, an artwork, a _____ with another person – is determined _____.

(A) conspicuous; dialogue; diligently
(B) **global; relationship; pragmatically**
(C) ordinal; conversation; imaginatively
(D) nominal; dinner; meaningfully

ANSWER **(b) global; relationship; pragmatically**

**SOLUTION**

**Blank 1 — what kind of scale?** The phrase is "on an increasingly ___ **scale**". Scales are described by size or reach: *a global scale*, *a national scale*, *a massive scale*.

- **global** ✓ — idiomatic and fits "the culture of the 21st century", which is a claim about the whole world.
- *conspicuous*, *ordinal*, *nominal* ✘ — none collocates with *scale* in this sense. (*Nominal scale* exists in statistics, but that is a technical term about measurement types, not about something increasing.)

**Blank 2 — complete the list.** The list runs: "an idea, an activity, an artwork, a ___ **with another person**". The item must be a *thing of worth* that is shared **with** someone.

- **relationship** ✓ — the natural fourth item, and the only one that matches the list's rising abstraction (idea → activity → artwork → relationship).
- *dialogue* and *conversation* are possible with *with*, but both are narrower events rather than things whose "worth" is weighed.
- *dinner* (d) ✘ — bathetic, and out of keeping with the list.

**Blank 3 — how is worth determined?** The passage has just defined instrumentality as "the capacity to produce money or things". Worth is therefore judged by usefulness:

pragmatically

- *diligently* (a) ✘ — describes care in the judging, not the criterion.
- *imaginatively* (c) and *meaningfully* (d) ✘ — both are the **opposite** of the utilitarian outlook the paragraph is describing, and indeed what the writer implies has been lost.

**Answer: (b)**

**Shortcut**

**Blank 3 is the fastest: the paragraph has already defined its own criterion.** "Utility, effectiveness, and impact" and "the capacity to produce money or things" all point to one adverb — *pragmatically*. Two options (*imaginatively*, *meaningfully*) contradict the paragraph's whole argument.

**Then blank 1 confirms by collocation:** only *global* goes with *scale* in this sense.

**Note the tonal signal.** The writer is describing a utilitarian culture with evident unease. An option offering a warm word like *meaningfully* is describing what the passage says is **missing**, not what it says is happening — a very common cloze trap in argumentative passages.

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**78** VARC VERBAL ABILITY FILL IN THE BLANKS ●●●●●○○○○○ 5 /10

*Some of the words in the sentences below are missing. Choose the best option from those given below to complete them.*

The human resource chief said that the company will not _____ on investing in people and has _____ spending on employee needs in order to _____ them and provide them with a sense of stability and certainty.

(A) debate; assured; confront
(B) delay; assured; empower
(C) **compromise; prioritised; reassure**
(D) prioritise; compromised; include

**ANSWER** **(c) compromise; prioritised; reassure**

**SOLUTION**

**Blank 1 — read the preposition and the polarity.** "will not ___ **on** investing in people". The phrase must take *on* and must be something a company promises **not** to do with its investment in people.

- **compromise on** ✔ — the standard business collocation: *we will not compromise on quality/safety/people*.
- *debate on* (a) — grammatical, but "will not debate on investing in people" says the company refuses to discuss it, which is not reassuring and clashes with the rest.
- *delay* (b) — takes no *on*; you delay something, not delay *on* something.
- *prioritise* (d) ✘ — fatal. "will **not** prioritise on investing in people" says the opposite of the intended message, and *prioritise* takes no preposition.

**Blank 2 — what has the company done with spending?** The sentence is positive about employee needs, so spending has been **put first**:

prioritised

*Assured spending* (a, b) is not idiomatic — you assure a person, or assure someone *of* something.

**Blank 3 — the purpose.** The clause ends "and provide them with a **sense of stability and certainty**." Giving back confidence is:

reassure

- *confront* (a) ✘ — hostile, and contradicts providing comfort.
- *empower* (b) — positive, but about granting power, not about restoring calm. The pairing with "stability and certainty" calls for *reassure*.
- *include* (d) ✘ — unrelated.

**Answer: (c)**

**Shortcut**

**Option (d) can be dismissed on logic alone:** "will **not** prioritise... investing in people" reverses the entire message of a sentence about caring for employees. Watch the negation — the blank sits inside a *not*, so the word must be something the company declines to do.

**Then blank 3 settles the rest:** the clause spells out its own goal — "a sense of **stability and certainty**" — and *reassure* is the verb for producing exactly that. *Confront* is its opposite, *empower* is a different idea.

**Two collocations worth storing:** *compromise* ***on*** something, and *reassure* someone (not *assure* them, unless you are assuring them *of* a fact).

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**79** VARC VERBAL ABILITY FILL IN THE BLANKS ●●●●○○○○○○ 4 /10

*Some of the words in the sentences below are missing. Choose the best option from those given below to complete them.*

_____ have to label their _____ posts in order to bring about transparency and _____ the interests of the customers.

(A) Promoters; social media; incite
(B) Advertisers; commercials; capture
(C) Distributors; Facebook; multiply
(D) **Influencers; promotional; safeguard**

ANSWER **(d) Influencers; promotional; safeguard**

SOLUTION

**Blank 3 — the cleanest test.** The purpose is "to bring about **transparency** and ___ the interests of the customers." Transparency protects consumers, so the second verb must be protective:

safeguard

- *incite* (a) ✘ — to stir up, usually to violence. You cannot incite an interest in this sense.
- *capture* (b) ✘ — capturing customers' interests means winning their attention, which serves the advertiser, not the customer. It also clashes with *transparency*.
- *multiply* (c) ✘ — nonsensical with "interests of the customers".

