

ICAS-STYLE PREPARATION SERIES

Paper **H**. Form 4 / Secondary 3 Student Workbook

Original ICAS-style practice questions with full worked answers, written for students sitting ICAS Paper H. The test is taken by Form 4 (Malaysia) and Secondary 3 (Singapore) students.

● English · 30 Q

● Writing · 2 practice tasks

● Science · 10 Q

● Mathematics · 12 Q

STUDENT NAME

SCHOOL

DATE

TOTAL QUESTIONS

52 original ICAS-style questions + 2 writing tasks

ANSWERS

Full worked explanations at back



How to Use This Workbook

PAPER H · FORM 4 / SECONDARY 3

This workbook is an independent preparation resource for students preparing for the ICAS-style Paper H assessments in English, Writing, Science and Mathematics. Every question is original, written specifically for this workbook, and designed to test the same skills and knowledge areas as the real Paper H assessment framework.

Paper H sits at a real turning point. The topics that arrived at Paper G (algebra, Pythagoras, compound probability, chemical equations) are now expected to be familiar ground, and on top of them the paper layers new ideas: quadratics, coordinate geometry, trigonometry, two-step probability, curved surface areas, acid–base chemistry, isotopes, and Fahrenheit. The reading texts are longer and denser; the writing task demands a real counter-argument, not just an acknowledgement. This is the last year of the common marking scale for Writing before Paper I raises it further, and it is the last year before algebra and trigonometry become mandatory tools for nearly every Maths question.

You do not need to do the sections in order, and you do not need to finish in one sitting. A good approach is to do one section at a time, mark your answers against the explanations at the back, and then return to any questions you got wrong after a day or two has passed. The questions you get right on the second attempt are the ones you have really learned from.

At a glance: official Paper H format (Sources: eats.com.my · eats.com.sg)

SUBJECT	QUESTIONS	TIME	NOTES
English	55	1 hour	Reading comprehension & cloze · multiple choice
Writing	1 task	35 minutes	Narrative or persuasive · common marking scale
Mathematics	40	1 hour	Multiple choice · calculator permitted
Science	40	1 hour	Multiple choice · every Q with a visual stimulus

THE THREE-PASS STRATEGY

In a timed paper you cannot afford to spend four minutes on a single question. At Paper H, where the average question requires two or three reasoning steps, this matters more than ever. Use three passes through the paper instead of one slow walk:

- **Pass 1, Sweep.** Answer every question you can do inside 30–40 seconds. If a question needs more thought, such as a two-stimulus comparison, a multi-step calculation, or a craft question you want to reread, mark it and move on. Aim to reach the last question before the halfway mark on the clock.
- **Pass 2, Settle.** Go back to the marked questions. Now you have time to read carefully, extract from tables, run the calculation, check the units. Two minutes per question is fine here. At Paper H the questions you marked are usually the ones with the highest reward.
- **Pass 3, Check.** In the last few minutes, re-read any answer you weren't sure about. On Paper H the most common mistake is not a wrong concept but a sign error, a unit slip, or picking an option that was almost right. A 30-second re-read catches most of them.



English

READING · WRITER'S CRAFT · VOCABULARY ·
SYNTAX

30 questions

~35 min

At Paper H, you are expected to read longer, denser texts than at Paper G: a philosophical argument, a classical literary excerpt, a sharply-written review, a popular-science piece with an embedded curve. You must read them with genuine craft awareness. Questions will frequently ask not just what the writer says but *how* the writer says it, and why the choice matters.

WHAT'S HARDER AT PAPER H

- **Dense classical prose.** You may meet a long, philosophical paragraph with a single controlling idea stretched across three or four sentences. Read such passages twice. Track the subject carefully; the verb often comes late.
- **Rhetorical-strategy questions.** Expect questions that ask which tactic the writer uses (analogy, expert quotation, inclusive language, concession) or which one the writer does *not* use. Read all four options before deciding.
- **Conceptual graph-match.** A text will describe a relationship in prose and give you four curves. The correct curve is often *not* drawn for you anywhere in the text; you have to build it in your head from the argument.
- **Sophisticated vocabulary in context.** Words like *apace*, *leached*, *dispassionate* or *novel* (in its older "innovative" sense) will not be highlighted or defined. The paper is checking whether you notice them.
- **Two-adjective tone questions.** Not "what is the tone" but "which *pair* of adjectives captures it". Both words must fit. If one is off, the pair is wrong.

The Cost of Speed

AN OPINION ESSAY

There is a question we have stopped asking, perhaps because we are no longer sure the answer is one we want. It is the question of whether faster, as a general principle, is better.

Not in every particular case. Even the most enthusiastic defender of modern life would concede that it is better for an ambulance to arrive quickly than slowly, or for a message to reach its recipient before the occasion it refers to has passed. The question is broader: whether, across the whole span of our activities, the steady compression of the time each task takes has been a good trade. Whether, when we gain an hour, we spend it on something richer, or on another hour's worth of the faster thing.

