INDEPENDENT CAT PREPARATION / ORIGINAL MOCK

CAT 2026 Prediction Paper 08

Answer key & worked solutions

68 questions · 120 minutes · Maximum 204 marks

This is an original practice paper informed by recent CAT patterns and the forecast in this study. It is not the official CAT 2026 paper and does not claim to reproduce unreleased questions. Its difficulty has not been calibrated on a candidate cohort.

SECTION	QUESTIONS	TIME	MARKS
Verbal Ability & Reading Comprehension	24	40 minutes	72
Data Interpretation & Logical Reasoning	22	40 minutes	66
Quantitative Ability	22	40 minutes	66

Correct answer: +3. Incorrect MCQ: –1. Incorrect TITA or unanswered question: 0. Each MCQ has exactly one correct option. TITA answers are whole numbers.

Design reference: IMS CAT 2025 exam analysis and the instructions of the official CAT 2026 mock (released 6 November 2026). The 24/22/22 structure, four-question RC passages and four- or five-question DILR sets inform this mock. Original contexts and exact question allocations are authoring choices. Method and source limitations: validation.html. Practice profile: Modern Math holds four.

Quick answer key

V01 D	**V02** B	**V03** C	**V04** A	**V05** A	**V06** C
V07 B	**V08** D	**V09** B	**V10** D	**V11** A	**V12** C
V13 C	**V14** A	**V15** D	**V16** B	**V17** D	**V18** B
V19 C	**V20** A	**V21** 2341	**V22** 3421	**V23** 3	**V24** 4
D01 122	**D02** C	**D03** 39	**D04** B	**D05** A	**D06** 7
D07 D	**D08** 2	**D09** 3	**D10** D	**D11** 2	**D12** B
D13 2	**D14** D	**D15** 30	**D16** A	**D17** 37	**D18** B
D19 27	**D20** C	**D21** 12	**D22** A	**Q01** D	**Q02** B
Q03 1800	**Q04** C	**Q05** A	**Q06** 50	**Q07** A	**Q08** 8
Q09 C	**Q10** B	**Q11** 0	**Q12** 6	**Q13** D	**Q14** 23
Q15 C	**Q16** 1	**Q17** A	**Q18** D	**Q19** 190	**Q20** B
Q21 C	**Q22** B				

VARC · 24 questions

RC 1 · Whose noon?

Until the nineteenth century, most towns kept their own time. Noon was the moment when the sun stood highest over the town, so a city a few hundred kilometres to the east was several minutes ahead of one to the west. For people who travelled by horse or on foot, the differences hardly mattered. A journey took days, and arriving a few minutes earlier or later by some distant clock meant nothing. Each town's clocks were, in their own terms, perfectly correct.

Railways changed this. A timetable that listed departures from many towns had to choose whose noon it would follow. Early railway companies often ran on the time of their headquarters, so a single station might display several clocks, one for each line, alongside the local time kept by the town hall. Some timetables even printed several times for the same departure, one for each town the train would pass. Passengers missed trains, and, more seriously, two trains running on the same track according to different clocks could meet where neither expected the other.

The solution, adopted gradually and unevenly, was to divide the world into zones within which every clock would show the same time, with neighbouring zones differing by whole hours. The change was technical, but it was also cultural. In some towns it was resisted as an imposition by distant companies and governments, a replacement of the sun's authority by that of a timetable. Newspapers printed angry letters complaining that noon no longer meant noon. For a while some public clocks showed two times, local and standard, as if the town could not decide which world it belonged to.

The telegraph made the new system workable. Observatories could send a signal at an exact moment, allowing distant clocks to be set together. Time became something transmitted from a centre rather than observed in each place. That shift had consequences beyond railways. Factories, schools and offices could coordinate their hours across long distances, and punctuality changed from arriving roughly when expected to arriving at a particular minute.

It is easy to see standard time as simple progress, the replacement of confusion by order. But the story also shows how a convenience for one kind of activity reorganised daily life for everyone. People who never boarded a train found their days measured by a clock designed for those who did.

V01. The passage is primarily about MCQ

A. why local solar time was more accurate than standard time.
B. the invention of the telegraph and its use by observatories.
C. the complaints that newspapers printed about railway timetables.
D. how the coordination needs of railways led to standard time, a change that reshaped daily life well beyond railways.

Answer: D. how the coordination needs of railways led to standard time, a change that reshaped daily life well beyond railways.

The passage traces the railway problem, the zone solution, the telegraph that enabled it and the wider social effects. Accuracy of solar time is not argued, and the telegraph and newspaper letters are parts of the account rather than its subject.

V02. It can be inferred that a station displaying several clocks before standard time MCQ

A. was designed to show passengers the time in each zone of the world.
B. showed the different reference times used by different railway lines and by the town.
C. had its clocks set together by telegraph signals from an observatory.
D. showed that its town had already adopted standard time.

Answer: B. showed the different reference times used by different railway lines and by the town.

The second paragraph says companies ran on the time of their headquarters, so stations showed one clock per line beside local time. Zones and telegraph synchronisation came later, as the solution.

V03. According to the passage, the telegraph made standard time workable because it MCQ

A. allowed each town to observe when the sun stood highest.
B. replaced timetables with direct messages between trains.
C. allowed a signal sent at an exact moment to set distant clocks together.
D. obliged railway companies to keep the time of their headquarters.

Answer: C. allowed a signal sent at an exact moment to set distant clocks together.

The fourth paragraph states the first option. Solar observation is the older system, the telegraph did not replace timetables, and headquarters time was the practice standard time ended.

V04. The author's attitude towards standard time is best described as MCQ

A. appreciative of its benefits but aware that it imposed the needs of one activity on everyone.
B. nostalgic, preferring a return to local solar time.
C. wholly celebratory, treating it as simple progress.
D. hostile, regarding it as an imposition that should be reversed.

Answer: A. appreciative of its benefits but aware that it imposed the needs of one activity on everyone.

The final paragraph grants the move from confusion to order but notes that a railway convenience reorganised everyone's days. The author neither wishes to return to solar time nor calls for reversal, and explicitly resists the simple-progress view.

RC 2 · Dialects in birdsong

Many songbirds learn their songs rather than inheriting them complete. A young bird listens to adults during a sensitive period early in life, practises imperfect versions, and gradually matches what it heard. A bird that hears no adult song during that period usually develops only a simplified version. Because learning is local, small copying errors and innovations spread within a neighbourhood but not beyond it. Over time, birds of the same species in different areas come to sing recognisably different songs. Researchers call these regional variants dialects, borrowing a word from the study of human speech.

