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PREVIOUS YEAR PAPER • FULLY SOLVED

IPMAT Indore 2024

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 published key.

WHERE THIS PAPER NEEDS A CAVEAT

Three questions where this document departs from the circulated answer key. Each is flagged again at the question itself, with the full working.

- **Q32** (balloons) was **cancelled by IIM Indore** — an objection was upheld, none of the four options is correct, and every candidate was awarded +4. An independent count gives 2901, which lies below every printed range.
- **Q42** and **Q43** (election set): the circulated key marks 6 and 2. Both are arithmetically impossible, and the key **contradicts the worked solution printed beside it** — that solution's own table gives B's votes as 1, 5, 6, 11, 12, from which the answers are **5** and **3**. This document uses the verified values.

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 →

Create a free login

THE PAPER

Pattern & cut-offs

IIM Indore · 23 May 2024 · 90 questions · 360 marks · 120 minutes

Exam pattern

Section	Questions	Type	Correct	Wrong	Time
Quantitative Ability — Short Answer	15	TITA (incl. a 3-question DI set)	+4	0	40 min
Quantitative Ability — MCQ	30	MCQ (incl. a 5-question LR set)	+4	−1	40 min
Verbal Ability	45	MCQ (+ 5 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 2024. All three must be cleared, however high the total.

Category	QA (SA) /60	QA (MCQ) /120	VARC /180	Sum /360
General	24	35	113	172
EWS	16	26	89	131
NC-OBC	12	23	78	113
SC	12	18	60	90
ST	8	13	40	61
PwD	8	13	40	61

How to read this table. The three sectional figures are corroborated by two independent sources and are the ones that matter: a candidate must clear **all three** to be shortlisted, however high the total. The last column is simply the sum of the three sectional minimums, not a separately published overall cut-off — treat it as a floor, not a target. The PwD row appears in only one of the two sources. For anything you intend to quote to students, confirm against iimidr.ac.in.

Year on year. The 2023 General cut-offs were 12 / 39 / 125 and the 2025 General figures were 24 / 28 / 112. So 2024 sat between them: the QA (SA) bar rose sharply from 2023 and then held, while QA (MCQ) fell steadily across all three years — a useful signal that the MCQ section has been getting harder, not easier.

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

PAPER ANALYSIS

What IPMAT Indore 2024 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.

37	8	45	5.4
QUANTITATIVE ABILITY	DATA INTERPRETATION	VERBAL & RC	AVERAGE DIFFICULTY / 10

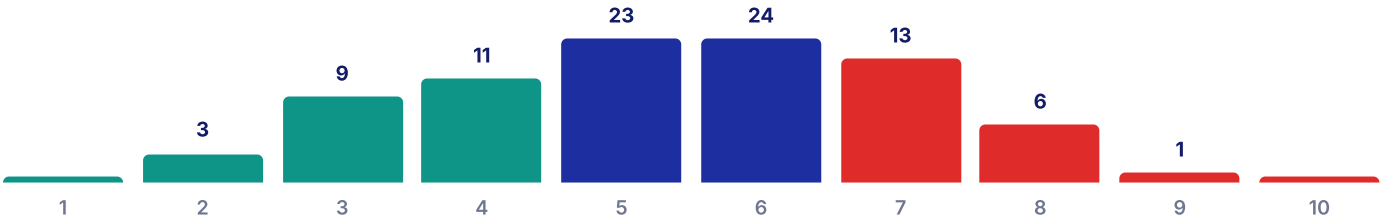
Quant & DI — where the marks sat



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 (incl. a 3-question DI set)

MOST ASKED HERE — Algebra 3 · Data Interpretation 3 · Geometry And Mensuration 3 · Arithmetic 3 · Modern Maths 2

1 QA · NUMBER SYSTEM · FACTORS AND MULTIPLES — 3 /10

The number of factors of 1800 that are multiple of 6 is _____

ANSWER 18

SOLUTION

Step 1 — factorise.

$1800 = 2^3 \times 3^2 \times 5^2$

Step 2 — force the factor to be a multiple of 6. A divisor $d = 2^a 3^b 5^c$ is a multiple of $6 = 2 \times 3$ exactly when it carries at least one 2 **and** at least one 3:

$1 \le a \le 3, \qquad 1 \le b \le 2, \qquad 0 \le c \le 2$

Step 3 — count the choices.

$3 \times 2 \times 3 = 18$

The trick worth remembering: instead of counting, just divide out the 6. Every such factor is $6k$ where k divides $1800/6 = 300 = 2^2 \times 3 \times 5^2$, and 300 has $(2+1)(1+1)(2+1) = 18$ divisors. Same answer, one line.

Answer: 18

Shortcut

Divide first, count second. Factors of N that are multiples of m = number of factors of N/m — provided $m \mid N$. Here $1800/6 = 300 = 2^2 3^1 5^2$, giving $3 \times 2 \times 3 = \mathbf{18}$. One division and one product; no case work.

2 QA ALGEBRA EXPONENTS AND INDICES 6 /10

The number of real solutions of the equation $\left(x^2-15x+55\right)^{x^2-5x+6}=1$ is _____

ANSWER 6

SOLUTION

The governing idea. A power B^E equals 1 in exactly three ways. Check all three — missing one is how this question is lost.

Case 1 — the exponent is zero (with a non-zero base).

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

Base at $x=2$: $4-30+55=29\neq 0$. At $x=3$: $9-45+55=19\neq 0$. Both valid. **2 roots.**

Case 2 — the base is 1.

$x^2-15x+55=1 \Rightarrow x^2-15x+54=0 \Rightarrow (x-6)(x-9)=0$

$x=6,\ 9$. A base of 1 works for any exponent. **2 roots.**

Case 3 — the base is -1 and the exponent is even.

$x^2-15x+55=-1 \Rightarrow x^2-15x+56=0 \Rightarrow (x-7)(x-8)=0$

$x=7$: exponent $=49-35+6=20$, even. ✔ $x=8$: exponent $=64-40+6=30$, even. ✔ **2 roots.**

Total. $x\in\{2,3,6,7,8,9\}$ — all distinct.

Answer: 6

Shortcut

Remember "0, 1, −1". $B^E=1$ needs $E=0$ (with $B\neq 0$), or $B=1$, or $B=-1$ with E even. Each case here is a neat quadratic giving two roots, so the count is $2+2+2=\mathbf{6}$ — you can answer without even checking the parity, since the symmetric set-up all but guarantees it. Students who solve only Case 1 answer 2; those who skip Case 3 answer 4. Both wrong answers are the ones the setter planted.

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3 DILR DATA INTERPRETATION TABLES 7 /10

The highest possible age of an employee of company A is ____

ANSWER 29

SOLUTION

The structure of this set. The eight companies form a *strictly increasing chain* of age blocks: every employee of A is younger than every employee of B, who are all younger than every employee of C, and so on. So if you lined up all 245 employees by age, they would come out **company by company, in order A, B, C, D, E, F, G, H** — with no interleaving anywhere.

Total headcount.

$32+28+43+39+35+29+23+16=245$

The median rule you need throughout. For n values in sorted order:

- n **odd**: the median is the $\frac{n+1}{2}$-th value.

- n **even**: the median is the average of the $\frac{n}{2}$-th and $\left(\frac{n}{2}+1\right)$-th values.

Step 1 — what the question really asks. A's oldest employee must still be younger than **every** employee of B. So $\max\ (A) < \min\ (B)$

To make $\max\ (A)$ as large as possible, we must first make $\min\ (B)$ as large as possible.

Step 2 — how large can B's youngest be? B has 28 employees (even) with median 30, so

$$\frac{14\text{th} + 15\text{th}}{2} = 30 \Rightarrow 14\text{th} + 15\text{th} = 60$$

Since the list is sorted, $14\text{th} \le 15\text{th}$, which forces $14\text{th} \le 30$. Every employee from the 1st to the 14th is at most the 14th, so

$\min\ (B) \le 30$

This is attainable: let all 28 of B's employees be aged exactly 30. Then the 14th and 15th are both 30 ✔ and $\min\ (B) = 30$.

Step 3 — bound A. With $\min\ (B) = 30$ and integer ages,

$\max\ (A) \le 29$

Step 4 — check 29 is actually achievable. A has 32 employees (even) with median 24, so the 16th and 17th must average 24, i.e. sum to 48. Take

- employees 1–16 aged 24,
- employee 17 aged 24,
- employees 18–32 aged 29.

Then the 16th and 17th are both 24, median $= 24$ ✔, all ages are integers ✔, and the maximum is $29 < 30$ ✔

Answer: 29

Shortcut

Chain the two constraints — nothing else matters. $\max\ (A) < \min\ (B)$, and $\min\ (B)$ is capped by B's *lower* median value: with 28 employees the 14th ≤ 30. So $\min\ (B) \le 30$ and $\max\ (A) \le 29$.

The reusable principle: in a median question, the median only constrains the **middle** positions. Everything above the median position is free to be as large as you like, and everything below as small as you like — which is exactly what lets A's top 15 sit at 29 while its median stays at 24. Answer **29**.

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4 QA MODERN MATHS SET THEORY ●●●●○○○○○○ 4 /10

In a group of 150 students, 52 like tea, 48 like juice and 62 like coffee. If each student in the group likes at least one among tea, juice and coffee, then the maximum number of students that like more than one drink is ____

ANSWER 12

SOLUTION

Step 1 — use the counting identity. Let e_1, e_2, e_3 be the number of students liking exactly one, exactly two, exactly three drinks. Since everyone likes at least one:

$e_1 + e_2 + e_3 = 150$

Adding the three individual totals counts a student once for each drink they like:

$52 + 48 + 62 = e_1 + 2e_2 + 3e_3 = 162$

Step 2 — subtract.

$(e_1 + 2e_2 + 3e_3) - (e_1 + e_2 + e_3) = 162 - 150 \Rightarrow e_2 + 2e_3 = 12$

Step 3 — maximise $e_2 + e_3$**,** the number liking more than one drink. From $e_2 = 12 - 2e_3$,

$e_2 + e_3 = 12 - 2e_3 + e_3 = 12 - e_3$

This is largest when e_3 is smallest, i.e. $e_3 = 0$, giving $e_2 = 12$.

Step 4 — check it is achievable. With $e_3 = 0$, $e_2 = 12$, $e_1 = 138$: the sum $138 + 2(12) = 162$ ✔, and the 12 overlaps can be split among the three pairs to match 52, 48 and 62.

Answer: 12

Shortcut

The "excess" shortcut. $\sum(\text{singles}) - (\text{total}) = e_2 + 2e_3$. Here $162 - 150 = 12$. Each triple-overlap student eats **two** units of that excess while each double eats one, so to maximise the *number* of overlapping students you want **no triples**: answer $=$ excess $= \mathbf{12}$. Conversely, the *minimum* would push everything into triples, giving 6.

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5 QA GEOMETRY AND MENSURATION MENSURATION 2D ●●●●○○○○○○ 4 /10

Let ABC be a triangle right-angled at B with AB = BC = 18. The area of largest rectangle that can be inscribed in this triangle and has B as one of the vertices is _____

ANSWER 81

SOLUTION

Step 1 — set up coordinates. Put B at the origin with the legs along the axes: $B(0,0)$, $A(0,18)$, $C(18,0)$. The hypotenuse AC is the line

$x + y = 18$

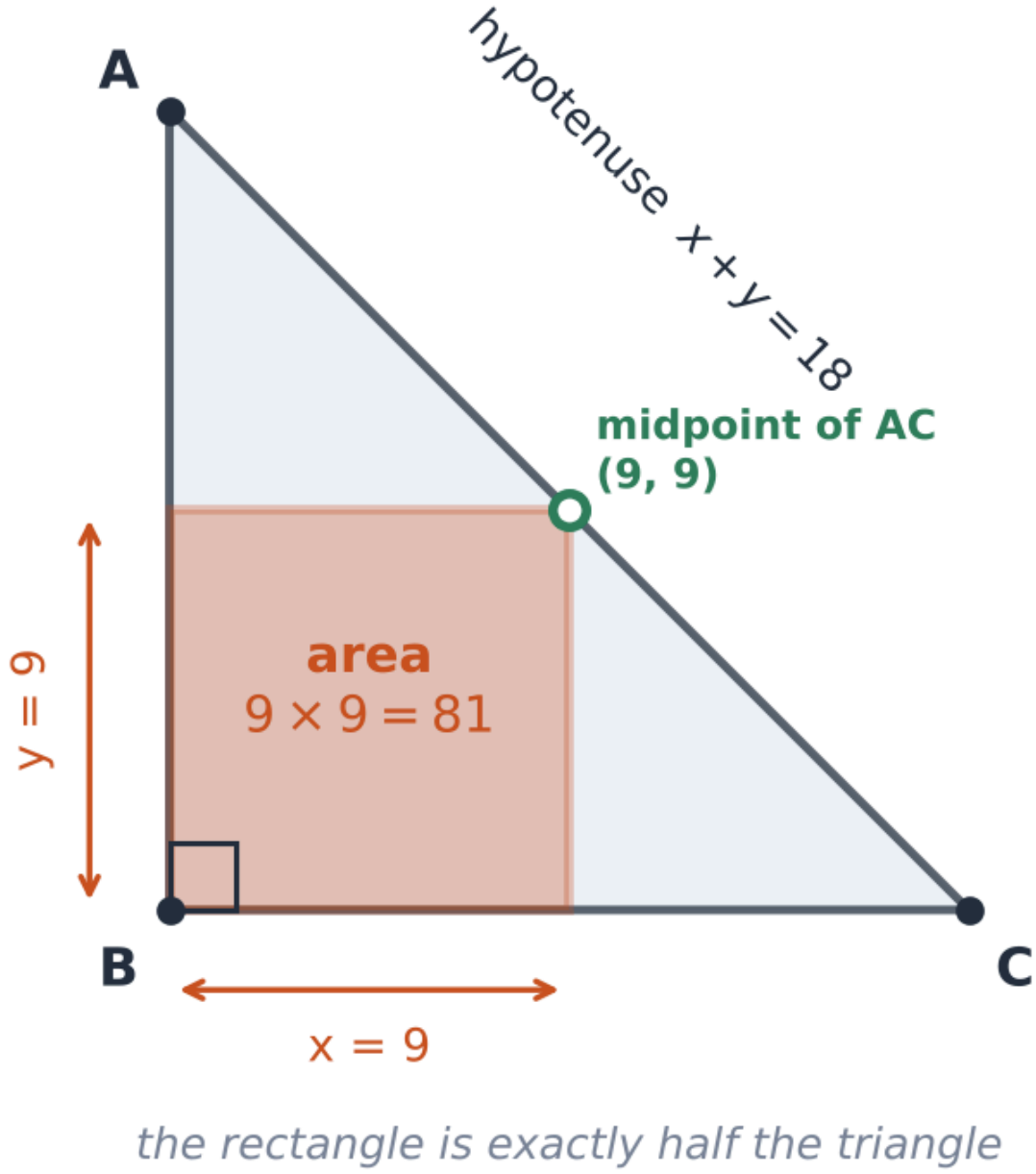
Step 2 — describe the rectangle. With B as one vertex and the sides along the legs, the rectangle has corners $(0,0)$, $(x,0)$, (x,y), $(0,y)$. For it to fit inside, the far corner (x,y) must lie on or below the hypotenuse:

$x + y \leq 18$

Step 3 — maximise the area. Area $= xy$ subject to $x + y \leq 18$. The maximum sits on the boundary $x + y = 18$, and for a fixed sum the product is largest when the two are equal (AM–GM):

$$\frac{x+y}{2} \geq \sqrt{xy} \Rightarrow xy \leq \left(\frac{18}{2}\right)^2 = 81$$

with equality at $x = y = 9$.



Answer: 81

Shortcut

Memorise the result. The largest rectangle inscribed in a triangle with a vertex at the right angle is the one whose far corner is the **midpoint of the hypotenuse**, and its area is exactly **half** the triangle's. Here the triangle is $\frac{1}{2}(18)(18) = 162$, so the rectangle is 81 — no calculus, no AM–GM, one halving.

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6 QA ARITHMETIC RATIO AND PROPORTION 3 /10

A fruit seller has oranges, apples and bananas in the ratio 3:6:7. If the number of oranges is a multiple of both 5 and 6, then the minimum number of fruits the seller has is _____

ANSWER 160

SOLUTION

Step 1 — introduce the multiplier. Let the counts be $3k$, $6k$ and $7k$ for a positive integer k. The total is

$3k + 6k + 7k = 16k$

Step 2 — apply the condition. The oranges, $3k$, must be a multiple of both 5 and 6, i.e. a multiple of $lcm\ (\ 5, 6\ )\ = 30$:

$30 \mid 3k\ \Rightarrow\ 10 \mid k$

Step 3 — take the smallest k. The least such k is 10, giving

$\text{oranges} = 30, \quad \text{apples} = 60, \quad \text{bananas} = 70, \quad \text{total} = 16\ (\ 10\ )\ = 160$

Check: 30 is divisible by 5 ✔ and by 6 ✔.

Answer: 160

Shortcut

Push the condition onto k. "$3k$ is a multiple of 30" is just "k is a multiple of 10". Minimum $k = 10$, total $= 16k = \mathbf{160}$. The common slip is to set the *total* to a multiple of 30 and answer 30 — but the condition is on the oranges alone.

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7 QA GEOMETRY AND MENSURATION COORDINATE GEOMETRY BASICS ●●●●●○○○○○ 5 /10

The number of pairs (x, y) of integers satisfying the inequality $|x - 5| + |y - 5| \leq 6$ is ____

ANSWER 85

SOLUTION

Step 1 — shift to the origin. Put $u = x - 5$ and $v = y - 5$. Since x, y are integers, so are u, v, and the condition becomes

$|u| + |v| \leq 6$

Shifting does not change how many lattice points there are.

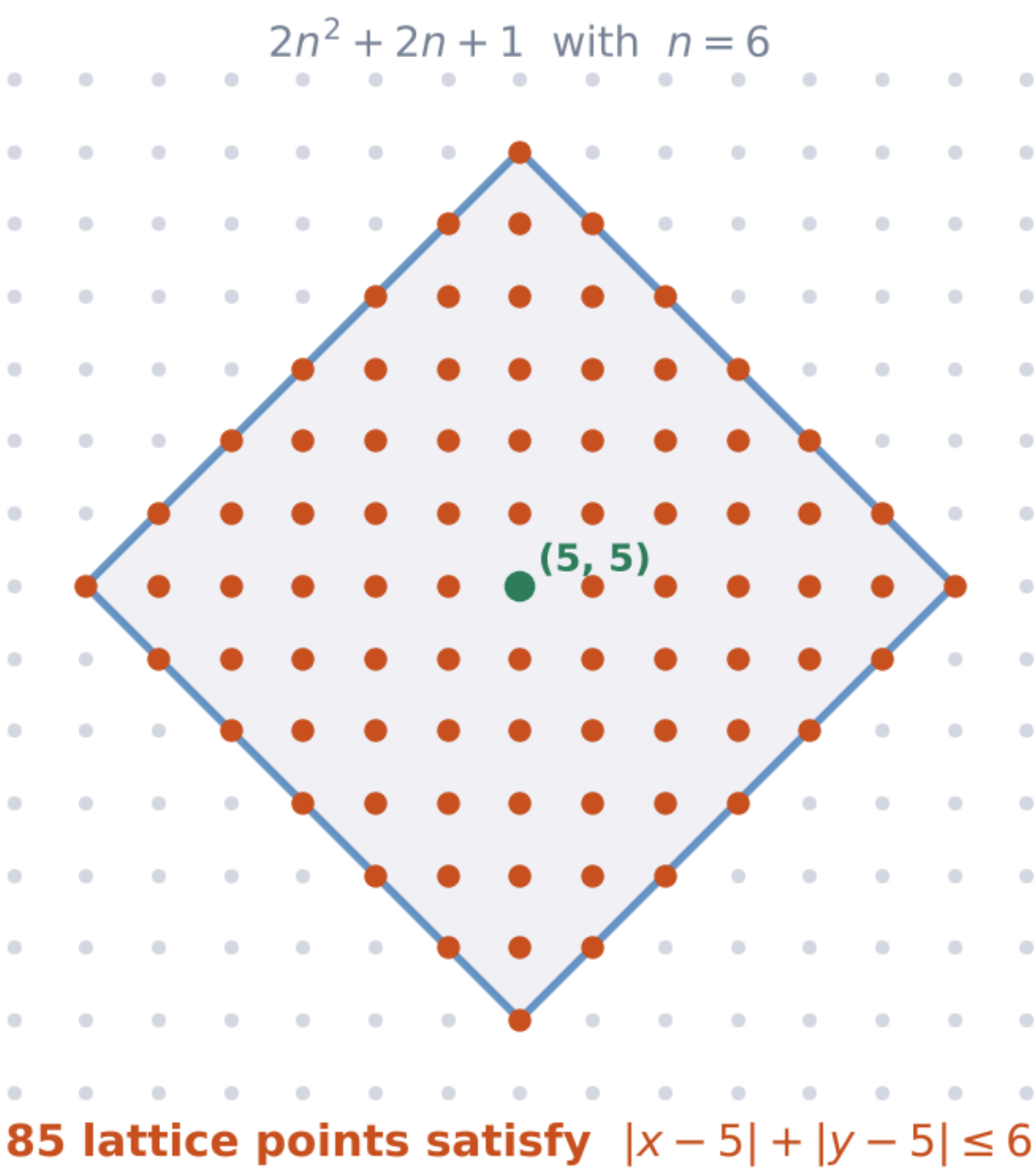
Step 2 — count column by column. Fix u with $|u| \leq 6$. Then $|v| \leq 6 - |u|$, which allows

$2\ (\ 6 - |u|\ )\ + 1$ values of v

Step 3 — add up.

$$\sum_{u\ =\ -6}^{6} [\ 2\ (\ 6 - |u|\ )\ + 1\ ]\ = 13 + 2 \sum_{u\ =\ 1}^{6} [\ 2\ (\ 6 - u\ )\ + 1\ ]$$

$$= 13 + 2\ (\ 11 + 9 + 7 + 5 + 3 + 1\ )\ = 13 + 2\ (\ 36\ )\ = 85$$



Answer: 85

Shortcut

Learn the diamond formula. The number of lattice points with $|u| + |v| \leq n$ is

$2n^2 + 2n + 1$

For $n = 6$: $2\,(\,36\,) + 12 + 1 = \mathbf{85}$. (Sanity check at $n = 1$: the formula gives 5 — the origin plus its four neighbours. ✔) The -5 shifts are pure decoration.

8 QA ARITHMETIC PERCENTAGE 3 /10

The price of a chocolate is increased by x% and then reduced by x%. The new price is 96.76% of the original price. Then x is ____

ANSWER 18

SOLUTION

Step 1 — write the successive changes. Starting from price P:

$$P \xrightarrow{+x\%} P\left(1+\frac{x}{100}\right) \xrightarrow{-x\%} P\left(1+\frac{x}{100}\right)\left(1-\frac{x}{100}\right)$$

Step 2 — use the difference of squares.

$$P\left(1-\frac{x^2}{10000}\right) = 0.9676\,P$$

Step 3 — solve.

$$\frac{x^2}{10000} = 1 - 0.9676 = 0.0324 \;\Rightarrow\; x^2 = 324 \;\Rightarrow\; x = 18$$

(The negative root is rejected since x is a percentage increase.)

Answer: 18

Shortcut

The net-change identity. An $x\%$ rise followed by an $x\%$ fall always leaves

$$-\frac{x^2}{100}\,\% \quad \text{net change.}$$

A drop to 96.76% is a net loss of 3.24%, so $\frac{x^2}{100} = 3.24 \Rightarrow x^2 = 324 \Rightarrow x = 18$. Recognising $324 = 18^2$ ends it in seconds.

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9 QA ALGEBRA FUNCTIONS 6 /10

Let f and g be two functions defined by $f(x) = |x + |x||$ and $g(x) = \frac{1}{x}$ for $x \neq 0$. If $f(a) + g(f(a)) = \frac{13}{6}$ for some real a, then the maximum possible value of $f(g(a))$ is ____

ANSWER 6

SOLUTION

Step 1 — simplify f. Split on the sign of x:

$$f(x) = |x + |x|| = \begin{cases} |2x| = 2x, & x \geq 0 \\ |x - x| = 0, & x < 0 \end{cases}$$

So $f(x) = 2x$ for $x \geq 0$ and 0 otherwise.

Step 2 — use the given equation. Write $t = f(a)$. Then $g(f(a)) = 1/t$, so

$$t + \frac{1}{t} = \frac{13}{6} \;\Rightarrow\; 6t^2 - 13t + 6 = 0 \;\Rightarrow\; (2t-3)(3t-2) = 0$$

$$t = \frac{3}{2} \quad \text{or} \quad t = \frac{2}{3}$$

Note $t \neq 0$, so $a > 0$ and $t = f(a) = 2a$.

Step 3 — recover a.

$$2a = \frac{3}{2} \Rightarrow a = \frac{3}{4}, \qquad 2a = \frac{2}{3} \Rightarrow a = \frac{1}{3}$$

Step 4 — evaluate $f(g(a)) = f(1/a)$. Both values of a are positive, so $1/a > 0$ and $f(1/a) = 2/a$:

$$a = \frac{3}{4} \Rightarrow \frac{2}{3/4} = \frac{8}{3}, \qquad a = \frac{1}{3} \Rightarrow \frac{2}{1/3} = 6$$

The maximum is 6.

Answer: 6

Shortcut

Two compressions. First, $|x + |x||$ is just $2x^+$ — twice the positive part. Second, $t + 1/t = \frac{13}{6}$ is the classic reciprocal pair $\frac{3}{2}, \frac{2}{3}$ (spot it from $13 = 9 + 4$ over 6). Then $f(g(a)) = 2/a = 4/t$, which is **largest when t is smallest**: $4 \div \frac{2}{3} = 6$. No need to compute both branches.

Refers to the DI set above.

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

10 DILR DATA INTERPRETATION TABLES 7 /10

The median age of an employee across the eight companies is ____

ANSWER 45

SOLUTION

The structure of this set. The eight companies form a *strictly increasing chain* of age blocks: every employee of A is younger than every employee of B, who are all younger than every employee of C, and so on. So if you lined up all 245 employees by age, they would come out **company by company, in order A, B, C, D, E, F, G, H** — with no interleaving anywhere.

Total headcount.

$$32 + 28 + 43 + 39 + 35 + 29 + 23 + 16 = 245$$

The median rule you need throughout. For n values in sorted order:

- n **odd**: the median is the $\frac{n+1}{2}$-th value.
- n **even**: the median is the average of the $\frac{n}{2}$-th and $\left(\frac{n}{2} + 1\right)$-th values.

Step 1 — find the median position. There are 245 employees — an odd number — so the median is the

$$\frac{245 + 1}{2} = 123\text{rd}$$

value in the sorted list.

Step 2 — use the chain to locate the 123rd person. Because the companies form a strictly increasing chain, the sorted list is simply A, then B, then C, and so on. Build the cumulative count:

Company	Count	Positions occupied
A	32	1 – 32
B	28	33 – 60
C	43	61 – 103
D	**39**	**104 – 142**
E	35	143 – 177
F	29	178 – 206
G	23	207 – 229
H	16	230 – 245

Position 123 falls inside **company D**.

Step 3 — which employee of D is it?

$123 - 103 = 20$

so it is D's **20th** employee by age.

Step 4 — recognise that this is D's own median. D has 39 employees — odd — so D's median is its

$$\frac{39+1}{2} = 20\text{th}$$

employee, which the table gives as 45.

The overall median *is* D's median, exactly.

Answer: 45

Shortcut

Cumulate, then land. 245 employees $\Rightarrow$ the 123rd value. Running totals $32, 60, 103, 142$ show 123 sits in **D**, at D's $123 - 103 = 20$th place — and 20 is precisely D's median position since D has 39 (odd) employees.

So the answer is just D's tabulated median, 45 — no construction of individual ages is needed. **Whenever the overall median position coincides with a company's own median position, the table hands you the answer directly.**

Refers to the DI set above.

11 DILR DATA INTERPRETATION TABLES 7 /10

In company F, the lowest possible sum of the ages of all employees is _____

ANSWER 1510

SOLUTION

The structure of this set. The eight companies form a *strictly increasing chain* of age blocks: every employee of A is younger than every employee of B, who are all younger than every employee of C, and so on. So if you lined up all 245 employees by age, they would come out **company by company, in order A, B, C, D, E, F, G, H** — with no interleaving anywhere.