Those who defend the compression make a serious case. They point out that the time saved is not, in fact, lost; it is available, at least in principle, for better uses. A meal prepared in ten minutes by a machine is a meal; the ninety minutes it would have taken otherwise can now be given to a child, a book, a walk. The aggregate effect of such gains across a modern life should be, by this argument, a kind of time wealth: a surplus distributed across the day, ready to be spent on the things that matter.

There is nothing foolish in this view. It is possibly the defining belief of our age. But it rests, when examined, on a psychological premise that the evidence does not support: that the hour you save from one task is an hour spent on another of your own choosing. It is not. It is overwhelmingly spent on *more* of the task you were trying to compress (more messages, more meals, more meetings) until the saving is absorbed and the original problem has simply been scaled.

This is a structural feature of any system in which the cost of doing a thing falls while the demand for it does not. A road widened to reduce congestion will, in a year, carry the same congestion at a higher volume. A household that halves the time each meal takes will not, on average, spend the rest of the evening reading Proust. It will simply find itself eating, discussing food, and shopping for food for longer, because the marginal cost of doing so has fallen. What looked like a saving was an invitation.

One could argue that this is everyone's responsibility and no one's problem; that individuals who wish to spend their saved hours on Proust are free to do so. That is true. But the organising logic of a society is not reducible to the sum of individual freedoms. If every interface rewards faster, and every slower habit costs more, in money or attention, than the faster alternative, then it is disingenuous to blame individuals for failing to resist a tilt they did not design. The hour saved is, on closer inspection, an hour not spent; the deeper question is whether it was ever really in our hands to spend.

1

WRITER'S CRAFT

The opening sentence ("There is a question we have stopped asking...") is effective mainly because it

- A establishes an unexpected intimacy by suggesting the reader is already complicit in an avoidance.
- B provides a factual claim that the rest of the essay will set out to disprove.
- C signals that the writer is uncertain about the subject and will explore it provisionally.
- D summarises the conclusion of the essay before the argument begins.

2

TEXT COMPREHENSION

The main counter-argument that the writer attributes to "those who defend the compression" is that

- A time saved from routine tasks is, at least in principle, available for more meaningful uses.
- B modern machines have made the cost of most activities close to zero.
- C individuals should be free to decide for themselves how to spend any time they save.
- D a nostalgic return to slower practices would be impractical in a modern society.

3

WRITER'S CRAFT

What is the main function of the two examples in the third paragraph (the quick meal, the saved ninety minutes)?

- A To present the opposing view in its strongest, most concrete form before answering it.
- B To show, by personal aside, that the writer also relies on time-saving technologies at home.
- C To suggest that the opposing argument is naïve and may safely be dismissed without further discussion.
- D To prove, by survey evidence, that most people in fact use their saved time on something meaningful.

4

VOCABULARY

Which word is closest in meaning to *aggregate* as used in paragraph three?

A immediate

B combined

C disputed

D uncertain

5

TEXT COMPREHENSION

The writer uses the widened road and the household that halves its meal times to make which point?

A Modern infrastructure and household technology can solve most of the problems they appear to create.

B When the cost of an activity falls, the activity expands to absorb the saving.

C Individuals, rather than systems, are primarily responsible for how they choose to spend any time they save.

D Meal preparation and daily commuting are the two most wasteful uses of modern adult time.

The Administrator

FROM A CLASSICAL NOVEL

Evelyn had come to the reception with the express intention of disliking Mr Harcourt, and she was surprised, in the course of the first half hour, by the difficulty of doing so. She had expected a man whose cleverness was worn as an ornament, who would wait for silence before speaking and would speak too long when he did; she had been briefed, by those who wished him less well, to watch for the small cruelties of his attention, for the moment at which he would listen to her only as long as it took to determine that she was not useful, and then detach, politely, for someone who might be. Such signals, she was told, would arrive within five minutes of her introduction.

Five minutes passed. Ten minutes passed. Mr Harcourt, who had asked for her opinion of the new municipal library and received it with the quiet seriousness she used with her own sister, was still standing opposite her, still attending, still asking the sort of follow-up question that cannot be constructed by a mind that has already moved on.

She began to suspect that she had been misled about him, and then, with the immediate qualification of a careful observer, that she had not. For it occurred to her, watching his face, that there was a particular artistry in the warmth of his listening, a quality of being exactly as interested as the person in front of him required, which might have been indistinguishable from real interest were it not for the fact that real interest had no such precision. He was, she realised with an effect somewhere between admiration and apprehension, listening to her correctly. This was not quite the same as listening to her.

And yet the effect, on Evelyn, of being listened to correctly was difficult to separate from the effect of being listened to. Her opinions, as they emerged, grew better for being attended to. She found herself arranging her ideas with more care than she usually bothered with, producing, between her first sentence and her third, distinctions she had never quite made explicit before. Mr Harcourt, who had done nothing but ask questions, had extracted from her something she had not known she possessed. It was, she thought afterwards, rather like being lent an instrument of greater range than one's own; one played, briefly, better than oneself.

It was a capacity she had observed in only a handful of people in her life, and never, she was obliged to admit, in anyone of such obvious political ambition. She did not trust him any better for it. The most effective kind of untruthfulness, she reflected later, was the kind that arranged for you to say your most truthful sentences in its presence; there was a sophistication, in the concealment of a motive behind the eliciting of another person's best self, which the simpler forms of deceit could not match.