The comparison is useful but can be overdone. Bird dialects do not carry meanings in the way human words do; a sparrow's regional variant does not say anything different from its neighbour's. What dialects may do is mark membership. In several species, females respond more strongly to songs from their own area, and males defend territories more vigorously against singers with familiar dialects, perhaps because a local rival is a more serious competitor than a passing stranger.

Dialects also change, and their changes can be tracked across decades because song is easy to record. In one well-studied case, a variant that first appeared in a small population spread across a large region within a few years, displacing older forms. Recordings made by amateurs over many years have proved valuable for tracing such shifts. Why it spread is debated. It may have been easier to sing, or more noticeable against background noise, or it may simply have been copied by chance by birds whose songs were widely heard.

Human activity is another influence. Birds in noisy cities often sing at higher pitches than their rural relatives, perhaps because low notes are masked by traffic. Young birds raised in such places learn the higher songs, so a change that began as an adjustment by individuals becomes part of the local tradition. Whether city and country birds will eventually stop recognising each other's songs is an open question.

For researchers, dialects offer an unusual opportunity. In most animals, behaviour that passes between generations is hard to separate from what is inherited genetically. In songbirds, the learned element can

be heard, recorded and compared. Dialects thus provide a natural record of how culture, in a modest sense, arises and changes outside our own species.

V05. Which of the following best describes the passage? MCQ

A. It explains how learned song produces regional dialects, what they may signal and why they interest researchers of culture.
B. It argues that bird dialects carry meanings in the way human words do.
C. It proves that noise is the main cause of change in birdsong.
D. It shows that females always prefer songs from distant areas.

Answer: A. It explains how learned song produces regional dialects, what they may signal and why they interest researchers of culture.

The passage covers learning and local spread, membership signalling, change and the research value of dialects. It denies that dialects carry word-like meanings, treats noise as one influence and reports a preference for local songs.

V06. Which of the following would the author most likely accept? MCQ

A. Birds inherit their complete regional dialect genetically.
B. A bird's dialect tells listeners where food can be found.
C. Young birds raised hearing only songs from a distant region might come to sing that region's dialect.
D. City birds can no longer recognise rural songs.

Answer: C. Young birds raised hearing only songs from a distant region might come to sing that region's dialect.

Since songs are learned from what young birds hear during a sensitive period, a different model should produce a different dialect. The passage says songs are not inherited complete, denies that dialects carry such meanings, and calls recognition between city and country birds an open question.

V07. According to the passage, birds in noisy cities MCQ

A. sing louder than rural birds but at the same pitch.
B. often sing at higher pitches, possibly because traffic masks low notes.
C. have stopped learning songs from adult birds.
D. have been shown to ignore songs from the countryside.

Answer: B. often sing at higher pitches, possibly because traffic masks low notes.

The fourth paragraph states the first option. Loudness is not mentioned, young city birds still learn from adults, and mutual recognition is unresolved.

V08. The final paragraph serves mainly to MCQ

A. argue that birdsong is the same as human language.
B. summarise the debate about why one variant spread.
C. warn that city noise will eliminate bird dialects.
D. explain why dialects are valuable for studying how learned behaviour arises and changes.

Answer: D. explain why dialects are valuable for studying how learned behaviour arises and changes.

The last paragraph presents dialects as a recordable form of learned behaviour separable from genetics. The comparison with language was qualified earlier, the debate is in the third paragraph, and no such warning is made.

RC 3 · Trust without gatekeepers

Crowdfunding platforms allow people to raise money for projects by collecting small contributions from many backers. A designer can fund the first batch of a new product, an author can pay for printing a book, and a family can cover medical bills. The appeal is that it bypasses gatekeepers, such as banks and publishers, who might reject a project that many ordinary people would support. Supporters described it as a democratic alternative to institutions that had long decided which ideas deserved money.

Removing gatekeepers, however, does not remove the problem they addressed. A bank lending money investigates whether the borrower can repay; a publisher judges whether a book will sell. Backers on a crowdfunding platform face the same uncertainty with far less information. Unlike a lender, a backer usually cannot ask questions, inspect accounts or demand security. They usually see a video, a description and a target, and they must decide whether the creator is able, and willing, to deliver what is promised. Many projects deliver late; some never deliver at all.

Platforms have responded by building trust in other ways. Some release funds only if the target is reached, so that backers do not pay for projects too small to succeed. Many display a creator's past projects and backers' comments, allowing reputation to accumulate. Some ask creators to show working prototypes rather than drawings. These measures do not guarantee success, but they shift risk and reward towards creators who can offer evidence of reliability.

That shift has an ironic consequence. Crowdfunding was celebrated for opening opportunities to newcomers, yet its trust mechanisms favour those who have already succeeded. A first-time creator without a following or a polished presentation may struggle to attract backers, however good the idea. Visibility, in other words, can become a substitute for evidence of ability. In this respect the platforms recreate a form of gatekeeping, spread across thousands of backers rather than concentrated in a single committee.

None of this means that crowdfunding has failed; its record is mixed rather than poor. It has funded products and books that conventional institutions refused, and it allows creators to test demand before

investing heavily. But it changes rather than abolishes the work of judging who deserves support. That work is now done by backers who rarely meet the creators, guided by signals that reward visibility as much as merit.

V09. The main argument of the passage is that crowdfunding MCQ

A. has failed, because most projects never deliver what they promise.
B. does not abolish the problem of judging whom to trust but redistributes it, in ways that can again favour established creators.
C. has removed every barrier faced by first-time creators.
D. is more reliable than bank lending because backers share information.

Answer: B. does not abolish the problem of judging whom to trust but redistributes it, in ways that can again favour established creators.

The passage says gatekeeping is changed rather than abolished and recreated in distributed form. It explicitly denies failure, says first-time creators may struggle, and says backers have less information than banks.

V10. According to the passage, which of the following would most help a first-time creator win backers' trust? MCQ

A. Asking a bank to review the project before it is posted.
B. Leaving out any information about the creator's background.
C. Setting a funding target that is far too small for the project.
D. Showing a working prototype rather than drawings of the product.

Answer: D. Showing a working prototype rather than drawings of the product.

Prototypes are listed among the measures that build trust, and they are available to newcomers who lack a track record. Bank review is not mentioned, hiding information reduces trust, and targets too small to succeed are what threshold rules guard against.