Only (d) survives this blank, but the others confirm it.

**Blank 1 — who labels posts?** The word *posts* points to social media, and the people required by regulators to disclose paid content are **influencers**. *Distributors* (c) do not make posts; *advertisers* (b) place commercials rather than posts; *promoters* (a) is vague and, in Indian usage, usually means company founders.

**Blank 2 — which posts?** What must be labelled is **paid or sponsored** content:

promotional

- *social media posts* (a) is redundant — all posts here are social media posts, and labelling *every* post is not the rule.
- *commercials* (b) are not "posts".
- *Facebook* (c) is a single platform, far too narrow for a general rule.

**Answer: (d)**

**Shortcut**

**Start with blank 3 and the question is over.** "Transparency and ___ the interests of the customers" needs a protective verb, and only *safeguard* is one. The other three serve the seller, not the buyer — a polarity mismatch you can spot without reading the rest of the sentence.

**Then sanity-check blank 2 for redundancy.** "Influencers have to label their **social media** posts" repeats information already carried by *posts*; "label their **promotional** posts" adds the distinction that makes the rule meaningful.

**Redundancy is a reliable wrongness signal in cloze** — the correct option almost always adds information rather than restating it.

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**80** VARC VERBAL ABILITY VOCABULARY AND WORD USAGE ●●●●●○○○○○ 5 /10

One of the statements below contains a word used incorrectly or inappropriately. Choose the option which has the incorrect or inappropriate usage of the word.

(A) We need to discuss this problem right away and avoid letting it fester any further.

(B) The politician was so flustered by the animosity of the crowd that he refused to answer further questions.

(C) I live farther away from college than all my classmates.

(D) **If you need to farther your career, you should avoid all kinds of distractions.**

ANSWER **(d) If you need to farther your career, you should avoid all kinds of distractions.**

**SOLUTION**

**The word pair being tested: *farther* vs *further*.**

- **farther** — comparative of *far*, used for **physical distance**. It is an adjective or adverb only.
- **further** — used for **degree, extent or additional amount**, and — crucially — it is also a **verb** meaning *to advance or promote*.

**Checking each option:**

- **(a)** "letting it **fester**" — a different word entirely (to become worse, like an infected wound), used correctly ✔
- **(b)** "refused to answer **further** questions" — additional questions ✔
- **(c)** "I live **farther** away from college" — literal physical distance ✔
- **(d)** "If you need to **farther** your career" ✘ — here the word is a **verb** meaning *to advance*. *Farther* has no verb form. The correct word is **further**: *to further your career*.

**Answer: (d)**

**Shortcut**

**Decide by part of speech, not by meaning.** In (c) the word is an adverb of distance; in (d) it sits after *to* and takes an object — it is a **verb**. *Farther* is never a verb, so (d) is wrong whatever the distance/degree rule says.

**The rule in one line: *farther* for physical distance, *further* for everything else — including every verb use.** *Further your career, further the cause, further our understanding.*

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**81** VARC VERBAL ABILITY VOCABULARY AND WORD USAGE ●●●●●●○○○○ 6 /10

One of the statements below contains a word used incorrectly or inappropriately. Choose the option which has the incorrect or inappropriate usage of the word.

(A) **The musician would hear a cord in his head and play each note individually.**

(B) He purchased a cord of wood from the market.

(C) To keep the key safe, she wore it on a cord around her neck.

(D) Teenagers may feel a need to cut the umbilical cord tying them to their homes

**ANSWER** **(a) The musician would hear a cord in his head and play each note individually.**

**SOLUTION**

**The word pair being tested: *cord* vs *chord*.**

- **cord** — a length of thin rope or flexible cable; also a unit of cut firewood; also *vocal cords*, *umbilical cord*.
- **chord** — a group of musical notes sounded together; also a straight line joining two points on a curve.

**Checking each option:**

- **(b)** "a **cord** of wood" ✔ — a genuine unit of volume for firewood (128 cubic feet). Unfamiliar to many students, but correct.
- **(c)** "wore it on a **cord** around her neck" ✔ — a thin rope.
- **(d)** "cut the umbilical **cord**" ✔ — the fixed anatomical term, used here figuratively.
- **(a)** "The musician would hear a **cord** in his head and play **each note** individually" ✘ — the mention of *notes* makes it unmistakably musical. A group of notes is a **chord**.

**Answer: (a)**

**Shortcut**

**The giveaway is three words later: "play each note individually."** Notes belong to a *chord*, not a *cord*. Read past the tested word before judging it — the error in these questions is almost always confirmed by the rest of the sentence.

**Don't be put off by option (b).** "A cord of wood" sounds wrong to anyone who has not met it, and that unfamiliarity is deliberate bait. **Unfamiliar is not the same as incorrect** — verify by meaning, never by whether you have heard the phrase before.

**Memory hook: *chord* has an** h**, like *harmony*.**

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🧪 Vocabulary sticks when it is drilled in short bursts, not memorised in lists. Word Lab

82 VARC VERBAL ABILITY VOCABULARY AND WORD USAGE 5 /10

One of the statements below contains a word used incorrectly or inappropriately. Choose the option which has the incorrect or inappropriate usage of the word.

(A) They found that all the flowers placed on their mother's grave had withered within a week.

(B) The landlord issued a warning to the tenants that non-payment of rent was a grave matter and would lead to a court case.

**(C) The pet dog could not come to terms with his master's death and went to grave for him, even refusing to eat for several days.**

(D) When the witness was summoned by the lawyer, he made grave allegations against the accused.