She thanked him for the conversation at a moment of her own choosing and moved, with the sense of a narrow escape she could not quite justify, to a quieter part of the room, where she observed him for some minutes longer without being observed herself. He was now engaged in the same

posture of perfect attention with the wife of a junior official, whose face had the faint flush of a woman who was speaking above herself. Evelyn was no longer sure whether what she was watching was a kindness delivered with exceptional skill, or a cruelty so refined it had learned to pass, in polite company, for the opposite.

6

TEXT COMPREHENSION

What does Evelyn discover about Mr Harcourt in the course of their conversation?

- A He is genuinely, and without reservation, more interested in other people than in himself.
- B He is less clever than those who warned her had suggested, and easy to dismiss.
- C He possesses an unusually precise kind of attention, which resembles real interest closely enough to be almost indistinguishable from it.
- D He is shy and uncomfortable in social situations and listens only because he does not know what else to do.

7

VOCABULARY

The word *artistry*, as used in paragraph three, most nearly means

- A creativity or originality in producing something new.
- B a skilful, crafted quality in the performance of something.
- C enthusiasm for the visual arts.
- D natural, untrained ability.

8

WRITER'S CRAFT

What is the main purpose of the image of "an instrument of greater range than one's own" in paragraph four?

- A To suggest, in a passing aside, that Mr Harcourt is a talented musician as well as a politician.
- B To show that skilful attention can draw from another person a performance better than that person could produce alone.
- C To indicate that Evelyn has long privately wished she could be a more interesting and confident speaker.
- D To establish, beyond any reasonable doubt, that Mr Harcourt's attention is entirely sincere.

The narrator's reflection that "the most effective kind of untruthfulness... was the kind that arranged for you to say your most truthful sentences in its presence" invites the reader to conclude that

- A most people are untruthful most of the time, even in conversations they themselves believe are sincere.
- B Mr Harcourt has told Evelyn a specific lie which she has only just succeeded in detecting.
- C certain forms of charm are dangerous because they elicit our most truthful selves without themselves being truthful.
- D Evelyn has decided, on the evidence of one evening, that she cannot trust her own judgment of others.

Apart from the precision of his attention, what **other** detail in the passage most clearly unsettles Evelyn?

- A The fact that Mr Harcourt openly disagreed with her opinion of the new municipal library.
- B The fact that he turns the same posture of attention on another woman, whose flush suggests she too is being elicited.
- C The unusual number of people at the reception who had taken the trouble to warn her about him.
- D The observation that he had stayed at the reception considerably longer than she had expected him to.

Mr Harcourt, as the passage finally presents him, is best described as

- A** a straightforwardly cruel man whose careful social polish barely conceals his underlying contempt.
- B** a genuinely kind man whom Evelyn has unfairly misjudged out of an inherited and unexamined prejudice.
- C** a figure whose virtue and calculation are so finely intertwined that neither can be settled on as dominant.
- D** a politician whose unconcealed ambition has by now made him obvious, clumsy and easily read.

Harbour: A Review

A FILM REVIEW

Does a film have the right to be boring? It is the question that, fifteen minutes into *Harbour*, you will find yourself asking, and the question you will still be asking, uneasily and without resolution, as the credits begin to roll ninety minutes later. In between, very little happens. A man repairs a boat. His daughter, who has not spoken to him in four years, arrives without warning and leaves again after three days. An old photograph is looked at twice. The boat is not, in the end, repaired.

And yet, and yet. *Harbour* is the most defiantly held piece of film I have seen this year, a work that trusts its audience to sit with silence for longer than almost any living director would dare to ask. It is also, by any reasonable measure of conventional storytelling, a failure.

The story, such as there is one, belongs to Tomas Nilsson, a retired fisherman who lives alone in a small coastal town that the film does not trouble to name. He is played by the veteran actor Henrik Lindqvist, whose face (weathered, closed, occasionally softened by a glance at something just off-screen) is the central achievement of the film. Lindqvist has understood, as few actors can afford to, that the camera rewards stillness more richly than it rewards effort. He does almost nothing in *Harbour*, and the nothing is riveting. When, in the fourth scene, he pauses for ten full seconds before answering a simple question, the pause is not an absence of drama. It is the drama.

The daughter, Linnea, played by the first-time film actress Ida Sjöberg, is a different matter. Sjöberg is competent, sometimes more than competent, and in a role that asked less of her she would have been fine. But Linnea is supposed to carry the counterweight to her father's silence, and the script, written by Eva Ohlsson, who also directed, has given Sjöberg almost nothing to work with. She is required to produce, entirely from her own reserves, the years of grievance, tenderness, and unfinished reconciliation that the dialogue declines to address. She does not quite manage it. There is a scene, about halfway through, in which she sits opposite her father and attempts to tell him why she came; her face works bravely, but the words will not land, because the script has not earned them. Ohlsson's faith in her leading man is very nearly total; her faith in her leading woman is visibly thinner.