V11. According to the passage, releasing funds only when a project reaches its target MCQ

A. protects backers from paying for projects with too little money to succeed.
B. guarantees that every funded project is delivered on time.
C. lets creators keep money raised for projects that fail.
D. favours first-time creators over established ones.

Answer: A. protects backers from paying for projects with too little money to succeed.

The third paragraph states the first option and adds that such measures do not guarantee success. The other options contradict the passage or are unsupported.

V12. The "ironic consequence" in the fourth paragraph is that MCQ

A. backers rarely meet the creators they choose to support.
B. banks invest more in the projects that crowdfunding rejects.
C. a system praised for opening doors to newcomers ends up favouring those who have already succeeded.
D. platforms charge creators more than publishers do.

Answer: C. a system praised for opening doors to newcomers ends up favouring those who have already succeeded.

The irony lies in the contrast between the celebrated openness and the trust mechanisms that reward existing success. The other options are either details from elsewhere or unsupported.

RC 4 · Freedom built from practice

Improvisation is sometimes imagined as music created from nothing, a performer inventing freely in the moment. Musicians who improvise describe something different. Long before they perform, they absorb patterns: phrases, harmonic routes, rhythmic figures and the habits of particular players they admire. What happens on stage is less creation from nothing than recombination under pressure, guided by rules that the performer may no longer consciously notice. Listeners hearing a solo for the first time cannot tell which parts were prepared and which arose in the moment.

This does not make improvisation less creative. Spoken language works in a similar way. Speakers rarely invent new words, yet they constantly form sentences they have never heard. Their freedom depends on mastery of shared materials. An improviser who has learned hundreds of phrases can vary, shorten, extend and combine them, responding to what the other musicians play. Without that vocabulary, the improviser would have nothing to vary.

The social side of improvisation is equally important. In a group, each player listens and adjusts, so that a phrase offered by one musician may be echoed, answered or deliberately contradicted by another. A performance therefore depends on a kind of trust: each player must assume that the others will notice and respond, and must be willing to follow a direction they did not plan. A misjudged entry can even become a new idea if the others take it up. Groups that play together for years develop shared signals that outsiders may not hear at all.

Teaching improvisation presents a puzzle. If it depended entirely on inspiration, it could not be taught; if it depended entirely on learned patterns, students could simply memorise them. Good teachers do neither. They ask students to learn models closely, often by copying recordings note for note, and then to alter them in deliberate ways: change the rhythm, start the phrase on a different beat, combine two ideas. Freedom is built up gradually, through constraints chosen to make variation possible.

Seen this way, improvisation is not the opposite of discipline but one of its products. The apparent spontaneity of a great improviser rests on years of practice that the audience never sees. Preparation does

not remove surprise; it makes surprise usable. What the audience does see is the moment when that practice meets an unexpected situation and produces something no one had planned.

V13. Which of the following best expresses the main idea of the passage? MCQ

A. Improvisation is music invented from nothing at the moment of performance.
B. Improvisation cannot be taught because it depends on inspiration.
C. Improvisation recombines deeply learned material in response to others, so its freedom rests on discipline.
D. Improvisers should memorise many phrases and repeat them exactly.

Answer: C. Improvisation recombines deeply learned material in response to others, so its freedom rests on discipline.

The passage describes learned vocabulary, responsive group play and deliberate practice, ending with improvisation as a product of discipline. The second option is the view it corrects, the third ignores the teaching paragraph, and exact repetition contradicts the emphasis on variation.

V14. The comparison with spoken language suggests that MCQ

A. the freedom to produce new combinations depends on command of shared materials.
B. improvisers invent new phrases as often as speakers invent new words.
C. music carries fixed meanings in the same way as words do.
D. speakers improvise less than musicians do.

Answer: A. the freedom to produce new combinations depends on command of shared materials.

Speakers form new sentences from words they did not invent, just as improvisers vary learned phrases. The passage says speakers rarely invent words, and it does not compare meanings or amounts of improvisation.

V15. According to the passage, good teachers of improvisation MCQ

A. discourage students from listening to recordings.
B. rely entirely on their students' inspiration.
C. require students to memorise patterns without changing them.
D. have students copy models closely and then vary them in deliberate ways.

Answer: D. have students copy models closely and then vary them in deliberate ways.

The fourth paragraph describes copying recordings and then altering them deliberately. It rejects reliance on inspiration alone and on memorisation alone.

V16. Which of the following situations is most similar to group improvisation as described in the passage? MCQ

A. A pianist practises scales alone every morning.
B. A long-established kitchen team adjusts its tasks without discussion as orders change, using signals its members have developed together.
C. An orchestra plays a symphony exactly as written in the score.
D. A student memorises a speech and recites it word for word.

Answer: B. A long-established kitchen team adjusts its tasks without discussion as orders change, using signals its members have developed together.

The third paragraph stresses mutual listening, adjustment to unplanned directions and shared signals built over years. Solitary practice, exact execution of a score and recitation lack the responsive group element.

V17. Choose the best summary.

Trials of a four-day working week, in which staff work fewer hours for the same pay, often report that productivity holds steady or even rises. Supporters take this as proof that long hours are wasteful. The results deserve attention, but they come mostly from firms that volunteered, which may be those whose work suits the change. Many trials last only months, too short to reveal whether early enthusiasm fades. And jobs differ: a team that writes software can reorganise its meetings, while a hospital ward must still be staffed every day. The trials show that shorter weeks can work in some settings. They do not yet show how widely the arrangement would succeed. MCQ

A. Four-day-week trials prove that long working hours are always wasteful.
B. Hospitals cannot adopt shorter working weeks.
C. Firms that volunteer for trials are less productive than others.
D. Four-day-week trials are encouraging, but self-selection, short durations and differences between jobs limit how far their results can be generalised.

Answer: D. Four-day-week trials are encouraging, but self-selection, short durations and differences between jobs limit how far their results can be generalised.

The paragraph accepts the encouraging results and lists three limits on generalising them. The second option is the supporters' claim it questions, the third overstates an example, and the fourth is unsupported.

V18. Choose the best summary.