Total headcount.

$$32 + 28 + 43 + 39 + 35 + 29 + 23 + 16 = 245$$

The median rule you need throughout. For n values in sorted order:

- n **odd**: the median is the $\frac{n+1}{2}$-th value.
- n **even**: the median is the average of the $\frac{n}{2}$-th and $\left(\frac{n}{2}+1\right)$-th values.

Step 1 — what F must satisfy. F has 29 employees (odd), so its median is the

$$\frac{29+1}{2} = 15\text{th}$$

employee, whose age is therefore exactly 54. Sorted, F looks like

$$\underbrace{f_1 \le \cdots \le f_{14}}_{\text{14 below}} \le \underbrace{54}_{\text{15th}} \le \underbrace{f_{16} \le \cdots \le f_{29}}_{\text{14 above}}$$

Step 2 — minimise the top 14. Each must be at least the median, so the cheapest choice is 54 each:

$$14 \times 54 = 756$$

Step 3 — minimise the bottom 14. These may be below 54, but every F employee must be **older than every E employee**. So we need $\min(F) > \max(E)$, and to push F's floor down we must push E's ceiling down.

E has 35 employees (odd) with median 49, i.e. its 18th employee is 49. Employees 18 through 35 are all ≥ 49, so $\max(E) \ge 49$. The smallest possible $\max(E)$ is therefore 49 — achieved by making all of E's employees exactly 49.

With $\max(E) = 49$ and integer ages,

$$\min(F) \ge 50$$

so the cheapest bottom 14 are all aged 50:

$$14 \times 50 = 700$$

Step 4 — add the three pieces.

$$700 + 54 + 756 = 1510$$

Step 5 — confirm the chain still holds. F's ages run 50 (×14), 54, 54 (×14). All exceed E's 49 ✔, and all are below G's employees, whose median is 59 and which can all be set to 59 or above ✔

Answer: 1510

Shortcut

Three blocks, each pushed to its floor.

$$\underbrace{14 \times 50}_{\text{below median}} + \underbrace{54}_{\text{median}} + \underbrace{14 \times 54}_{\text{above median}} = 700 + 54 + 756 = \mathbf{1510}$$

The only subtle number is the 50. It comes from E, not F: E's median of 49 means E's *oldest* cannot be pushed below 49, so F's *youngest* cannot drop below 50.

General rule for these chain-of-medians questions: to minimise a block, set everything at or above its median equal to the median, and everything below it equal to one more than the previous block's median.

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12 QA ALGEBRA LOGARITHMS ●●●●●○○○○○ 5 /10

If $4^{\log_2 x} - 4x + 9^{\log_3 y} - 16y + 68 = 0$, then $y - x$ equals _____

ANSWER 6

SOLUTION

Step 1 — clear the exponentials. Use $a^{\log_b c} = c^{\log_b a}$, or more directly:

$$4^{\log_2 x} = \left(2^2\right)^{\log_2 x} = 2^{2\log_2 x} = \left(2^{\log_2 x}\right)^2 = x^2$$

$$9^{\log_3 y} = \left(3^2\right)^{\log_3 y} = \left(3^{\log_3 y}\right)^2 = y^2$$

Step 2 — rewrite the equation.

$$x^2 - 4x + y^2 - 16y + 68 = 0$$

Step 3 — complete both squares.

$$(x^2 - 4x + 4) + (y^2 - 16y + 64) = 4 + 64 - 68 = 0$$

$$(x-2)^2 + (y-8)^2 = 0$$

Step 4 — a sum of two squares is zero only if both are zero.

$$x = 2, \qquad y = 8 \;\Rightarrow\; y - x = 6$$

Both are in the domain of the logarithms ($x, y > 0$) ✔

Answer: 6

Shortcut

Two reflexes. $4^{\log_2 x} = x^2$ and $9^{\log_3 y} = y^2$ — whenever the outer base is the square of the log base, you get the square of the argument. After that, a two-variable quadratic equal to zero with **no cross term** is always a sum of squares: force each bracket to vanish. $x = 2$, $y = 8$, so $y - x = 6$.

---

13 QA ARITHMETIC SIMPLE INTEREST ●●●○○○○○○○ 3 /10

Person A borrows Rs. 4000 from another person B for a duration of 4 years. He borrows a portion of it at 3% simple interest per annum, while the rest at 4% simple interest per annum. If B gets Rs. 520 as total interest, then the amount A borrowed at 3% per annum in Rs. is _____

ANSWER 3000

SOLUTION

Step 1 — name the unknown. Let Rs. x be lent at 3%; then Rs. $(4000 - x)$ is at 4%. Both run for 4 years.

Step 2 — write the simple interest. Using $SI = \frac{P \times R \times T}{100}$:

$$\frac{x \times 3 \times 4}{100} + \frac{(4000 - x) \times 4 \times 4}{100} = 520$$

Step 3 — simplify.

$12x + 16\,(\,4000 - x\,) = 52000$

$12x + 64000 - 16x = 52000 \;\Rightarrow\; -4x = -12000 \;\Rightarrow\; x = 3000$

Check. 3000 at 3% for 4 years $= 360$; 1000 at 4% for 4 years $= 160$; total $= 520$ ✔

Answer: Rs. 3000

Shortcut

Alligation on the rate. Over 4 years the total interest is Rs. 520 on Rs. 4000, an effective rate of

$\dfrac{520}{4000 \times 4} = 3.25\%$ per annum.

Now alligate 3% and 4% about 3.25%: the distances are 0.75 and 0.25, so the amounts are in the ratio $0.75 : 0.25 = 3 : 1$ in favour of the **3%** part. Hence $\frac{3}{4} \times 4000 = \mathbf{3000}$. Mental arithmetic, no equation.

---

14 QA GEOMETRY AND MENSURATION TRIANGLES ●●●●●○○○○○ 5 /10

The number of triangles with integer sides and with perimeter 15 is _____

ANSWER 7

SOLUTION

Step 1 — state the conditions. We need integers $a \le b \le c$ with

$a + b + c = 15 \qquad \text{and} \qquad a + b > c \;\; (\text{triangle inequality})$

Step 2 — bound the largest side. From $a + b > c$ and $a + b = 15 - c$:

$15 - c > c \;\Rightarrow\; c < 7.5 \;\Rightarrow\; c \le 7$

Also $c \ge \lceil 15/3 \rceil = 5$, since c is the largest of three numbers summing to 15.

Step 3 — list by c.

c	$a+b$	valid (a,b) with $a \le b \le c$	count
5	10	$(5,5)$	1
6	9	$(3,6)$, $(4,5)$	2
7	8	$(1,7)$, $(2,6)$, $(3,5)$, $(4,4)$	4

Total: $1 + 2 + 4 = 7$

The seven triangles are $(5,5,5)$, $(3,6,6)$, $(4,5,6)$, $(1,7,7)$, $(2,6,7)$, $(3,5,7)$, $(4,4,7)$.

Answer: 7

Shortcut

Use the standard formula. For an **odd** perimeter p, the number of incongruent integer-sided triangles is the nearest integer to

$\dfrac{(\,p+3\,)^{\,2}}{48}$

Here $\frac{18^2}{48} = \frac{324}{48} = 6.75 \to \mathbf{7}$. If you'd rather not memorise it, the "largest side $\leq \lfloor (p-1)/2 \rfloor = 7$" bound cuts the listing to three short rows.

---

15 QA MODERN MATHS MATRICES AND DETERMINANTS ●●●●●●●○○ 7 /10

If $A = \begin{bmatrix} x_1 & x_2 & 7 \\ y_1 & y_2 & y_3 \\ z_1 & 8 & 3 \end{bmatrix}$ is a matrix such that the sum of all three elements along any row, column or diagonal are equal to each other, then the value of determinant of A is _____

ANSWER 288

SOLUTION

This is a 3×3 **magic square** with three entries given: $a_{13} = 7$, $a_{32} = 8$, $a_{33} = 3$. Call the common sum s.

Step 1 — the anti-diagonal pins the centre. Row 3 gives $z_1 + 8 + 3 = s$, so $z_1 = s - 11$. The anti-diagonal $a_{13} + a_{22} + a_{31}$ gives

$7 + y_2 + (s - 11) = s \Rightarrow y_2 = 4$

(The centre of a magic square never depends on s once two entries on a through-line are known.)

Step 2 — work out the rest in terms of s.

- Column 3: $7 + y_3 + 3 = s \Rightarrow y_3 = s - 10$
- Main diagonal: $x_1 + 4 + 3 = s \Rightarrow x_1 = s - 7$
- Column 1: $x_1 + y_1 + z_1 = s \Rightarrow (s - 7) + y_1 + (s - 11) = s \Rightarrow y_1 = 18 - s$

Step 3 — row 2 fixes s.

$y_1 + y_2 + y_3 = (18 - s) + 4 + (s - 10) = 12$

The s terms cancel, leaving $12 = s$. **The magic sum is forced to be 12.**

Step 4 — fill in. $x_1 = 5$, $y_1 = 6$, $y_2 = 4$, $y_3 = 2$, $z_1 = 1$, and row 1 gives $x_2 = 12 - 5 - 7 = 0$:

$$A = \begin{bmatrix} 5 & 0 & 7 \\ 6 & 4 & 2 \\ 1 & 8 & 3 \end{bmatrix}$$

Check column 2: $0 + 4 + 8 = 12$ ✔

Step 5 — expand the determinant.

$|A| = 5(4 \cdot 3 - 2 \cdot 8) - 0(6 \cdot 3 - 2 \cdot 1) + 7(6 \cdot 8 - 4 \cdot 1)$

$= 5(-4) + 7(44) = -20 + 308 = 288$

Answer: 288

Shortcut

Two magic-square facts end this fast.

1. The centre is always $s/3$. Here the anti-diagonal $7 + y_2 + z_1 = s$ together with row 3 ($z_1 = s - 11$) gives $y_2 = 4$, so $s = 12$ immediately.
2. Once $s = 12$ the grid fills itself by subtraction — no simultaneous equations.

Then $\det = 288$. Note also that $288 = 2 \times 12^2$, an instance of the general identity $\det = 2s^2 \cdot \underline{^{(\text{something})}}$ for magic squares built this way — but filling the grid is faster than recalling it.

COMMON DATA SET

Eight companies – headcount and median age

The following table shows the number of employees and their median age in eight companies located in a district.

Company	Number of employees	Median age
A	32	24
B	28	30
C	43	39
D	39	45
E	35	49
F	29	54
G	23	59
H	16	63

It is known that the age of all employees are integers. It is known that the age of every employee in A is strictly less than the age of every employee in B, the age of every employee in B is strictly less than the age of every employee in C..... the age of every employee in G is strictly less than the age of every employee in H.

This set covers Q3, Q10, Q11.

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) →

Free login

SECTION 2

QA-MCQ

Quantitative Ability — MCQ

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

MCQ (incl. a 5-question LR set)

MOST ASKED HERE — Algebra **9** · Geometry And Mensuration **6** · Modern Maths **5** · Logical Reasoning **5** · Arithmetic **3**

16 QA GEOMETRY AND MENSURATION HEIGHTS AND DISTANCES ●●●○○○○○○○ 3 /10

The angle of elevation of the top of a pole from a point A on the ground is 30°. The angle of elevation changes to 45°, after moving 20 metres towards the base of the pole. Then the height of the pole, in metres, is

(A) 30

(B) $15\,(\sqrt{5}+1)$

(C) $20\,(\sqrt{3}+1)$

(D) $10\,(\sqrt{3}+1)$

ANSWER **(d)** $10\,(\sqrt{3}+1)$

SOLUTION

Step 1 — set up. Let the pole be PQ with foot Q and height h. Let B be the nearer point, A the farther one, with $AB = 20$.

$$\tan 30^\circ = \frac{h}{AQ} \Rightarrow AQ = h\sqrt{3}, \qquad \tan 45^\circ = \frac{h}{BQ} \Rightarrow BQ = h$$

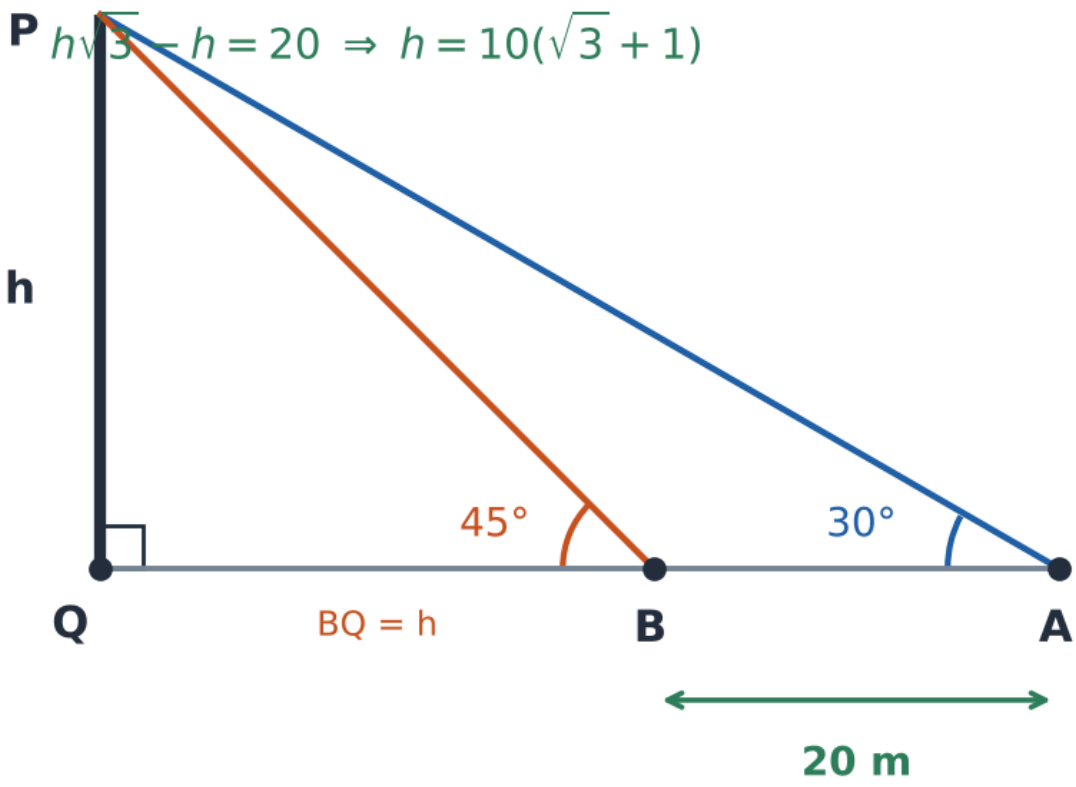
Step 2 — use the 20 m walk.

$$AQ - BQ = 20 \Rightarrow h\sqrt{3} - h = 20 \Rightarrow h\left(\sqrt{3}-1\right) = 20$$

Step 3 — rationalise.

$$h = \frac{20}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1} = \frac{20\,(\sqrt{3}+1)}{3-1} = 10\left(\sqrt{3}+1\right)$$

Numerically $h \approx 10\,(2.732) \approx 27.3$ m — comfortably more than the 20 m walked, as it must be.



Answer: (d) — $10\,(\sqrt{3}+1)$

Shortcut

The two-angle formula. When the elevation goes from θ_1 to θ_2 over a walk of d,

$$h = \frac{d}{\cot\theta_1 - \cot\theta_2}$$

Here $\frac{20}{\sqrt{3}-1} = 10\,(\sqrt{3}+1)$. Even faster: a 45° elevation means the remaining distance **equals** h, so the picture reduces to one equation on sight. Option (c) is the trap for anyone who forgets to rationalise and halve.

---

17 QA ALGEBRA INEQUALITIES AND MODULUS 2 /10

If $|x+1| + (y+2)^2 = 0$ and $ax - 3ay = 1$, then the value of a is

A $\frac{1}{5}$

B $\frac{1}{2}$

C $\frac{1}{7}$

D 2

ANSWER (a) $\frac{1}{5}$

SOLUTION

Step 1 — a sum of non-negatives equal to zero. Both $|x+1| \geq 0$ and $(y+2)^2 \geq 0$. Their sum is zero only if **each** is zero:

$|x+1| = 0 \Rightarrow x = -1$

$(y+2)^2 = 0 \Rightarrow y = -2$

Step 2 — substitute into the second equation.

$a(-1) - 3a(-2) = 1$

$-a + 6a = 1 \Rightarrow 5a = 1 \Rightarrow a = \frac{1}{5}$

Answer: (a) — $\frac{1}{5}$

Shortcut

"Non-negatives summing to zero" is a gift. It hands you both variables at once: $x = -1$, $y = -2$. Then $ax - 3ay = a(x - 3y) = a(-1 + 6) = 5a = 1$. Factor out a before substituting and the arithmetic is a single step: $a = 1/5$. Watch the double negative — dropping it gives $-7a = 1$ and tempts you toward option (c).

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18 QA ALGEBRA LOGARITHMS ●●●●○○○○○○ 4 /10

If $\log_4 x = a$ and $\log_{25} x = b$ then $\log_x 10$ is

(A) $\frac{a+b}{2(a-b)}$ (B) $\frac{a+b}{2}$

(C) $\frac{a+b}{2ab}$ (D) $\frac{a-b}{2ab}$

ANSWER (c) $\frac{a+b}{2ab}$

SOLUTION

Step 1 — convert to a common base. Write every log in base 10 (any fixed base works).

$$a = \log_4 x = \frac{\log x}{\log 4} = \frac{\log x}{2\log 2} \Rightarrow \log 2 = \frac{\log x}{2a}$$

$$b = \log_{25} x = \frac{\log x}{\log 25} = \frac{\log x}{2\log 5} \Rightarrow \log 5 = \frac{\log x}{2b}$$

Step 2 — build $\log 10$**.** Since $10 = 2 \times 5$,

$$\log 10 = \log 2 + \log 5 = \frac{\log x}{2a} + \frac{\log x}{2b} = \log x \cdot \frac{a+b}{2ab}$$

Step 3 — form the required log.

$$\log_x 10 = \frac{\log 10}{\log x} = \frac{a+b}{2ab}$$

Sanity check. Put $x = 100$: $a = \log_4 100 \approx 3.322$, $b = \log_{25} 100 \approx 1.431$. Then $\frac{a+b}{2ab} \approx \frac{4.753}{9.508} \approx 0.5$, and indeed $\log_{100} 10 = 0.5$ ✔

Answer: (c) — $\frac{a+b}{2ab}$

Shortcut

Flip to reciprocals. $\frac{1}{a} = \log_x 4 = 2\log_x 2$ and $\frac{1}{b} = \log_x 25 = 2\log_x 5$. Adding,

$$\frac{1}{a} + \frac{1}{b} = 2(\log_x 2 + \log_x 5) = 2\log_x 10$$

So $\log_x 10 = \frac{1}{2}\left(\frac{1}{a} + \frac{1}{b}\right) = \frac{a+b}{2ab}$ in one line. **Reciprocals of logs are the fast lane** whenever the unknown has x as its base.

---

19 QA GEOMETRY AND MENSURATION CIRCLES 8 /10

Let ABC be an equilateral triangle, with each side of length k. If a circle is drawn with diameter AB, then the area of the portion of the triangle lying inside the circle is

(A) $(3\sqrt{3}+\pi)\left(\frac{k^2}{6}\right)$

(B) $(3\sqrt{3}-\pi)\left(\frac{k^2}{24}\right)$

(C) $(3\sqrt{3}+\pi)\left(\frac{k^2}{24}\right)$

(D) $(3\sqrt{3}-\pi)\left(\frac{k^2}{6}\right)$

ANSWER **(c)** $(3\sqrt{3}+\pi)\left(\frac{k^2}{24}\right)$

SOLUTION

Step 1 — place the figure. Let $A(0,0)$, $B(k,0)$, $C\left(\frac{k}{2},\frac{k\sqrt{3}}{2}\right)$. The circle has centre $O\left(\frac{k}{2},0\right)$ and radius $\frac{k}{2}$.

Step 2 — find where the circle meets the sides. The circle on diameter AB passes through any point seeing AB at 90°. Let M be the **midpoint of** AC. Then $\angle AMB = 90^\circ$ (the median from B in an equilateral triangle is also the altitude), so M lies on the circle. By symmetry the midpoint N of BC lies on it too.

Step 3 — decompose the region. The part of the triangle inside the circle is

$$\underbrace{\triangle AMNB}_{\text{quadrilateral } AMNB} + \underbrace{\text{circular segment on } MN}_{\text{bulge beyond } MN}$$

It is cleaner to split as: **triangle** AOM **+ triangle** BON **+ circular sector** MON.

- $OA = OB = OM = ON = \frac{k}{2}$.
- $\angle AOM$: M is the midpoint of AC, so $OM \parallel BC$ (midsegment), giving $\angle AOM = 60^\circ$. Likewise $\angle BON = 60^\circ$, leaving $\angle MON = 60^\circ$.

Step 4 — compute each piece.

$$[\triangle AOM] = \frac{1}{2}\cdot\frac{k}{2}\cdot\frac{k}{2}\cdot\sin 60^\circ = \frac{k^2\sqrt{3}}{16}$$

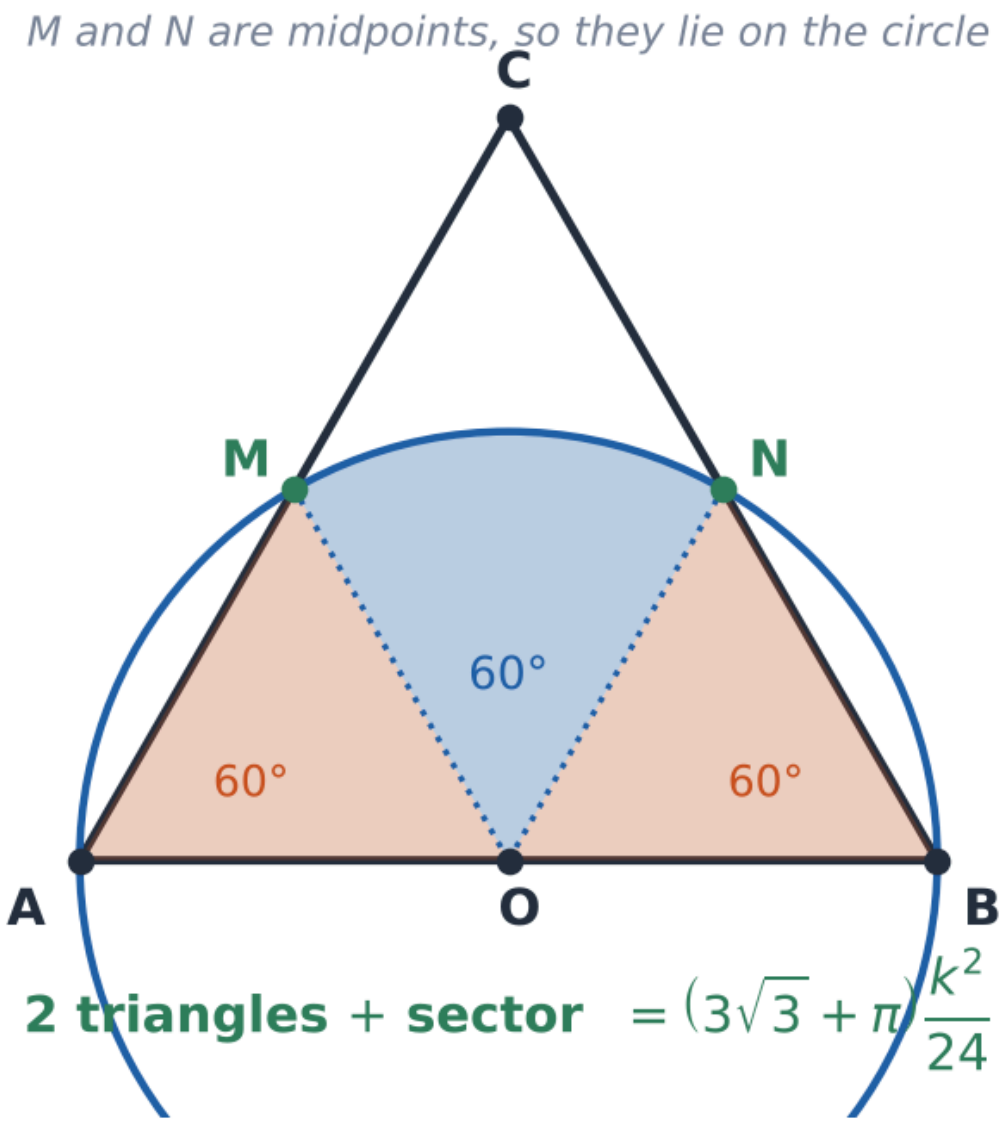
and the same for $[\triangle BON]$. The sector:

$$[\text{sector } MON] = \frac{60}{360}\pi\left(\frac{k}{2}\right)^2 = \frac{\pi k^2}{24}$$

Step 5 — add.

$$\text{Area} = 2\cdot\frac{k^2\sqrt{3}}{16} + \frac{\pi k^2}{24} = \frac{k^2\sqrt{3}}{8} + \frac{\pi k^2}{24} = \frac{3\sqrt{3}\,k^2 + \pi k^2}{24} = \left(3\sqrt{3}+\pi\right)\frac{k^2}{24}$$

Numerical check ($k=1$): $(5.196 + 3.142)/24 \approx 0.347$. A grid count over the figure gives 0.3474 ✔



Answer: (c) — $(3\sqrt{3}+\pi)\frac{k^2}{24}$

Shortcut

Eliminate, don't compute. The region is a decent chunk of the triangle, whose area is $\frac{\sqrt{3}}{4}k^2 \approx 0.433k^2$. Test each option at $k = 1$:

- $(3\sqrt{3}+\pi)/6 \approx 1.39$ — bigger than the whole triangle. Out.
- $(3\sqrt{3}-\pi)/24 \approx 0.086$ — far too small. Out.
- $(3\sqrt{3}-\pi)/6 \approx 0.342$ and $(3\sqrt{3}+\pi)/24 \approx 0.347$ — both plausible.

Now the clincher: the region is a **sector plus two triangles**, so the π term must be **added**, not subtracted. That leaves $(3\sqrt{3}+\pi)k^2/24$. **Sign of the π term is the whole question.**

Let ABC be a triangle with AB = AC and D be a point on BC such that ∠BAD = 30°. If E is a point on AC such that AD = AE, then ∠CDE equals

(A) 15° (B) 60°

(C) 30° (D) 10°

ANSWER **(a)** 15°

SOLUTION

Step 1 — name the base angles. Since $AB = AC$, let $\angle ABC = \angle ACB = \beta$. Then $\angle BAC = 180^\circ - 2\beta$.

Step 2 — split the apex. Given $\angle BAD = 30^\circ$,

$\angle DAC = \angle BAC - \angle BAD = (180^\circ - 2\beta) - 30^\circ = 150^\circ - 2\beta$

Step 3 — find $\angle ADC$ from triangle ADC.