This imbalance is, I think, the real weakness of *Harbour*, and it is a weakness that almost any other film would not survive. That *Harbour* survives it is a testament to the sheer density of what is happening in every other register. The cinematography, by Anders Berg, is some of the most patient I have seen: long takes of grey water under grey sky, a door left half-open for three full seconds before anyone walks through it, the light in a kitchen changing by degrees over the length of a silent meal. The score, a single viola used sparingly, does what a great score should do, which is to arrive only at moments when the image alone would be insufficient, and then to withdraw. Not many films this year will show you a sequence as quietly devastating as Tomas, alone in the half-

repaired boat at dusk, listening to a recording of his late wife's voice on a tape he had not played for twenty-two years.

So what is one to make, finally, of such a film? It is neither a masterpiece nor a misfire; it is a work of unusual conviction partially undone by a writer's unwillingness to trust any voice but one. I suspect it will not find the audience it deserves, and I suspect that those who do find it will remember it longer than most of the more accomplished films of the year. If you go, go without hurry. *Harbour* does not reward the impatient; but neither, to be fair, does the sea.

12

TEXT COMPREHENSION

The reviewer's overall judgement of *Harbour* is that it is

- A a great film of unusual quality, marred only by minor technical weaknesses most viewers will not notice.
- B a commercially disastrous and creatively confused film that has, on balance, nothing whatever to recommend it.
- C a film of real conviction whose central weakness lies in the unevenness of the two leading performances.
- D a conventional family drama made more interesting than it should have been by its skilful cinematographer.

13

WRITER'S CRAFT

What is the effect of the reviewer's very short second paragraph ("And yet, and yet...")?

- A It marks a clean pivot from the opening ambivalence into a real defence, without softening the prior criticism.
- B It signals that the reviewer has lost the thread of the argument and is awkwardly starting it again.
- C It is a stylistic flourish of the kind reviewers favour, with no real argumentative function in the piece.
- D It shows that the reviewer dislikes the film but is being politely diplomatic about saying so.

The reviewer devotes considerably more space to Lindqvist's performance than to Sjöberg's. The most likely reason for this imbalance is that

- A the reviewer harbours a personal dislike of women actors and is reluctant to discuss them at length.
- B Sjöberg's performance is so completely thin that there is literally nothing of substance to say about it.
- C the review's own imbalance mirrors the film's imbalance, which is the reviewer's central complaint.
- D the reviewer ran out of allotted column space before being able to discuss Sjöberg's work properly.

Why does the review open with a rhetorical question ("Does a film have the right to be boring?")?

- A To express the reviewer's own genuine uncertainty about whether they are personally qualified to review the film at all.
- B To name, in one provocative sentence, the question the whole review will go on to try to answer.
- C To signal that the review will adopt a deliberately humorous rather than serious approach to its subject matter.
- D To pose a literal question that the reviewer wishes the reader to answer in writing or in a letter.

The reviewer writes, of Lindqvist, that "the camera rewards stillness more richly than it rewards effort." This remark implies that

- A** actors who exert themselves visibly often seem less truthful on screen than actors who do very little.
- B** modern camera equipment has become too sensitive to the visible effort of all but the most disciplined actors.
- C** cinema audiences, on the whole, secretly prefer actors who give the appearance of being lazy or under-rehearsed.
- D** Lindqvist himself did not work very hard on this particular film, and the camera has rewarded him for it.

The Curious Shape of Confidence

A POPULAR-SCIENCE ARTICLE

When we first learn a skill, we are usually, and accurately, aware that we have no idea what we are doing. A student new to chess sees only pieces moving at random; a beginner on a bicycle feels, correctly, that they are one wobble away from the pavement. Confidence, at this stage, is at its lowest, and for good reason.

If skill and confidence rose together through every stage of learning, the story would end there. But they do not, and the divergence between the two is one of the more interesting findings of the last thirty years of cognitive psychology. A series of experiments first reported in the late 1990s, and since replicated across domains from medicine to motor repair, describes a relationship between ability and self-confidence that is novel in both senses of the word: surprising, and shaped, oddly enough, like a piece of fiction, with a beginning, a middle, and an end.

Here is the pattern. At the very beginning of learning, ability is low, but so is confidence; the beginner is aware of the gap between what they can do and what the task requires. With a small amount of practice, however, ability rises slightly, and confidence rises much more steeply than ability, overshooting it. The novice who has taken their first three lessons, won a game against someone weaker, and read one article about openings, now feels like an expert. This, the psychologists note, is the most dangerous moment in any learning curve: the learner has not yet accumulated enough experience to recognise what they do not know.

As genuine experience accumulates, the pattern reverses. Ability continues to rise steadily; confidence, however, falls. The intermediate student, who can now see the full landscape of the field, is newly aware of how much of that landscape they have not yet crossed. They were, in effect, too confident before they knew enough to be humbled; they are now, if anything, less confident than the facts would warrant. Confidence reaches its lowest adult value not at the beginning, but somewhere in the middle, at the point where ability is already respectable but the sense of how much remains unknown has caught up.