ANSWER **(c) The pet dog could not come to terms with his master's death and went to grave for him, even refusing to eat for several days.**

SOLUTION

**The word being tested: *grave*,** across its senses.

- **grave** (noun) — a burial place.
- **grave** (adjective) — serious, weighty.

**Checking each option:**

- **(a)** "flowers placed on their mother's **grave**" ✔ — the noun, a burial place.
- **(b)** "a **grave** matter" ✔ — the adjective, meaning serious.
- **(d)** "made **grave** allegations" ✔ — the adjective again.
- **(c)** "went to **grave** for him" ✘ — this is neither sense. The intended meaning is clearly *mourned*, and the word required is **grieve**: "the pet dog... **grieved** for him."

Note also that even read as the noun, "went to grave" is ungrammatical — it would need an article, *went to the grave*, and that would mean *died*, which contradicts the dog refusing to eat for several days afterwards.

**Answer: (c)**

**Shortcut**

**Two faults in the same phrase, either of which settles it:** the missing article ("went to grave") and the wrong word (*grieve*, not *grave*).

**The sentence also contradicts itself on the noun reading** — *go to the grave* means *to die*, yet the dog goes on refusing food. **An internal contradiction is as good a signal as a wrong definition.**

**The pair to store: *grave* (serious / burial place) vs *grieve* (to mourn).** One letter apart, and this is the second question in this paper built that way — see also Q84's *tide/tied*.

**83** VARC VERBAL ABILITY VOCABULARY AND WORD USAGE ●●●●●○○○○○ 5 /10

One of the statements below contains a word used incorrectly or inappropriately. Choose the option which has the incorrect or inappropriate usage of the word.

(A) To catch the terrorist the security forces formed a ring around the house where he was hiding.

(B) She had left home for the first time, so her parents made her promise that she would ring them up every day.

(C) **They were all soaking wet and their mother told them to ring their clothes first and then put them out to dry.**

(D) The witch waved her wand, recited a magical verse, pressed the blue stone on her ring and vanished into thin air.

**ANSWER** **(c) They were all soaking wet and their mother told them to ring their clothes first and then put them out to dry.**

**SOLUTION**

**The word pair being tested: *ring* vs *wring*.**

- **ring** — a circular band or shape; to telephone; to make a bell sound.
- **wring** — to twist something forcibly, especially to squeeze liquid out of wet cloth.

**Checking each option:**

- **(a)** "formed a **ring** around the house" ✔ — a circular formation.
- **(b)** "**ring** them up every day" ✔ — to telephone.
- **(d)** "the blue stone on her **ring**" ✔ — jewellery.
- **(c)** "told them to **ring** their clothes first and then put them out to dry" ✘ — squeezing water out of wet clothes is **wringing** them. The silent *w* is what the question is testing.

**Answer: (c)**

**Shortcut**

**"Soaking wet… and then put them out to dry" frames the action unmistakably:** water is being squeezed out, which is *wring*.

**Three of the four options use a different, perfectly ordinary sense of *ring*** — circle, telephone, jewellery. When a word has several common senses, the wrong option is usually the one needing a **homophone** rather than another sense.

**The silent-letter homophones worth revising together:** *wring/ring*, *wrack/rack*, *wrest/rest*, *write/right/rite*, *whole/hole*.

**84** VARC VERBAL ABILITY VOCABULARY AND WORD USAGE 4 /10

One of the statements below contains a word used incorrectly or inappropriately. Choose the option which has the incorrect or inappropriate usage of the word.

(A) **It was a full moon night and the tied was high, but he went boating and, unfortunately, he drowned.**

(B) After many years of knowing one another, they eventually tied the knot.

(C) The bags placed on the carrier were not securely tied, which led to an unfortunate accident.

(D) I have a good chance of a promotion since my firm has recently tied up with a global conglomerate.

**ANSWER** **(a) It was a full moon night and the tied was high, but he went boating and, unfortunately, he drowned.**

**SOLUTION**

**The word pair being tested: *tied* vs *tide*.**

- **tied** — past tense of *tie*, to fasten.
- **tide** — the rise and fall of the sea.

**Checking each option:**

- **(b)** "**tied** the knot" ✔ — the idiom for getting married.
- **(c)** "not securely **tied**" ✔ — fastened.
- **(d)** "**tied** up with a global conglomerate" ✔ — the phrasal verb for forming a partnership.
- **(a)** "It was a full moon night and the **tied** was high" ✘ — the subject here is the sea, and the word needed is **tide**. The reference to a **full moon** confirms it: moon phases govern tides.

**Answer: (a)**

**Shortcut**

**The context word is *full moon*.** Moon → tide. That single association identifies the error before you examine the grammar.

**The grammar confirms it independently:** "the tied was high" puts a past-tense verb in a **noun** slot after *the*. *Tied* is never a noun, so the sentence cannot parse.

**Run the part-of-speech check first in every word-usage question.** In this paper it settles Q80 (*farther* as a verb) and Q84 (*tied* as a noun) outright, with no vocabulary knowledge at all.

85 VARC VERBAL ABILITY VOCABULARY AND WORD USAGE 5 /10

One of the statements below contains a word used incorrectly or inappropriately. Choose the option which has the incorrect or inappropriate usage of the word.

(A) Under certain climatic conditions, hailstorms are formed in the atmosphere, resulting in unexpected accidents.

(B) The passengers in the bus were sweating profusely because of the hot climatic conditions.

(C) Our products have to function in extreme weather conditions, which is why we put them through climatic testing.

(D) **The climatic moment of the match was when the captain got caught behind the wicket.**

ANSWER **(d) The climatic moment of the match was when the captain got caught behind the wicket.**

SOLUTION

**The word pair being tested: *climatic* vs *climactic*.**

- **climatic** — relating to **climate**, i.e. weather.
- **climactic** — relating to a **climax**, i.e. the decisive or most intense moment.