For most of history, salt was valuable less as a seasoning than as a preservative. Before refrigeration, salting allowed meat and fish to be stored through winters and carried on long voyages. Some trade routes existed largely to carry it. Communities that controlled salt sources gained wealth and influence, and governments often taxed salt heavily because everyone needed it. Those taxes could be deeply resented, since they fell hardest on the poor, who spent a larger share of their income on basic food. Refrigeration and cheap production later reduced salt's importance, but its long history explains why it once carried a political weight that seems surprising today. MCQ

A. Salt was valued mainly because it improved the taste of food.
B. Salt's role in preserving food made it economically and politically important for centuries, an importance that faded only with refrigeration and cheap production.
C. Governments taxed salt in order to discourage its use in cooking.
D. Refrigeration was invented so that people could avoid salt taxes.

Answer: B. Salt's role in preserving food made it economically and politically important for centuries, an importance that faded only with refrigeration and cheap production.

The summary keeps the preservation role, the economic and political consequences and their decline. The second option reverses the opening claim, and the third and fourth invent motives the paragraph does not give.

V19. Choose the best position for the missing sentence.

Sentence: A map that showed every detail would be as large as the land it describes, and just as hard to read.

Every map leaves things out. (1) A road atlas omits most buildings, a geological map ignores roads, and a metro map distorts distances so that connections are easy to follow. (2) These omissions are not failures but the source of a map's usefulness. (3) Choosing what to omit, however, is never neutral. A map that shows highways but not footpaths tells walkers that their routes do not matter, and a map that names some villages but not others can shape where visitors go and where investment follows. (4) Readers therefore do well to ask not only what a map shows but whose purposes its choices serve. MCQ

A. Position (1)
B. Position (2)
C. Position (3)
D. Position (4)

Answer: C. Position (3)

The sentence justifies the claim that omissions are the source of usefulness, so it follows that claim at (3), before the turn signalled by "however". Earlier, the usefulness claim has not been made; at (4) it would interrupt the conclusion about whose purposes are served.

V20. Choose the best position for the missing sentence.

Sentence: Customers, in effect, had become the testers.

Software was once sold in boxes, and a version that reached customers was expected to be finished. (1) Updates were rare, so errors discovered after release could persist for years. Fixing a fault often meant mailing new disks to every customer. (2) As products moved online, companies began releasing changes continually, sometimes several times a day. (3) This allowed faults to be fixed quickly, but it also changed when faults were found. Instead of testing extensively before release, many firms released early and watched how real users behaved, correcting problems as reports arrived. (4) That approach speeds development, but it shifts some of the cost of errors onto the people who encounter them. MCQ

A. Position (4)
B. Position (1)
C. Position (2)
D. Position (3)

Answer: A. Position (4)

The sentence summarises the practice of releasing early and learning from users' reports, so it belongs at (4), just before the evaluation of that approach. At earlier positions customers have not yet been described as discovering faults.

V21. Arrange the sentences and enter their numbers without spaces.

1. That small difference can decide whether a ball curls into the goal or past it.
2. When a footballer strikes a ball off-centre, it spins as it flies.
3. The spinning ball drags air around with it, so the pressure on one side becomes lower than on the other.
4. The ball is pushed towards the low-pressure side, and its path bends. TITA

Answer: 2341

2 introduces the spin; 3 explains its effect on the surrounding air; 4 gives the resulting push and bend; 1's "That small difference" refers to the bend and states its practical effect.

V22. Arrange the sentences and enter their numbers without spaces.

1. Such loans therefore depend on trust within the group as much as on any assets.
2. Members know one another and can see who is working, which makes it hard to hide difficulties.
3. Some lenders to small businesses ask borrowers to form groups that are jointly responsible for repayment.
4. If one member cannot pay, the others must cover the shortfall, so they have reason to choose partners carefully. TITA

Answer: 3421

3 introduces group lending; 4 explains joint responsibility; 2 adds the mutual knowledge that makes monitoring easy; 1 concludes with “Such loans”.

V23. Four sentences form a coherent paragraph. Enter the odd sentence number.

1. Honeybees communicate the location of food through a movement known as the waggle dance.
2. The angle of the dance relative to the vertical indicates the direction of the food relative to the sun.
3. Honey has been found in ancient tombs, still edible after thousands of years.
4. The duration of the waggling run indicates how far away the food is.
5. Bees that watch the dance can therefore fly to a source they have never visited. TITA

Answer: 3

Sentences 1, 2, 4 and 5 explain how the dance encodes direction and distance. Sentence 3 is about the durability of honey.

V24. Four sentences form a coherent paragraph. Enter the odd sentence number.

1. Rubber trees are tapped by cutting a thin groove into the bark.
2. A milky sap called latex flows from the cut into a small cup.
3. The collected latex is mixed with a mild acid so that it thickens into sheets.
4. Rubber-soled shoes became fashionable early in the twentieth century.
5. The sheets are then dried and smoked before being sold to factories. TITA

Answer: 4

Sentences 1, 2, 3 and 5 describe the steps of producing raw rubber. Sentence 4 concerns a later consumer fashion.

DILR · 22 questions

Scores in three tests

Six students took three tests, each marked out of 50. Some scores are missing from the table below.

Student | Test 1 | Test 2 | Test 3
U | 42 | 38 | ?
V | 35 | ? | 44
W | ? | 41 | 39
X | 30 | 36 | 33
Y | 47 | 29 | 40
Z | 38 | 45 | ?

The average Test 1 score of the six students was 39 and the average Test 2 score was 38. U's total over the three tests was 120. Z scored the same in Test 3 as in Test 1.

Any additional condition or change in a question applies only to that question.

D01. What was W's total score over the three tests? TITA

Answer: 122

Test 1 total must be 6 × 39 = 234, so W scored 42. Test 2 total must be 6 × 38 = 228, so V scored 39. U's total of 120 gives U 40 in Test 3, and Z's Test 3 score equals its Test 1 score, 38.
Student | Test 1 | Test 2 | Test 3 | Total
U | 42 | 38 | 40 | 120
V | 35 | 39 | 44 | 118
W | 42 | 41 | 39 | 122
X | 30 | 36 | 33 | 99
Y | 47 | 29 | 40 | 116
Z | 38 | 45 | 38 | 121

W scored 42 + 41 + 39 = 122.

D02. Which student had the highest total? MCQ

A. V
B. U
C. W
D. Z

Answer: C. W

Test 1 total must be 6 × 39 = 234, so W scored 42. Test 2 total must be 6 × 38 = 228, so V scored 39. U's total of 120 gives U 40 in Test 3, and Z's Test 3 score equals its Test 1 score, 38.
Student | Test 1 | Test 2 | Test 3 | Total
U | 42 | 38 | 40 | 120
V | 35 | 39 | 44 | 118
W | 42 | 41 | 39 | 122
X | 30 | 36 | 33 | 99
Y | 47 | 29 | 40 | 116
Z | 38 | 45 | 38 | 121

Totals: U 120, V 118, W 122, X 99, Y 116, Z 121. W is highest.