$\angle ADC = 180^\circ - \angle DAC - \angle ACD = 180^\circ - (150^\circ - 2\beta) - \beta = 30^\circ + \beta$

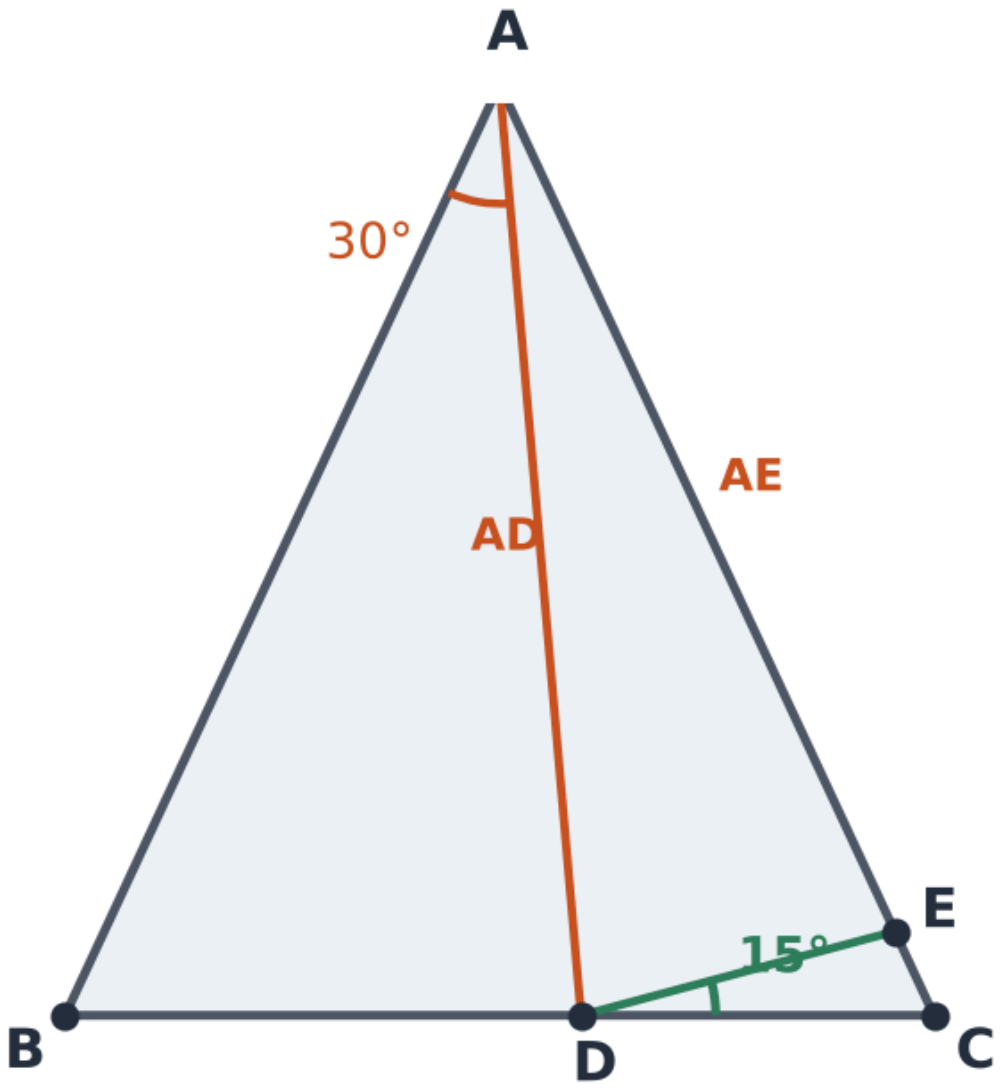
Step 4 — use $AD = AE$. Triangle ADE is isosceles with apex angle $\angle DAE = \angle DAC = 150^\circ - 2\beta$, so its base angles are

$$\angle ADE = \angle AED = \frac{180^\circ - (150^\circ - 2\beta)}{2} = \frac{30^\circ + 2\beta}{2} = 15^\circ + \beta$$

Step 5 — subtract.

$\angle CDE = \angle ADC - \angle ADE = (30^\circ + \beta) - (15^\circ + \beta) = 15^\circ$

The β cancels — the answer does not depend on the shape of the isosceles triangle at all.



AB = AC and AD = AE $\Rightarrow \angle CDE = \frac{1}{2}\angle BAD = 15^\circ$

the answer does not depend on the base angle

Answer: (a) — 15°

Shortcut

Learn the result: $\angle CDE = \frac{1}{2}\angle BAD$**.** Whenever $AB = AC$, D on BC, E on AC with $AD = AE$, the angle $\angle CDE$ is always **half** of $\angle BAD$, independent of the triangle's shape.

Since the answer is shape-independent, you may simply **pick a convenient triangle** — take $\beta = 60^\circ$ (equilateral), so $\angle BAC = 60^\circ$, $\angle DAC = 30^\circ$, $\angle ADC = 90^\circ$, $\angle ADE = 75^\circ$, and $\angle CDE = \mathbf{15}^\circ$. Thirty seconds, no algebra.

21 QA MODERN MATHS PROBABILITY 6 /10

If 5 boys and 3 girls randomly sit around a circular table, the probability that there will be at least one boy sitting between any two girls, is

A $\frac{2}{7}$

B $\frac{1}{7}$

C $\frac{1}{4}$

D $\frac{1}{3}$

ANSWER (a) $\frac{2}{7}$

SOLUTION

Reading the condition. "At least one boy between any two girls" means **no two girls are adjacent**.

Step 1 — total arrangements. Eight people around a circular table:

$(8-1)! = 7! = 5040$

Step 2 — favourable arrangements. Seat the boys first, then slot the girls into the gaps.

- Arrange the 5 boys in a circle: $(5-1)! = 4! = 24$ ways.
- Five boys create **5 gaps** between them. Choose 3 gaps for the 3 girls and order the girls:

${}^5P_3 = 5 \times 4 \times 3 = 60$

Placing at most one girl per gap guarantees no two girls are adjacent.

$\text{Favourable} = 24 \times 60 = 1440$

Step 3 — divide.

$$P = \frac{1440}{5040} = \frac{2}{7}$$

Answer: (a) — $\frac{2}{7}$

Shortcut

Gap method, then cancel early.

$$P = \frac{4! \times {}^5P_3}{7!} = \frac{4! \cdot 5 \cdot 4 \cdot 3}{7!}$$

Write $7! = 7 \cdot 6 \cdot 5!$ and note $4! \cdot 5 = 5!$, so

$$P = \frac{5! \cdot 12}{7 \cdot 6 \cdot 5!} = \frac{12}{42} = \mathbf{\frac{2}{7}}$$

The circular-gap rule: n people in a circle make exactly n gaps (not $n+1$ as in a row). Using $n+1$ is the single commonest error here and leads to $1/3$.

22 QA GEOMETRY AND MENSURATION TRIANGLES 7 /10

The side AB of a triangle ABC is c. The median BD is of length k. If ∠BDA = θ < 90°, then the area of triangle ABC is

(A) $\frac{k^2 \cos 2\theta}{2} + k \sin\theta\sqrt{\left(c^2 - k^2\cos^2\theta\right)}$

(B) $\frac{k^2 \sin 2\theta}{2} + k \sin\theta\sqrt{\left(c^2 - k^2\sin^2\theta\right)}$

(C) $\frac{k^2 \cos\theta}{4} - k \sin\theta\sqrt{\left(c^2 + k^2\sin^2\theta\right)}$

(D) $\frac{k^2 \cos 2\theta}{4} + k \sin\theta\sqrt{\left(c^2 - k^2\sin^2\theta\right)}$

ANSWER **(b)** $\frac{k^2 \sin 2\theta}{2} + k \sin\theta\sqrt{\left(c^2 - k^2\sin^2\theta\right)}$

SOLUTION

Step 1 — exploit the median. BD is the median to AC, so D is the **midpoint of** AC. A median splits a triangle into two of equal area:

$[\triangle ABC] = 2[\triangle ABD]$

Step 2 — work inside triangle ABD**.** Here $AB = c$, $BD = k$, $\angle BDA = \theta$, and AD is unknown. Apply the cosine rule at D:

$c^2 = AD^2 + k^2 - 2\,(AD)\,k\cos\theta$

$AD^2 - (2k\cos\theta)\,AD + \left(k^2 - c^2\right) = 0$

Step 3 — solve for AD**.**

$AD = k\cos\theta \pm \sqrt{k^2\cos^2\theta - k^2 + c^2} = k\cos\theta \pm \sqrt{c^2 - k^2\sin^2\theta}$

Since $AD > 0$ and $\theta < 90^\circ$, take the $+$ sign.

Step 4 — area of ABD**.** Using two sides and the included angle at D:

$[\triangle ABD] = \frac{1}{2}\cdot AD\cdot BD\cdot \sin\theta = \frac{1}{2}k\sin\theta\left(k\cos\theta + \sqrt{c^2 - k^2\sin^2\theta}\right)$

Step 5 — double it.

$[\triangle ABC] = k\sin\theta\left(k\cos\theta + \sqrt{c^2 - k^2\sin^2\theta}\right) = k^2\sin\theta\cos\theta + k\sin\theta\sqrt{c^2 - k^2\sin^2\theta}$

$= \frac{k^2\sin 2\theta}{2} + k\sin\theta\sqrt{c^2 - k^2\sin^2\theta}$

Answer: (b)

Shortcut

Don't derive — eliminate on structure. Two observations kill three options instantly:

1. Area must come from $\frac{1}{2}ab\sin C$, so the leading term carries $\sin\theta\cos\theta = \frac{1}{2}\sin 2\theta$ — **not** $\cos 2\theta$ and **not** a bare $\cos\theta$. That removes (a), (c) and (d).
2. The surd came from a discriminant $c^2 - k^2\sin^2\theta$; a $+k^2\sin^2\theta$ inside the root (option c) can never arise from the cosine rule here.

Only option (b) survives. **On "messy expression" questions, match the trigonometric *shape* rather than redoing the algebra.**

23 QA ALGEBRA LOGARITHMS 6 /10

Let $a = \frac{(\log_7 4)(\log_7 5 - \log_7 2)}{(\log_7 25)(\log_7 8 - \log_7 4)}$. Then the value of 5^a is

A $\frac{7}{2}$

B 5

C 8

D $\frac{5}{2}$

ANSWER (d) $\frac{5}{2}$

SOLUTION

Step 1 — abbreviate. Let $p = \log_7 2$ and $q = \log_7 5$. Then

$\log_7 4 = 2p, \qquad \log_7 8 = 3p, \qquad \log_7 25 = 2q$

Step 2 — substitute.

$$a = \frac{(2p)(q-p)}{(2q)(3p-2p)} = \frac{2p(q-p)}{2qp} = \frac{q-p}{q}$$

Step 3 — simplify.

$$a = 1 - \frac{p}{q} = 1 - \frac{\log_7 2}{\log_7 5} = 1 - \log_5 2$$

Step 4 — exponentiate.

$$5^a = 5^{1-\log_5 2} = \frac{5^1}{5^{\log_5 2}} = \frac{5}{2}$$

using $5^{\log_5 2} = 2$.

Answer: (d) — $\frac{5}{2}$

Shortcut

Collapse the differences first. $\log_7 5 - \log_7 2 = \log_7 \frac{5}{2}$ and $\log_7 8 - \log_7 4 = \log_7 2$. So

$$a = \frac{\log_7 4 \cdot \log_7 \frac{5}{2}}{\log_7 25 \cdot \log_7 2} = \frac{2\log_7 2 \cdot \log_7 \frac{5}{2}}{2\log_7 5 \cdot \log_7 2} = \frac{\log_7 \frac{5}{2}}{\log_7 5} = \log_5 \frac{5}{2}$$

Therefore $5^a = \frac{5}{2}$ — **the answer is sitting inside the logarithm.** Turning differences into quotients before anything else saves the whole middle of the solution.

24 QA ALGEBRA INEQUALITIES AND MODULUS 5 /10

For some non-zero real values of a, b and c, it is given that $\left|\frac{c}{a}\right| = 4$, $\left|\frac{a}{b}\right| = \frac{1}{3}$ and $\frac{b}{c} = -\frac{3}{4}$. If $ac > 0$, then $\left(\frac{b+c}{a}\right)$ equals

(A) 7 (B) -7

(C) -1 (D) 1

ANSWER **(d)** 1

SOLUTION

Step 1 — read off the magnitudes. Scale so that $|a| = 1$. Then

$$\left|\frac{c}{a}\right| = 4 \Rightarrow |c| = 4, \qquad \left|\frac{a}{b}\right| = \frac{1}{3} \Rightarrow |b| = 3$$

Consistency check with the third condition: $\left|\frac{b}{c}\right| = \frac{3}{4}$ ✔ matches $|b|/|c| = 3/4$.

Step 2 — fix the signs.

- $ac > 0$: a and c have the **same** sign.
- $\frac{b}{c} = -\frac{3}{4} < 0$: b and c have **opposite** signs.

Take $a = 1$ (the ratio asked for is sign-invariant under $a \to -a$, as all three of a, b, c flip together). Then $c = +4$ and $b = -3$.

Step 3 — evaluate.

$$\frac{b+c}{a} = \frac{-3+4}{1} = 1$$

Verify with $a = -1$: then $c = -4$, $b = 3$, and $\frac{3-4}{-1} = 1$ ✔ — the same value.

Answer: (d) — 1

Shortcut

Magnitudes then signs — never together. Set $|a| = 1$, read $|b| = 3$, $|c| = 4$ off the two modulus equations (the third one only confirms they are consistent). Now only $\frac{b}{c} < 0$ and $ac > 0$ matter: b is the odd one out, so b and c carry opposite signs while a matches c. That gives $\frac{b+c}{a} = \frac{-3+4}{1} = 1$. Options 7 and -7 are there for anyone who adds $|b| + |c|$ without the sign.

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

25 QA ALGEBRA QUADRATIC EQUATIONS 6 /10

The difference between the maximum real root and the minimum real root of the equation $\left(x^2-5\right)^4+\left(x^2-7\right)^4=16$ is

(A) $2\sqrt{5}$

(B) $2\sqrt{7}$

(C) $\sqrt{7}$

(D) $\sqrt{10}$

ANSWER **(b)** $2\sqrt{7}$

SOLUTION

Step 1 — centre the substitution. The two brackets, x^2-5 and x^2-7, are symmetric about x^2-6. Put

$u=x^2-6 \Rightarrow x^2-5=u+1, \qquad x^2-7=u-1$

Step 2 — expand using the symmetry. Odd powers cancel:

$(u+1)^4+(u-1)^4=2\left(u^4+6u^2+1\right)$

So the equation becomes

$2\left(u^4+6u^2+1\right)=16 \Rightarrow u^4+6u^2-7=0$

Step 3 — factorise as a quadratic in u^2.

$\left(u^2+7\right)\left(u^2-1\right)=0$

$u^2=-7$ is rejected (no real u), leaving $u^2=1$, i.e. $u=\pm 1$.

Step 4 — back-substitute.

- $u=1$: $x^2=7 \Rightarrow x=\pm\sqrt{7}$
- $u=-1$: $x^2=5 \Rightarrow x=\pm\sqrt{5}$

Step 5 — take the extremes. The real roots are $-\sqrt{7}, -\sqrt{5}, \sqrt{5}, \sqrt{7}$.

$\max-\min=\sqrt{7}-\left(-\sqrt{7}\right)=2\sqrt{7}$

Answer: (b) — $2\sqrt{7}$

Shortcut

Symmetry beats expansion. Whenever you see $(A)^n+(B)^n$ with A and B equidistant from something, substitute the midpoint. Here $u=x^2-6$ turns a quartic-in-disguise into $u^4+6u^2-7=0$, which factors on sight because $-7=7\times(-1)$.

Then the finish is pure structure: the root set is symmetric about 0, so **the required difference is just twice the largest root**, $2\sqrt{7}$. Option (c) $\sqrt{7}$ catches anyone who forgets the negative roots.

If θ is the angle between the pair of tangents drawn from the point $A\left(0, \frac{7}{2}\right)$ to the circle $x^2 + y^2 - 14x + 16y + 88 = 0$, then tan θ equals

(A) $\frac{5}{4}$

(B) $\frac{20}{21}$

(C) $\frac{2}{5}$

(D) $\frac{4}{5}$

ANSWER (b) $\frac{20}{21}$

SOLUTION

Step 1 — find the centre and radius. For $x^2 + y^2 + 2gx + 2fy + c = 0$, the centre is $(-g, -f)$ and $r = \sqrt{g^2 + f^2 - c}$. Here $2g = -14$, $2f = 16$, $c = 88$:

$$\text{Centre } C(7, -8), \qquad r = \sqrt{49 + 64 - 88} = \sqrt{25} = 5$$

Step 2 — distance from A to the centre.

$$d^2 = (0 - 7)^2 + \left(\frac{7}{2} + 8\right)^2 = 49 + \left(\frac{23}{2}\right)^2 = 49 + \frac{529}{4} = \frac{725}{4}$$

Step 3 — half-angle of the tangent pair. The tangent length is $\sqrt{d^2 - r^2}$ and

$$\tan\frac{\theta}{2} = \frac{r}{\sqrt{d^2 - r^2}} = \frac{5}{\sqrt{\frac{725}{4} - 25}} = \frac{5}{\sqrt{\frac{625}{4}}} = \frac{5}{\frac{25}{2}} = \frac{2}{5}$$

Step 4 — double the angle. With $t = \tan\frac{\theta}{2} = \frac{2}{5}$:

$$\tan\theta = \frac{2t}{1 - t^2} = \frac{\frac{4}{5}}{1 - \frac{4}{25}} = \frac{\frac{4}{5}}{\frac{21}{25}} = \frac{4}{5} \cdot \frac{25}{21} = \frac{20}{21}$$

Answer: (b) — $\frac{20}{21}$

Shortcut

Two formulas, in this order.

$$\tan\frac{\theta}{2} = \frac{r}{L} \quad \text{where } L = \sqrt{d^2 - r^2} \text{ is the tangent length;} \qquad \tan\theta = \frac{2t}{1 - t^2}$$

The numbers are engineered to be clean: $d^2 - r^2 = \frac{625}{4}$, so $L = \frac{25}{2}$ and $t = \frac{2}{5}$ exactly.

The trap is options (c) and (d): $\frac{2}{5}$ is $\tan\frac{\theta}{2}$ and $\frac{4}{5}$ is $2t$ — both are stages on the way, not the answer. **Whenever a tangent-pair question gives you a neat half-angle, the printed options will include it.**

27 QA NUMBER SYSTEM NUMBER OF DIGITS 5 /10

The numbers 2^{2024} and 5^{2024} are expanded and their digits are written out consecutively on one page. The total number of digits written on the page is

(A) 1987
(B) 2025
(C) 2065
(D) 2000

ANSWER **(b)** 2025

SOLUTION

Step 1 — the digit-count formula. For a positive integer N,

$$\text{number of digits} = \lfloor \log_{10} N \rfloor + 1$$

Step 2 — apply to both numbers.

$$D_1 = \lfloor 2024 \log_{10} 2 \rfloor + 1, \qquad D_2 = \lfloor 2024 \log_{10} 5 \rfloor + 1$$

Step 3 — use the key identity.

$$2024 \log_{10} 2 + 2024 \log_{10} 5 = 2024 \left(\log_{10} 2 + \log_{10} 5 \right) = 2024 \log_{10} 10 = 2024$$

So the two quantities inside the floors are **non-integers summing to exactly 2024** (neither is an integer because $\log_{10} 2$ is irrational). For such a pair,

$$\lfloor \alpha \rfloor + \lfloor 2024 - \alpha \rfloor = 2024 - 1 = 2023$$

Step 4 — total.

$$D_1 + D_2 = 2023 + 1 + 1 = 2025$$

Sanity check with a small case. $2^3 = 8$ (1 digit), $5^3 = 125$ (3 digits); total $4 = 3 + 1$ ✔

Answer: (b) — 2025

Shortcut

Memorise: $d(2^n) + d(5^n) = n + 1$.

The reason is one line — $2^n \times 5^n = 10^n$, and multiplying two numbers whose product is a power of ten always gives digit counts adding to $n + 1$. So the answer is $2024 + 1 = \mathbf{2025}$, with **no logarithm tables and no computation at all**. Option (d) 2000 and (a) 1987 exist purely to reward guessing-by-size.

28 QA ARITHMETIC BOATS AND STREAMS 3 /10

A boat goes 96 km upstream in 8 hours and covers the same distance moving downstream in 6 hours. On the next day boat starts from point A, goes downstream for 1 hour, then upstream for 1 hour and repeats this four more time that is, 5 upstream and 5 downstream journeys. Then the boat would be

(A) 22.5 km downstream of A
(B) 15 km downstream of A
(C) 12.5 km downstream of A
(D) **20 km downstream of A**

ANSWER **(d) 20 km downstream of A**

SOLUTION

Step 1 — get the two effective speeds. Read them straight off the first sentence; you never need the boat's own speed or the stream's.

$$\text{Upstream speed} = \frac{96}{8} = 12 \text{ km/h}, \qquad \text{Downstream speed} = \frac{96}{6} = 16 \text{ km/h}$$

Step 2 — one cycle. Each cycle is 1 hour downstream then 1 hour upstream:

$+16 - 12 = +4$ km (net displacement downstream)

Step 3 — five cycles. The boat completes 5 downstream hours and 5 upstream hours:

$5 \times 16 - 5 \times 12 = 80 - 60 = 20$ km downstream

Answer: (d) — 20 km downstream of A

Shortcut

Net drift per cycle $\times$ number of cycles. A one-hour-each-way cycle displaces the boat by $(\text{down} - \text{up}) = 16 - 12 = 4$ km downstream, and there are 5 cycles: $5 \times 4 = \mathbf{20}$ km.

The decisive step is arithmetic, not method: $96/6 = 16$, **not 18**. Reading it as 18 gives $5\,(18 - 12) = 30$, which is not even an option — a useful signal that you have mis-divided. Options (a)–(c) are what you get from 4, 3 or 2.5 cycles.

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29 QA GEOMETRY AND MENSURATION CIRCLES 4 /10

If the shortest distance of a given point to a given circle is 4 cm and the longest distance is 9 cm, then the radius of the circle is

(A) **2.5 cm or 6.5 cm.**
(B) 6.5 cm
(C) 5 cm or 13 cm
(D) 2.5 cm

ANSWER **(a) 2.5 cm or 6.5 cm.**

SOLUTION

The question does **not** say whether the point lies inside or outside the circle, so both cases must be considered. Let the radius be r and the distance from the point to the centre be d.

Case 1 — the point is outside. The nearest point of the circle is toward the centre, the farthest is beyond it:

$d - r = 4, \qquad d + r = 9$

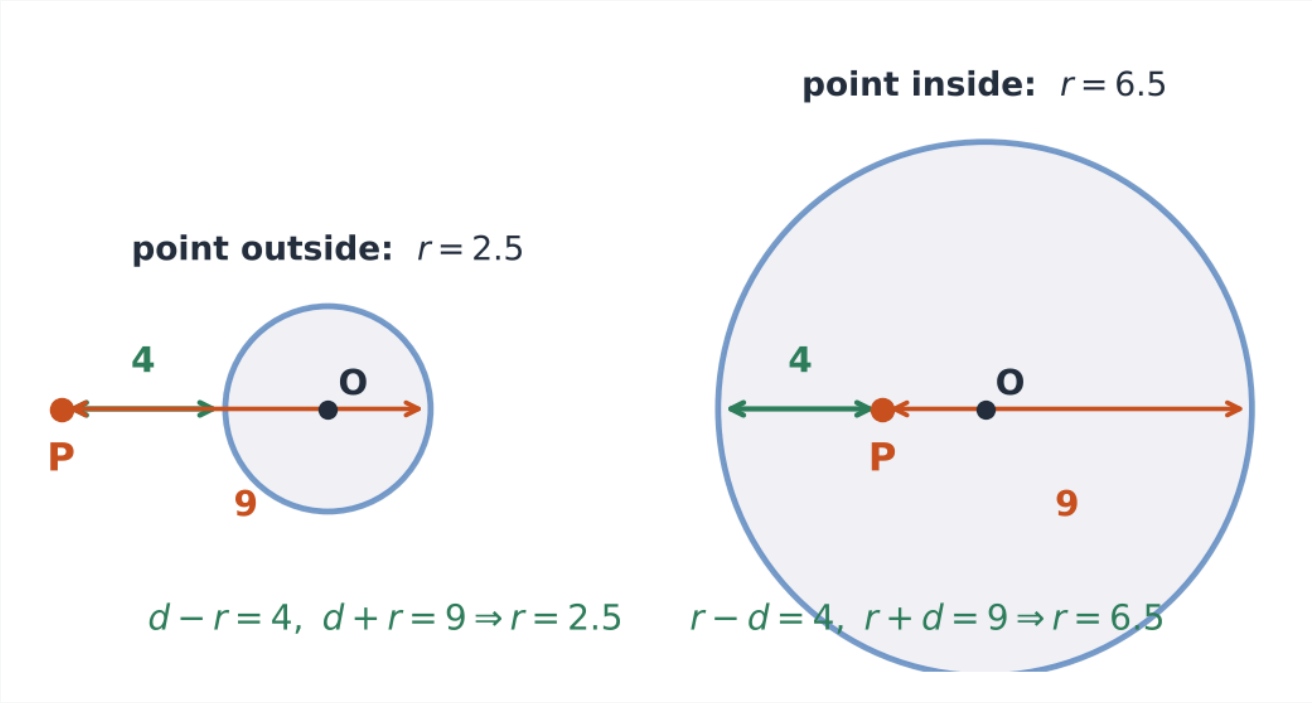
Subtracting: $2r = 5 \Rightarrow r = 2.5$, and $d = 6.5$. Check $d > r$ ✔ (consistent: the point really is outside).

Case 2 — the point is inside. Now the shortest and longest distances are measured outward in opposite directions:

$r - d = 4, \qquad r + d = 9$

Adding: $2r = 13 \Rightarrow r = 6.5$, and $d = 2.5$. Check $d < r$ ✔ (consistent: the point really is inside).

Both cases are self-consistent, so **both radii are possible**.



Answer: (a) — 2.5 cm or 6.5 cm

Shortcut

Add and subtract — you get both answers at once.

$\text{Sum} = 9 + 4 = 13, \qquad \text{Difference} = 9 - 4 = 5$

Then r is **half of one of them**: $\frac{13}{2} = 6.5$ (point inside) or $\frac{5}{2} = 2.5$ (point outside), and d is half of the other.

The exam skill here is noticing the ambiguity, not the algebra. Any option offering a single value (b) or (d) is incomplete, and (c) just forgets to halve. **When a geometry question withholds "inside" or "outside", expect a two-answer option.**

30 QA MODERN MATHS SET THEORY 2 /10

In a survey of 500 people, it was found that 250 owned a 4-wheeler but not a 2-wheeler, 100 owned a 2-wheeler but not a 4-wheeler, and 100 owned neither a 4-wheeler nor a 2-wheeler. Then the number of people who owned both is

(A) 75
(B) 60
(C) **50**
(D) 100

ANSWER (c) 50

SOLUTION

Step 1 — note that the given regions are disjoint. Read the wording carefully: "4-wheeler **but not** a 2-wheeler" and "2-wheeler **but not** a 4-wheeler" are the two *exclusive* regions, and "neither" is outside both circles. These three never overlap, and together with "both" they account for everyone.

Step 2 — add up the four disjoint regions.

$$\underbrace{250}_{\text{only 4W}} + \underbrace{100}_{\text{only 2W}} + \underbrace{100}_{\text{neither}} + \underbrace{x}_{\text{both}} = 500$$

Step 3 — solve.

$$450 + x = 500 \;\Rightarrow\; x = 50$$

Answer: (c) — 50

Shortcut

Four boxes, one subtraction. A two-set Venn diagram has exactly four regions: only-A, only-B, both, neither. When the question hands you three of them, the fourth is just $500 - (250 + 100 + 100) = \mathbf{50}$.

The only real trap is misreading "250 owned a 4-wheeler" as the *total* 4-wheeler count. It says "but not a 2-wheeler", so it is already the exclusive region — no inclusion–exclusion formula is needed at all. Taking it as a total gives 100, which is option (d).

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31 QA ALGEBRA PROGRESSIONS 7 /10

The sum of a given infinite geometric progression is 80 and the sum of its first two terms is 35. Then the value of n for which the sum of its first n terms is closest to 100, is

(A) 6
(B) **5**
(C) 7
(D) 4

ANSWER (b) 5

SOLUTION

Step 1 — spot the warning sign. The infinite sum is 80, yet we are asked when a partial sum is near 100. A partial sum can only exceed the limit if the terms **alternate in sign**, so expect $r < 0$.

Step 2 — set up.

$$\frac{a}{1-r} = 80, \qquad a + ar = a(1+r) = 35$$

From the first, $a = 80\,(\,1-r\,)$. Substituting:

$$80\,(\,1-r\,)\,(\,1+r\,) = 35 \;\Rightarrow\; 80\,(\,1-r^2\,) = 35 \;\Rightarrow\; 1-r^2 = \frac{7}{16}$$

$$r^2 = \frac{9}{16} \;\Rightarrow\; r = \pm\frac{3}{4}$$

Step 3 — reject $r = +\frac{3}{4}$**.** It gives $a = 20$ and $S_n = 80\left(1-\left(\frac{3}{4}\right)^n\right) < 80$ always — never close to 100. So

$$r = -\frac{3}{4}, \qquad a = 80\left(1+\frac{3}{4}\right) = 140$$

Step 4 — write the partial sums.

$$S_n = \frac{a\,(\,1-r^n\,)}{1-r} = \frac{140\left(1-\left(-\frac{3}{4}\right)^n\right)}{\frac{7}{4}} = 80\left(1-\left(-\frac{3}{4}\right)^n\right)$$

Step 5 — tabulate. Odd n overshoots, even n undershoots.

n	1	2	3	4	5	6	7
S_n	140	35	113.75	54.69	**98.98**	65.80	110.68
$\lvert S_n - 100\rvert$	40	65	13.75	45.31	**1.02**	34.20	10.68

Answer: (b) — $n = 5$

Shortcut

Let the structure choose the sign. "Partial sum near 100 when the infinite sum is 80" can only happen with $r < 0$ — that single observation removes half the work.