They differ by a single letter and are among the most frequently confused adjectives in English.

**Checking each option:**

- **(a)** "Under certain **climatic** conditions, hailstorms are formed" ✔ — weather.
- **(b)** "the hot **climatic** conditions" ✔ — weather again.
- **(c)** "we put them through **climatic** testing" ✔ — a genuine engineering term for testing products under controlled temperature and humidity.
- **(d)** "The **climatic** moment of the match" ✘ — a decisive moment in a cricket match has nothing to do with weather. The word required is **climactic**.

**Answer: (d)**

**Shortcut**

**Ask one question of each sentence: is this about weather?** Hailstorms ✔, hot bus ✔, product testing ✔, a wicket falling ✘. The odd one out is the answer.

**The pair to fix permanently:**

- **climatic** ← **climate** (weather)
- **climactic** ← **climax** (peak moment)

The extra **c** belongs with the **c** of *climax*.

**And note option (c) again** — *climatic testing* is a real technical term, and like *a cord of wood* in Q81 it is placed there to make an unfamiliar-but-correct usage look like the error. **Unfamiliar is not wrong.**

**86** VARC VERBAL ABILITY PARA JUMBLES 5 /10

*The sentences given below, when properly sequenced, form a coherent paragraph. Each sentence is labelled with a number. Decide on the most logical order and enter the sequence of numbers in the space provided.*

1. This instance highlights how young people from different backgrounds can make important contributions to climate change.
2. Participation in environmental education programmes can motivate children to act responsibly towards the environment.
3. They were motivated to act in ways that would help the environment, like using a reusable water bottle or refusing to use plastic straws.
4. Six hundred elementary school children from varied social and linguistic groups participated in an ocean pollution education programme.

**ANSWER** 2431

**SOLUTION**

**Step 1 — find the opener.** Sentence **2** is the only general claim, and it names its subject in full with no backward reference:

"**Participation in environmental education programmes** can motivate children to act responsibly towards the environment."

Every other sentence depends on something already said: 4 describes one specific programme, 3 begins with "**They**", and 1 begins with "**This instance**".

**Step 2 — the example.** Sentence **4** supplies the specific case that illustrates the claim: six hundred children in an ocean pollution education programme. General claim → concrete instance is the paragraph's basic move.

**Step 3 — the outcome.** Sentence **3** begins "**They** were motivated to act..." — *they* must be the six hundred children of sentence 4. This is a **mandatory pair**: $4 \to 3$.

**Step 4 — the closer.** Sentence **1** begins "**This instance** highlights..." — *this instance* refers to the whole episode just described, and the sentence draws the general moral from it. A sentence that comments on everything before it can only come last.

**The sequence:**

$2 \to 4 \to 3 \to 1$

**Answer: 2431**

**Shortcut**

**Three of the four sentences are disqualified from opening** by a backward reference — *They* (3), *This instance* (1) — or by being a specific example with no frame (4). That leaves **2** as the opener without any further thought.

**Then the pronoun chain finishes it:** *They* in 3 needs the children introduced in 4, so $4 \to 3$ is locked, and *This instance* in 1 needs the whole story, so 1 is last.

**The shape here is the commonest in para jumbles: claim → example → result → moral.** Recognise it and you can often order five sentences without reading them closely.

**87** VARC VERBAL ABILITY PARA JUMBLES 5 /10

*The sentences given below, when properly sequenced, form a coherent paragraph. Each sentence is labelled with a number. Decide on the most logical order and enter the sequence of numbers in the space provided.*

1. Yet, even as TikTok delights consumers and advertisers, others believe the sunny app has a dark side.
2. Since launching just five years ago, the app has brought a warm glow to its 1 billion plus users, as well as an icy dash of competition to the social media incumbents of Silicon Valley.
3. ByteDance, its owner, has its headquarters in China, whose government is addicted to surveillance and propaganda- making it a worrying place for a media app to be placed.
4. With its wholesome dancing and lip-syncing videos, TikTok once billed itself as the "last sunny corner on the Internet.

**ANSWER** 4213

**SOLUTION**

**Step 1 — find the opener.** Sentence **4** introduces TikTok by name with a full description and no backward reference. It also plants the metaphor — "the **last sunny corner** on the Internet" — that the other three sentences all play on.

Sentence 2 says "**the app**" (needs an antecedent), 1 begins "**Yet**" (a connective), and 3 says "**its** owner" (a pronoun). None can open.

**Step 2 — the expansion.** Sentence **2** develops the sunny image: "brought a **warm glow** to its 1 billion plus users, as well as an **icy dash** of competition". It continues the temperature metaphor from 4 and supplies the scale.

**Step 3 — the turn.** Sentence **1** begins "**Yet**" and reverses direction: "the **sunny** app has a **dark side**." A *Yet* must come after the positive account it contradicts, so it follows 2.

**Step 4 — the explanation.** Sentence **3** explains what the dark side is: ByteDance's Chinese headquarters and the surveillance concern. It must follow 1, which announces that a dark side exists.

**The sequence:**

$4 \rightarrow 2 \rightarrow 1 \rightarrow 3$

**Answer: 4213**

**Shortcut**

**Follow the metaphor.** The paragraph runs on a sunny/dark and warm/icy contrast, and the sentence that *introduces* the metaphor must come first — that is 4, with "last sunny corner on the Internet".

**Then the connectives place everything else:** *Yet* (1) needs something positive before it, and 3's explanation of the "worrying" owner needs 1's announcement of a dark side.