D03. What was the average Test 3 score of the six students? TITA

Answer: 39

Test 1 total must be 6 × 39 = 234, so W scored 42. Test 2 total must be 6 × 38 = 228, so V scored 39. U's total of 120 gives U 40 in Test 3, and Z's Test 3 score equals its Test 1 score, 38.
Student | Test 1 | Test 2 | Test 3 | Total
U | 42 | 38 | 40 | 120
V | 35 | 39 | 44 | 118
W | 42 | 41 | 39 | 122
X | 30 | 36 | 33 | 99
Y | 47 | 29 | 40 | 116
Z | 38 | 45 | 38 | 121

Test 3 scores 40, 44, 39, 33, 40 and 38 total 234, an average of 39.

D04. A student qualifies if every one of his or her three scores is at least 35. How many students qualify? MCQ

A. 5
B. 4
C. 6
D. 8

Answer: B. 4

Test 1 total must be 6 × 39 = 234, so W scored 42. Test 2 total must be 6 × 38 = 228, so V scored 39. U's total of 120 gives U 40 in Test 3, and Z's Test 3 score equals its Test 1 score, 38.
Student | Test 1 | Test 2 | Test 3 | Total
U | 42 | 38 | 40 | 120
V | 35 | 39 | 44 | 118
W | 42 | 41 | 39 | 122
X | 30 | 36 | 33 | 99
Y | 47 | 29 | 40 | 116
Z | 38 | 45 | 38 | 121

X (30) and Y (29) fall short; U, V, W and Z qualify.

D05. In how many of the three tests did U score above that test's average? MCQ

A. 2
B. 3
C. 1
D. 0

Answer: A. 2

Test 1 total must be 6 × 39 = 234, so W scored 42. Test 2 total must be 6 × 38 = 228, so V scored 39. U's total of 120 gives U 40 in Test 3, and Z's Test 3 score equals its Test 1 score, 38.
Student | Test 1 | Test 2 | Test 3 | Total
U | 42 | 38 | 40 | 120
V | 35 | 39 | 44 | 118
W | 42 | 41 | 39 | 122
X | 30 | 36 | 33 | 99
Y | 47 | 29 | 40 | 116
Z | 38 | 45 | 38 | 121

U scored 42 against 39, 38 against 38 and 40 against 39: above average in two tests.

Five families, five floors

Five families, the Aroras, Boses, Chawlas, Dases and Iyers, live on floors 1 to 5 of a building, one family per floor. Each family keeps exactly one pet: a cat, a dog, a fish, a parrot or a rabbit, all different.
The Boses live on a higher floor than the Dases.
The family with the parrot lives on floor 3.
The Aroras live on the floor immediately above the family with the dog.
The Chawlas keep the fish and live on neither floor 1 nor floor 5.
The Iyers do not live on floor 5.
The cat and the dog are not on adjacent floors.

Any additional condition or change in a question applies only to that question.

D06. How many different assignments of floors and pets are possible? TITA

Answer: 7

The parrot is on floor 3, so Chawla (fish, not on floors 1 or 5) is on floor 2 or 4. Arora sits directly above the dog, the cat is not next to the dog, Bose is above Das and Iyer is not on top. Checking all 14,400 floor-and-pet assignments leaves seven (floor 1 to floor 5):
Das (dog) / Arora (rabbit) / Iyer (parrot) / Chawla (fish) / Bose (cat)
Iyer (dog) / Arora (rabbit) / Das (parrot) / Chawla (fish) / Bose (cat)
Das (rabbit) / Iyer (dog) / Arora (parrot) / Chawla (fish) / Bose (cat)
Iyer (rabbit) / Das (dog) / Arora (parrot) / Chawla (fish) / Bose (cat)
Das (cat) / Chawla (fish) / Bose (parrot) / Iyer (dog) / Arora (rabbit)
Das (cat) / Chawla (fish) / Iyer (parrot) / Bose (dog) / Arora (rabbit)
Iyer (cat) / Chawla (fish) / Das (parrot) / Bose (dog) / Arora (rabbit)

Seven assignments satisfy every condition.

D07. Which family can never live on floor 3? MCQ

A. Bose
B. Arora
C. Das
D. Chawla

Answer: D. Chawla

The parrot is on floor 3, so Chawla (fish, not on floors 1 or 5) is on floor 2 or 4. Arora sits directly above the dog, the cat is not next to the dog, Bose is above Das and Iyer is not on top. Checking all 14,400 floor-and-pet assignments leaves seven (floor 1 to floor 5):
Das (dog) / Arora (rabbit) / Iyer (parrot) / Chawla (fish) / Bose (cat)
Iyer (dog) / Arora (rabbit) / Das (parrot) / Chawla (fish) / Bose (cat)
Das (rabbit) / Iyer (dog) / Arora (parrot) / Chawla (fish) / Bose (cat)
Iyer (rabbit) / Das (dog) / Arora (parrot) / Chawla (fish) / Bose (cat)
Das (cat) / Chawla (fish) / Bose (parrot) / Iyer (dog) / Arora (rabbit)
Das (cat) / Chawla (fish) / Iyer (parrot) / Bose (dog) / Arora (rabbit)
Iyer (cat) / Chawla (fish) / Das (parrot) / Bose (dog) / Arora (rabbit)

Floor 3 holds the parrot, but the Chawlas keep the fish. Every other family appears on floor 3 in some assignment.

D08. In how many of the possible assignments do the Aroras live on floor 2? TITA

Answer: 2

The parrot is on floor 3, so Chawla (fish, not on floors 1 or 5) is on floor 2 or 4. Arora sits directly above the dog, the cat is not next to the dog, Bose is above Das and Iyer is not on top. Checking all 14,400 floor-and-pet assignments leaves seven (floor 1 to floor 5):
Das (dog) / Arora (rabbit) / Iyer (parrot) / Chawla (fish) / Bose (cat)
Iyer (dog) / Arora (rabbit) / Das (parrot) / Chawla (fish) / Bose (cat)
Das (rabbit) / Iyer (dog) / Arora (parrot) / Chawla (fish) / Bose (cat)
Iyer (rabbit) / Das (dog) / Arora (parrot) / Chawla (fish) / Bose (cat)
Das (cat) / Chawla (fish) / Bose (parrot) / Iyer (dog) / Arora (rabbit)
Das (cat) / Chawla (fish) / Iyer (parrot) / Bose (dog) / Arora (rabbit)
Iyer (cat) / Chawla (fish) / Das (parrot) / Bose (dog) / Arora (rabbit)

Two assignments place the Aroras on floor 2.