After that, $S_n = 80\left(1-\left(-\frac{3}{4}\right)^n\right)$ means the partial sums **oscillate around 80**, overshooting on odd n and converging. Since you need a value near 100, only **odd** n qualifies: test $n = 3, 5, 7$ and nothing else. $n = 5$ lands at 98.98 — within 1. **Three evaluations instead of seven.**

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32 QA MODERN MATHS PERMUTATION AND COMBINATION ●●●●●●●●●○ 9 /10

Let n be the number of ways in which 20 identical balloons can be distributed among 5 girls and 3 boys such that everyone gets at least one balloon and no girl gets fewer balloons than a boy does. Then

A $8000 \le n < 9000$

B $7000 \le n < 8000$

C $9000 \le n < 10000$

D $6000 \le n < 7000$

ANSWER **(a)** $8000 \le n < 9000$

SOLUTION

This question was dropped by IIM Indore. The official answer key marks it with an asterisk: the institute accepted a candidate objection, acknowledged that **none of the four options is correct**, and awarded **+4 to every test taker**. The working below shows why.

Step 1 — formalise the condition. "No girl gets fewer balloons than a boy does" means every girl's count is at least every boy's count:

$$\min\,(\,\text{girls}\,) \;\ge\; \max\,(\,\text{boys}\,)$$

Step 2 — count by exhaustion. Let the girls receive $g_1, \ldots, g_5 \ge 1$ and the boys $b_1, b_2, b_3 \ge 1$, with

$$\sum g_i + \sum b_j = 20, \qquad \min g_i \ge \max b_j$$

Enumerating every ordered pair of compositions subject to that constraint gives

$n = 2901$

Step 3 — compare with the options. 2901 lies below every printed range — the smallest on offer starts at 6000. Hence no option is correct.

Why the options are so far out. A plausible intended reading drops the "$\min \geq \max$" restriction, giving the plain positive-composition count

$$\binom{19}{7} = 50388$$

which is larger than every option too. Whatever the setter intended, the four ranges do not match any natural reading, which is precisely what the objection established.

Answer: Officially cancelled — all candidates awarded full marks. (The marked option in the published key is option (a), but it is not mathematically correct.)

Shortcut

Know this one as a "free 4 marks" question. In the real exam the right move was to attempt it (there was no penalty once it was cancelled) or skip it quickly — the balloon-with-ordering constraint is a 4–5 minute problem whose options do not fit.

The transferable lesson: when a counting question's options cluster in a narrow band far from a quick estimate, sanity-check with a crude bound before investing time. Here even the unrestricted count $\binom{19}{7} = 50,388$ overshoots every option, which should trigger suspicion within 30 seconds.

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33 QA ALGEBRA EXPONENTS AND INDICES ●●●●○○○○○○ 4 /10

The greatest number among 2^{300}, 3^{200}, 4^{100}, $2^{100} + 3^{100}$ is

(A) 3^{200}
(B) $2^{100} + 3^{100}$
(C) 4^{100}
(D) 2^{300}

ANSWER (a) 3^{200}

SOLUTION

Step 1 — put everything over a common exponent of 100. This is the whole technique.

$2^{300} = \left(2^3\right)^{100} = 8^{100}$

$3^{200} = \left(3^2\right)^{100} = 9^{100}$

$4^{100} = 4^{100}$

Step 2 — compare the first three. With the same exponent, the larger base wins:

$4^{100} < 8^{100} < 9^{100}$

Step 3 — handle the sum. Bound it above:

$2^{100} + 3^{100} < 3^{100} + 3^{100} = 2 \cdot 3^{100}$

and since $3^{200} = 3^{100} \cdot 3^{100}$ with 3^{100} astronomically larger than 2,

$2^{100} + 3^{100} < 2 \cdot 3^{100} \lll 3^{100} \cdot 3^{100} = 3^{200}$

So the sum is nowhere near the largest.

Answer: (a) — 3^{200}

Shortcut

Force a common exponent, then read off the base. $\gcd\ (\ 300, 200, 100\ )\ = 100$, so rewrite as 8^{100}, 9^{100}, 4^{100} — and $9^{100} = 3^{200}$ wins immediately.

Dismiss the sum on sight: a *sum* of two 100th powers can never compete with a *product* of two of them. More generally, **adding exponentials is negligible beside multiplying them** — the sum is bounded by twice the larger term, while 3^{200} is 3^{100} *times* it.

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

34 QA MODERN MATHS PERMUTATION AND COMBINATION 4 /10

The number of values of x for which ${}^{17-x}C_{3x+1}$ is defined as an integer is

(A) 5 (B) 6

(C) 2 (D) 4

ANSWER (a) 5

SOLUTION

Step 1 — state when ${}^{n}C_{r}$ is defined. We need

$n \geq 0, \qquad r \geq 0, \qquad r \leq n$

with n and r non-negative integers. Here $n = 17 - x$ and $r = 3x + 1$, so x must be an integer.

Step 2 — write the three inequalities.

$17 - x \geq 0 \ \Rightarrow\ x \leq 17$

$3x + 1 \geq 0 \ \Rightarrow\ x \geq -\frac{1}{3} \ \Rightarrow\ x \geq 0 \ \ (\ x \text{ integer}\ )$

$3x + 1 \leq 17 - x \ \Rightarrow\ 4x \leq 16 \ \Rightarrow\ x \leq 4$

Step 3 — intersect. The binding constraints are $0 \leq x \leq 4$:

$x \in \{0, 1, 2, 3, 4\}$

Step 4 — verify each.

x	$n = 17 - x$	$r = 3x + 1$	${}^{n}C_{r}$
0	17	1	${}^{17}C_{1}$ ✔
1	16	4	${}^{16}C_{4}$ ✔
2	15	7	${}^{15}C_{7}$ ✔
3	14	10	${}^{14}C_{10}$ ✔
4	13	13	${}^{13}C_{13}$ ✔

Answer: (a) — 5

Shortcut

Only one inequality does any work. $r \geq 0$ and $n \geq 0$ are nearly free; the binding condition is always

$r \le n \;\Rightarrow\; 3x+1 \le 17-x \;\Rightarrow\; x \le 4$

Combined with $x \ge 0$ that is $\{0,1,2,3,4\}$ — count **5**.

Two habitual slips: forgetting that $x=0$ is allowed (giving 4, option d), and forgetting $r \le n$ altogether (giving 18 values). **Check the endpoints explicitly** — here $x=4$ gives ${}^{13}C_{13}=1$, which is perfectly legitimate.

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35 QA MODERN MATHS PERMUTATION AND COMBINATION ●●●●○○○○○○ 4 /10

The number of solutions of the equation $x_1+x_2+x_3+x_4=50$, where $x_1,\ x_2,\ x_3,\ x_4$ are integers with $x_1 \ge 1,\ x_2 \ge 2,\ x_3 \ge 0,\ x_4 \ge 0$ is

A **19600**
B 19200
C 20200
D 18400

ANSWER **(a) 19600**

SOLUTION

Step 1 — shift each variable to a zero floor. Define

$y_1 = x_1 - 1 \ge 0, \qquad y_2 = x_2 - 2 \ge 0, \qquad y_3 = x_3 \ge 0, \qquad y_4 = x_4 \ge 0$

Step 2 — rewrite the equation.

$(y_1+1)+(y_2+2)+y_3+y_4=50 \;\Rightarrow\; y_1+y_2+y_3+y_4=47$

Step 3 — apply stars and bars. The number of non-negative integer solutions of $y_1+\cdots+y_k=N$ is $\binom{N+k-1}{k-1}$. With $N=47$, $k=4$:

$$\binom{47+3}{3}=\binom{50}{3}$$

Step 4 — evaluate.

$$\binom{50}{3}=\frac{50\times49\times48}{6}=\frac{117600}{6}=19600$$

Answer: (a) — 19600

Shortcut

Subtract the floors first, then one formula. The lower bounds cost $1+2+0+0=3$, so the problem becomes $y_1+y_2+y_3+y_4=47$ with all $y_i \ge 0$, giving $\binom{50}{3}$.

Fast evaluation: $\frac{50\cdot49\cdot48}{6}$ — cancel $48/6=8$ first, then $50\times49\times8=19600$. **Always cancel before multiplying**; it keeps every intermediate under three digits.

Note that $\binom{50}{3}$ is a number worth recognising, as it recurs across IPMAT and CAT papers.

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36 QA ARITHMETIC COMPOUND INTEREST 5 /10

Sagarika divides her savings of 10000 rupees to invest across two schemes A and B. Scheme A offers an interest rate of 10% per annum, compounded half-yearly, while scheme B offers a simple interest rate of 12% per annum. If at the end of first year, the value of her investment in scheme B exceeds the value of her investment in scheme A by 2310 rupees, then the total interest, in rupees, earned by Sagarika during the first year of investment is

(A) 1100
(B) **1130**
(C) 1111
(D) 1000

ANSWER **(b) 1130**

SOLUTION

Step 1 — convert scheme A to its half-yearly terms. 10% per annum compounded half-yearly means 5% per half-year for 2 periods. If Rs. x goes into A, its value after one year is

$$x\,(1.05)^2 = 1.1025\,x$$

Step 2 — scheme B. The remaining Rs. $(10000 - x)$ at 12% simple interest for one year is worth

$$(10000 - x)\,(1.12)$$

Step 3 — use the given gap.

$$(10000 - x)\,(1.12) - 1.1025x = 2310$$
$$11200 - 1.12x - 1.1025x = 2310$$
$$2.2225x = 8890 \;\Rightarrow\; x = 4000$$

So Rs. 4000 in A and Rs. 6000 in B.

Step 4 — compute each interest.

$$\text{A: } 4000 \times 0.1025 = 410, \qquad \text{B: } 6000 \times 0.12 = 720$$
$$\text{Total} = 410 + 720 = 1130$$

Check: values are 4410 and 6720; difference $= 2310$ ✔

Answer: (b) — 1130

Shortcut

Memorise the effective rate. 10% compounded half-yearly is exactly 10.25% **effective** for one year — that single number replaces the whole $(1.05)^2$ computation.

Then the split follows from a clean subtraction:

$$1.12\,(10000 - x) - 1.1025x = 2310 \;\Rightarrow\; x = 4000$$

and the total interest is $410 + 720 = \mathbf{1130}$.

Estimate first if time is short: the whole 10000 at 12% would give 1200, and shifting part of it to a 10.25% scheme pulls the total a little below that. Only option (b) sits just under 1200 in a plausible way.

37 QA ARITHMETIC PERCENTAGE 7 /10

A fruit seller had a certain number of apples, bananas and oranges at the start of the day. The number of bananas was 10 more than the number of apples, and the total number of bananas and apples was a multiple of 11. She was able to sell 70% of apples, 60% of bananas, and 50% of oranges during the day. If she was able to sell 55% of the fruits she had at the start of the day, then the minimum number of oranges she had at the start of the day was

(A) 220
(B) 190
(C) 210
(D) 180

ANSWER (c) 210

SOLUTION

Step 1 — name the quantities. Let apples $= a$, so bananas $= a + 10$, and oranges $= r$.

Step 2 — write the "55% overall" condition.

$0.7a + 0.6\,(\,a + 10\,) + 0.5r = 0.55\,(\,a + \,(\,a + 10\,) + r\,)$

Step 3 — expand and simplify.

$1.3a + 6 + 0.5r = 0.55\,(\,2a + 10 + r\,) = 1.1a + 5.5 + 0.55r$

$0.2a + 0.5 = 0.05r \;\Rightarrow\; r = 4a + 10$

Step 4 — apply the divisibility condition. $a + \,(\,a + 10\,) = 2a + 10$ must be a multiple of 11:

$2a + 10 \equiv 0\;(\,mod\,11\,) \;\Rightarrow\; 2a \equiv 1\;(\,mod\,11\,) \;\Rightarrow\; a \equiv 6\;(\,mod\,11\,)$

(since $2 \times 6 = 12 \equiv 1$).

Step 5 — require whole fruits sold. 70% of a must be a whole number, so $10 \mid a$. (Then 60% of $a + 10$ and 50% of $r = 4a + 10$ are automatically integers.)

Step 6 — combine. We need $a \equiv 0\;(\,mod\,10\,)$ and $a \equiv 6\;(\,mod\,11\,)$. Testing $a = 10, 20, \ldots$: $a = 50$ gives

$50 = 4\,(\,11\,) + 6$ ✔

$r = 4\,(\,50\,) + 10 = 210$

Check: apples 50, bananas 60 (sum $110 = 11 \times 10$ ✔), oranges 210; total 320. Sold $= 35 + 36 + 105 = 176 = 0.55 \times 320$ ✔

Answer: (c) — 210

Shortcut

Reduce to one linear relation, then use the options. The weighted-average condition collapses to the clean $r = 4a + 10$

Now **work backwards from the options** rather than solving congruences: each option gives $a = \,(\,r - 10\,)/4$, so

r	220	190	210	180
a	52.5	45	**50**	42.5

Two are non-integers, leaving 190 and 210. Check the multiple-of-11 rule: $a = 45 \Rightarrow 2a + 10 = 100$ ✘; $a = 50 \Rightarrow 110 = 11 \times 10$ ✔.

Answer 210 in under a minute — this is the standard way to beat "minimum value with divisibility" questions.

38 QA ALGEBRA PROGRESSIONS 7 /10

The terms of a geometric progression are real and positive. If the p^{th} term of the progression is q and the q^{th} term is p, then the logarithm of the first term is

(A) $\frac{(1-q)\log(p)-(1-p)\log(q)}{(p-q)}$

(B) $\frac{(1-q)\log(p)+(1-p)\log(q)}{(p-q)}$

(C) $\frac{(1-q)\log(q)+(1-p)\log(p)}{(p-q)}$

(D) $\frac{(1-q)\log(q)-(1-p)\log(p)}{(p-q)}$

ANSWER **(d)** $\frac{(1-q)\log(q)-(1-p)\log(p)}{(p-q)}$

SOLUTION

Step 1 — write the two conditions. With first term a and ratio r:

$ar^{p-1}=q, \qquad ar^{q-1}=p$

Step 2 — take logarithms. This turns the GP into an AP in $\log$ terms.

$\log a+(p-1)\log r=\log q$

$\log a+(q-1)\log r=\log p$

Step 3 — subtract (2) from (1).

$$(p-q)\log r=\log q-\log p \Rightarrow \log r=\frac{\log q-\log p}{p-q}$$

Step 4 — substitute back into (1).

$$\log a=\log q-(p-1)\cdot\frac{\log q-\log p}{p-q}$$

$$=\frac{(p-q)\log q-(p-1)\log q+(p-1)\log p}{p-q}$$

$$=\frac{(p-q-p+1)\log q+(p-1)\log p}{p-q}=\frac{(1-q)\log q+(p-1)\log p}{p-q}$$

Step 5 — match the printed form. Since $(p-1)=-(1-p)$:

$$\log a=\frac{(1-q)\log q-(1-p)\log p}{p-q}$$

Answer: (d)

Shortcut

Logs turn this into the standard AP result. Setting $A=\log a$, $R=\log r$, conditions (1) and (2) are exactly the classic "pth term $=q$, qth term $=p$" linear system.

Then eliminate by inspection of the options. All four share the denominator $(p-q)$; they differ only in which log pairs with which bracket, and in one sign. Two checks settle it:

1. The numerator must pair $\log q$ with $(1-q)$ — because equation (1), which contains $\log q$, is the one weighted by p. That removes (a) and (b).
2. A quick test with $p=1$: then $ar^0=q$, so $\log a=\log q$. Substituting $p=1$ into (c) gives $\frac{(1-q)\log q}{1-q}=\log q$ ✔ and into (d) gives the same ✔ — so use $q=1$ instead, where $\log a$ must equal $\log p$: (c) gives $\frac{(1-p)\log p}{p-1}=-\log p$ ✘, while (d) gives $+\log p$ ✔.

Plugging $p=1$ or $q=1$ into the options is faster than deriving whenever the answer choices are algebraic rearrangements of one another.

39 QA ALGEBRA INEQUALITIES AND MODULUS 3 /10

The number of real solutions of the equation $x^2 - 10|x| - 56 = 0$ is

(A) 3 (B) 4

(C) 2 (D) 1

ANSWER (c) 2

SOLUTION

Step 1 — substitute. Note $x^2 = |x|^2$ for every real x, so put $t = |x| \geq 0$:

$t^2 - 10t - 56 = 0$

Step 2 — factorise. Looking for two numbers with product -56 and sum -10: these are -14 and $+4$.

$(t - 14)\ (t + 4) = 0 \Rightarrow t = 14 \quad \text{or} \quad t = -4$

Step 3 — reject the impossible root. $t = |x| \geq 0$, so $t = -4$ gives nothing.

Step 4 — unfold the modulus.

$|x| = 14 \Rightarrow x = 14 \quad \text{or} \quad x = -14$

Check: $196 - 140 - 56 = 0$ ✔ for both.

Answer: (c) — 2

Shortcut

Each positive root of the t-quadratic gives two x; each non-positive root gives none (and $t = 0$ would give exactly one).

So the count is decided purely by the **signs of the roots**, which you can read off without factorising: product $= -56 < 0$ means **one positive and one negative root**, hence $2 \times 1 = \mathbf{2}$ solutions. Three seconds, no factorisation at all.

Option (b) 4 is the trap for anyone who doubles both roots; option (d) 1 for anyone who forgets the negative x.

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40 QA NUMBER SYSTEM FRACTIONS AND DECIMALS 6 /10

The smallest possible number of students in a class if the girls in the class are less than 50% but more than 48% is

(A) 25 (B) 100

(C) 27 (D) 200

ANSWER (c) 27

SOLUTION

Step 1 — state the requirement. With n students and g girls, we need an **integer** g with

$0.48 < \frac{g}{n} < 0.50 \Rightarrow 0.48\,n < g < 0.5\,n$

The window has width $0.02n$, so for small n it usually contains no integer at all.

Step 2 — test increasing n.

n	window $(0.48n,\ 0.5n)$	integer inside?
25	$(12,\ 12.5)$	no — 12 is excluded (that is exactly 48%)
26	$(12.48,\ 13)$	no — 13 is excluded (that is exactly 50%)
27	$(12.96,\ 13.5)$	**yes,** $g = 13$

Step 3 — confirm.

$\frac{13}{27} = 0.4815...$

which is strictly between 0.48 and 0.50 ✔

A check of every n from 2 to 26 confirms none works, so 27 is genuinely the smallest.

Answer: (c) — 27

Shortcut

Both bounds are strict — that is the entire question. At $n = 25$ the only candidate is $g = 12$, which is *exactly* 48%, and at $n = 26$ the only candidate is $g = 13$, which is *exactly* 50%. Both fail the strict inequalities, which is why the "obvious" answer 25 is wrong.

The structural shortcut: you need a fraction strictly between $\frac{12}{25}$ and $\frac{1}{2}$. The **mediant** of two fractions always lies strictly between them:

$\frac{12+1}{25+2} = \frac{13}{27}$

giving $n = 27$ directly, and the mediant is guaranteed to have the **smallest possible denominator** between two neighbouring fractions. A genuinely useful tool for this family of questions.

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41 DILR LOGICAL REASONING DEDUCTIVE REASONING ●●●●●●●●○○ 8 /10

The constituency in which B got lower number of votes compared to A and C is

(A) S4 (B) S1

(C) S3 (D) **S2**

ANSWER (d) S2

SOLUTION

Step 1 — check the totals. Five constituencies with 20 voters each is 100 votes, and $49 + 35 + 16 = 100$ ✔ Every voter is accounted for, so in each seat

$a_i + b_i + c_i = 20$

Step 2 — who won S4 and S5? A won *only* S1, and C won S2 and S3. So S4 and S5 went to B or C.

To win a 20-voter seat outright a party needs **more than both others combined would leave it**, i.e. strictly more than half of what remains. Concretely, to win seat i a party needs at least 7 votes (if it had 6, the other two would share 14 and one of them would have at least 7).

Now, C won S2 **and** S3, so $c_2 \geq 7$ and $c_3 \geq 7$, using up at least 14 of C's 16 votes. That leaves C **at most 2 votes** for S1, S4 and S5 combined — far too few to win anything. Therefore

B won S4 and S5.

Step 3 — pin down C. Since $c_2 + c_3 \le 16$ and both are ≥ 7, and C must beat B in those seats, the only arrangement that also leaves A and B enough votes elsewhere is

$$c_2 = c_3 = 8, \qquad c_1 = c_4 = c_5 = 0$$

Step 4 — B's votes. $b_1 < b_2 < b_3 < b_4 < b_5$ are distinct natural numbers summing to 35. B wins S4 and S5 with $c_4 = c_5 = 0$, so $b_4 > a_4 = 20 - b_4$, forcing $b_4 \ge 11$ and likewise $b_5 \ge 12$. Also $b_2 < c_2 = 8$ and $b_3 < c_3 = 8$.

An exhaustive check of every possibility leaves exactly **one** distribution:

	S1	S2	S3	S4	S5	Total
A	19	7	6	9	8	**49**
B	1	5	6	11	12	**35**
C	0	8	8	0	0	**16**
Winner	A	C	C	B	B	

Verify: each column sums to 20 ✔, each row to its stated total ✔, B's row is strictly increasing ✔, and every seat has a unique top scorer ✔

Now read the question. We need the seat where B's tally is below **both** A's and C's.

Seat	A	B	C	B below both?
S1	19	1	0	No — B beats C
S2	**7**	**5**	**8**	**Yes ✔**
S3	6	6	8	No — B ties A
S4	9	11	0	No — B is highest
S5	8	12	0	No — B is highest

Only **S2** qualifies: $5 < 7$ and $5 < 8$.

Answer: (d) — S2

Shortcut

B is last only where C is strong and B is weak. C has votes in just two seats (S2 and S3), so B can possibly be third only there. In S3 B ties A at 6, so it must be **S2**.

You can reach this without the full grid: B finishes third only where a third party is actually competitive, which narrows the field to two seats before any arithmetic.

Refers to the LR set above.

The number of votes obtained by B in S2 is

(A) 5
(B) 7
(C) 4
(D) 6

ANSWER (a) 5

SOLUTION

Step 1 — check the totals. Five constituencies with 20 voters each is 100 votes, and $49 + 35 + 16 = 100$ ✔ Every voter is accounted for, so in each seat

$a_i + b_i + c_i = 20$

Step 2 — who won S4 and S5? A won *only* S1, and C won S2 and S3. So S4 and S5 went to B or C.

To win a 20-voter seat outright a party needs **more than both others combined would leave it**, i.e. strictly more than half of what remains. Concretely, to win seat i a party needs at least 7 votes (if it had 6, the other two would share 14 and one of them would have at least 7).

Now, C won S2 **and** S3, so $c_2 \geq 7$ and $c_3 \geq 7$, using up at least 14 of C's 16 votes. That leaves C **at most 2 votes** for S1, S4 and S5 combined — far too few to win anything. Therefore

B won S4 and S5.

Step 3 — pin down C. Since $c_2 + c_3 \leq 16$ and both are ≥ 7, and C must beat B in those seats, the only arrangement that also leaves A and B enough votes elsewhere is

$c_2 = c_3 = 8, \qquad c_1 = c_4 = c_5 = 0$

Step 4 — B's votes. $b_1 < b_2 < b_3 < b_4 < b_5$ are distinct natural numbers summing to 35. B wins S4 and S5 with $c_4 = c_5 = 0$, so $b_4 > a_4 = 20 - b_4$, forcing $b_4 \geq 11$ and likewise $b_5 \geq 12$. Also $b_2 < c_2 = 8$ and $b_3 < c_3 = 8$.

An exhaustive check of every possibility leaves exactly **one** distribution:

	S1	S2	S3	S4	S5	Total
A	19	7	6	9	8	**49**
B	1	5	6	11	12	**35**
C	0	8	8	0	0	**16**
Winner	A	C	C	B	B	

Verify: each column sums to 20 ✔, each row to its stated total ✔, B's row is strictly increasing ✔, and every seat has a unique top scorer ✔

Read B's row. $b_2 = 5$.

Why it cannot be anything else. Suppose $b_2 = 6$ (the value the published key gives). The constraint $b_1 < b_2 < b_3 < b_4 < b_5$ would then force $b_3 \geq 7$, $b_4 \geq 8$, $b_5 \geq 9$.

But C wins S3, so $c_3 > b_3 \geq 7$, i.e. $c_3 \geq 8$; and C wins S2, so $c_2 > a_2 = 20 - 6 - c_2$, giving $c_2 \geq 8$. Then $c_2 + c_3 \geq 16$, which exhausts C's entire total and forces $c_1 = c_4 = c_5 = 0$ and $c_2 = c_3 = 8$. Hence $b_3 = 7$ exactly.

Now B must win S4 and S5 outright against A with no C votes present, so $b_4 \geq 11$ and $b_5 \geq 12$. Summing B's row:

$b_1 + 6 + 7 + b_4 + b_5 \;\geq\; b_1 + 6 + 7 + 11 + 12 = b_1 + 36 > 35$

which **exceeds B's total of 35 for any** $b_1 \geq 0$ — a contradiction. So $b_2 = 6$ is impossible.

The same elimination applied to every candidate value leaves $b_2 = 5$ as the only survivor.

Answer: (a) — 5

Note on the published key. The widely circulated answer key marks option (d) (6) here, and 6 is arithmetically impossible once "distinct natural numbers in increasing order" is applied, as shown above.

The key contradicts **its own worked solution**. The solution table printed alongside it gives B's row as $1,\ 5,\ 6,\ 11,\ 12$ — identical to the grid above — and its accompanying text states that B "received **1, 5 and 6** votes in S1, S2 and S3". By the source's own working, $b_2 = 5$. The printed letter is a transcription error. The verified answer is **5**.

Shortcut

Build B's row from the top down. B must win S4 and S5 against 20-voter fields, so $b_4 \geq 11$ and $b_5 \geq 12$ — that is already 23 of B's 35, leaving just **12 votes for S1, S2 and S3 combined**.

With $b_1 < b_2 < b_3$ summing to 12 and $b_3 < 8$ (C's 8 must beat it), the only fit is $1 + 5 + 6 = 12$. So $b_2 = \mathbf{5}$.

The 23-votes-at-the-top observation is the whole question — it collapses a five-variable problem to a three-variable one in a single line.

Refers to the LR set above.

📖 Reading comprehension improves with daily practice, not last-minute revision. Start Daily Reads

43 DILR LOGICAL REASONING DEDUCTIVE REASONING ●●●●●●●●○○ 8 /10

Assume that A and C had formed an alliance and any voter who voted for either A or C would have voted for this alliance. Then the number of seats this alliance would have won is

(A) 3 (B) 4

(C) 5 (D) 2

ANSWER (a) 3

SOLUTION

Step 1 — check the totals. Five constituencies with 20 voters each is 100 votes, and $49 + 35 + 16 = 100$ ✔ Every voter is accounted for, so in each seat

$a_i + b_i + c_i = 20$

Step 2 — who won S4 and S5? A won *only* S1, and C won S2 and S3. So S4 and S5 went to B or C.

To win a 20-voter seat outright a party needs **more than both others combined would leave it**, i.e. strictly more than half of what remains. Concretely, to win seat i a party needs at least 7 votes (if it had 6, the other two would share 14 and one of them would have at least 7).