**A dependable rule: a sentence beginning with *Yet*, *But*, *However* or *Nevertheless* is never first**, and the sentence it contradicts is almost always immediately before it.

88 VARC VERBAL ABILITY PARA JUMBLES 5 /10

*The sentences given below, when properly sequenced, form a coherent paragraph. Each sentence is labelled with a number. Decide on the most logical order and enter the sequence of numbers in the space provided.*

1. Once they reach a high altitude, they manage to travel all over the world.
2. An expert from the team explained that the bacteria usually lived on the surface of vegetation, such as leaves.
3. The wind carries them off the surface and into the atmosphere.
4. A group of researchers were surprised to find that clouds had carried drug resistant bacteria over a long distance.

ANSWER 4231

**SOLUTION**

**Step 1 — find the opener.** Sentence **4** introduces both the researchers and the finding, with no backward reference:

"A group of researchers were surprised to find that clouds had carried **drug resistant bacteria** over a long distance."

Sentences 1 and 3 both begin with or contain "**they**"/"**them**" with no antecedent of their own, and 2 refers to "**the team**" and "**the bacteria**" — both requiring prior introduction.

**Step 2 — the explanation begins.** Sentence **2** has "An expert from **the team**" (the researchers of 4) explaining where the bacteria normally live: on leaves. This sets the starting point of the journey.

**Step 3 — the mechanism.** Sentence **3**: "The wind carries **them off the surface** and into the atmosphere." *The surface* refers directly to "the surface of vegetation" in sentence 2 — a **mandatory pair**, $2 \to 3$.

**Step 4 — the destination.** Sentence **1**: "**Once they reach a high altitude**, they manage to travel all over the world." High altitude follows being lifted into the atmosphere, completing the chain and returning to the "long distance" of sentence 4.

**The sequence:**

$4 \to 2 \to 3 \to 1$

**Answer: 4231**

**Shortcut**

**The paragraph is a physical journey, so order it by the stages:** leaves (2) → lifted by wind into the atmosphere (3) → high altitude, travelling worldwide (1). Sentence 4 states the finding that the journey explains.

**The decisive link is the repeated noun.** Sentence 2 ends on "the surface of vegetation" and sentence 3 begins "The wind carries them off **the surface**" — a verbatim echo that locks $2 \to 3$.

**Look for repeated nouns before you look for pronouns.** They are less ambiguous and bind two sentences just as tightly.

89 VARC VERBAL ABILITY PARA JUMBLES 6 /10

*The sentences given below, when properly sequenced, form a coherent paragraph. Each sentence is labelled with a number. Decide on the most logical order and enter the sequence of numbers in the space provided.*

1. But the mutiny of Visakhapatnam predates this.
2. Instead of going against their heroic leader, the sepoys attacked the British soldiers and managed to escape from the town.
3. The Sepoy Mutiny of 1857 in the garrison town of Meerut is regarded as the First War of Independence.
4. It happened in 1780 when the British officers asked the local sepoys to join the fight against Hyder Ali.

ANSWER 3142

**SOLUTION**

**Step 1 — find the opener.** Sentence **3** states the accepted historical fact in full, with no connective and no pronoun:

"The Sepoy Mutiny of **1857** in the garrison town of Meerut is regarded as the First War of Independence."

Sentence 1 begins "**But**", 4 begins "**It**", and 2 begins "**Instead**" — all three are disqualified from opening.

**Step 2 — the correction.** Sentence **1**: "But the mutiny of Visakhapatnam **predates this**." *This* refers to the 1857 mutiny, and *But* signals the challenge to the accepted view. It must follow 3.

**Step 3 — the date.** Sentence **4**: "**It** happened in **1780**..." — *it* is the Visakhapatnam mutiny of sentence 1, and 1780 indeed predates 1857, confirming the claim. Mandatory pair: $1 \to 4$.

**Step 4 — the events.** Sentence **2**: "**Instead of** going against their heroic leader, the sepoys attacked the British soldiers..." This only makes sense after 4 has explained that the officers asked the sepoys to fight **against Hyder Ali** — the "heroic leader" in question.

**The sequence:**

$3 \to 1 \to 4 \to 2$

**Answer: 3142**

**Shortcut**

**The chronology is a trap, not a guide.** The paragraph mentions 1857 before 1780, because it moves from the *accepted* account to the *earlier, lesser-known* one. **Never order a jumble by date alone.**

**Order it by the argument instead:** received view (3) → challenge (1) → evidence (4) → detail (2).

**The clinching link is semantic:** "their heroic leader" in sentence 2 has no referent until sentence 4 names **Hyder Ali**. Whenever a sentence uses a definite phrase like *their heroic leader*, find where that person is introduced — it must come earlier.

**90** VARC VERBAL ABILITY PARA JUMBLES

5 /10

*The sentences given below, when properly sequenced, form a coherent paragraph. Each sentence is labelled with a number. Decide on the most logical order and enter the sequence of numbers in the space provided.*

1. What is more shocking to observe is how often such strokes lead to death.
2. When the body temperature rises, our vital organs swell, and this causes death.
3. One main reason for this is that people underestimate how badly heat can affect the body.
4. Heat strokes have become more common in our country than ever before.

**ANSWER** 4132

**SOLUTION**

**Step 1 — find the opener.** Sentence **4** introduces the topic as a plain statement of fact:

"**Heat strokes** have become more common in our country than ever before."

The others are all dependent: 1 says "**such strokes**", 3 says "**this**", and 2 explains a mechanism that needs a context.

**Step 2 — the escalation.** Sentence **1**: "What is **more shocking** to observe is how often such strokes lead to **death**." The comparative *more shocking* needs something already shocking — the rising frequency in 4. And "such strokes" points back to "heat strokes". Mandatory pair: $4 \to 1$.