D09. If the cat is on floor 1 and the Iyers live on floor 4, on which floor do the Boses live? TITA

Answer: 3

The parrot is on floor 3, so Chawla (fish, not on floors 1 or 5) is on floor 2 or 4. Arora sits directly above the dog, the cat is not next to the dog, Bose is above Das and Iyer is not on top. Checking all 14,400 floor-and-pet assignments leaves seven (floor 1 to floor 5):
Das (dog) / Arora (rabbit) / Iyer (parrot) / Chawla (fish) / Bose (cat)
Iyer (dog) / Arora (rabbit) / Das (parrot) / Chawla (fish) / Bose (cat)
Das (rabbit) / Iyer (dog) / Arora (parrot) / Chawla (fish) / Bose (cat)
Iyer (rabbit) / Das (dog) / Arora (parrot) / Chawla (fish) / Bose (cat)
Das (cat) / Chawla (fish) / Bose (parrot) / Iyer (dog) / Arora (rabbit)
Das (cat) / Chawla (fish) / Iyer (parrot) / Bose (dog) / Arora (rabbit)
Iyer (cat) / Chawla (fish) / Das (parrot) / Bose (dog) / Arora (rabbit)

Only Das (cat), Chawla, Bose, Iyer, Arora fits, so the Boses are on floor 3.

D10. Which of the following must be true? MCQ

A. Das lives on floor 1
B. Arora lives on a higher floor than Iyer
C. The rabbit lives on an even-numbered floor
D. Chawla lives on a lower floor than Bose

Answer: D. Chawla lives on a lower floor than Bose

The parrot is on floor 3, so Chawla (fish, not on floors 1 or 5) is on floor 2 or 4. Arora sits directly above the dog, the cat is not next to the dog, Bose is above Das and Iyer is not on top. Checking all 14,400 floor-and-pet assignments leaves seven (floor 1 to floor 5):
Das (dog) / Arora (rabbit) / Iyer (parrot) / Chawla (fish) / Bose (cat)
Iyer (dog) / Arora (rabbit) / Das (parrot) / Chawla (fish) / Bose (cat)
Das (rabbit) / Iyer (dog) / Arora (parrot) / Chawla (fish) / Bose (cat)
Iyer (rabbit) / Das (dog) / Arora (parrot) / Chawla (fish) / Bose (cat)
Das (cat) / Chawla (fish) / Bose (parrot) / Iyer (dog) / Arora (rabbit)
Das (cat) / Chawla (fish) / Iyer (parrot) / Bose (dog) / Arora (rabbit)
Iyer (cat) / Chawla (fish) / Das (parrot) / Bose (dog) / Arora (rabbit)

In all seven assignments the Chawlas are below the Boses; each other statement fails in some assignment.

A four-team league

Four teams A, B, C and D played a league in which every team played every other team exactly once. A win earned 3 points, a draw 1 point each and a loss 0 points. The final points were A 7, B 5, C 3 and D 1.

Any additional condition or change in a question applies only to that question.

D11. How many matches ended in a draw? TITA

Answer: 2

Six matches give 18 points when every match is decisive and one point fewer for each draw. The points total 16, so exactly two matches were drawn. Checking all 729 result tables leaves one: A drew with B, A beat C, A beat D, B beat C, B drew with D and C beat D.

16 points from 6 matches means 18 – 16 = 2 draws.

D12. What was the result of the match between B and C? MCQ

A. Cannot be determined
B. B won
C. Drawn
D. C won

Answer: B. B won

Six matches give 18 points when every match is decisive and one point fewer for each draw. The points total 16, so exactly two matches were drawn. Checking all 729 result tables leaves one: A drew with B, A beat C, A beat D, B beat C, B drew with D and C beat D.

B's 5 points must be one win and two draws; the only consistent table has B beating C.

D13. How many matches did D lose? TITA

Answer: 2

Six matches give 18 points when every match is decisive and one point fewer for each draw. The points total 16, so exactly two matches were drawn. Checking all 729 result tables leaves one: A drew with B, A beat C, A beat D, B beat C, B drew with D and C beat D.

D drew with B and lost to A and C.

D14. Which team did not win any match? MCQ

A. B
B. Every team won at least one match
C. C
D. D

Answer: D. D

Six matches give 18 points when every match is decisive and one point fewer for each draw. The points total 16, so exactly two matches were drawn. Checking all 729 result tables leaves one: A drew with B, A beat C, A beat D, B beat C, B drew with D and C beat D.

D's single point came from a draw; every other team won at least once.

Choosing projects

A firm can fund some of six projects. Each project is either funded in full or not at all.

Project | Cost (₹ lakh) | Annual return (₹ lakh)
P1 | 30 | 9
P2 | 25 | 8
P3 | 40 | 13
P4 | 20 | 5
P5 | 35 | 11
P6 | 15 | 4

Rules: the total cost may not exceed ₹100 lakh; at most four projects may be funded; P1 and P2 cannot both be funded; if P3 is funded, P4 must also be funded.

Any additional condition or change in a question applies only to that question.

D15. What is the largest possible total annual return, in ₹ lakh? TITA

Answer: 30

Enumerate every portfolio of one to four projects that respects the rules and the budget. Within ₹100 lakh the best is P2 + P3 + P4 + P6: cost 25 + 40 + 20 + 15 = 100, return 8 + 13 + 5 + 4 = 30.
Project | Cost (₹ lakh) | Return (₹ lakh)
P1 | 30 | 9
P2 | 25 | 8
P3 | 40 | 13
P4 | 20 | 5
P5 | 35 | 11
P6 | 15 | 4

The best portfolio, P2 + P3 + P4 + P6, returns ₹30 lakh.

D16. Which project is not funded in the portfolio with the largest return? MCQ

A. P5
B. P4
C. P2
D. P3

Answer: A. P5

Enumerate every portfolio of one to four projects that respects the rules and the budget. Within ₹100 lakh the best is P2 + P3 + P4 + P6: cost 25 + 40 + 20 + 15 = 100, return 8 + 13 + 5 + 4 = 30.
Project | Cost (₹ lakh) | Return (₹ lakh)
P1 | 30 | 9
P2 | 25 | 8
P3 | 40 | 13
P4 | 20 | 5
P5 | 35 | 11
P6 | 15 | 4

The best portfolio is P2, P3, P4 and P6, so P5 (and P1) are left out.