Only after long practice do the two curves begin to converge. A genuine expert, by this account, is not someone whose confidence is highest; it is someone whose confidence has finally steadied at a level that corresponds, within reason, to what they can actually do. In a long career, the two lines meet, not at the peak of either, but at the point where the honest answer to "how good are you?" is neither an overestimate nor an apology.

The findings have been used to explain, among other things, why near-beginners in a field can be so difficult to teach (they know enough to believe they do not need instruction) and why experienced practitioners can sometimes seem oddly modest (they know enough to have located the edges of their competence). They have also been enlisted, inevitably, in popular writing about politics, the internet, and the tendency of public opinion to be loudest on the questions it

understands least. Whether this transfer from the laboratory to the comment section is warranted is itself a matter on which, one might say, the evidence suggests we should hold our confidence in check.

17

TEXT COMPREHENSION

The article's central finding is that, during learning, confidence and ability

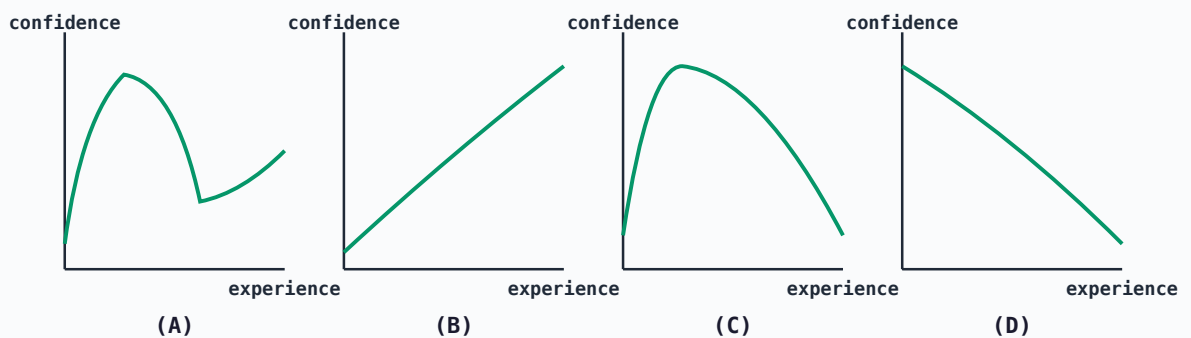
- A rise together steadily and predictably, with confidence always lagging slightly behind genuine ability.
- B do not track each other simply: confidence first outruns ability, then falls below it, and only later catches up.
- C are essentially unrelated quantities and should not, in the writer's view, be compared with each other at all.
- D both reach their highest point at the very beginning of learning and decline together steadily after that.

18

WRITER'S CRAFT • DIAGRAMMATIC

The article describes the relationship between experience and self-confidence. Which graph best represents this relationship, with experience on the horizontal axis and self-confidence on the vertical axis?

CHOOSE THE BEST MATCH



A Graph A

B Graph B

C Graph C

D Graph D

19

VOCABULARY

In the second paragraph, the writer notes that the word *novel* applies "in both senses of the word". In this context, the two senses are

- A "a book-length story" and "a piece of fiction".
- B "new or unexpected" and "a long work of prose fiction".
- C "well known" and "unfamiliar".
- D "surprising" and "unprecedented in the history of science".

20

WRITER'S CRAFT

Which of the following does the writer **NOT** use to build the credibility of the argument?

- A reference to experiments first reported in a specific decade and "since replicated across domains"
- B the use of an inclusive "we" in the opening paragraph, drawing the reader into the argument
- C extended direct quotation from the original researchers' own published conclusions on the topic
- D analogy with concrete situations such as the chess beginner and the new cyclist

21

TEXT COMPREHENSION

The final sentence of the article ("Whether this transfer from the laboratory to the comment section is warranted...") is best understood as

- A a lightly ironic aside that turns the article's finding back on the way the finding itself is often used.
- B a straightforward condemnation of the general public's ignorance of cognitive psychology and its findings.
- C a polite recommendation that readers should henceforth stop writing in online comment sections altogether.
- D an admission that the writer has not in fact understood the research they are attempting to describe here.

Unfinished

A REFLECTIVE ESSAY

On the back wall of my grandmother's house there hangs a small embroidered panel, perhaps the size of a dinner plate, which she began in 1963 and never completed. Seven flowers of an intended twelve have been worked in painstaking detail, each one slightly different from the next, the colours deepening towards a central stem. The remaining five flowers are only outlined: faint pencil marks on the linen, visible if the light catches them. A single threaded needle is still pinned in the fabric beside the eighth outline, as if the work had been set down for five minutes.

She died, of course; the five minutes became sixty years. But that is not what I mean when I say that the panel is the most beautiful thing in her house.

A completed version of the panel would have hung above the mantelpiece and been admired, by visitors, as a nicely done piece of work. The unfinished version has had, on everyone who has stood in front of it, a stranger and larger effect. We stay longer. We move closer. We read, without being able to help it, the unfinished outline as if it were a sentence that had stopped mid-word. And in the gap between the seven completed flowers and the five unstarted ones, we see, more honestly than we could if the whole thing had been done, the fact of the person who was working on it.