**Step 3 — the reason.** Sentence **3**: "One main reason for **this** is that people **underestimate** how badly heat can affect the body." *This* refers to the deaths introduced in 1.

**Step 4 — the mechanism.** Sentence **2** explains what people are underestimating: "When the body temperature rises, our vital organs swell, and this causes death." It spells out the bodily process, so it follows the claim that people underestimate that process.

**The sequence:**

$4 \to 1 \to 3 \to 2$

**Answer: 4132**

**Shortcut**

**Only one sentence can open** — the other three carry *such strokes*, *this* and an unanchored mechanism. So 4 is first with no analysis at all.

**Then the comparative decides second place.** "What is **more** shocking" requires a previous shocking fact, so 1 follows 4 directly.

**Finally, reason before mechanism:** sentence 3 says people underestimate the danger, and 2 explains what that danger physically is. An explanation of *how* something kills belongs after the claim it supports.

**Across all five jumbles in this paper, the opener was identified the same way every time: it is the sentence with no backward-pointing word.** Train that one reflex and you will place the first sentence correctly almost every time.

Want this paper scored, ranked and analysed? Attempt it on the exam interface. Take the test

READING PASSAGE

## Passage 2 – Apple's retail stores and the Indian market

*Read the following passage and choose the answer that is closest to each of the questions that are based on the passage.*

Two Apple stores in Delhi and in Mumbai – opened in April 2023. Until now, Indians could buy Apple products in the country either online or through a vast network of what the company calls 'premium resellers'. Will the new-found ability to sell products directly to customers in India – the world's second largest smartphone market – impact its fortunes here? Apple has long tried to open physical retail stores in India. In 2019, the Indian government relaxed some investment rules, exempting companies selling 'cutting-edge' items, such as Apple's iPhones and iPads, from restrictions.

Apple first launched an online store in India through a website which allows users to request for customised products. Apple's decision to open physical stores in India could be the next step in its branding strategy. It is not as if this will change Apple's sales in any dramatic way, but it is still a key milestone, one that will allow Apple to deliver to Indian customers the full Apple experience.

The iPhone is still an aspirational product in the price-sensitive Indian market. When you launch an Apple store, you are basically giving a premium experience to your premium consumers. It might not pull up sales, but it pulls more people into the Apple ecosystem.

Setting up an Apple store in India is also a statement that the country is now big enough for Apple to be actually interested in expanding operations here, and comes at a time when India is rising fast as a manufacturing base for the iPhone. Apple first began making a lower-end model of the iPhone in India in 2017. Last year, it began producing its latest model of iPhone 14 in the country, which now accounts for 5 percent of total iPhone production. For years, Apple had relied on China's sophisticated manufacturing network to produce the bulk of its products. But analysts predict that by 2025, a quarter of all iPhones the company makes could be produced in India. Apple was already making between 5-7 percent of its products in India, and they are targeting to go up to 25 percent of their manufacturing capacity.

In 2022, Apple had a 60 percent market share in the Indian 'premium smartphone' market – which refers to mobiles that cost INR 40,000 or more, ahead of Samsung's 21 percent share. Apple is doing well across categories. The real issue will be to pull consumers to these flagship centres without alienating the partner sellers.

Apple has finally understood that India's premium market is growing, so why not be serious about it.

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APPENDIX

# Topic notes

The concepts this paper leaned on, pulled out of the solutions and written as revision notes. Read them after you have attempted the paper, not before.

## Number system

**Remainders of factorial sums** *(Q2)* — Once $n!$ contains all the prime factors of the divisor, it contributes **nothing**. Here $15 = 3 \times 5$, so every term from $5!$ onward is divisible by 15 and only $1! + 2! + 3! + 4! = 33$ matters, giving a remainder of 3. **The whole question is deciding where the tail dies.**

**Cube residues modulo 10** *(Q30)* — The map $d \mapsto d^3 \ mod\ 10$ is a **bijection**:

| $d$ | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| $d^3$ | 0 | 1 | 8 | 7 | 4 | 5 | 6 | 3 | 2 | 9 |

Every digit appears exactly once, so a cube's unit digit **determines** the base's unit digit. Squares are not like this (they only ever end in 0, 1, 4, 5, 6, 9), which is why cube questions are often easier than they look.

## Arithmetic

**Time and work with a changing rate** *(Q3)* — Convert to units of work per day and track the timeline literally, day by day. When someone works "at half the original rate", that is a new rate from that day forward — do not average it over the whole job.

**Simple and compound interest** *(Q7, Q28)* — $SI = \frac{PRT}{100}$. For compounding more often than yearly, divide the rate and multiply the periods; memorise that $10\%$ compounded half-yearly is exactly $10.25\%$ effective.

**Percentage** *(Q9)* — "$x\%$ more than $y$" is $y\left(1 + \frac{x}{100}\right)$. Successive changes multiply, never add.

**Profit, loss and discount** *(Q32)* — $SP = MP(1 - d) = CP(1 + p)$. Work with the whole consignment and divide by the count only at the end.

**Ratio** *(Q13)* — One multiplier $k$, every later stage written in terms of it, and push any divisibility condition onto $k$ rather than onto the total.

**Time, speed and distance** *(Q11, Q40)* — For equal **distances** at different speeds, the average is the **harmonic** mean, never the arithmetic one:

$$\bar{v} = \frac{n}{\sum \frac{1}{v_i}}$$

The arithmetic mean will always be among the options, and it is always wrong. Keep $1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} = \frac{25}{12}$ to hand — it recurs constantly.