Now, C won S2 **and** S3, so $c_2 \geq 7$ and $c_3 \geq 7$, using up at least 14 of C's 16 votes. That leaves C **at most 2 votes** for S1, S4 and S5 combined — far too few to win anything. Therefore

$\mathrm{B\ won\ S4\ and\ S5.}$

Step 3 — pin down C. Since $c_2 + c_3 \leq 16$ and both are ≥ 7, and C must beat B in those seats, the only arrangement that also leaves A and B enough votes elsewhere is

$c_2 = c_3 = 8, \qquad c_1 = c_4 = c_5 = 0$

Step 4 — B's votes. $b_1 < b_2 < b_3 < b_4 < b_5$ are distinct natural numbers summing to 35. B wins S4 and S5 with $c_4 = c_5 = 0$, so $b_4 > a_4 = 20 - b_4$, forcing $b_4 \geq 11$ and likewise $b_5 \geq 12$. Also $b_2 < c_2 = 8$ and $b_3 < c_3 = 8$.

An exhaustive check of every possibility leaves exactly **one** distribution:

	S1	S2	S3	S4	S5	Total
A	19	7	6	9	8	**49**
B	1	5	6	11	12	**35**
C	0	8	8	0	0	**16**
Winner	A	C	C	B	B	

Verify: each column sums to 20 ✔, each row to its stated total ✔, B's row is strictly increasing ✔, and every seat has a unique top scorer ✔

Step 1 — reduce to a two-party contest. If A and C merge, each seat becomes alliance versus B. Since every seat has exactly 20 voters,

$$\text{Alliance votes in seat } i = a_i + c_i = 20 - b_i$$

Step 2 — state the winning condition. The alliance wins seat i when

$$20 - b_i > b_i \;\Leftrightarrow\; b_i < 10$$

So the question reduces entirely to: how many of B's five tallies are below 10?

Step 3 — count.

Seat	b_i	Alliance $= 20 - b_i$	Alliance wins?
S1	1	19	✔
S2	5	15	✔
S3	6	14	✔
S4	11	9	✘
S5	12	8	✘

$$3 \text{ seats}$$

A stronger statement. Even without pinning down the full grid, B's row must contain exactly three values below 10: B needs $b_4 \geq 11$ and $b_5 \geq 12$ to win its two seats, which leaves at most $35 - 23 = 12$ votes for the other three seats — so all three of b_1, b_2, b_3 are necessarily below 10. **The answer is 3 under every reading of the constraints.**

Answer: (a) — 3

Note on the published key. The circulated key marks option (d) (2). For the alliance to win only 2 seats, three of B's tallies would have to be at least 10, which would require $b_3 + b_4 + b_5 \geq 10 + 11 + 12 = 33$, leaving under 2 votes for $b_1 + b_2$ — incompatible with distinct increasing values and with C's ability to win S2 and S3.

As with Q42, the key contradicts **its own worked solution**: the table printed in the same document gives B's row as $1,\ 5,\ 6,\ 11,\ 12$, from which the alliance totals are $19,\ 15,\ 14,\ 9,\ 8$ and it wins S1, S2 and S3 — three seats. The verified answer is **3**.

Shortcut

One inequality replaces the whole table. With only two contestants and 20 voters, the alliance wins seat i exactly when $b_i < 10$. So count how many of B's numbers are single-digit.

B spends at least $11 + 12 = 23$ votes winning S4 and S5, leaving at most 12 for the remaining three seats — so **all three must be under 10**. Answer **3**, reachable in two lines without ever constructing A's or C's rows.

The general trick: in an alliance question, convert "who wins" into a threshold on the *one* party left out. It is almost always a shorter route than recomputing every seat.

Refers to the LR set above.

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44 DILR LOGICAL REASONING DEDUCTIVE REASONING ●●●●●●●●○○ 8 /10

The number of votes obtained by A is S5 is

(A) 7
(B) 9
(C) 6
(D) **8**

ANSWER (d) 8

SOLUTION

Step 1 — check the totals. Five constituencies with 20 voters each is 100 votes, and $49 + 35 + 16 = 100$ ✔ Every voter is accounted for, so in each seat

$$a_i + b_i + c_i = 20$$

Step 2 — who won S4 and S5? A won *only* S1, and C won S2 and S3. So S4 and S5 went to B or C.

To win a 20-voter seat outright a party needs **more than both others combined would leave it**, i.e. strictly more than half of what remains. Concretely, to win seat i a party needs at least 7 votes (if it had 6, the other two would share 14 and one of them would have at least 7).

Now, C won S2 **and** S3, so $c_2 \geq 7$ and $c_3 \geq 7$, using up at least 14 of C's 16 votes. That leaves C **at most 2 votes** for S1, S4 and S5 combined — far too few to win anything. Therefore

$$\text{B won S4 and S5.}$$

Step 3 — pin down C. Since $c_2 + c_3 \leq 16$ and both are ≥ 7, and C must beat B in those seats, the only arrangement that also leaves A and B enough votes elsewhere is

$$c_2 = c_3 = 8, \qquad c_1 = c_4 = c_5 = 0$$

Step 4 — B's votes. $b_1 < b_2 < b_3 < b_4 < b_5$ are distinct natural numbers summing to 35. B wins S4 and S5 with $c_4 = c_5 = 0$, so $b_4 > a_4 = 20 - b_4$, forcing $b_4 \geq 11$ and likewise $b_5 \geq 12$. Also $b_2 < c_2 = 8$ and $b_3 < c_3 = 8$.

An exhaustive check of every possibility leaves exactly **one** distribution:

	S1	S2	S3	S4	S5	Total
A	19	7	6	9	8	**49**
B	1	5	6	11	12	**35**
C	0	8	8	0	0	**16**
Winner	A	C	C	B	B	

Verify: each column sums to 20 ✔, each row to its stated total ✔, B's row is strictly increasing ✔, and every seat has a unique top scorer ✔

Read A's row. $a_5 = 8$.

Direct derivation, without the full grid. In S5, C has no votes ($c_5 = 0$, since C's entire 16 votes are consumed by S2 and S3). So

$a_5 = 20 - b_5$

B's row is $1, 5, 6, 11, 12$, so $b_5 = 12$ and

$a_5 = 20 - 12 = 8$

Cross-check against A's total: $19 + 7 + 6 + 9 + 8 = 49$ ✔

Answer: (d) — 8

Shortcut

C is absent from S5, so A and B split all 20 votes. That makes $a_5 = 20 - b_5$, and b_5 is B's largest value, 12. Hence $a_5 = 8$.

Recognising which seats C contests is the single most useful observation in this set — C's 16 votes are entirely spent on S2 and S3, which turns S1, S4 and S5 into simple two-party seats where every tally is just 20 minus the other.

Refers to the LR set above.

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45 DILR LOGICAL REASONING DEDUCTIVE REASONING ●●●●●●●●○○ 8 /10

Comparing the number votes obtained by A across different constituencies, the lowest number of votes were in constituency

(A) S2
(B) S5
(C) **S3**
(D) S4

ANSWER (c) S3

SOLUTION

Step 1 — check the totals. Five constituencies with 20 voters each is 100 votes, and $49 + 35 + 16 = 100$ ✔ Every voter is accounted for, so in each seat

$a_i + b_i + c_i = 20$

Step 2 — who won S4 and S5? A won *only* S1, and C won S2 and S3. So S4 and S5 went to B or C.

To win a 20-voter seat outright a party needs **more than both others combined would leave it**, i.e. strictly more than half of what remains. Concretely, to win seat i a party needs at least 7 votes (if it had 6, the other two would share 14 and one of them would have at least 7).

Now, C won S2 **and** S3, so $c_2 \geq 7$ and $c_3 \geq 7$, using up at least 14 of C's 16 votes. That leaves C **at most 2 votes** for S1, S4 and S5 combined — far too few to win anything. Therefore

B won S4 and S5.

Step 3 — pin down C. Since $c_2 + c_3 \leq 16$ and both are ≥ 7, and C must beat B in those seats, the only arrangement that also leaves A and B enough votes elsewhere is

$c_2 = c_3 = 8, \qquad c_1 = c_4 = c_5 = 0$

Step 4 — B's votes. $b_1 < b_2 < b_3 < b_4 < b_5$ are distinct natural numbers summing to 35. B wins S4 and S5 with $c_4 = c_5 = 0$, so $b_4 > a_4 = 20 - b_4$, forcing $b_4 \geq 11$ and likewise $b_5 \geq 12$. Also $b_2 < c_2 = 8$ and $b_3 < c_3 = 8$.

An exhaustive check of every possibility leaves exactly **one** distribution:

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A	19	7	6	9	8	**49**
B	1	5	6	11	12	**35**
C	0	8	8	0	0	**16**
Winner	A	C	C	B	B	

Verify: each column sums to 20 ✔, each row to its stated total ✔, B's row is strictly increasing ✔, and every seat has a unique top scorer ✔

Read A's row and take the minimum.

Seat	S1	S2	S3	S4	S5
A's votes	19	7	**6**	9	8

The smallest is 6, in **S3**.

Answer: (c) — S3

Shortcut

A is squeezed hardest where B and C are both strongest. C takes 8 in each of S2 and S3, so A's worst seats are those two; between them, B polls more in S3 (6) than in S2 (5), leaving A with less. Hence **S3**.

A quick sanity check: A's five values must sum to 49 with 19 already spent on S1, so the other four average 7.5 — consistent with the row $7, 6, 9, 8$.

COMMON DATA SET

Five constituencies – parties A, B and C

In an election there were five constituencies S1, S2, S3, S4 and S5 with 20 voters each all of whom voted. Three parties A, B and C contested the elections.

The party that gets maximum number of votes in a constituency wins that seat. In every constituency there was a clear winner. The following additional information is available:

- Total number of votes obtained by A, B and C across all constituencies are 49, 35 and 16 respectively.
- S2 and S3 were won by C while A won only S1.
- Number of votes obtained by B in S1, S2, S3, S4 and S5 are distinct natural numbers in increasing order.

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 (+ 5 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

5 /10

Based on the information in the passage, who has endorsed the right to clean air?

(A) The government.

(B) **The courts.**

(C) The media.

(D) Parliament.

ANSWER **(b) The courts.**

SOLUTION

Where the passage says it. Paragraph 3 opens:

"Many **judicial pronouncements** have upheld 'the right to clean air' as a corollary to the fundamental right to life and pushed governments to act."

"Judicial pronouncements" are rulings by **courts**.

Why the others fail:

- **(a) The government** — the passage says the courts *pushed governments to act*. Governments are the party being pushed, not the endorser.
- **(c) The media** — IQAir's findings are reported, but no media endorsement of a right is mentioned anywhere.
- **(d) Parliament** — no legislature appears in the passage. A right created by *judicial pronouncement* is specifically **not** a statutory one.

Answer: (b)

Shortcut

One keyword decides it: *judicial* → courts. The distractors are the three other bodies a student might loosely associate with rights, but only one is actually named in the text.

The transferable habit: for a "who did X?" question, find the verb from the question (*endorsed / upheld*) in the passage and read only the subject of that sentence. Here that is a seven-word scan.

Refers to the RC set above.

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47 VARC | READING COMPREHENSION - QUESTION TYPES | RC INFERENCE QUESTIONS ●●●●●○○○○○ 5 /10

In the last sentence of the passage, "This is the battle for our future", the writer is

(A) projecting a bleak future for India.
(B) being melodramatic.
(C) being ambivalent.
(D) **emphasizing the need to fight for clean air.**

ANSWER **(d) emphasizing the need to fight for clean air.**

SOLUTION

Step 1 — read the sentence in its context. The final paragraph lists three "fundamental changes" needed and then insists that clean air is "not just the responsibility of the Centre or a battle for courts to wage, but a fight that states and municipal governments have to be a part of."

The closing line caps a **call to collective action**.

Step 2 — test each option.

- **(a) Bleak future** — the paragraph is prescriptive, not despairing. It says what *can* be done, which is the opposite of projecting hopelessness.
- **(b) Melodramatic** — this is a judgement *against* the writer. The passage builds its case on IQAir data, WHO limits and policy measures; a sober, evidence-led argument does not become melodrama in one closing line.
- **(c) Ambivalent** — ambivalence means being pulled both ways. The writer's position could hardly be more single-minded.
- **(d) Emphasizing the need to fight** ✔ — the sentence literally extends the "fight"/"battle" metaphor already running through the paragraph, and gives it urgency.

Answer: (d)

Shortcut

Match the rhetorical function, not the vocabulary. The word *battle* sounds dramatic, which is exactly the bait in option (b).

Ask instead: *what is this sentence doing in the paragraph?* It closes a list of required actions — so it is **emphasis**, not prophecy (a), not theatre (b), not hesitation (c).

A reliable rule for tone questions: options that criticise the author (*melodramatic*, *confused*, *biased*) are almost never right in a passage drawn from editorial journalism, unless the passage is explicitly quoting someone else.

Refers to the RC set above.

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48 VARC READING COMPREHENSION - QUESTION TYPES

RC DETAIL AND FACT BASED QUESTIONS

5 /10

Based on the information in the passage, which one of the following statements is correct?

(A) The problem of air pollution is limited to the major cities in India.

(B) The 50 most polluted cities in the world are in India.

(C) Delhi's air quality is the poorest in the entire world.

(D) **Industrialization makes Begusarai the most polluted city in the world.**

ANSWER **(d) Industrialization makes Begusarai the most polluted city in the world.**

SOLUTION

Work through the options against the text.

- **(a)** Directly contradicted: "the problem is far from unique to metropolises... even lower-tier cities and towns in India are choking." ✘
- **(b)** Overstated. The passage says **42** of the 50 most polluted are Indian, not all 50. ✘
- **(c)** A precision trap. Delhi is "the world's most polluted **capital**", and the larger UT of Delhi is the **third** most polluted region. The most polluted *city* is Begusarai. ✘
- **(d)** Supported. Begusarai is named "the world's most polluted city", and the passage attributes its pollution to its being "partly industrialized, housing among others an oil refinery." ✔

A fair caveat. Option (d) is the *best* available answer rather than a perfect paraphrase: the passage also calls Begusarai "primarily agrarian", so industrialisation is presented as a contributing factor rather than a proven sole cause. Elimination still makes it the only defensible choice.

Answer: (d)

Shortcut

Three of the four are quantifier or category errors — the standard construction for this question type:

Option	Error
(a)	*limited to* — a scope error
(b)	*the 50* instead of *42 of the 50* — a number error
(c)	*capital* vs *city* — a category error

Train yourself to check quantifiers first (*all, only, most, limited to*). Here that single pass eliminates (a) and (b) without re-reading, and the capital/city distinction in paragraph 1 settles (c).

Refers to the RC set above.

The first sentence in the passage mentions that India was in the news again as a world leader. What is the writer's intention in pointing this out?

(A) To create confusion.
(B) **To be critical.**
(C) To be negative.
(D) To be judgemental.

ANSWER **(b) To be critical.**

SOLUTION

Step 1 — note the device. The opening reads: "India was in the news again as a world leader – **but this time for the wrong reason**."

"World leader" normally signals praise; the dash reverses it. This is **irony** — praise-shaped language used to deliver a rebuke.

Step 2 — identify the purpose. The writer is holding India's governments to account for a failure. That is **criticism**.

Step 3 — separate the near-synonyms. The three wrong options are all vaguely negative, so the distinction matters:

- **(a) To create confusion** — a writer never intends to confuse; the irony is immediately resolved by the same sentence.
- **(c) To be negative** — too weak and too unfocused. "Negative" describes a mood; the passage has a specific target (policy failure) and goes on to propose remedies, which a merely negative piece would not.
- **(d) To be judgemental** — this implies condemning *people* unfairly. The writer evaluates a measurable outcome against WHO limits, which is reasoned criticism, not personal judgement.
- **(b) To be critical** ✓ — precise and supported.

Answer: (b)

Shortcut

When the options are near-synonyms, pick the most precise, not the strongest. *Critical* is the neutral, accurate description of evidence-based fault-finding; *negative* and *judgemental* both carry extra baggage the passage does not earn.

And note the giveaway in the question stem itself: "for the wrong reason" is in the sentence being asked about, so the intention must be fault-finding. That alone removes (a).

Refers to the RC set above.

50 VARC READING COMPREHENSION - QUESTION TYPES RC EXCEPT OR NOT QUESTIONS 5 /10

Which of the following points is not made by the writer?

(A) Governments at all levels should be involved in tackling the problem of air pollution.

(B) **Clean air is the right of every consumer.**

(C) Scientific methods are needed to address the problem of air pollution.

(D) Polluting behaviour should be punished.

ANSWER **(b) Clean air is the right of every consumer.**

SOLUTION

This is a NOT question: three options are in the passage, one is not. Locate each.

- **(a)** ✔ Found: "not just the responsibility of the Centre... but a fight that **states and municipal governments** have to be a part of."
- **(c)** ✔ Found: "governments must turn to **science** to understand, measure, and monitor the problem."
- **(d)** ✔ Found: "use a combination of incentives and **penalties**." Penalties are punishment for polluting behaviour.
- **(b) ✘ Not found.** The passage frames clean air as "a corollary to the **fundamental right to life**" and "a common **public good**" — the language of citizenship, not of consumption. The word *consumer* never appears, and it changes the category: a public good belongs to everyone collectively, whereas a consumer right attaches to a purchaser.

Answer: (b)

Shortcut

Tick off the three you can find, and the odd one out is the answer. Each of (a), (c) and (d) maps to a separate clause of the final paragraph — the three "fundamental changes" plus the closing sentence — so the whole question lives in six lines of text.

The discriminator in (b) is a single noun: *consumer*. Swapping one category word (citizen → consumer, public good → private right) is the most common way an option is made false while still sounding like the passage.

Refers to the RC set above.

51 VARC READING COMPREHENSION - QUESTION TYPES

RC VOCABULARY IN CONTEXT QUESTIONS

5 /10

The phrase "that kicks in" (para 3) means

(A) gets rejected.

(B) gains importance.

(C) causes violence.

(D) **comes into force.**

ANSWER **(d) comes into force.**

SOLUTION

Step 1 — read the full clause.

"...a Graded Response Action Plan (GRAP) **that kicks in** when the air quality turns bad and becomes more stringent as the air quality worsens."

Step 2 — use the grammar of the sentence. The subject is a *plan*, and the trigger is a *condition* ("when the air quality turns bad"). A plan that activates on a trigger **comes into effect** at that moment.

Step 3 — confirm with the follow-on. "...and becomes more stringent as the air quality worsens." Something can only become *more* stringent if it is already operating — so "kicks in" must mark the start of operation.

Step 4 — eliminate.

- **(a) Gets rejected** — the opposite; the plan is being applied, not refused.
- **(b) Gains importance** — close but imprecise. GRAP does not gradually grow in significance; it **switches on** at a threshold. The escalation is described separately, in the next clause.
- **(c) Causes violence** — a literal reading of *kick*. The idiom has nothing to do with physical force.

Answer: (d)

Shortcut

For "what does this phrase mean", substitute each option back into the sentence and listen.

"a plan that *gets rejected* when the air quality turns bad" — contradicts the sentence. "a plan that *causes violence* when the air quality turns bad" — absurd. "a plan that *comes into force* when the air quality turns bad" — exactly right.

Option (c) is the standard literal-meaning trap on any idiom built from a physical verb (*kick, strike, break, run*). The idiom *kick in* = begin to take effect.

READING PASSAGE

Passage 1 – India's air quality and the right to clean air

Read the following passage and choose the answer that is closest to each of the questions that are based on the passage.

Recently, India was in the news again as a world leader – but this time for the wrong reason. According to the Swiss firm IQAir's assessment of the air quality of world cities 2023, New Delhi is back to being the world's most polluted capital. New Delhi's annual air quality rating is 19 times the World Health Organization's annual limit recommended in 2021 for its pollutant level. The picture is no better as far as the larger Union Territory of Delhi is considered – its annual record of pollutant levels makes it the third most polluted region globally.

Delhi may have hogged the headlines on air pollution, but the problem is far from unique to metropolises. IQAir's findings reveal that even lower-tier cities and towns in India are choking because of very poor air quality. Indeed, Begusarai in Bihar is the world's most polluted city. Partly industrialized, housing among others an oil refinery, Begusarai is primarily agrarian. And Begusarai is not an outlier: Mullanpur in Punjab, which is transitioning to an urban settlement, and Siwan in Bihar are among the 42 Indian cities/towns that are among the 50 most polluted globally.

Many judicial pronouncements have upheld "the right to clean air" as a corollary to the fundamental right to life and pushed governments to act. But Delhi's bad air is despite the introduction of CNG in public transport and the building of a metro network in the early years of this decade, and in spite of the presence of a Graded Response Action Plan (GRAP) that kicks in when the air quality turns bad and becomes more stringent as the air quality worsens.

Improving air quality across Indian cities requires three fundamental changes. One, governments must turn to science to understand, measure, and monitor the problem. Two, they have to understand that the response will have to include behavioural changes and use a combination of incentives and penalties to achieve this. And three, clean air has to be seen as a common public good. To be sure, it is not just the responsibility of the Centre or a battle for courts to wage, but a fight that states and municipal governments have to be a part of. This is the battle for our future.

52 VARC READING COMPREHENSION - QUESTION TYPES RC INFERENCE QUESTIONS 6 /10

Which of the following best indicates the relationship between anxiety and survival?

(A) Despite being inherited from our evolutionary past, anxiety frequently undermines survival as it is not an integral part of human nature.

(B) Anxiety is part of our evolutionary past, yet has limited relevance now as it does not significantly impact our chances of survival.

(C) Anxiety is ingrained within us due to our evolutionary heritage and generally serves to promote survival.

(D) Anxiety, an intrinsic part of human nature, often disrupts our ability to thrive by acting as an impediment to survival.

ANSWER **(c) Anxiety is ingrained within us due to our evolutionary heritage and generally serves to promote survival.**

SOLUTION

Step 1 — find the governing sentence. Paragraph 1:

"It has been **built into us**; we have **inherited it from our evolutionary past**, because, **in general, anxiety has a survival function**."

Two claims: anxiety is inherited and ingrained, and it *generally* helps survival.

Step 2 — match. Option (c) states both: "ingrained within us due to our evolutionary heritage" and "generally serves to promote survival." The hedge *generally* matches the passage's own *in general* exactly — important, because paragraph 2 concedes anxiety can become problematic.

Step 3 — eliminate the three reversals.

- **(a)** Contradicts itself and the passage: it accepts the evolutionary inheritance, then denies anxiety is part of human nature. The passage says it is "built into us".
- **(b)** "Limited relevance now" is false. The passage gives live modern examples — meeting deadlines, jumping clear of a speeding car.
- **(d)** Inverts the main claim. Disruption is the *exception* (an anxiety disorder), not the rule.

Answer: (c)

Shortcut

Sort the options by their verb polarity. Three say anxiety *undermines / has limited relevance / disrupts*; only one says it *promotes* survival. The passage's thesis sentence is positive, so the lone positive option wins before you read any of them closely.

Also watch the hedge. The passage says "in general" — so the correct option must hedge too. "Generally serves to promote" is the only option that preserves it; absolute claims in either direction are wrong.

Refers to the RC set above.

In what way might the relationship between exercise or physical activity and anxiety relief suggest a potential solution for individuals with anxiety disorders?

(A) Physical activity serves as a temporary distraction from anxiety, but its long-term effects remain unclear.

(B) Exercise-induced endorphins facilitate cognitive behavioural therapy's effectiveness.

(C) Exercise may directly target the amygdala to reduce anxiety symptoms.

(D) Physical activity could enhance sleep quality, indirectly lessening anxiety symptoms.

ANSWER **(d) Physical activity could enhance sleep quality, indirectly lessening anxiety symptoms.**

SOLUTION

Step 1 — locate the exercise paragraph (para 5). It makes exactly two claims:

1. Exercise produces endorphins, "chemicals in the brain that act as natural painkillers."
2. "Getting physically tired can help people fall asleep faster and have deeper, more relaxing sleep. As many people suffering from anxiety often have problems with **insomnia**, just the ability to get a good night's rest can change their perspectives."

Step 2 — match option (d). It names the sleep pathway and correctly calls the effect **indirect** — exercise improves sleep, and better sleep eases anxiety. That is precisely the chain the passage draws.

Step 3 — eliminate.

- **(a)** "Temporary distraction" and "long-term effects remain unclear" are the writer's opposite: the passage says "there is **plenty of evidence** that exercise can help."
- **(b)** A fabricated link. Endorphins and cognitive behaviour therapy are both discussed, but in different paragraphs, and no connection between them is asserted.
- **(c)** The amygdala appears in paragraph 3, in the context of *brain imaging research*, not exercise. Joining two separate paragraphs is the classic RC trap. Note also "**directly** target", which the passage never claims for anything.

Answer: (d)

Shortcut

Beware options that weld two paragraphs together. Both (b) and (c) take a real term from the passage (endorphins, amygdala) and attach it to a mechanism stated somewhere else. **A term being present is not the same as the relationship being asserted.**

The surviving option is the one whose whole causal chain — exercise → sleep → less anxiety — sits inside a **single** paragraph. When an option's logic spans paragraphs, demand an explicit connective in the text; if there isn't one, it's a distractor.

Refers to the RC set above.

54 VARC READING COMPREHENSION - QUESTION TYPES

RC STRUCTURE AND ORGANISATION QUESTIONS

6 /10

In the passage, the information about anxiety treatments is organized in which of the following ways?

(A) By comparing different types of anxiety disorders.

(B) By presenting contrasting viewpoints on the subject.

(C) By outlining the historical development of anxiety treatments.

(D) **By discussing various treatment options and their effectiveness.**

ANSWER **(d) By discussing various treatment options and their effectiveness.**

SOLUTION

Step 1 — map paragraph 4, the treatments paragraph. It names three things in turn and comments on how well each works:

Treatment	What the passage says about its effectiveness
Exposure therapy	"the first psychotherapy treatment that was **shown to be effective**"
Group cognitive behaviour therapy	helps people "manage anxiety and **feel in control**"
Medication	"will **not cure** an anxiety disorder, it can only help to keep it under control"

Paragraph 5 then adds exercise, again with an effectiveness claim ("plenty of evidence").

That is a **catalogue of options, each with an evaluation** — exactly option (d).

Step 2 — eliminate.

- **(a)** No *types* of anxiety disorder are ever distinguished, let alone compared.
- **(b)** There are no opposing viewpoints. One voice presents a settled account; nobody disagrees with anybody.
- **(c)** Tempting, because of the word "first" in "the first psychotherapy treatment that was shown to be effective." But that phrase ranks the treatment by *evidence*, not by date, and no other treatment is placed in time. One ordinal does not make a history.

Answer: (d)

Shortcut

Structure questions are answered by scanning connectives, not content. Look at how paragraph 4 moves between items: *"The first... Another is... There are, of course, drugs..."* That is pure **enumeration**, and each item carries a verdict attached.

If the paragraph were historical you would see dates or *later / subsequently / by the 1980s*; if it were contrastive you would see *however / on the other hand / critics argue*. Neither appears, which disposes of (b) and (c) in one pass.

Refers to the RC set above.

✏ 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

Based on the information in the passage, which of the following statements best describes the potential danger associated with anxiety disorder?

(A) It is always indicative of an imagined danger rather than a real one.

(B) **It is characterized by a persistent and exaggerated perception of danger.**

(C) It occurs when the perceived danger is proportionate to the real danger.

(D) It primarily arises from genetic factors rather than environmental influences.

ANSWER **(b) It is characterized by a persistent and exaggerated perception of danger.**

SOLUTION

Step 1 — find the defining sentence (para 2).

"it can get problematic if the danger is **imagined rather than real, or is something that is exaggerated**... particularly if the perceived danger is **out of proportion** to the real danger, and it is **persistent and disabling**, then there is a danger of an anxiety disorder."

Step 2 — match option (b). "Persistent and exaggerated perception of danger" captures both named conditions — *persistent* and *out of proportion*. ✔

Step 3 — eliminate.

- **(a)** The word **always** breaks it. The passage offers two alternatives joined by *or*: imagined **or** exaggerated. An exaggerated response to a genuine danger also qualifies, so "always imagined" is false.
- **(c)** A direct reversal. Proportionate anxiety is the *healthy* kind; the disorder is marked by disproportion.
- **(d)** Unsupported ranking. Paragraph 3 says scientists are investigating genes **and** environmental factors (pollution, stress, diet). Neither is said to be primary; the research is ongoing.

Answer: (b)

Shortcut

Three different failure modes, one per wrong option — a useful pattern to recognise:

- a. fails on an **absolute quantifier** (*always*),
- c. fails on a **reversal** (proportionate vs out of proportion),
- d. fails on an **unsupported comparison** (*primarily... rather than*).