The beauty of the unfinished, I have come to think, is not really a beauty of incompleteness, which is what the phrase implies. It is a beauty of *visible intention*. A finished work presents itself to us as if it had arrived in the world whole; it effaces its own making. An unfinished work cannot do this. The working hand is still there in the evidence of its absence. You can see where the craftsman was going; you can see, too, that the craftsman was a particular person, and that the work was something that happened to their attention for a period of their life.

I notice this in other places: a building with one wall left in bare brick; a poem that breaks off at its eighth line; a piano piece whose last movement the composer never wrote, now played as it stands, to the unfailing silence of audiences that would, if it were whole, applaud politely and move on. These things hold us, I think, because they remind us that art is something a person does, rather than something a person produces. The finished thing is the outcome; the unfinished thing is the record.

I am aware that this argument is, to a degree, the consolation of one who has spent a certain amount of her own life leaving things unfinished. I would prefer, as a rule, to finish what I begin. My grandmother, I imagine, would have preferred to finish the panel. But I am grateful, in a way I could not have been if she had completed it, for the particular eloquence of what she left behind: seven flowers, carefully worked, and the quiet confession of the five she did not have time to make.

22

WRITER'S CRAFT

What is the main purpose of the first paragraph?

- A** To give a precise, visual description of the object whose presence will carry the argument that follows.
- B** To explain, in technical detail, how to embroider flowers in the careful manner used by the writer's grandmother.
- C** To establish, by quiet implication, that the writer's grandmother was not in fact a particularly skilled craftswoman.
- D** To introduce the reader to the writer's childhood home and to the rooms she remembers most fondly from it.

23

VOCABULARY

Which word is closest in meaning to *painstaking* as used in the opening paragraph?

- A** sorrowful
- B** meticulous
- C** hurried
- D** medical

24

WRITER'S CRAFT

Which of the following is **LEAST** likely to be a reason the writer composed the second paragraph as a single short sentence ("She died, of course; the five minutes became sixty years")?

- A** to refuse to dwell on the death itself, so that the essay can move quickly to the idea it actually wants to explore
- B** to mark a temporal pivot between the panel as she would have seen it and the panel as we see it now
- C** to give the reader a brief, deliberate pause before the central argument of the essay begins
- D** to indicate that the writer was too grief-stricken to construct a longer paragraph at this point in the essay

25

WRITER'S CRAFT

The title "Unfinished" functions effectively in the essay because it refers, in combination, to

- A only the embroidered panel hanging on the back wall of the writer's grandmother's house.
- B the panel, the other unfinished works the writer cites, and her own still-forming understanding.
- C the writer's grandmother's life, which ended quite suddenly before she was ready and before the work was done.
- D a particular embroidery technique briefly fashionable among home craftswomen in Britain during the 1960s.

26

WRITER'S CRAFT

The tone of the essay is best described as

- | | |
|--------------------------|---------------------------------|
| A mournful and resigned | B tender and quietly reflective |
| C scholarly and detached | D ironic and dismissive |

The Longitude Problem

A HISTORICAL CLOZE

By the early eighteenth century, the problem of determining a ship's longitude at sea had become the most pressing unsolved question in European navigation. Latitude, the ship's position north or south, could be fixed with reasonable accuracy from the angle of the sun or the pole star. Longitude, **27**, required something quite different: a reliable way of knowing, while at sea, the exact time at a fixed reference point on land.

The principle was straightforward. The Earth rotates once every twenty-four hours, meaning that for every fifteen degrees of longitude, local time differs by one hour from the time at the reference meridian. A navigator who could compare local noon, easily measured from the sun, with the current time in, say, London, could in principle calculate how far east or west of London the ship had sailed. The difficulty lay in the second half of that comparison. **28** the London time while at sea for weeks or months on end, the navigator needed a clock that would run accurately despite the violent motion of the ship, the changes in temperature, and the fluctuations in humidity that had defeated every previous timekeeping device.

In 1714 the British government established the Board of Longitude, offering a prize of twenty thousand pounds, an enormous sum, to anyone who could produce a reliable solution. **29** most of the scientific establishment favoured astronomical methods, involving complex tables of the positions of the moon, a self-taught Yorkshire carpenter named John Harrison began instead to work on the mechanical problem. Over the next four decades, at an increasingly fine scale, he would produce a series of timepieces, the fourth of which, no bigger than a large pocket watch, **30** the ocean crossing to Jamaica in 1761 having lost only a handful of seconds.

27

SYNTAX · CLOZE

Choose the option that best completes the text.

A furthermore

B by contrast

C for example

D as a result

28

SYNTAX · CLOZE

Choose the option that best completes the text.

A In order to know

B Knowing

C To have known

D Known

29

SYNTAX · CLOZE

Choose the option that best completes the text.

A Because

B So that

C Although

D Whereas

30

SYNTAX · CLOZE

Choose the option that best completes the text.