D17. If the budget limit rises to ₹120 lakh with all other rules unchanged, what is the largest possible total annual return, in ₹ lakh? TITA

Answer: 37

Enumerate every portfolio of one to four projects that respects the rules and the budget. Within ₹100 lakh the best is P2 + P3 + P4 + P6: cost 25 + 40 + 20 + 15 = 100, return 8 + 13 + 5 + 4 = 30.
Project | Cost (₹ lakh) | Return (₹ lakh)
P1 | 30 | 9
P2 | 25 | 8
P3 | 40 | 13
P4 | 20 | 5
P5 | 35 | 11
P6 | 15 | 4

With ₹120 lakh the best portfolio is P2 + P3 + P4 + P5 (cost 120, return 37).

D18. If P3 may be funded without P4 (other rules and the ₹100 lakh limit unchanged), what is the largest possible total annual return, in ₹ lakh? MCQ

A. 36
B. 32
C. 33
D. 34

Answer: B. 32

Enumerate every portfolio of one to four projects that respects the rules and the budget. Within ₹100 lakh the best is P2 + P3 + P4 + P6: cost 25 + 40 + 20 + 15 = 100, return 8 + 13 + 5 + 4 = 30.
Project | Cost (₹ lakh) | Return (₹ lakh)
P1 | 30 | 9
P2 | 25 | 8
P3 | 40 | 13
P4 | 20 | 5
P5 | 35 | 11
P6 | 15 | 4

Without the P3–P4 rule the best portfolio within ₹100 lakh is P2 + P3 + P5 (cost 100, return 32).

A painted cube

A solid wooden cube is painted on all six faces: the top and bottom faces red, the front and back faces blue, and the left and right faces green. It is then cut into 125 identical small cubes by cuts parallel to its faces (a 5 × 5 × 5 arrangement).

Any additional condition or change in a question applies only to that question.

D19. How many small cubes have no paint on them? TITA

Answer: 27

Label each unit cube by its position (x, y, z) from 1 to 5. A cube shows red if it lies in the top or bottom layer, blue if in the front or back layer and green if in the left or right layer. Opposite faces share a colour, so a cube can show at most three colours.
Unpainted cubes form the inner 3 × 3 × 3 block: 27. Cubes on an edge but not a corner show two colours: 12 edges × 3 = 36.

The inner 3 × 3 × 3 block of 27 cubes has no painted face.

D20. How many small cubes show exactly two different colours? MCQ

A. 38
B. 37
C. 36
D. 40

Answer: C. 36

Label each unit cube by its position (x, y, z) from 1 to 5. A cube shows red if it lies in the top or bottom layer, blue if in the front or back layer and green if in the left or right layer. Opposite faces share a colour, so a cube can show at most three colours.
Unpainted cubes form the inner 3 × 3 × 3 block: 27. Cubes on an edge but not a corner show two colours: 12 edges × 3 = 36.

Edge cubes other than corners: 12 edges with 3 such cubes each, 36 in all.

D21. How many small cubes show red and green but not blue? TITA

Answer: 12

Label each unit cube by its position (x, y, z) from 1 to 5. A cube shows red if it lies in the top or bottom layer, blue if in the front or back layer and green if in the left or right layer. Opposite faces share a colour, so a cube can show at most three colours.
Unpainted cubes form the inner 3 × 3 × 3 block: 27. Cubes on an edge but not a corner show two colours: 12 edges × 3 = 36.

These lie on the 4 edges where a red face meets a green face, 3 cubes per edge: 12.

D22. How many small cubes have at least one red face? MCQ

A. 50
B. 52
C. 54
D. 51

Answer: A. 50

Label each unit cube by its position (x, y, z) from 1 to 5. A cube shows red if it lies in the top or bottom layer, blue if in the front or back layer and green if in the left or right layer. Opposite faces share a colour, so a cube can show at most three colours.
Unpainted cubes form the inner 3 × 3 × 3 block: 27. Cubes on an edge but not a corner show two colours: 12 edges × 3 = 36.

The top and bottom layers hold 25 cubes each: 50.

QA · 22 questions

Q01. A dealer claims to sell goods at cost price but uses a weight of 900 g in place of 1 kg. What is his profit percentage? MCQ

A. 10
B. 25/2
C. 9
D. 100/9

Answer: D. 100/9

For every 900 g he gives, he charges the cost of 1000 g. His profit is 100 on a cost of 900, which is 100/900 × 100 = 100/9 = 11 1/9 percent.

Q02. For what positive value of m does the equation $x^2 + (m - 2)x + 9 = 0$ have two equal real roots? MCQ

A. 4
B. 8
C. 6
D. 10

Answer: B. 8

Equal roots need a zero discriminant: $(m - 2)^2 - 36 = 0$, so $m - 2 = \pm 6$ and $m = 8$ or -4. The positive value is 8.

Q03. A can do a piece of work in 10 days and B in 15 days. Working together they finish it and are paid ₹3,000. What is A's share, in rupees? TITA

Answer: 1800

Wages are shared in the ratio of work done per day: 1/10 : 1/15 = 3 : 2. A's share is 3/5 of ₹3,000, which is ₹1,800.

Q04. A regular polygon has four times as many diagonals as sides. What is each of its interior angles, in degrees? MCQ

A. 150
B. 1440/11
C. 1620/11
D. 160

Answer: C. 1620/11

A polygon with n sides has n(n – 3)/2 diagonals. Setting this equal to 4n gives n – 3 = 8, so n = 11. Each interior angle is 180 – 360/11 = 1620/11 degrees, about 147.3.

Q05. A car goes from A to B at 40 km/h and returns at 60 km/h. The whole trip, including a 30-minute halt at B, takes 5½ hours. What is the distance AB in km? MCQ

A. 120
B. 100
C. 150
D. 132

Answer: A. 120

Driving time is 5.5 – 0.5 = 5 hours. So d/40 + d/60 = 5, which gives d × 5/120 = 5 and d = 120 km.

Q06. Real numbers a, b and c satisfy a + b + c = 12 and ab + bc + ca = 47. What is $a^2 + b^2 + c^2$? TITA

Answer: 50

Since $(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$, we get $144 = a^2 + b^2 + c^2 + 94$, so $a^2 + b^2 + c^2 = 50$.