Scan for these three markers before reading for meaning. Words like *always, only, primarily, rather than* are where RC options break, and in this question they break three of the four.

Refers to the RC set above.

The passage is chiefly concerned with

(A) investigating the physiological benefits of exercise on anxiety management.

(B) evaluating the effectiveness of psychotherapy and medication in treating anxiety.

(C) understanding the complex interplay between genetic and environmental factors in anxiety disorders.

(D) exploring the multifaceted nature of anxiety and its adaptive functions.

ANSWER **(d) exploring the multifaceted nature of anxiety and its adaptive functions.**

SOLUTION

Step 1 — trace the whole arc. The passage moves through: what anxiety is and why we evolved it → when it becomes a disorder → what research says about brain and genes → how it is treated → the role of exercise → a closing reminder that normal anxiety is adaptive but excessive anxiety needs treatment.

Step 2 — apply the scope test. A main-idea option must cover the *whole* passage, not one good paragraph.

- **(a) Exercise** — paragraph 5 only. Too narrow.
- **(b) Psychotherapy and medication** — paragraph 4 only. Too narrow.
- **(c) Genes and environment** — paragraph 3 only, and the passage explicitly says this is still under investigation rather than concluded. Too narrow.
- **(d) The multifaceted nature of anxiety and its adaptive functions** ✔ — "multifaceted" covers the evolutionary, pathological, neurological and therapeutic strands; "adaptive functions" matches both the opening (survival function) and the closing ("normal anxiety serves a beneficial and adaptive purpose").

Answer: (d)

Shortcut

Count paragraphs per option. Three options each describe exactly one paragraph; one describes all six. In a main-idea question that is decisive on its own.

Then confirm with the first and last paragraphs, which almost always bracket the central claim. Here paragraph 1 says anxiety "has a survival function" and the final paragraph says it "serves a beneficial and adaptive purpose" — the word **adaptive** appears in the correct option and nowhere else.

Refers to the RC set above.

57 VARC READING COMPREHENSION - QUESTION TYPES

RC DETAIL AND FACT BASED QUESTIONS

6 /10

Based on the information in the passage, which one of the following statements is correct?

(A) Regular exercise does little to alleviate anxiety symptoms and improve sleep quality.

(B) **Exposure therapy encourages individuals to face their feared situations gradually.**

(C) Cognitive behaviour therapy is the most preferred treatment for anxiety disorders.

(D) Medication is the first-line therapy and primary cure for anxiety disorders.

ANSWER **(b) Exposure therapy encourages individuals to face their feared situations gradually.**

SOLUTION

Check each against the text.

- **(a)** ✘ Reversed. "There is **plenty of evidence** that exercise can help with anxiety problems," and it improves sleep.
- **(b)** ✔ Exact. Exposure therapy "encourages people **in a graded way** to go into their feared situations." *Graded* = gradual.
- **(c)** ✘ Unsupported superlative. CBT is described as "another" treatment. Nothing ranks it first, and in fact the only ordinal in the paragraph ("the first... shown to be effective") attaches to **exposure therapy**.
- **(d)** ✘ Directly contradicted: "medication will **not cure** an anxiety disorder, it can only help to keep it under control while the person receives psychotherapy." Medication is explicitly an adjunct, not a cure.

Answer: (b)

Shortcut

The correct option is the only paraphrase; the other three are edits. (a) negates the passage, (c) inserts a superlative, (d) promotes a supporting role to a primary one.

A reliable screen for "which statement is correct" questions: cross out every option containing a superlative (*most preferred*), an absolute, or a reversal of the passage's verb. Here that leaves exactly one option standing, and *graded* → *gradually* is a straight synonym swap — the signature of a correct answer.

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.

My supervisor seemed to be in a bad mood because he _____ when I asked if I could leave an hour early.

(A) ate my head
(B) cut my voice
(C) **bit my head off**
(D) hit my ear off

ANSWER **(c) bit my head off**

SOLUTION

The idiom. *To bite someone's head off* means to **respond with sudden, disproportionate anger**.

Why it fits. The sentence explains the supervisor's behaviour by his "bad mood", and the trigger is an ordinary, reasonable request. An angry over-reaction is exactly what the clause needs.

Why the others fail:

- **(a) ate my head** — not standard English. (*Eat someone's head* exists in Indian English informally, meaning to nag or pester continuously — which is the wrong sense here anyway, since the supervisor reacted once, not repeatedly.)
- **(b) cut my voice** — no such idiom. The nearest real phrase is *cut someone off*, meaning to interrupt.
- **(d) hit my ear off** — invented. (*Talk someone's ear off* is real, but it means to talk excessively.)

Answer: (c)

Shortcut

Only one option is a real English idiom — a surprisingly common situation in IPMAT's idiom questions, where the distractors are built by swapping a body part or a verb into a half-remembered phrase.

Test each against your memory of the fixed form: *bite someone's head off* ✔, *talk someone's ear off* (not *hit*), *cut someone off* (not *cut someone's voice*). Idioms are **fixed expressions** — a single altered word makes them non-existent, not merely unusual.

59 VARC VERBAL ABILITY IDIOMS AND PHRASES 5 /10

Complete the following sentence by choosing the most appropriate word/phrase from the options given below.

In a circus where performers share dressing rooms, training spaces and work in a fast-paced environment, the success of a show _____ fostering team-work and collaboration.

(A) comes with
(B) come along with
(C) **comes down to**
(D) comes about

ANSWER **(c) comes down to**

SOLUTION

The idiom. *To come down to* something means **to depend ultimately on it** — to be reducible to a single decisive factor.

Why it fits. The sentence builds up a list of shared conditions and then identifies the one thing that determines success: team-work. "Comes down to" is precisely the phrase for naming a decisive factor.

Why the others fail:

- **(a) comes with** — means *is accompanied by*. That makes team-work a by-product of success rather than its cause, reversing the intended logic.
- **(b) come along with** — ungrammatical here: the subject "the success" is singular and needs *comes*. The agreement error alone eliminates it.
- **(d) comes about** — means *happens* or *occurs*, and is intransitive. It cannot take "fostering team-work" as an object.

Answer: (c)

Shortcut

Two quick filters settle this.

1. **Subject–verb agreement:** "the success … come along with" is wrong, so (b) goes without any idiom knowledge.
2. **Transitivity:** *come about* takes no object, so (d) cannot be followed by a noun phrase.

Between (a) and (c), ask which direction the causation runs. The sentence is naming **what success depends on**, so *comes down to* ✓ — **always check whether an option reverses cause and effect.**

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60 VARC VERBAL ABILITY IDIOMS AND PHRASES 2 /10

Complete the following sentence by choosing the most appropriate word/phrase from the options given below.

Anil could not go to his friend's party, as he had fever and was _____.

(A) beneath the weather
(B) **under the weather**
(C) outside the weather
(D) beside the weather

ANSWER **(b) under the weather**

SOLUTION

The idiom. *Under the weather* means **slightly unwell**.

Why it fits. The sentence gives the symptom ("had fever") and needs a phrase restating his condition. *Under the weather* is the standard idiom for mild illness.

Why the others fail. All three are fabricated variants. The preposition in an idiom is **not** interchangeable with its near-synonyms:

- *beneath* means much the same as *under* literally, but **beneath the weather** is not an English expression.
- *outside the weather* and *beside the weather* are meaningless.

A note on origin (useful for remembering it): the phrase is nautical. A seasick sailor was sent below deck, literally *under* the weather rail where the ship's motion was least severe.

Answer: (b)

Shortcut

Prepositions in idioms are fixed and unswappable. This question type — one correct idiom plus three preposition swaps — appears in almost every IPMAT paper, so the drill is simply to recall the exact form.

A short list worth memorising in the same family: *under the weather* (unwell), *under a cloud* (in disgrace), *over the moon* (delighted), *in the dark* (uninformed), *on the mend* (recovering).

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61 VARC VERBAL ABILITY IDIOMS AND PHRASES ●●●●○○○○○○ 4 /10

Complete the following sentence by choosing the most appropriate word/phrase from the options given below.

In his address to the candidates contesting the student council elections the Principal said, "If you want others to take you seriously then you must _____ on issues like gender bias and inclusivity."

(A) rule the roost
(B) **walk the talk**
(C) read the lines
(D) go around the bend

ANSWER **(b) walk the talk**

SOLUTION

The idiom. *To walk the talk* means **to act in accordance with what one says** — to back words with deeds.

Why it fits. The context is election candidates who want "others to take [them] seriously". Credibility comes from matching conduct to promises, which is exactly this idiom.

Why the others fail:

- **(a) rule the roost** — to be the dominant person in a group. It describes power, not credibility, and sits oddly in advice about being believed.
- **(c) read the lines** — not an idiom. (*Read between the lines* is, and means to infer something unstated — a different idea and a different form.)
- **(d) go around the bend** — to go mad. Clearly wrong in register and sense.

Answer: (b)

Shortcut

Match the idiom to the *purpose* named in the sentence. The stated goal is "if you want others to take you seriously" — that is about **credibility**, so look for the credibility idiom.

Sorting the options by what they are *about* does the work instantly: (a) dominance, (c) inference, (d) insanity, (b) credibility. **Classifying idioms by theme is far faster than translating each one.**

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62 VARC VERBAL ABILITY PHRASAL VERBS ●●●○○○○○○○ 3 /10

Complete the following sentence by choosing the most appropriate word/phrase from the options given below.

The students' picnic plans _____ when it started raining heavily in the morning.

(A) dropped out
(B) dropped off
(C) **fell through**
(D) fell behind

ANSWER **(c) fell through**

SOLUTION

The phrasal verb. *To fall through* means **to fail to happen; to collapse before completion**. It is the standard verb for plans or arrangements that do not come off.

Why it fits. Heavy rain cancels a picnic — the plans did not merely slow down, they collapsed entirely.

Why the others fail:

- **(a) dropped out** — to withdraw from something (a course, a race). It needs a **person** as subject; plans cannot drop out.
- **(b) dropped off** — to decline gradually (*sales dropped off*) or to fall asleep. Rain cancels a picnic abruptly, not gradually.
- **(d) fell behind** — to lag in schedule or progress. Falling behind implies the activity continues, just late; the picnic did not happen at all.

Answer: (c)

Shortcut

Check the subject first. "Plans" is inanimate, which rules out (a) immediately — *drop out* requires a human agent.

Then distinguish by **abruptness**: *drop off* and *fall behind* both describe gradual change, while the trigger here ("started raining heavily") is sudden and total. Only *fall through* carries that all-or-nothing sense.

Learn the collocation: plans, deals, sales and negotiations *fall through*. It is one of the most frequently tested phrasal verbs in the paper.

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63 VARC VERBAL ABILITY PHRASAL VERBS 4 /10

Complete the following sentence by choosing the most appropriate word/phrase from the options given below.

All the employees agreed that the new regulations had _____ positive changes in the workplace.

(A) brought up
(B) brought on
(C) brought along
(D) **brought about**

ANSWER **(d) brought about**

SOLUTION

The phrasal verb. *To bring about* means **to cause something to happen**.

Why it fits. The regulations are the cause and the positive changes are the effect. *Bring about* is the neutral, standard verb for causing change.

Why the others fail:

- **(a) brought up** — to raise a topic for discussion, or to rear a child. Regulations do not raise changes as a subject of conversation.
- **(b) brought on** — also means to cause, but it collocates almost exclusively with **unwelcome** things: *brought on a headache, a crisis, an attack*. Pairing it with "positive changes" is jarring.
- **(c) brought along** — to bring someone or something with you to a place. Purely physical.

Answer: (d)

Shortcut

The discriminator is connotation, not meaning. Both *bring about* and *bring on* mean "cause", so you cannot separate them by definition alone.

Rule: *bring on* takes negative objects (illness, disaster, trouble); *bring about* is neutral and takes change, reform, improvement. The adjective **"positive"** in the sentence is the deciding word.

This is worth generalising: when two options share a dictionary meaning, the answer turns on which one the surrounding adjective permits.

Which colleges, what cut-offs, which deadlines? The UG guide maps the whole route. Open the guide

64 VARC VERBAL ABILITY PHRASAL VERBS 3 /10

Complete the following sentence by choosing the most appropriate word/phrase from the options given below.

Sheila keeps interrupting Manohar when he is playing with his friends, but he _____ because she is his younger sister.

(A) puts her off
(B) **puts up with her**
(C) puts along with her
(D) puts her on

ANSWER **(b) puts up with her**

SOLUTION

The phrasal verb. *To put up with* someone means **to tolerate them**, to endure something annoying without complaint.

Why it fits. The sentence is built on a contrast: she keeps interrupting, *but* he does something — and the reason given ("because she is his younger sister") explains forbearance. Tolerance is the only sense the *but... because* structure allows.

Why the others fail:

- **(a) puts her off** — to postpone, or to repel/discourage. Both senses contradict the affectionate reason given.
- **(c) puts along with her** — not an English expression. The real phrase is *get along with*, meaning to have a good relationship.
- **(d) puts her on** — to deceive or tease someone (chiefly American). Teasing is not what a reason like "she is his younger sister" would explain.

Answer: (b)

Shortcut

Let the connectives do the reasoning. The frame is:

annoying behaviour **but** *he* ___ **because** *she is his younger sister*

"But" demands that his response **contrast** with being annoyed, and "because" demands a reason for **indulgence**. Only tolerance satisfies both.

Three-word phrasal verbs are usually fixed: *put up with*, *get along with*, *look forward to*, *come up with*. Blending two of them (as option (c) does) is the commonest way a distractor is manufactured.

65 VARC VERBAL ABILITY GRAMMAR AND SENTENCE CORRECTION 4 /10

*In the following sentence, the incorrect part of the sentence is **underlined**. Choose an alternative from the four given options so that the sentence is rendered correct.*

He is very careless and has loosed his keys all the time.

(A) was losing his keys
(B) is loosing his keys
(C) **loses his keys**
(D) has loses his keys

ANSWER **(c) loses his keys**

SOLUTION

Two separate errors in the underlined part.

1. **Wrong word.** *Loose* (rhymes with *goose*) is an adjective meaning "not tight", or a verb meaning "to release". The verb needed here is **lose** (rhymes with *news*), meaning "to misplace". *Loosed* is therefore the wrong word entirely.
2. **Wrong tense.** The adverbial "**all the time**" signals a habitual action, which English expresses with the **simple present**. The present perfect ("has lost") describes completed actions with present relevance, not repeated habits.

Building the correct form. Habitual + third person singular → **loses**.

He is very careless and **loses his keys** all the time.

This also keeps the two clauses parallel: "is very careless" (simple present) and "loses" (simple present).

Why the others fail:

- **(a) was losing his keys** — past continuous; clashes with the present-tense "is very careless".
- **(b) is loosing his keys** — repeats the *loose/lose* spelling error, and the continuous tense is wrong for a habit.
- **(d) has loses his keys** — ungrammatical; an auxiliary *has* cannot be followed by a finite verb.

Answer: (c)

Shortcut

"All the time" is the giveaway — frequency adverbs (*always, often, all the time, every day*) require the **simple present** for habits. That single rule eliminates (a), (b) and (d) before you even notice the spelling trap.

And fix the spelling confusion permanently:

- **lose** (verb, one *o* sound as in *news*) — to misplace, to be defeated
- **loose** (adjective) — not tight

Mnemonic: *lose* has **lost** an *o*.

66 VARC VERBAL ABILITY GRAMMAR AND SENTENCE CORRECTION 5 /10

*In the following sentence, the incorrect part of the sentence is **underlined**. Choose an alternative from the four given options so that the sentence is rendered correct.*

I had been having a headache, so I will not attend the meeting.

(A) was having a headache
(B) **have a headache**
(C) used to have a headache
(D) have headache

ANSWER **(b) have a headache**

SOLUTION

The error. Two problems compound here.

1. **Tense mismatch.** The main clause uses "**will not attend**" — a future decision made now. A present reason must support it, not a past-perfect-continuous one. "Had been having" places the headache in a period completed before some *other* past event, which does not exist in this sentence.
2. **Stative verb.** *Have*, in the sense of "experience a condition", is a **stative** verb and resists continuous forms. "I am having a headache" is non-standard; "I have a headache" is correct.

The fix. Simple present:

I have a headache, so I will not attend the meeting.

Why the others fail:

- **(a) was having a headache** — past continuous; still mismatched with "will not attend", and still uses the continuous form of a stative verb.
- **(c) used to have a headache** — describes a discontinued past habit, implying he no longer gets headaches, which would be a reason *to* attend.
- **(d) have headache** — the tense is right but the **article is missing**. Countable illnesses take *a*: *a headache, a cold, a sore throat*. (Uncountable ones do not: *flu, pneumonia, malaria*.)

Answer: (b)

Shortcut

Work backwards from the unchangeable clause. "so I **will** not attend" is fixed and present/future-oriented, so the reason must be present. That removes (a) and (c) at once.

Between (b) and (d), the difference is a single article — and **that is exactly the point of the question.** Remember: *have **a** headache*, *have **a** cold*, but *have flu*, *have pneumonia*.

A broader habit: in sentence-correction questions, identify the part of the sentence that is *not* underlined first. It constrains everything the answer can be.

67 VARC VERBAL ABILITY GRAMMAR AND SENTENCE CORRECTION 6 /10

*In the following sentence, the incorrect part of the sentence is **underlined**. Choose an alternative from the four given options so that the sentence is rendered correct.*

The negotiations are unsuccessful, and the Boards' hopes to continuing talks on a future deal seems to be increasingly improbable.

(A) **Board's hopes to continuing talks on a future deal seem**

(B) Boards' hopes to continued talks on a future deal seems

(C) Boards' hopes on continued talks on a future deal seem

(D) Board's hopes to continuing talks on a future deal seems

ANSWER **(a) Board's hopes to continuing talks on a future deal seem**

SOLUTION

The error: subject–verb agreement. The subject of the underlined clause is "**hopes**" — plural. The verb must therefore be **seem**, not *seems*.

A singular verb has been attracted to the nearest noun ("deal"), which is a classic agreement trap when a long modifier separates subject from verb. Strip it out:

the Board's **hopes** ... **seem** to be increasingly improbable

The second issue: the apostrophe. The sentence refers to a single governing body making the negotiations, so **Board's** (singular possessive) is appropriate. *Boards'* would mean several boards share one set of hopes, which the context does not support.

Why the others fail:

- **(b)** retains the singular *seems* ✘ and keeps the plural *Boards'* ✘.
- **(c)** fixes the verb to *seem* ✔ but keeps *Boards'* ✘ and introduces a clumsy doubled preposition, "hopes **on** continued talks **on** a future deal".
- **(d)** fixes the apostrophe ✔ but keeps *seems* ✘.

Only **(a)** corrects both.

Answer: (a)

Shortcut

Two-error questions are solved by elimination on one error at a time.

Pass 1 — the verb. Must be *seem* (plural subject "hopes"). That kills (b) and (d). **Pass 2 — the apostrophe.** Must be *Board's* (one board). Between the survivors (a) and (c), only (a) has it.

Done in two passes, without reading the options in full. The general technique: find the error you are most confident about, filter on it, then apply the second filter to whatever remains. **Never evaluate four long options as wholes.**

68 VARC VERBAL ABILITY GRAMMAR AND SENTENCE CORRECTION 6 /10

*In the following sentence, the incorrect part of the sentence is **underlined**. Choose an alternative from the four given options so that the sentence is rendered correct.*

In my opinion, the psychological thrillers of Alfred Hitchcock, who is a master of suspense and horror, have more lasting impact than any other filmmaker in history.

(A) are having more lasting impact than those of other filmmakers

(B) has had a more lasting impact than those of other filmmakers

(C) **have had a more lasting impact than those of any other filmmaker**

(D) had more lasting impact than any filmmaker

ANSWER **(c) have had a more lasting impact than those of any other filmmaker**

SOLUTION

The error: a faulty comparison. As written, the sentence compares *thrillers* with a *filmmaker* — two different kinds of thing. You cannot compare films to a person.

The fix is the pronoun **those of**, which restores the parallel:

the thrillers of Hitchcock … compared with **those of** [= the thrillers of] any other filmmaker

A second requirement: "any other". Hitchcock is himself a filmmaker, so he must be excluded from the group he is compared against. *Than any filmmaker* would illogically include him; *than any **other** filmmaker* is correct.

A third: agreement and tense. The subject "thrillers" is plural, so *have*, not *has*. And the present perfect "**have had**" suits a lasting effect continuing into the present.

Why the others fail:

- **(a)** "are having" — continuous form of a stative idea; also wrong register.
- **(b)** "has had" — singular verb with the plural subject "thrillers" ✘ (the *those of* is correct, but the agreement is not).
- **(d)** "than any filmmaker" — omits *other*, so it illogically includes Hitchcock; also drops *those of*, restoring the original faulty comparison.

Answer: (c)

Shortcut

Three checks, each of which alone narrows the field:

1. **Parallel comparison** — needs *those of*. Kills (d).
2. **Agreement** — plural "thrillers" needs *have*. Kills (b).
3. **"Any other"** — excludes the subject from his own comparison group. Confirms (c) over (d).

The *those of / that of* construction is tested almost every year. Whenever a sentence compares a possessed thing ("the novels of X", "the climate of Delhi"), the comparison must be to *those of* / *that of* Y — never to Y itself.

69 VARC VERBAL ABILITY GRAMMAR AND SENTENCE CORRECTION 6 /10

*In the following sentence, the incorrect part of the sentence is **underlined**. Choose an alternative from the four given options so that the sentence is rendered correct.*

While the bustling city streets were filled with the cacophony of honking horns and chatter of pedestrians, the serene countryside, where time seemed to move at a slower pace, provide a welcome retreat for their seeking solace amidst the chaos of urban living.

(A) provides a welcome retreat for them seeking solace

(B) provides a welcoming retreat for those seeking solace

(C) **provided a welcome retreat for those seeking solace**

(D) provided a welcoming retreat for who seek solace

ANSWER **(c) provided a welcome retreat for those seeking solace**

SOLUTION

Three errors in the underlined portion.

1. **Tense.** The opening clause uses "**were** filled" and "**seemed** to move" — both past. The main verb must match: **provided**.
2. **Pronoun.** "their seeking solace" is wrong. The sentence needs a noun phrase meaning *the people who seek solace*, which is **those** (as in *those who seek*). A possessive pronoun cannot fill a noun slot here.
3. **Adjective choice.** *Welcome* (adjective) means "gladly received" — a **welcome retreat** is one people are glad of. *Welcoming* means "friendly towards visitors", which describes a host, not a refuge. The idiom is **a welcome retreat**.

The corrected clause:

...the serene countryside ... **provided a welcome retreat for those seeking solace** amidst the chaos of urban living.

Why the others fail:

- **(a)** "provides" — present tense, clashing with *were filled* ✘; "for them seeking" is ungrammatical ✘.
- **(b)** "provides" — wrong tense ✘; "welcoming" — wrong adjective ✘.
- **(d)** tense ✔, but "welcoming" ✘ and "for who seek solace" ✘ (needs *those who seek* or *for whom*).

Answer: (c)

Shortcut

Filter on tense first — it is the cheapest check. The non-underlined clause carries *were* and *seemed*, so the answer must be past: (a) and (b) are gone instantly.

Between (c) and (d), one word decides it: **welcome** vs **welcoming**.

- *a welcome retreat* = a retreat people are glad to have ✔
- *a welcoming retreat* = a retreat that greets people warmly ✘

Note the pattern across Q65–Q69: every one of these five is solved by reading the part of the sentence that is **not** underlined and forcing the answer to agree with it.

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.

Most artificial intelligence (AI) applications in the fields of healthcare, industry, finance, transportation, and writing, rely heavily on deep learning and natural language processing. However, while AI systems can mimic existing styles and patterns, there is an ongoing debate about whether AI can truly possess creativity in the same sense as humans. _____.

(A) Man has long feared the rise of the machine, his own creation becoming smarter and more intelligent than him

(B) **AI-generated works may lack the depth, emotional connection, and unique perspectives that come with human experiences and emotions**

(C) AI usage raises a number of ethical concerns such as privacy issues, bias in algorithms, and the potential misuse of AI in many applications

(D) High-performance computing has already proven a machine's ability to perform advanced calculations far faster and more accurately than the human mind

ANSWER **(b) AI-generated works may lack the depth, emotional connection, and unique perspectives that come with human experiences and emotions**

SOLUTION

Step 1 — identify what the blank must continue. The paragraph narrows from AI applications → the limits of mimicry → "an ongoing debate about whether AI can truly possess **creativity in the same sense as humans**."

The blank is the final sentence, so it must **develop that debate about creativity**.

Step 2 — test option (b). "AI-generated works may lack the **depth, emotional connection, and unique perspectives that come with human experiences and emotions**" supplies exactly the substance of the debate: *why* AI creativity may differ from human creativity. The hedge "may lack" preserves the "ongoing debate" framing rather than settling it. ✔

Step 3 — eliminate.

- **(a)** Machines becoming *smarter* is a different concern from whether they are *creative*. It also introduces fear, a theme absent from the paragraph.
- **(c)** Ethics — privacy, bias, misuse — is a new topic. Nothing in the paragraph prepares it, and it abandons creativity entirely.
- **(d)** Speed and accuracy of calculation are the opposite pole from creativity, and the paragraph has already conceded AI's technical competence. This would contradict the drift of the final sentence.

Answer: (b)

Shortcut

The last sentence of the paragraph sets the topic the blank must serve. Here that is *creativity*, so underline it and reject every option that changes subject.

Scanning only the key noun in each option: (a) intelligence, (b) **creativity**, (c) ethics, (d) computation. **One match, three topic shifts.**

A general rule for para completion: the correct option almost never introduces a noun that has no root in the paragraph. If you have to supply a bridge yourself to make an option work, it is the wrong option.

71 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.

In an era where privacy and individualism are often prized above all else, Japanese architect Riken Yamamoto blurs the boundary between public and private. _____. His work is a testament to the power of architecture to break down barriers and to foster a sense of community. Through his innovative designs, he challenges traditional notions of public and private spaces, seamlessly blending the two realms.

(A) He successfully integrates traditional Japanese aesthetics and modern design principles in his work

(B) He was recently named the 2024 Laureate of the prestigious Pritzker Architecture Prize

(C) **In the world of architecture, he stands out as a visionary voice advocating a return to a more interconnected way of living**

(D) He is deeply committed to building harmonious societies through his architectural practice

ANSWER **(c) In the world of architecture, he stands out as a visionary voice advocating a return to a more interconnected way of living**

SOLUTION

Step 1 — note that the blank has text on *both* sides. It must bridge sentence 1 and sentence 3.

- **Before:** Yamamoto "blurs the boundary between public and private" in an era that prizes privacy and individualism.
- **After:** "His work is a testament to the power of architecture to **break down barriers** and to **foster a sense of community**."

Step 2 — identify the missing link. Sentence 3 begins "His work is a testament to...", which presupposes that we have just been told **what he stands for**. The blank must state his standpoint, and specifically one that leads to *community*.

Step 3 — test option (c). "a visionary voice advocating a return to a more **interconnected way of living**" does both jobs:

- It contrasts with the "privacy and individualism" of sentence 1 — *interconnected* is the antonym of *individualistic*.
- It sets up "foster a sense of **community**" in sentence 3 — interconnection is the idea community then testifies to.

✔ The bridge is complete in both directions.

Step 4 — eliminate.

- **(a)** Traditional vs modern aesthetics is a different axis entirely. The paragraph's axis is public vs private, not old vs new.
- **(b)** A biographical fact. It is true and relevant to Yamamoto, but a prize announcement cannot be what "his work is a testament to" refers back to. **Factual accuracy does not make an option coherent.**
- **(d)** Very close, and it does mention harmonious societies. But it merely restates sentence 3's point ("foster a sense of community") *in advance*, making the next sentence redundant. It also fails to pick up the individualism contrast from sentence 1.

Answer: (c)

Shortcut

A blank with text on both sides must satisfy both neighbours. Check each option twice — once looking back, once looking forward.

Option	Links back to *individualism*?	Sets up *community*?
(a)	✘	✘
(b)	✘	✘
(c)	✔ *interconnected*	✔
(d)	✘	✔ but redundant

The trap here is (d), the "premature conclusion". An option that says what the *following* sentence is about to say is wrong by definition — the paragraph would then repeat itself. **Redundancy is as fatal as irrelevance in para completion.**

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72 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.