A has survived

B survived

C is surviving

D had survived



Writing

PERSUASIVE & NARRATIVE · COMMON MARKING SCALE

2 tasks

~70 min total

ICAS Writing is marked on a common scale across all levels. That means the rubric wording is the same at Paper H as it is at earlier papers, but the expectations at the STRONG band rise noticeably from year to year. At Paper H, the STRONG band rewards not just clear, correct writing but *considered* writing: persuasive pieces that engage the strongest form of the opposing view rather than merely naming it; narratives that let the reader assemble understanding from detail and silence, rather than handing it over in direct statement. The rubric wording does not change; what changes is what "confident", "deliberate", and "controlled" now mean.

In the real paper you will be given one writing task to complete in 35 minutes. This workbook gives you two tasks, one persuasive and one narrative, so you can practise both. Set a timer for 35 minutes per task and resist the temptation to go over.

WHAT MARKERS REWARD AT PAPER H

- **Genre, at depth.** A persuasive piece no longer scores at STRONG for merely acknowledging the other side. It must state the opposing view in its strongest form, then answer that form, not a weakened version. A narrative no longer scores at STRONG for "showing rather than telling"; it must manage interiority obliquely, letting the reader assemble feeling from what the character notices, remembers, and does.
- **Textual grammar with purpose.** Sentence length should vary for rhythm, not by accident. Short sentences after long ones should land. If you shift tense, do it on purpose and make the shift audible. Paragraphing should build the argument or the story, not merely separate it.
- **Syntax and punctuation at range.** At Paper H the markers reward confident use of the colon, semicolon, and dash, each earning its place. Every punctuation mark should be deliberate. Vocabulary should reach beyond the everyday without sounding borrowed.
- **Plan before you write.** Spend the first four or five minutes planning. At Paper H the mark difference between a sound response and a strong one is almost always visible in the shape of the plan, not in how hard the student pushed in the last five minutes.

TASK 1 • PERSUASIVE

The cost of speed

Many people argue that the most valuable skill in modern life is the ability to do things quickly. Others argue that the most valuable skill is the willingness to do things slowly, with care. Take one of these positions. Your piece must state the opposing view in its strongest form, not a weakened version, and then answer that form directly.

GENRE: Persuasive • TIME: 35 minutes • AUDIENCE: a thoughtful adult reader

BEFORE YOU WRITE • TASK 1

- Pick **one** side, and commit to it in the first two sentences. Paper H rewards a piece that knows where it is going; it does not reward a piece that is still deciding at paragraph three.
- Write the opposing view as one full sentence in your plan, *before you begin drafting*. Make that sentence as strong as you can. Your piece now has to answer it, not a weaker version of it.
- A real rebuttal does more than acknowledge. It says: "those who argue the opposite are right about X; they are wrong about Y; here is why Y matters more than X in this case." That is the structural move markers look for at H.
- Avoid phrases like "I think" or "In my opinion." At Paper H, the position should be visible in the sentences themselves, not announced in advance.
- Leave three minutes at the end to re-read. Most H-level errors are small: a missing comma, a dropped word, a noun and verb that disagree across a long clause. Three minutes is enough to catch them.

PLAN / DRAFT • TASK 1

The Mistaken Belief

Write the complication stage of a story in which a character discovers that a long-held belief about someone close to them is wrong. You must not state the belief directly. The reader should be able to work out what the belief was, and how it has been overturned, entirely from what the character notices, remembers, and does.

GENRE: Narrative (complication stage) • TIME: 35 minutes • AUDIENCE: a reader who is paying attention

BEFORE YOU WRITE • TASK 2

- Plan the belief and its overturning before you write a word. Write both in your plan, so you know exactly what the reader should eventually piece together. If you do not know it, they certainly will not.
- The restriction, allowing no direct statement of the belief, is the whole craft test. Every detail you include should either hint at the old belief, or hint at the new realisation that replaces it. Details that do neither are not carrying their weight; cut them.
- This is a *complication*, not an opening. Your reader should feel, quickly, that they are mid-way into a story that has a past and a future. Do not set the scene from scratch; start with the moment the character notices the thing that changes everything.
- Interiority at Paper H is oblique. If the character is hurt, do not say so. Let the hurt appear in what they do next: an object handled more carefully than usual, a phone picked up and put down, a memory returning in the wrong order.
- One good sentence doing the work of a paragraph will score higher than a paragraph doing the work of one sentence. Restraint is rewarded.

PLAN / DRAFT · TASK 2



Science

REASONING · INVESTIGATING · INTERPRETING ·
PREDICTING

10 questions

~15 min

At Paper H, Science questions test whether you can *reason* with what you have learned, not whether you can recall a definition. A question will hand you the data, such as a labelled diagram, a graph, a small table, or a formula, but it will rarely hand you the principle that connects them. That step is yours. Many questions require you to read two pieces of evidence together (a graph plus a table, a diagram plus an equation) and combine them with your own knowledge to reach a conclusion. Before answering, ask yourself: *what do I already know that the question is expecting me to bring?*

WHAT'S NEW AT PAPER H

- **Acid–base chemistry.** The pH scale arrives at H. Remember that pH is logarithmic: pH 3 is ten times more acidic than pH 4, not one unit more. When an acid and a base are mixed, whichever has far more reactive particles dominates the result.
- **Isotopes.** Mass number (top left) counts protons plus neutrons; atomic number (bottom left) counts protons only. In decay equations, both quantities must balance on each side.
- **Trigonometry-style reasoning in data.** Two-variable optimisation, meaning finding a condition that satisfies two constraints at once, will appear in at least one question per paper.
- **Effects on the human body.** Alcohol, electric current, and non-Celsius temperature scales are all fair game at H. Expect to apply a rule sensibly to a realistic situation.
- **Apparent vs. intrinsic properties.** A recurring H theme: what you measure from Earth (star magnitude, current through skin, reaction time) depends on both the underlying quantity and a mediating factor such as distance, resistance, or body mass.