## Algebra

**Logarithms** *(Q6, Q17)* — Reduce everything to one base and let a single symbol carry the algebra. Useful identities: $a^{\log_b c} = c^{\log_b a}$ and $\log_x a = \frac{1}{\log_a x}$. When the unknown sits in the **base**, flipping to reciprocals is almost

always the short route.

**Polynomials and common roots** *(Q8, Q24)* — If two polynomials share a root, that value satisfies both: factor whichever one you can and test its roots in the other. For a quadratic with roots $\alpha, \beta$: $\alpha + \beta = -b/a$ and $\alpha\beta = c/a$ — use the sums, not the roots themselves.

**Algebraic identities** *(Q27)* — A proportion like $\frac{a+b}{b+c} = \frac{c+d}{d+a}$ should be cross-multiplied and **factored**, not solved. Here everything collapses to

$$(a-c)\ (a+b+c+d) = 0$$

so there are **two** branches. "Which is always true?" questions almost always hinge on an option being too strong — check both branches before choosing.

**Quadratics** *(Q18, Q39)* — Discriminant for nature of roots; Vieta for symmetric functions. For "how many real solutions", substitute to reduce the degree before solving.

**Progressions** *(Q10, Q29)* — $S_\infty = \frac{a}{1-r}$ for $|r| < 1$. For a **spiral** with directions cycling with period 4 and lengths in GP, split into $x$ and $y$ components; each becomes its own GP with ratio $-r^2$. Here $x = \frac{32}{1+\frac{1}{4}}\cdot$ and $y = \frac{-16}{1+\frac{1}{4}}$, giving $\frac{64}{\sqrt{5}}$.

**Functions** *(Q5, Q35)* — Simplify the definition before substituting anything. For composite functions, work from the inside out and watch the domain at each stage.

**Graphs** *(Q4)* — For an intersection question, sketch rather than solve. A modulus graph is a pair of rays; a parabola meets it in a predictable number of places once you look at the picture.

**Inequalities and modulus** *(Q31)* — Settle the domain first. $x^2 = |x|^2$, so substituting $t = |x| \geq 0$ is safe; each **positive** root of the $t$-equation gives **two** values of $x$, and non-positive roots give none.

## Geometry and coordinate geometry

**Triangles** *(Q16)* — Two formulas carry most ratio questions:

$$\text{projection: } BM = \frac{AB^2 + BC^2 - CA^2}{2\,BC} \qquad \text{median: } AD^2 = \frac{2AB^2 + 2CA^2 - BC^2}{4}$$

Learn them as a pair — this question is immediate with both and painful without.

**Circles** *(Q33, Q34)* — Centre $(-g, -f)$ and $r = \sqrt{g^2 + f^2 - c}$ for $x^2 + y^2 + 2gx + 2fy + c = 0$. Tangent length from an external point is $\sqrt{d^2 - r^2}$.

**Coordinate geometry** *(Q14)* — Put the area in terms of **one** variable before counting. With a base on the $x$-axis, area $= \frac{1}{2} \times \text{base} \times |y|$, which turns a geometry question into a short list of $y$ values. Remember to discard degenerate (collinear) cases — that is the single mark most often dropped here.

**Trigonometry** *(Q20, Q36)* — Keep $\sin^2\theta + \cos^2\theta = 1$ and the double-angle forms in front of you, and convert everything to a single ratio ($t = \tan\theta$) when the expression mixes functions.

## Modern maths

**Permutations and combinations** *(Q1, Q12, Q23, Q25)* — Count by **structure**, not by listing. For tournament questions, count games rather than players: each pair inside a group plays once, each cross-pair plays twice, and the totals give a quadratic in the group size. For arrangements with a restriction, it is usually faster to count the **complement**.

**Binomial theorem** *(Q15)* — Consecutive binomial coefficients in ratio give linear equations:

$$\frac{{}^{n}C_{r}}{{}^{n}C_{r-1}} = \frac{n-r+1}{r}$$

Two such ratios pin both $n$ and $r$ exactly.

**Probability** *(Q22, Q37, Q38)* — Identify the restricted sample space before anything else; when a condition is given, the denominator is the restricted count, not the total. For "at least" near an extreme, count downward from the top.

**Set theory** *(Q21)* — $n(A \cup B) = n(A) + n(B) - n(A \cap B)$; for three sets, **exactly one** $= \sum \text{singles} - 2\sum \text{pairs} + 3(\text{triple})$. For a maximum or minimum, push the overlap to the limit the constraints permit.

**Matrices and determinants** *(Q26)* — For a triangular matrix the determinant is the product of the diagonal. Row operations do not change a determinant; row swaps flip its sign.

## Logical reasoning

**Deductive reasoning** *(Q19)* — Write the constraints as a grid and fill in what is **forced** before guessing anything. Where a question asks only for a count, you often never need to resolve who is who.

**Grid puzzles** *(Q41–Q45)* — The drugs-and-organisms set is solved by one habit: **chase the most constrained element.** Three moves do almost everything:

1. **Propagate the implications first.** "Wherever A works, B works" turns one tick into two, and often fills a row to its maximum. A full row is then an eliminator for every later question.
2. **Count every column against its cap.** With "at most three drugs per organism", a column holding three is closed — that single observation answers whole questions by itself.
3. **Place the element with no table entry last but reason about it first.** Drug E appears nowhere in the given grid, yet the rule "D and E never share an organism" pins it completely.

A useful check at the end: the number of ticks must satisfy both the row totals (each drug 1–2) and the column totals (each organism 2–3). Here $1+2+2+2+1 = 8 = 2+3+3$, which confirms the grid before you answer anything.