The pursuit of a career in sports offers individuals opportunities for personal fulfilment and professional success. _____. Athletes must therefore undergo rigorous training regimens to maintain peak physical condition and hone their skills. Additionally, competition in the sports industry is fierce, requiring dedication, perseverance, and mental resilience to succeed. Despite the challenges, successful athletes can enjoy lucrative contracts, endorsements, and global recognition for their achievements.

(A) **Sports careers are often short-lived due to the physical demands and risks of injury associated with athletic competition**

(B) Athletes often face pressure from coaches, sponsors, and fans to perform at their best, adding to the stress of professional sports

(C) The sports industry encompasses a wide range of career paths, including coaching, sports management, and sports journalism

(D) Many athletes choose to pursue higher education alongside their sports careers to ensure long-term stability and success

ANSWER **(a) Sports careers are often short-lived due to the physical demands and risks of injury associated with athletic competition**

SOLUTION

Step 1 — find the connective that governs the blank. Sentence 3 begins:

"Athletes must **therefore** undergo rigorous training regimens to maintain **peak physical condition**..."

Therefore means the blank is the **cause** of which rigorous physical training is the consequence. So the blank must be about the **body** — physical demands.

Step 2 — test option (a). "Sports careers are often short-lived due to the **physical demands and risks of injury**" ✔

The logic reads perfectly: because careers are short and injuries threaten them, athletes *therefore* train rigorously to stay in peak condition. The cause (physical vulnerability) matches the effect (physical conditioning) exactly.

It also fits the paragraph's shape: sentence 1 gives the upside, the blank gives the first downside, sentence 4 adds a second downside ("Additionally, competition ... is fierce"), and sentence 5 resolves with "**Despite the challenges**". The word *challenges* is plural and retrospective — it needs at least two, and the blank supplies the first.

Step 3 — eliminate.

- **(b)** Pressure and stress are **psychological**. They would motivate *mental resilience*, not physical training — and mental resilience is already covered in sentence 4, which would make (b) redundant.
- **(c)** Career variety is a neutral fact that creates no challenge at all, so "Despite the challenges" would have nothing to refer to.
- **(d)** Higher education is off-topic and contradicts the drift toward athletic demands.

Answer: (a)

Shortcut

Hunt for the connective — it names the relationship you must supply. Here "**therefore**" in the next sentence demands that the blank be a *cause*, and the effect is explicitly **physical** ("peak physical condition").

So the test reduces to: *which option is about the body?* Only (a). Option (b) is the near-miss, and it fails on category — mental, not physical.

Also use the closing sentence as a checksum. "Despite the **challenges**" requires the paragraph to have listed challenges. Options (c) and (d) list no challenge at all, so they cannot be right whatever else they say.

Prefer a structured plan with recorded classes and tests? Look at the self-prep courses. See courses

73 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.

_____. This happened after a lorry laden with tomatoes worth 21 lakh rupees went missing. One of the three traders who had sent his tomatoes on the lorry said that they had lost contact with the driver in Nashik and that his GPS had been switched off. The traders were not sure if the truck had been hijacked or if the driver had stolen the tomatoes. This is the third time tomatoes have been stolen following the rise of tomato prices to Rs.150 per kg.

(A) Nashik overtook Kolar as the biggest tomato market in Asia

(B) **Panic and confusion reigned among traders in the Kolar agricultural produce market**

(C) A couple took the hijacked vehicle to a nearby market and sold the tomatoes there

(D) Three traders jointly hired a lorry to carry tomatoes

ANSWER **(b) Panic and confusion reigned among traders in the Kolar agricultural produce market**

SOLUTION

Step 1 — note that the blank is the opening sentence, and the second sentence begins:

"**This** happened after a lorry ... went missing."

So the blank must name a **state of affairs** that the lorry's disappearance caused. The pronoun *This* needs a situation to refer to, not an event that is itself part of the story.

Step 2 — test option (b). "**Panic and confusion reigned** among traders in the **Kolar** agricultural produce market" ✔

- It is a reaction — exactly what "This happened after..." requires.
- It introduces the **traders**, who are referred to as "the three traders" and "The traders" in the sentences that follow. An opening sentence must introduce the players before they are referred to with the definite article.
- It supplies the **location** (Kolar), which the paragraph never otherwise establishes.

Step 3 — eliminate.

- **(a)** A market-ranking fact with no connection to a theft, and nothing for *This* to point at.
- **(c)** Contradicts sentence 4, which says the traders "were **not sure** if the truck had been hijacked". The paragraph treats the hijacking as unresolved; this option states it as fact — and as the opening line, it would give away an ending the paragraph deliberately withholds.
- **(d)** True to the story but **chronologically and logically wrong for the opening**. Hiring the lorry happened *before* the lorry went missing, so "This happened **after** a lorry went missing" would be nonsense.

Answer: (b)

Shortcut

When the blank is the first sentence, read the second one for its pronoun. "**This** happened after..." tells you the blank is a *consequence*, not a background fact.

That single test disposes of (a) and (d) — both are prior or unrelated facts — and (c) fails on contradiction.

Two further opener tests worth internalising:

1. **Definite articles later in the paragraph** ("*the* traders") mean those people must be introduced in the opener.
2. **An opener never resolves the paragraph's central uncertainty.** Option (c) answers the very question sentence 4 poses.

74 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.

An _____ found that one of the marathon runners had _____ slowed down in the last two kilometres and after _____ to the one behind him had let him cross the finish line just one second before he did.

(A) analysis; systematically; waving

(B) overview; purposely; beckoning

(C) **investigation; deliberately; signalling**

(D) appraisal; particularly; speaking

ANSWER **(c) investigation; deliberately; signalling**

SOLUTION

Blank 1 — what uncovers wrongdoing? The sentence describes a suspected case of race-fixing. An **investigation** is what is conducted into suspected misconduct and what "finds" things.

- *Analysis* and *appraisal* examine data or value, and neither is the natural subject of "found that..." in a misconduct context.
- *Overview* is a summary, which cannot *find* anything.

Blank 2 — intention. The runner slowed on purpose. Both *purposely* and *deliberately* fit; *systematically* (methodically, in stages) and *particularly* (especially) do not express intent at all. This blank eliminates (a) and (d) but not (b).

Blank 3 — the decisive one. The runner communicated **to the one behind him** while running. Test each:

- **signalling to** someone ✔ — the standard verb for a discreet, non-verbal communication at a distance. "Signal **to**" takes exactly this preposition.
- **beckoning to** someone — grammatically possible, but *beckon* means to summon someone closer with a gesture. A runner is not calling his rival over; he is indicating an arrangement.
- **waving to** someone — a greeting, far too casual for a covert act.
- **speaking to** someone — possible, but paired with the wrong adverb in (d).

The best fit across all three: investigation; deliberately; signalling.

Answer: (c)

Shortcut

Solve the blank with the tightest constraint first — rarely the first one. Here blank 2 is purely about *intent*, which immediately removes *systematically* (a) and *particularly* (d).

That leaves (b) and (c), differing only in *overview/beckoning* versus *investigation/signalling*. An **overview** cannot "find" that something happened — findings come from investigations. Done.

General cloze strategy: read all three options in a row across, not one blank at a time. Two columns usually eliminate three options between them, and you never need to adjudicate the hardest blank.

75 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 outbreak of COVID-19 resulted in a health crisis and a drop in economic activity that were without _____ in history. While containing and _____ the spread of the virus was the first priority of public authorities, reducing the _____ of the disease and limiting the pressure on healthcare systems were also considered equally important.

(A) similarity; combating; prevalence

(B) **precedent; mitigating; incidence**

(C) equivalent; eradicating; toll

(D) parallel; controlling; outbreak

ANSWER **(b) precedent; mitigating; incidence**

SOLUTION

Blank 1 — the fixed phrase. "**Without precedent**" is the established idiom meaning *unprecedented*. Though *without parallel* also exists, *without precedent* is the standard collocation for an event of this kind, and the sentence is describing something never seen before **in history** — which is precisely what *precedent* means.

Without similarity and *without equivalent* are not idiomatic English.

Blank 2 — pairing with "containing". The phrase is "containing and _____ the spread". **Mitigating** (reducing the severity of) pairs naturally with containing: contain it, and soften what gets through.

- *Eradicating* is far too absolute — nobody claimed to be eradicating COVID-19 as a first priority, and it would make the third clause pointless.
- *Combating* and *controlling* are plausible but weaker; and crucially, their options fail on blank 1.

Blank 3 — the technical term. "Reducing the _____ of the disease" needs a measure of **new cases arising**. In epidemiology:

- **Incidence** = the rate of *new* cases over a period ✔ — this is what public health policy seeks to reduce.
- **Prevalence** = the total existing cases at a point in time.
- *Toll* usually means deaths, which the sentence separates from healthcare pressure.
- *Outbreak* would be redundant, since the sentence already began "The outbreak of COVID-19".

Answer: (b)

Shortcut

Blank 1 alone decides this question. *Without precedent* is a set phrase; the other three are not English. One recognition, one answer.

If you want a second confirmation, use the redundancy test on blank 3: option (d) would make the sentence read "the outbreak of COVID-19 … reducing the **outbreak** of the disease" — repeating a word from the first line. **Repetition of a word already used is a near-certain sign of a wrong option in cloze.**

Worth adding to your word list: *incidence* (new cases) vs *prevalence* (total cases) — a distinction tested in several entrance exams.

76 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 today's fast-paced world, individuals are inundated with information, necessitating the cultivation of critical thinking skills in order to navigate the influx of data _____. Additionally, the prevalence of fake news and misinformation presents a _____ challenge, undermining people's trust in media and institutions. Promoting media literacy and cultivating a culture of scepticism are vital for _____ informed citizenship and democratic values.

(A) judiciously; systematic; inhibiting

(B) **discerningly; pervasive; fostering**

(C) discreetly; global; serving

(D) thoughtfully; holistic; furthering

ANSWER **(b) discerningly; pervasive; fostering**

SOLUTION

Blank 3 is the fastest — start there. We need a verb that takes "informed citizenship and democratic values" as its object in a positive sense.

- **inhibiting** (a) means *holding back* — the exact opposite of what media literacy is said to be "vital for". ✘ Option (a) dies here.
- *serving*, *furthering*, *fostering* are all positive; this blank alone does not separate them.

Blank 1 — how do you navigate a flood of data? The skill named in the same sentence is **critical thinking**, so the adverb must mean *with discernment*.

- **discerningly** ✔ — perceiving distinctions, judging quality. It is the adverb of critical thinking itself.
- *discreetly* (c) means *without attracting attention* — about privacy, not judgement. ✘ Option (c) dies here.
- *judiciously* and *thoughtfully* are reasonable but less precise.

Blank 2 — the scale of the misinformation problem. The challenge is described as "undermining people's trust in media **and** institutions", i.e. it has spread everywhere.

- **pervasive** ✔ — spread throughout every part. It is the right word for something that has seeped into multiple domains.
- *holistic* (d) means *treating the whole rather than the parts* — it describes an **approach**, never a problem. A "holistic challenge" is close to meaningless. ✘
- *systematic* (a) means *methodical*; misinformation is diffuse, not organised.
- *global* (c) would be merely geographic and misses the point.

Consistent across all three: discerningly; pervasive; fostering.

Answer: (b)

Shortcut

Start with the blank whose *polarity* is fixed. Blank 3 follows "vital for", which guarantees a positive verb — and *inhibiting* is negative. Option (a) falls in two seconds.

Then use **word-class logic** on blank 2: *holistic* modifies approaches and methods, never problems. That is a collocation error, not a meaning error, and spotting it kills (d).

Of the two survivors, blank 1 decides: *discreetly* (privately) versus *discerningly* (with judgement). The sentence is about critical thinking, so it must be discernment.

The habit to build: in a three-blank cloze, you should almost never need to evaluate all twelve words. Find the two blanks with the cleanest right-or-wrong test and stop.

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77 VARC VERBAL ABILITY FILL IN THE BLANKS ●●●●●●●○○ 7 /10

Some of the words in the sentences below are missing. Choose the best option from those given below to complete them.

Conspiracy theorists suggest that if climate change is slowly turning the planet into an oven, then this must have been the outcome of our enemies' intentional _____. If there are no coincidences in the world, then everything, including _____ events, can be controlled. It is only a matter of power and _____.

(A) machinations; outstanding; determination

(B) errors; indescribable; information

(C) **plotting; catastrophic; prowess**

(D) inaction; advantageous; performance

ANSWER **(c) plotting; catastrophic; prowess**

SOLUTION

Blank 1 — what do conspiracy theorists allege? The adjective **"intentional"** immediately precedes the blank, and the actors are "our enemies". The noun must mean *secret scheming*.

- **plotting** ✓ — planning in secret to do harm. Direct and idiomatic after *intentional*.
- *machinations* (a) also means scheming, so this blank does not separate (a) and (c).
- *errors* (b) ✘ — an error is unintentional by definition, which contradicts "intentional".
- *inaction* (d) ✘ — failing to act cannot be the "outcome" producing climate change in this framing, and "intentional inaction" sits oddly as something *enemies* do to turn the planet into an oven.

Blank 2 — what kind of events must be controllable? The sentence's logic: *if nothing is coincidence, then even _____ events are controlled.* The word must name the events a conspiracy theory would most want to explain — large, destructive ones.

- **catastrophic** ✓ — matches the opening image of a planet turned into an oven, and makes the claim meaningful: even disasters are engineered.
- *outstanding* (a) means excellent or unresolved — neither sense works.
- *indescribable* (b) is vague and adds nothing.
- *advantageous* (d) reverses the sense; a conspiracy theory does not need to explain away *beneficial* events.

Blank 3 — what else is needed besides power? To engineer catastrophes you need power **and the capability to use it**.

- **prowess** ✓ — skill and expertise. "A matter of power and prowess" is also alliterative, which is clearly the setter's intent.
- *determination*, *information*, *performance* are each plausible in isolation but belong to options already eliminated.

Answer: (c)

Shortcut

Blank 1 is a one-word contradiction test. *Intentional errors* and *intentional inaction* both clash with the sentence's claim that enemies deliberately caused this. (b) and (d) go immediately.

Blank 2 then settles (a) against (c): *outstanding events* is not a meaningful category, while *catastrophic events* is exactly what a conspiracy theory exists to explain.

Two patterns worth carrying forward:

1. **The word next to the blank constrains it most.** Here "intentional" does all the work on blank 1.
2. **Setters like sound.** When two options survive, the one that alliterates or has rhythm ("power and prowess") is often the intended one.

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78 VARC VERBAL ABILITY FILL IN THE BLANKS ●●●●●●●○○ 7 /10

Some of the words in the sentences below are missing. Choose the best option from those given below to complete them.

It is widely argued that social media can benefit aspiring _____. Populists in particular latch on to social media today as a way to connect directly with people, _____ restraints on their behaviour that political parties would have provided in the pre-internet age. They can also profit from echo chambers, which reinforce the sense that a whole people _____ supports a populist leader.

(A) **autocrats; bypassing; uniformly**
(B) entrepreneurs; enforcing; presumably
(C) anarchists; unscrupulous; unanimously
(D) democrats; avoiding; surprisingly

ANSWER **(a) autocrats; bypassing; uniformly**

SOLUTION

Blank 1 — read ahead before filling it. The next sentence says "**Populists** in particular latch on to social media". The phrase *in particular* marks populists as a **subset** of the group named in blank 1. So blank 1 must be a broader category that contains populists and is served by bypassing institutions.

- **autocrats** ✓ — populists are a recognisable subset of would-be autocrats, and the whole paragraph describes the erosion of institutional restraint.
- *entrepreneurs* (b) ✘ — populists are not a kind of entrepreneur, and the paragraph is entirely political.
- *anarchists* (c) ✘ — anarchists oppose concentrated authority; populist leaders seek it. The paragraph's third sentence is about supporting *a leader*.
- *democrats* (d) ✘ — the paragraph describes **escaping** democratic restraints, so this inverts the meaning.

Blank 2 — what do they do to the restraints? The sentence contrasts connecting "**directly** with people" against restraints "that political parties **would have** provided". The counterfactual *would have* signals that those restraints are now absent.

- **bypassing** ✓ — going around them. It fits "directly" precisely: direct contact means the intermediary is skipped.
- *enforcing* (b) ✘ — the exact opposite.
- *unscrupulous* (c) ✘ — an adjective where the slot demands a participle; it is not even the right part of speech.

- *avoiding* (d) is close in meaning but belongs to an option already dead on blank 1.

Blank 3 — what does an echo chamber create the illusion of? It makes a partial view look total.

- **uniformly** ✔ — "a whole people uniformly supports" captures the manufactured impression of complete agreement.
- *presumably* (b) ✘ hedges, which destroys the point about false certainty.
- *unanimously* (c) is close in meaning, but applies to a formal vote or decision rather than a diffuse popular sentiment.
- *surprisingly* (d) ✘ adds an irrelevant note of surprise.

Answer: (a)

Shortcut

"In particular" in the next sentence is the key. It tells you blank 1 names a **category containing populists**. Run the test: are populists a kind of entrepreneur? No. Anarchist? No. Democrat? No — the paragraph is about escaping democratic restraint. Autocrat? Yes.

Then confirm on blank 2 with one word: "directly". Connecting *directly* with people means going **around** the intermediaries — *bypassing*. Option (b)'s *enforcing* reverses it, and (c)'s *unscrupulous* is the wrong part of speech entirely.

Note the part-of-speech check — it is the cheapest elimination available in any cloze, and it costs no comprehension at all.

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79 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 an era of globalization, cultural diversity is celebrated and valued across societies. However, the rise of xenophobia and intolerance poses a _____ challenge to social cohesion and harmony. Building inclusive communities and promoting intercultural dialogue are essential for _____ mutual understanding and respect among diverse populations. Additionally, educating individuals about the benefits of cultural diversity and challenging _____ are crucial steps toward creating inclusive societies and encouraging peaceful coexistence.

(A) complicated; advancing; truisms
(B) multi-faceted; stimulating; archetypes
(C) **pressing; nurturing; stereotypes**
(D) sophisticated; expediting; propositions

ANSWER **(c) pressing; nurturing; stereotypes**

SOLUTION

Blank 3 — the clearest test. What must be *challenged* in order to build an inclusive society, alongside educating people about diversity?

- **stereotypes** ✔ — oversimplified fixed beliefs about groups. This is the standard counterpart to xenophobia and intolerance, and the one thing anti-prejudice education exists to challenge.
- *truisms* (a) — obvious, self-evident statements. Harmless, and nothing to do with prejudice.

- *archetypes* (b) — universal symbolic patterns (the hero, the mentor). A literary and psychological term, not a social prejudice.
- *propositions* (d) — statements for consideration. Far too neutral.

Blank 1 — what kind of challenge? Xenophobia threatens social cohesion, so the adjective should convey **urgency**.

- **pressing** ✔ — demanding immediate attention. Exactly right for a threat.
- *complicated* and *multi-faceted* describe complexity, not urgency, and both understate a threat to cohesion.
- *sophisticated* (d) ✘ — means refined or advanced, which is almost complimentary. You cannot call xenophobia sophisticated.

Blank 2 — what do you do to mutual understanding?

- **nurturing** ✔ — to care for and encourage growth. It collocates naturally with understanding and respect, which develop slowly.
- *advancing* (a) is possible but mechanical.
- *stimulating* (b) suggests a short sharp prompt, not sustained cultivation.
- *expediting* (d) ✘ means *speeding up a process* — understanding between peoples is not a procedure to be rushed, and the word belongs to bureaucracy.

Answer: (c)

Shortcut

Blank 3 is the fastest elimination in the question — only one of the four words names a prejudice, and the sentence is explicitly about challenging prejudice. **Answer secured on a single blank.**

Build the vocabulary pairs this question tests, since they recur:

- **stereotype** (fixed oversimplified belief about a group) vs **archetype** (universal symbolic pattern) — these two are confused constantly.
- **truism** (an obvious truth) vs **proposition** (a statement put forward).
- **expedite** (speed up a process) vs **nurture** (cultivate over time).

And check adjective register: *sophisticated* is positive, so it can never describe a social evil.

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) When it is not too thick, the callus protects the foot from damage.

(B) A build-up of the callus is one of the most common causes of discomfort.

(C) **He received fifty lashes on his feet delivered with callus indifference.**

(D) The doctor examined the callus but neglected to treat it.

ANSWER **(c) He received fifty lashes on his feet delivered with callus indifference.**

SOLUTION

The word pair being tested: *callus* vs *callous*.

- **callus** (noun) — a thickened, hardened patch of skin, typically on the hands or feet.
- **callous** (adjective) — emotionally hardened; cruelly insensitive to others' suffering.

They are near-homophones with a shared root (Latin *callum*, hard skin), which is exactly why they are confused.

Checking each option:

- **(a)** "the **callus** protects the foot" — a patch of hard skin, used as a noun ✔
- **(b)** "A build-up of the **callus**" — hard skin accumulating ✔
- **(c)** "delivered with **callus** indifference" ✘ — here the word modifies the noun *indifference*, so an **adjective** is required. The sense needed is *cruel, unfeeling*, which is **callous**. The sentence should read "with **callous** indifference."
- **(d)** "The doctor examined the **callus**" — a physical lesion a doctor would inspect ✔

Answer: (c)

Shortcut

Use the part of speech, not the meaning. In (a), (b) and (d) the word sits in a **noun** slot (after *the*, as the object of a verb). In (c) it sits directly before a noun — an **adjective** slot — and *callus* is not an adjective.

You can answer without knowing either definition. Scan for the odd grammatical position and you have the answer in five seconds.

The pair to memorise: *callus* = hard skin (noun); *callous* = hard-hearted (adjective). The commonest real-world collocation is **"callous indifference"**, exactly as this question hints.

81 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) He used a fan to diffuse the smoke that had accumulated in the kitchen while cooking.

(B) Every morning, the aroma of freshly baked bread diffuses throughout the house, enticing everyone to the kitchen.

(C) **Realising that the argument between the two groups of students was getting out of control, the teacher diffused the situation by quickly changing the topic.**

(D) The stained glass diffused the light filtering through the windows.

ANSWER **(c) Realising that the argument between the two groups of students was getting out of control, the teacher diffused the situation by quickly changing the topic.**

SOLUTION

The word pair being tested: *diffuse* vs *defuse*.

- **diffuse** — to spread out over a wide area; to scatter or disperse. (Of gases, light, aromas, ideas.)
- **defuse** — literally, to remove the fuse from a bomb; figuratively, **to make a tense situation less dangerous**.

Checking each option:

- **(a)** "a fan to **diffuse** the smoke" — smoke being dispersed through the air ✔
- **(b)** "the aroma … **diffuses** throughout the house" — a scent spreading ✔
- **(c)** "the teacher **diffused** the situation" ✘ — the teacher calmed a volatile argument. That is **defusing** a situation, not spreading it out. Writing *diffuse* here would literally mean the teacher *spread the argument around*, which is the opposite of what the sentence describes.
- **(d)** "The stained glass **diffused** the light" — scattering light, the standard optical usage ✔

Answer: (c)

Shortcut

Ask one question: is something spreading out, or calming down?

- Spreading (smoke, aroma, light) → **diffuse**
- Calming (a row, a crisis, tension) → **defuse**

Options (a), (b) and (d) are all physical dispersal; only (c) is de-escalation.

A memory hook: *defuse* contains **fuse** — think of a bomb. *Diffuse* contains **-ffuse** as in *suffuse*, spreading throughout. This is one of the most frequently misused pairs in written English, and it appears regularly in entrance papers.

🧪 Vocabulary sticks when it is drilled in short bursts, not memorised in lists. Word Lab

82 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) **Bans provide the community a chance to raise objections and ensure transparency.**

(B) Organic farming bans the usage of all pesticides and involves manual weeding.

(C) The government bans anyone with irregularities in their passports from travelling abroad.

(D) The Child Marriage Restraint Act bans the marriage of those who are below 18 years of age.

ANSWER **(a) Bans provide the community a chance to raise objections and ensure transparency.**

SOLUTION

The word being tested: ***ban*** — to **prohibit** something officially.

Checking each option:

- **(b)** "Organic farming **bans** the usage of all pesticides" — a prohibition ✔
- **(c)** "The government **bans** anyone with irregularities … from travelling" — the standard construction *ban someone from doing something* ✔
- **(d)** "The … Act **bans** the marriage of those … below 18" — a legal prohibition ✔
- **(a)** "**Bans** provide the community a chance to raise objections and ensure transparency" ✘

Why (a) fails. A ban *forecloses* an activity; it does not create an opportunity to object or make anything transparent. The sentence describes a **consultation** process — the word that belongs here is something like **notices**, **public hearings** or **advance notifications**, which genuinely do invite objections and promote transparency.

Reading it as written produces a contradiction: prohibitions are precisely what communities object *to*, not a mechanism *for* objecting.

Answer: (a)

Shortcut

Three options use *ban* as a verb; one uses it as a plural noun. That grammatical outlier is the one to examine first — and it fails on meaning.

The logical test: substitute the definition. "**Prohibitions** provide the community a chance to raise objections" — a prohibition shuts an activity down; it does not open a channel for dissent. The sentence is describing the *opposite* instrument.

A useful principle for this question type: in a four-sentence usage question, the odd one out is usually either a different part of speech or a different sense of the word. Check the grammatical role before you check the meaning.

83 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) During her summer holidays she usually went to the village to stay with her grandparents and her large extended family.

(B) She said, "I always stay awake late into the night till my daughters come home, as I worry a lot about their safety."

(C) The ownership of the property went to the eldest son of the family, but the other siblings went to court and asked for a stay order.

(D) **Due to the ban on slaughter of cattle, the neglected ones often stay away, wandering into fields and eating the crops.**

ANSWER **(d) Due to the ban on slaughter of cattle, the neglected ones often stay away, wandering into fields and eating the crops.**

SOLUTION

The word being tested: *stay*, across its several senses.

- **(a)** "**stay** with her grandparents" — to reside temporarily ✔ the commonest sense.
- **(b)** "**stay** awake late into the night" — to remain in a state ✔
- **(c)** "asked for a **stay** order" — the legal sense: a court order suspending proceedings ✔ a genuine and precise usage.
- **(d)** "the neglected ones often **stay away**, wandering into fields and eating the crops" ✘

Why (d) fails. *Stay away* means **to keep one's distance; to not go near a place**. But the rest of the sentence describes cattle that are **wandering into fields and eating crops** — that is, coming *towards* cultivated land, not keeping away from it.

The sentence contradicts itself. The intended word is almost certainly **stray** — "the neglected ones often **stray**, wandering into fields and eating the crops" — which fits both the wandering and the context of abandoned cattle.

Answer: (d)

Shortcut

Read on past the tested word. The error in (d) is only visible from the clause that follows it: *stay away* and *wandering into fields* point in opposite directions.

The intended word is *stray* — one letter from *stay*, which is the whole design of the question.

Note how wide the net is cast here: (a) residence, (b) remaining in a state, (c) a legal instrument. **A word having an unfamiliar technical sense does not make it wrong** — many students flag (c) because they have not met a *stay order*. Verify by meaning, never by unfamiliarity.

84 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 rules of the organization proscribes members from engaging in conflicts of interest.

(B) The coach proscribes late night parties before an important game.

(C) The company's policy proscribes employees from disclosing confidential information to unauthorized individuals.

(D) **The software manual proscribes step-by-step instructions for installing and configuring the program.**

ANSWER **(d) The software manual proscribes step-by-step instructions for installing and configuring the program.**

SOLUTION

The word pair being tested: *proscribe* vs *prescribe*. These two look almost identical and mean nearly opposite things.

- **proscribe** — to **forbid**, to prohibit officially.
- **prescribe** — to **lay down a rule or direction**; to recommend or order (a treatment, a procedure).

Checking each option:

- **(a)** "rules … **proscribes** members from engaging in conflicts of interest" — forbidding ✔ *(the subject–verb agreement is faulty — "rules … proscribe" — but the question asks about word usage, not grammar, and the word itself is correctly chosen)*
- **(b)** "The coach **proscribes** late night parties" — forbidding ✔
- **(c)** "policy **proscribes** employees from disclosing confidential information" — forbidding ✔
- **(d)** "The software manual **proscribes** step-by-step instructions" ✘ — a manual **lays out** instructions; it does not forbid them. The word required is **prescribes** (or simply *provides*).