Q07. In how many ways can 5 boys and 3 girls sit in a row of 8 chairs so that no two girls sit next to each other? MCQ

A. 14400
B. 7200
C. 2880
D. 4320

Answer: A. 14400

First seat the boys in 5! = 120 ways. That leaves 6 gaps (including the ends), and the 3 girls can occupy 3 different gaps in 6 × 5 × 4 = 120 ordered ways. The total is 120 × 120 = 14,400.

Q08. The length of a rectangle is increased by 20% and its breadth is decreased by 10%. By what percentage does its area increase? TITA

Answer: 8

Area is length × breadth. The new length is 1.2 times and the new breadth 0.9 times the old, so the new area is 1.2 × 0.9 = 1.08 times the old area: an increase of 8%.

Q09. How many three-digit numbers are divisible by 7 but not by 14? MCQ

A. 63
B. 65
C. 64
D. 128

Answer: C. 64

Three-digit multiples of 7 run from 105 to 994, which is 128 numbers. Multiples of 14 run from 112 to 994, which is 64 numbers. The odd multiples of 7 number 128 − 64 = 64.

Q10. What amount does ₹10,000 grow to in 1 year at 20% per annum compound interest, compounded every six months? MCQ

A. 12000
B. 12100
C. 12200
D. 11900

Answer: B. 12100

Half-yearly compounding at 20% a year means two periods of six months at 10% each. The amount after one year is 10,000 × 1.1 × 1.1 = ₹12,100, slightly more than simple interest would give.

Q11. Non-zero real numbers x, y and z satisfy 2^x = 3^y = 6^(−z). What is the value of 1/x + 1/y + 1/z? TITA

Answer: 0

Let the common value be k. Then 2 = k^(1/x), 3 = k^(1/y) and 6 = k^(−1/z). Since 2 × 3 = 6, k^(1/x + 1/y) = k^(−1/z), so 1/x + 1/y + 1/z = 0 (k ≠ 1 because x is non-zero).

Q12. A right triangle has legs of 20 cm and 21 cm. What is the radius, in cm, of the circle inscribed in it? TITA

Answer: 6

The hypotenuse is $\sqrt{(400 + 441)} = 29$ cm. For a right triangle the inradius is $(a + b - c)/2 = (20 + 21 - 29)/2 = 6$ cm.

Q13. Rice costing ₹40 per kg is mixed with rice costing ₹55 per kg in the ratio 2 : 1, and the mixture is sold at ₹54 per kg. What is the profit percentage? MCQ

A. 18
B. 22.5
C. 15
D. 20

Answer: D. 20

Three kilograms of the blend cost $2 \times 40 + 55 = ₹135$, or ₹45 per kg. Selling at ₹54 gives a profit of 9 on 45, which is 20%.

Q14. How many ordered pairs (x, y) of non-negative integers satisfy $4x + 7y \le 30$? TITA

Answer: 23

Fix y and count x. For $y = 0$, $4x \le 30$ gives $x = 0$ to 7: 8 pairs. For $y = 1$, $4x \le 23$: 6 pairs. For $y = 2$, $4x \le 16$: 5 pairs. For $y = 3$, $4x \le 9$: 3 pairs. For $y = 4$, $4x \le 2$: 1 pair. In total $8 + 6 + 5 + 3 + 1 = 23$.

Q15. The present ages of A and B are in the ratio 4 : 5. Six years ago the ratio was 3 : 4. What is the sum of their present ages? MCQ

A. 45
B. 63
C. 54
D. 48

Answer: C. 54

Let the ages be 4k and 5k. Then $(4k - 6)/(5k - 6) = 3/4$, so $16k - 24 = 15k - 18$ and $k = 6$. The ages are 24 and 30, a sum of 54.

Q16. Find the remainder left over when 2^256 is divided by the prime 17. TITA

Answer: 1

Since 2^4 = 16 ≡ –1 (mod 17), 2^8 ≡ 1. As 256 is a multiple of 8, 2^256 ≡ 1 (mod 17), so the remainder is 1.

Q17. The 5th term of an arithmetic progression is 17 and its 12th term is 45. What is the sum of its first 20 terms? MCQ

A. 780
B. 760
C. 800
D. 820

Answer: A. 780

Seven steps raise the term by 28, so the common difference is 4 and the first term is 17 – 16 = 1. The sum of 20 terms is 10 × (2 + 19 × 4) = 780.

Q18. In an arithmetic progression with first term 78, the sum of the first 15 terms equals the sum of the first 25 terms. What is the common difference? MCQ

A. -3
B. -5
C. -6
D. -4

Answer: D. -4

Equal sums mean (15/2)(156 + 14d) = (25/2)(156 + 24d). Multiplying out, 2340 + 210d = 3900 + 600d, so 390d = –1560 and d = –4. Equivalently, terms 16 to 25 add up to zero, so the 16th and 25th terms are negatives of each other.

Q19. In a 1 km race, A beats B by 100 m and B beats C by 100 m. By how many metres does A beat C? TITA

Answer: 190

When A runs 1000 m, B runs 900 m. When B runs 1000 m, C runs 900 m, so when B runs 900 m, C runs 810 m. Hence A beats C by 1000 – 810 = 190 m.

Q20. A closed cylinder of radius 7 cm has a total surface area of 968 cm². Taking π = 22/7, what is its height in cm? MCQ

A. 14
B. 15
C. 16
D. 12

Answer: B. 15

Total surface area is $2\pi r(r + h) = 2 \times 22/7 \times 7 \times (7 + h) = 44(7 + h)$. Setting $44(7 + h) = 968$ gives $7 + h = 22$, so $h = 15$ cm.

Q21. Of 100 students, 45 study French, 38 German and 28 Spanish; 15 study French and German, 11 German and Spanish, 13 French and Spanish, and 6 study all three. How many study none of these languages? MCQ

A. 20
B. 24
C. 22
D. 18

Answer: C. 22

By inclusion–exclusion, students taking at least one language number $45 + 38 + 28 – 15 – 11 – 13 + 6 = 78$. So $100 – 78 = 22$ study none of them.

Q22. What is the minimum value of $|x – 1| + |x – 4| + |x – 10|$ over all real x? MCQ

A. 10
B. 9
C. 8
D. 11

Answer: B. 9

A sum of distances to points on a line is smallest at their median, here $x = 4$. The value there is $3 + 0 + 6 = 9$.