## Verbal ability

**Reading comprehension** *(Q46–Q57)* — Match the technique to the question type:

| Type | What to do |
|---|---|
| Detail / fact | Find the question's verb in the passage; read only that sentence |
| NOT / EXCEPT | Tick off the three you can locate; the odd one out is the answer |
| Main idea | Count how many paragraphs each option covers — the winner covers all |
| Purpose | Read the **last** paragraph; a closing list of recommendations means "to advise" |
| Vocabulary in context | Define the word first, then look for the option containing that definition |
| Inference | State only the step the passage leaves unsaid — never two steps |

Three traps that recur across both 2023 passages:

1. **Dates attached to the wrong event.** The Apple passage carries 2017, 2019, 2022 and 2023, and the NOT question simply swaps two of them. **Build a two-column timeline as you read any business passage** — it converts a hard question into a lookup.
2. **The wrong party.** Options name *competitors* where the passage said *partner sellers*, or *population* where it said *smartphone market*. Always ask **whom** an option is about.
3. **Reversals of a stated pair.** The sleep passage names ghrelin (hunger) against leptin (satiety), and an option duly swaps them. Where a passage gives opposites, expect one option to flip them.

**Idioms and sentence completion** *(Q58–Q64)* — From this paper: *off-the-cuff* (unprepared), *ill at ease* (uncomfortable), *go the extra mile* (do more than required), *to hear of*, *small fry* (people of no influence), *saving grace* (the one redeeming quality), *a man of no importance*.

**Prepositions inside idioms are fixed.** Most distractors here are manufactured by swapping one word into a half-remembered phrase — *go **to** the extra mile*, *ill **in** heart*, *tiny shots*. If the string is not exactly the one you have seen in print, it is not the idiom.

**Watch the real-but-wrong distractor.** *Saving face* is a genuine idiom, but it names an action a person performs, not a quality a car possesses. **When a distractor is itself a real expression, separate it by grammatical role rather than by meaning.**

**Grammar and sentence correction** *(Q65–Q69)* — Specific points tested, each worth knowing cold:

- **Third conditional**: *If* + **had** + $V_3$ … **would have** + $V_3$. Both halves need the participle.
- **Subjunctive after verbs of demand**: *insist / demand / suggest / recommend* + *that* + **base form** — "insisted that she **pay**", never *pays* or *paid*. And *insist* never takes a *to*-infinitive; it takes *on* + gerund or *that* + subjunctive.
- **affect vs effect**: **A**ffect is the **A**ction (verb, to influence); **E**ffect is the **E**nd result (noun).
- **Question tags reverse polarity**, and *nothing, nobody, never, hardly, seldom* all count as negatives: "*nothing* much has changed, **has it?**"
- **who vs whom**: substitute *he* or *him* inside the clause. *Him* → **whom**. Add **-ever** when there is no antecedent noun ("for **whomever** you are assigned").

**Para completion** *(Q70–Q73)* — Four tests, in order of power:

1. **The connective in the neighbouring sentence tells you the blank's job.** *Hence* demands a cause; *Then, gradually* demands a prior state; *substitute* demands the thing being replaced.
2. **A negative sets up its positive.** "Correa *avoided* high-rise solutions" is answered by what he focused on instead.
3. **Redundancy is fatal.** An option that states what the next sentence is about to state is wrong by construction.
4. **True is not the same as relevant.** Several distractors here are accurate facts about Correa, the Nawabs or water scarcity, and wrong purely because they break continuity.

**Cloze** *(Q74–Q79)* — Read **across the options column by column**, not blank by blank, and start with the blank carrying the tightest constraint: a fixed preposition (*put on screen*, *under a microscope*), a polarity requirement (two good aims joined by *and* cannot take *incite*), or an internal contradiction (*rare* then *abundant* in the same option).

Vocabulary this section tested: *disconcerting*, *indistinguishable*, *reversible*, *ubiquitous*, *immortalised*, *pragmatically*, *prioritised*, *reassure*, *safeguard*.

**Word usage** *(Q80–Q85)* — Every one of the six is a **near-identical pair**:

| Tested word | Confused with | How to separate them |
|---|---|---|
| farther | further | physical distance vs everything else; only *further* is a verb |
| cord | chord | **ch**ord has an **h**, like **h**armony |
| grave | grieve | *grave* has no verb form |
| ring | wring | *wring* = twist to remove water (silent *w*) |
| tied | tide | *tide* is a noun; *tied* is a verb form |
| climatic | climactic | *clima**c**tic* carries the **c** from *clima**x*** |

**Two habits settle this entire section.** First, check the **part of speech** the word occupies in each option — the error is usually a word pressed into a grammatical slot it cannot fill. Second, ask **what word is this one letter away from?** You can often answer without knowing either definition.

And note the reverse trap: *a cord of wood* and *climatic testing* both sound invented but are real. **Unfamiliarity is not incorrectness.**

**Para jumbles** *(Q86–Q90)* — In 2023 these were **MCQ with four options**, not TITA as in later years, so you can work backwards from the choices and rarely need the full order.

1. **Eliminate openers.** Any sentence containing *this, such, they, it, but, yet* or a comparative (*more shocking*) cannot come first.
2. **Chain the backward references.** "*This* instance" follows the instance; "*their* heroic leader" follows the leader's name; "*the* team" follows the researchers' introduction.
3. **Order the middle by natural sequence** — time, space or cause. The bacteria paragraph sorts purely by altitude: leaf surface → atmosphere → worldwide.
4. **Confirm with any dates.** The Visakhapatnam paragraph claims one mutiny predates another, and 1780 against 1857 checks the order for free.

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