Answer: (d)

Shortcut

One structural tell solves this instantly. *Proscribe* is a verb of prohibition, so it takes either a forbidden activity as its object or the pattern **"proscribes X from doing Y"**.

- a. and (c) use *from* ✔ — prohibition.
- b. takes a forbidden thing (late-night parties) ✔
- d. takes **instructions** — something a document supplies, never something it bans ✘

Memory hook: proscribe = **pro**hibit; **pre**scribe = **pre**pare a direction (what a doctor writes). Doctors *prescribe*; laws *proscribe*.

Don't be distracted by the grammatical error in (a). The question asks only about the chosen word. Answering (a) because "rules proscribes" is ungrammatical is the trap.

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) The sound of laughter and loud music from the neighbour's house disturbed his train of thought as he was writing his farewell speech.

(B) If you really want to see the landscape and the scenic countryside, it is better to take a train or go by road, rather than by plane.

(C) **By following the train of blood on the platform the police located the body of a young woman who had been brutally stabbed.**

(D) My friend has picked up a stray dog from the street and is now looking for somebody to train and domesticate the animal.

ANSWER **(c) By following the train of blood on the platform the police located the body of a young woman who had been brutally stabbed.**

SOLUTION

The word being tested: *train*, in its various senses.

- **(a)** "**train** of thought" — a fixed idiom for a connected sequence of ideas ✔
- **(b)** "take a **train**" — the railway sense ✔
- **(c)** "the **train** of blood on the platform" ✘
- **(d)** "**train** and domesticate the animal" — to teach ✔

Why (c) fails. *Train* can mean a trailing series — a *train* of followers, the *train* of a wedding gown, a *train* of thought. But a mark left on the ground that is followed to find something is a **trail**, not a train.

The idiom is fixed: police follow a **trail** of blood. "Train of blood" is not English.

Note the deliberate placement of *platform* in that sentence — the railway association is bait, designed to make "train" feel natural where it is wrong.

Answer: (c)

Shortcut

The question is a *trail/train* swap, one letter apart. The collocation is absolute: blood, footprints and clues leave a **trail**; thoughts, gowns and followers come in a **train**.

Spot the misdirection. Putting the word *platform* in the same sentence makes the railway sense feel live, but the noun is doing a completely different job there.

A good general check for these six questions (Q80–Q85): every one is built on a near-identical pair — *callus/callous*, *diffuse/defuse*, *stay/stray*, *proscribe/prescribe*, *train/trail*. When you spot the tested word, **ask what word it is one letter away from.** That question alone finds the answer in most cases.

86 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. By contrast, in America, it is estimated that even after post-COVID decline, total giving came to almost $ 500 billion in 2022.
2. There are no comparable data on different countries. But one report by Dasra, a Mumbai-based NGO, estimates total private giving in India came to about $ 13 billion in 2022.
3. A strategic sort of giving, involving philanthropy professionals, a long-term lens, and big ambitions of transforming society is gradually emerging. It differs, of course, between countries.
4. Researchers at the Chinese Academy of Social Sciences, put total giving in China at $ 21 billion in 2020.
5. By any measure, however, organised philanthropy across Asia is on a much smaller scale than in the West.

ANSWER 32415

SOLUTION

Step 1 — find the opener. Sentence **3** is the only one that introduces its subject in full ("A strategic sort of giving…") with no backward reference. Every other sentence either begins with a connective (*By contrast*, *By any measure however*) or supplies a specific country figure that needs a frame.

Crucially, sentence 3 ends with "**It differs, of course, between countries**" — an explicit promise that country-by-country figures are coming.

Step 2 — follow the promise. Sentence **2** delivers the first figures, opening with the caveat "There are no comparable data on different countries" — which answers sentence 3's "it differs between countries" directly — and gives India's $13 billion.

Step 3 — continue the Asian figures. Sentence **4** adds China's $21 billion. It must follow 2 rather than precede it, because 2 carries the data caveat that frames all the estimates that follow.

Step 4 — the contrast. Sentence **1** opens with "**By contrast, in America**" — it needs the Asian figures ($13 bn, $21 bn) already on the table to contrast against $500 billion.

Step 5 — the conclusion. Sentence **5** begins "**By any measure, however**" and generalises: "organised philanthropy across Asia is on a much smaller scale than in the West." This summarises the comparison just drawn, so it closes.

The sequence:

$3 \rightarrow 2 \rightarrow 4 \rightarrow 1 \rightarrow 5$

Answer: 32415

Shortcut

Connectives fix almost the whole order here.

Sentence	Opening	Where it must go
3	no connective, full subject	**opener**
1	"By contrast, in America"	after the Asian figures
5	"By any measure, however" + summary	**closer**

That pins 3 first and 5 last immediately, leaving only 2 and 4 to order in the middle — and **2 must precede 4** because it carries the "no comparable data" caveat that licenses every estimate.

The reliable rule: a sentence containing a *summary* word (*by any measure, in short, overall*) plus a comparison that covers everything already said is the closer, never the opener.

---

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. Farmers, however, especially during the peak farming season, ignore the warnings of the weather forecast.
2. People from some states of India have demanded that families of those who have been killed by lightning strikes should receive compensation.
3. The Minister for Disaster Management announced that over 2800 people have died after being struck by a lightning last year.
4. The Minister responded that pamphlets on the dangers of lightning and precautions to be taken are being distributed in villages.

ANSWER 3241

SOLUTION

Step 1 — find the opener. Sentence **3** introduces both the topic (lightning deaths) and the speaker ("The Minister for Disaster Management", with the full designation). Sentence 4 refers to "**The** Minister" with no designation — so 4 must come after 3, which introduces him.

Sentence 3 also supplies the statistic that gives the paragraph its reason to exist.

Step 2 — the demand. Sentence **2** is the public's reaction to those deaths: a demand for compensation. It follows naturally from the death toll.

Step 3 — the response. Sentence **4** begins "The Minister **responded**" — a response requires something to respond *to*, which is the demand in sentence 2. This is a **mandatory pair**: $2 $.

Step 4 — the closing qualification. Sentence **1** begins "Farmers, **however**, ... ignore the warnings". It qualifies the minister's claim that preventive information is being distributed: the information exists, but the people most at risk disregard it. That irony can only land after 4.

The sequence:

$\$3 \rightarrow 2 \rightarrow 4 \rightarrow 1\$$

Answer: 3241

Shortcut

Two signals do all the work.

1. **Full name before short name.** "The Minister **for Disaster Management**" (3) must precede the bare "The Minister" (4). This alone fixes 3 before 4.
2. **"Responded" demands a prior demand.** That makes $2 $ an unbreakable pair.

With 3 first and the 2–4 block locked, only sentence 1 is left — and its "however" marks it as a qualification, which belongs at the end.

Generalise signal 1: in any jumble involving a named person or organisation, the sentence with the **full designation comes before** the one using a short form or a pronoun. It is the single most reliable ordering clue in this question type.

---

88 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. Meanwhile, people are posting less. The share of Americans who say they enjoy documenting their life online has fallen from 40 per cent to 28 per cent since 2020.
2. The striking feature of the new social media is that they are no longer very social.
3. Some of the consequences of this are welcome. Political campaigners say they have to tone down their message to win over private groups.
4. Debate is moving to closed platforms such as WhatsApp and Telegram.
5. Inspired by TikTok, apps like Facebook increasingly serve a diet of clips selected by artificial intelligence according to a user's viewing behaviour, not their social connections.

ANSWER **25143**

SOLUTION

Step 1 — find the thesis. Sentence **2** states the paragraph's central claim: "The striking feature of the new social media is that they are **no longer very social**." Everything else is evidence for or consequence of that claim. It also has no backward reference, so it is the opener.

Step 2 — first evidence. Sentence **5** explains *how* they became less social: feeds are now driven by AI and viewing behaviour "**not their social connections**". That last phrase directly supports "no longer very social".

Step 3 — second evidence. Sentence **1** opens with "**Meanwhile**" — a parallel development, adding that people are also posting less. The word *meanwhile* requires a prior trend to run alongside, which 5 supplies.

Step 4 — third evidence. Sentence **4** completes the picture: debate has migrated to closed platforms. Together, 5, 1 and 4 give three strands of the same decline.

Step 5 — the turn. Sentence **3** begins "Some of the consequences of **this** are welcome." The pronoun *this* must refer to the whole shift described above, so 3 closes the paragraph by evaluating it.

The sequence:

$2 \rightarrow 5 \rightarrow 1 \rightarrow 4 \rightarrow 3$

Answer: 25143

Shortcut

Open with the thesis, close with the evaluation. Sentence 2 is a general claim; sentence 3 judges consequences ("Some of the consequences of **this**"). Those two bookends are identifiable before you order anything in between.

Then use "Meanwhile" (1) — it cannot be first, since it needs a parallel trend already running.

A broader structural pattern worth recognising: many jumbles follow **claim** → **evidence** → **evidence** → **evidence** → **consequence**. Find the one abstract sentence (the claim) and the one evaluative sentence (the consequence), and the concrete examples sort themselves in the middle.

---

89 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. In this microgravity environment, your blood also tends to move towards the heart and head.
2. Both effects are only short-lived and, after a brief period of readjustment on arriving back home, the heart and spine return to normal.
3. The heart interprets this as an increase in the amount of blood in the body and that it needs to pump less, so it shrinks.
4. In space with less gravitational force than on Earth, there's less pressure on your spine and so it'll get a bit longer, effectively making you as much as two inches taller.

ANSWER **4132**

SOLUTION

Step 1 — find the opener. Sentence **4** is the only one that establishes the setting: "**In space with less gravitational force than on Earth**...". Every other sentence presupposes that we already know we are in space:

- 1 says "In **this** microgravity environment" — *this* needs an antecedent.
- 3 says "The heart interprets **this**" — another backward reference.
- 2 says "**Both** effects" — requires two effects already named.

So 4 must be first, and it introduces **effect one**: the spine lengthens.

Step 2 — the second effect begins. Sentence **1** picks up with "In **this** microgravity environment, your blood **also** tends to move towards the heart and head." Both *this* and *also* confirm it follows 4.

Step 3 — the consequence of the blood shift. Sentence **3** explains what the heart makes of it: it "interprets **this**" — the blood movement from sentence 1 — "and... so it shrinks." This gives **effect two**.

Step 4 — the closer. Sentence **2** refers to "**Both** effects" — the lengthened spine (4) and the shrunken heart (3) — and resolves them: both are temporary. A sentence that resolves everything named before it can only be last.

The sequence:

$4 → 1 → 3 → 2$

Answer: 4132

Shortcut

Count the pronouns — three sentences are disqualified from opening. *this* (1), *this* (3) and *Both* (2) all point backwards, leaving **4** as the only possible first sentence. That is half the question answered by scanning first words.

Then "Both effects" fixes the closer. It can only appear once two effects exist, and the second effect (the shrinking heart) arrives in 3. So 2 is last.

With first and last pinned, only 1 and 3 remain, and 3's "interprets **this**" refers to the blood movement in 1, so $1 $.

Generalise: in a four-sentence jumble, identifying which sentences *cannot* be first is usually faster than deciding which one is.

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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. The muddy concoction – made by grinding the kava plant's roots and mixing it with water to create a dark, earthy liquid – holds a deep cultural significance throughout the region, and the drink is often shared between friends, guests, and colleagues.
2. Regular kava drinkers often describe this blissful state as a sort of peace, a way for the body and mind to uncoil from itself.
3. Called yaqona in Fiji, 'ava in Samoa and sakau in Micronesia, kava has occupied a sacred role in Pacific countries for centuries.
4. A swig (or two) taken from a bowl or shell – sometimes quite literally a coconut shell cut in half – can lead to profound relaxation, a sort of numbness that trickles down from your mouth through your shoulders and spine.

ANSWER **3142**

SOLUTION

Step 1 — find the opener. Sentence **3** names the subject for the first time and gives its names across the region: "Called yaqona in Fiji, 'ava in Samoa and sakau in Micronesia, **kava** has occupied a sacred role in Pacific countries for centuries."

It also introduces "the region" and "Pacific countries", which sentence 1 then refers back to with "throughout **the region**". A definite article pointing at an unintroduced noun is impossible, so 3 precedes 1.

Step 2 — describe the drink. Sentence **1** explains what kava physically is ("made by grinding the kava plant's roots…") and reinforces its cultural role. It follows 3 naturally: name and status first, substance second.

Step 3 — the experience. Sentence **4** moves from what kava *is* to what it *does*: "A swig… can lead to **profound relaxation**, a sort of numbness…". This is the first mention of the effect.

Step 4 — the closer. Sentence **2** refers to "**this** blissful state" — which must be the relaxation described in 4. It then characterises how regular drinkers describe it, deepening rather than introducing.

The sequence:

$3 → 1 → 4 → 2$

Answer: 3142

Shortcut

The chain of references orders this almost mechanically:

- 3 introduces *the region* $$ 1 says "throughout **the region**"

- 4 introduces *profound relaxation* $$ 2 says "**this** blissful state"

Two backward references, two fixed pairs: $3 $ and $4 $.Since3istheonlysentencenamingkavaforthefirsttime,theblocksassembleas$3 \rightarrow 1$ then $4 $.

The underlying structure is also a standard one: *what it is called* $\rightarrow$ *what it is made of* $\rightarrow$ *what it does* $\rightarrow$ *how it feels*. Moving from the objective to the subjective is a very common paragraph shape, and recognising it confirms the order in seconds.

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READING PASSAGE

Passage 2 – Anxiety: evolution, disorder and treatment

Read the following passage and choose the answer that is closest to each of the questions that are based on the passage.

Anxiety is an emotion that all people experience from time to time, and we do that for good reasons. It has been built into us; we have inherited it from our evolutionary past, because, in general, anxiety has a survival function. It kicks in whenever we sense danger – we freeze, we devote all of our attention to the danger, and our bodies react with a big release of adrenalin, an increase in blood flow to the muscles, getting us ready to run as fast as we can or fight as fiercely as we might. Anxiety also helps us to focus on things when we have deadlines and, if someone is driving too fast when we cross the road, it helps us to jump out of the way quickly.

So, there is nothing wrong with anxiety in general, and in fact, we would have difficulties if we did not experience it to some extent. However, it can get problematic if the danger is imagined rather than real, or is something that is exaggerated. In those cases, particularly if the perceived danger is out of proportion to the real danger, and it is persistent and disabling, then there is a danger of an anxiety disorder.

Scientists are looking at what role genes play in the development of these disorders and are also investigating the effects of environmental factors such as pollution, physical and psychological stress, and diet. Several parts of the brain are key actors in the production of fear and anxiety. Using brain imaging technology and neurochemical techniques, scientists have discovered that the amygdala plays a significant role in most anxiety disorders. By learning more about how the brain creates fear and anxiety, scientists may be able to devise better treatments for these disorders.

The first psychotherapy treatment that was shown to be effective was 'exposure therapy', which essentially encourages people in a graded way to go into their feared situations and stay in them for as long as they can and build their confidence that way. Another is 'group cognitive behaviour therapy', a talking therapy that helps people to understand the link between negative thoughts and mood and how altering their behaviour can enable them to manage anxiety and feel in control. There are, of course, drugs that can help people with anxiety, but medication will not cure an anxiety disorder, it can only help to keep it under control while the person receives psychotherapy.

There is plenty of evidence that exercise can help with anxiety problems. When stress affects the brain, with its many nerve connections, the rest of the body feels the impact as well. Exercise and other physical activity produce endorphins, which are chemicals in the brain that act as natural painkillers. Additionally, getting physically tired can help people fall asleep faster and have deeper, more relaxing sleep. As many people suffering from anxiety often have problems with insomnia, just the ability to get a good night's rest can change their perspectives.

Anxiety is a normal but highly subjective human emotion. While normal anxiety serves a beneficial and adaptive purpose, it can also become the cause of tremendous suffering for millions of people. It is

important that people recognise excessive anxiety in themselves at the earliest, as treatment can be very successful. Leaving it untreated can be a misery.

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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

Counting factors with a condition *(Q1)* — Write $N = 2^a 3^b 5^c \ldots$ The number of factors is $(a+1)(b+1)(c+1)\cdots$. For factors that are **multiples of** m, divide first: the answer is simply the number of factors of N/m. Here $1800/6 = 300$, giving 18.

Number of digits *(Q27)* — $d(N) = \lfloor \log_{10} N \rfloor + 1$. The one result worth memorising outright:

$$d(2^n) + d(5^n) = n + 1$$

because $2^n \cdot 5^n = 10^n$. It converts a logarithm question into an addition.

Fractions between two bounds *(Q40)* — To find the fraction with the **smallest denominator** strictly between $\frac{a}{b}$ and $\frac{c}{d}$, take the **mediant** $\frac{a+c}{b+d}$. Between $\frac{12}{25}$ (48%) and $\frac{1}{2}$ this gives $\frac{13}{27}$. Watch whether the inequalities are strict — that single word is what made 25 wrong and 27 right.

Arithmetic

Successive percentage change *(Q8)* — A rise of $x\%$ followed by a fall of $x\%$ always gives a **net loss of** $\frac{x^2}{100}\%$. There is never a net gain. A final price of 96.76% means a 3.24% loss, so $x = 18$.

Weighted average and divisibility *(Q37)* — When several groups are sold at different rates and an overall rate is given, set up the weighted average and it will collapse to one linear relation (here $r = 4a + 10$). Then test the options backwards rather than solving congruences forwards.

Simple interest and alligation *(Q13)* — Convert the total interest into an **effective rate** and alligate. Rs. 520 on Rs. 4000 over 4 years is 3.25% p.a.; alligating 3% and 4% about 3.25% gives the $3:1$ split instantly.

Compound interest, non-annual compounding *(Q36)* — Halve the rate, double the periods. Commit the effective rates to memory: 10% compounded half-yearly $= 10.25\%$; 20% compounded half-yearly $= 21\%$.

Boats and streams *(Q28)* — Upstream and downstream **speeds** are what you read off the data; you rarely need the boat's own speed or the current. For n cycles of one hour each way, the net drift is $n(\text{down} - \text{up})$.

Ratio *(Q6)* — Introduce one multiplier k, then push the divisibility condition onto k rather than onto the total. "$3k$ is a multiple of 30" means "k is a multiple of 10".

Algebra

When does $B^E = 1$? *(Q2)* — Three cases, always: $E = 0$ with $B \neq 0$; $B = 1$; $B = -1$ with E even. Checking only the first is the standard way to lose this question.

Logarithm identities *(Q12, Q18, Q23, Q38)* —

$$a^{\log_b c} = c^{\log_b a}, \qquad 4^{\log_2 x} = x^2, \qquad \log_x a = \frac{1}{\log_a x}$$

When the unknown sits in the **base** of the log, flip to reciprocals — it is almost always the shortest route (Q18). And turn differences of logs into quotients *before* doing anything else (Q23).

Completing the square in two variables *(Q12)* — A quadratic in x and y with **no cross term** that equals zero is a sum of squares. Force each bracket to vanish.

Symmetric substitution *(Q25)* — For $(A)^n + (B)^n$ with A and B equidistant from a centre, substitute the midpoint. Odd powers cancel and a quartic becomes a quadratic.

Progressions *(Q31, Q38)* — $S_\infty = \frac{a}{1-r}$ for $|r| < 1$. If a **partial** sum exceeds the infinite sum, the ratio must be **negative** — that single observation halves the work in Q31. For "the pth term is q and the qth term is p", take logs and the GP becomes an AP.

Modulus *(Q17, Q24, Q39)* — Three habits:

1. Non-negative quantities summing to zero must **each** be zero.
2. $x^2 = |x|^2$, so substitute $t = |x| \geq 0$ and discard non-positive roots. Each positive root gives **two** values of x.
3. With several modulus ratios, fix all the **magnitudes** first and only then the signs.

Functions *(Q9)* — $|x + |x|| = 2x$ for $x \geq 0$ and 0 otherwise. And recognise the reciprocal pair: $t + \frac{1}{t} = \frac{13}{6}$ gives $t = \frac{3}{2}$ or $\frac{2}{3}$.

Geometry and coordinate geometry

Heights and distances *(Q16)* —

$$h = \frac{d}{\cot\theta_1 - \cot\theta_2}$$

A 45° elevation always means the horizontal distance **equals** the height, which collapses the picture to one equation.

Circles *(Q19, Q26, Q29)* —

- Centre and radius of $x^2 + y^2 + 2gx + 2fy + c = 0$: centre $(-g, -f)$, $r = \sqrt{g^2 + f^2 - c}$.
- Tangent pair from an external point: $\tan\frac{\theta}{2} = \frac{r}{\sqrt{d^2 - r^2}}$, then $\tan\theta = \frac{2t}{1-t^2}$. **The half-angle value will be among the options** — do not stop there.
- Shortest and longest distance from a point: $|d \mp r|$ and $d + r$. If the question does not say whether the point is inside or outside, **both answers are valid**.
- A circle on diameter AB passes through every point that sees AB at 90° — which is how the midpoints of the other two sides land on it in Q19.

Triangles *(Q5, Q14, Q20, Q22)* —

- Largest rectangle inscribed with a vertex at the right angle has **half** the triangle's area.
- Integer-sided triangles with odd perimeter p: nearest integer to $\frac{(p+3)^2}{48}$.
- A **median** divides a triangle into two equal areas — use it with the cosine rule (Q22).
- Angle chasing: if the answer is independent of a free parameter, **pick a convenient value** and compute numerically (Q20).

Lattice points *(Q7)* — The diamond $|x| + |y| \leq n$ contains $2n^2 + 2n + 1$ lattice points. Shifting the centre never changes the count.

Modern maths

Set theory *(Q4, Q30)* — For three sets with everyone counted at least once:

$$\sum (\text{singles}) - (\text{total}) = e_2 + 2e_3$$

To **maximise** the number in more than one set, set $e_3 = 0$; to minimise it, push everything into triples. For two sets, remember the Venn diagram has only four regions — read carefully whether a given number is a total or an exclusive region.

Permutations and combinations *(Q21, Q34, Q35)* —

- **Stars and bars**: non-negative solutions of $y_1 + \cdots + y_k = N$ number $\binom{N+k-1}{k-1}$. Subtract the lower bounds first.
- **Circular gaps**: n people in a circle create exactly n gaps, not $n+1$. For no two of r girls adjacent among n boys: $(n-1)! \times {}^{n}P_{r}$.
- ${}^{n}C_{r}$ is defined only when $0 \le r \le n$; the binding condition is nearly always $r \le n$.

Magic squares and determinants *(Q15)* — In a 3×3 magic square the centre equals $\frac{s}{3}$, and any through-line with two known entries pins it. Once the magic sum is found the grid fills by subtraction alone.

Data interpretation and logical reasoning

Medians in grouped data *(Q3, Q10, Q11)* — The set with eight companies is the hardest thing in the paper, and all three questions turn on one idea: **a median constrains only the middle positions.** Everything above can be as large as you like and everything below as small.

- For n **odd**, the median is the $\frac{n+1}{2}$-th value; for n **even**, the average of the $\frac{n}{2}$-th and $\frac{n}{2}+1$-th.
- To **maximise** one group's top value, maximise the floor of the group above it.
- To **minimise** a group's total, set everything from the median upward equal to the median, and everything below equal to the smallest value the chain permits.

Elections and seat-counting *(Q41–Q45)* — In an n-voter seat, a party needs more than half of what the other two cannot jointly beat; practically, more than $\frac{n}{2}$ guarantees a win and a quick lower bound is $\lceil \frac{n+1}{3} \rceil$ for a three-way clear winner. Two moves solve almost every alliance question:

1. **Spend the small party's votes first.** If C has 16 votes and must win two 20-voter seats, those two seats consume nearly all of them — every other seat becomes a two-party contest.
2. **Convert "who wins" into a threshold on the excluded party.** With an A+C alliance and 20 voters, the alliance wins seat i exactly when $b_i < 10$. One inequality replaces the whole table.

Verbal ability

Reading comprehension — Match the technique to the question type:

Type	What to do
Detail / fact	Find the verb from the question in the passage; read only that sentence
Inference	State the consequence the writer leaves unsaid, nothing further

Type	What to do
Main idea	Count how many paragraphs each option covers — the winner covers all
Structure	Read the connectives, not the content
Vocabulary in context	Substitute each option back into the sentence and listen
EXCEPT / NOT	Tick off the three you can locate; the odd one out is the answer

Three recurring traps in the 2024 passages:

1. **Quantifier errors** — *all, only, limited to, always, primarily*. In Q48 and Q55 these alone eliminate most of the wrong options.
2. **Category swaps** — "most polluted **capital**" becomes "most polluted **city**" (Q48); "public good" becomes "**consumer** right" (Q50).
3. **Welded paragraphs** — an option takes a real term from one paragraph and attaches it to a mechanism from another (Q53). A term being present is not the same as the relationship being asserted.

Idioms and phrasal verbs *(Q58–Q64)* — From this paper: *bite someone's head off* (react with sudden anger), *come down to* (depend ultimately on), *under the weather* (unwell), *walk the talk* (match deeds to words), *fall through* (collapse, of plans), *bring about* (cause — neutral, unlike *bring on*, which takes unwelcome objects), *put up with* (tolerate).

Prepositions in idioms are fixed. Most distractors in this section are built by swapping one word into a half-remembered phrase, so the correct option is often the only real expression on offer.

Grammar and sentence correction *(Q65–Q69)* — The method is always the same: **read the part of the sentence that is not underlined** and force the answer to agree with it. Specific points tested:

- Frequency adverbs (*all the time*) require the **simple present** for habits.
- *Have* in the sense of experiencing is **stative** — no continuous form. And countable ailments take an article: *a headache*, *a cold*, but *flu*, *pneumonia*.
- **Subject–verb agreement** across a long modifier: "the Board's **hopes** … **seem**".
- **Faulty comparison**: compare like with like using *those of* / *that of*, and use *any* ***other*** to exclude the subject from its own comparison group.
- *welcome* (gladly received) vs *welcoming* (friendly to visitors).
- **Two-error questions**: decide each error independently, filter on the one you are surest of, then apply the second filter to the survivors.

Para completion *(Q70–Q73)* — Four tests, in order of usefulness:

1. **Topic continuity** — the correct option rarely introduces a noun with no root in the paragraph.
2. **Connectives in the neighbouring sentences** — *therefore* demands a cause, *however* a contrast.
3. **Redundancy** — an option that states what the next sentence is about to state is wrong.
4. **Opening blanks** — read the second sentence's pronoun. "**This** happened after…" means the blank is a consequence, and definite articles later ("*the* traders") must be introduced there.

Cloze *(Q74–Q79)* — Work across the options column by column, not blank by blank. Start with the blank that has the cleanest right-or-wrong test: a fixed phrase (*without precedent*), a polarity constraint (*vital for* needs a positive verb), or a part-of-speech mismatch. You should rarely need to adjudicate all twelve words.

Vocabulary pairs this section tested: *incidence* (new cases) vs *prevalence* (total cases); *stereotype* vs *archetype*; *truism* vs *proposition*; *expedite* vs *nurture*; *discreetly* (privately) vs *discerningly* (with judgement).

Word usage *(Q80–Q85)* — Every one of these six is a **near-identical pair**:

Tested word	Confused with	Difference
callus (noun, hard skin)	callous (adj., unfeeling)	part of speech
diffuse (spread out)	defuse (calm down)	spreading vs de-escalating
ban (prohibit)	—	logical contradiction in one option
stay	stray (wander)	one letter
proscribe (forbid)	prescribe (direct)	near-opposites
train	trail (a path followed)	one letter

The question to ask: what word is this one letter away from? Also check the **grammatical slot** first — in Q80 the answer is findable without knowing either definition, because only one option puts the word in an adjective position.

Para jumbles *(Q86–Q90)* — All five are TITA, so there are no options to work backwards from, but also **no negative marking**. Never leave one blank.

1. **Find the opener** — the only sentence naming its subject in full, with no backward pronoun (*this*, *both*, *it*) and no connective (*however*, *meanwhile*, *by contrast*).
2. **Lock the mandatory pairs** — a full designation before a short form ("The Minister for Disaster Management" before "The Minister"); a *responded* after a demand; a *this* after its antecedent.
3. **Find the closer** — a summary (*by any measure*), an evaluation of consequences, or a resolution (*both effects are only short-lived*).

In a four-sentence jumble it is usually faster to decide which sentences **cannot** be first than which one is.

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