A star's **apparent magnitude** is a measure of how bright it appears when viewed from Earth. The lower the number, the brighter the star appears.

How bright a star looks from Earth depends on both how much light it actually produces (its **luminosity**) and how far away it is: light from a distant star spreads out as it travels, so the same star looks dimmer the farther away it lies. Two stars with the same apparent magnitude can therefore have very different luminosities if they are at different distances.

The table gives the apparent magnitude and the distance of four stars.

FOUR STARS OBSERVED FROM EARTH

STAR	APPARENT MAGNITUDE	DISTANCE (LIGHT-YEARS)
Alpha	3	50
Beta	3	500
Gamma	5	50
Delta	1	25

Which star has the greatest **luminosity** (produces the most light)?

A Alpha

B Beta

C Gamma

D Delta

An **aurora** is a glow produced high in a planet's atmosphere when charged particles streaming from the Sun are drawn in and collide with gas particles. The table summarises four bodies in the solar system.

PROPERTIES OF FOUR BODIES IN THE SOLAR SYSTEM

BODY	MAGNETIC FIELD	ATMOSPHERE	EXPOSED TO SOLAR WIND
the Moon	none	almost none	yes
Mars	very weak (local patches only)	thin	yes
Venus	none (only induced)	thick	yes
Jupiter	very strong (~14× Earth's)	thick	yes

On which of these bodies would you expect to see the **brightest and most regular** auroras?

A the Moon

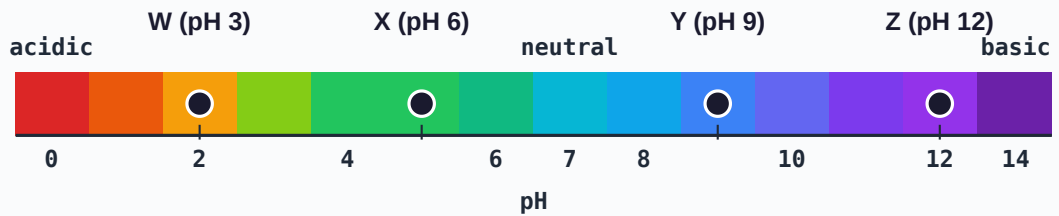
B Mars

C Venus

D Jupiter

The **pH scale** measures how acidic or basic a solution is. It is a *logarithmic* scale: each step of one pH unit represents a tenfold change in the concentration of reactive particles. The diagram shows four solutions and their pH values.

FOUR SOLUTIONS, WITH THEIR PH VALUES



Equal volumes of solution **W** (pH 3) and solution **Y** (pH 9) are mixed. The pH of the resulting mixture is most likely to be close to

A 3

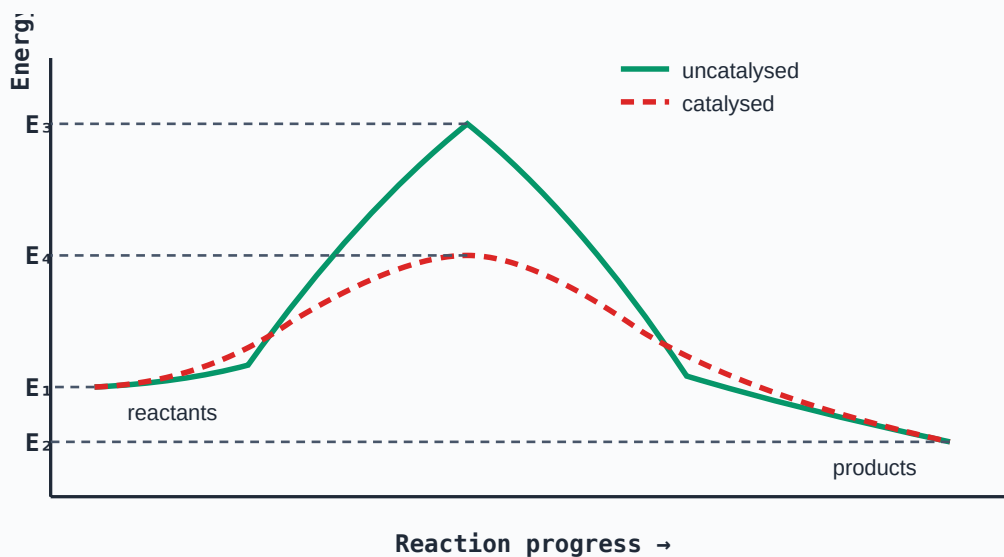
B 6

C 7

D 9

The energy profile below shows the same chemical reaction carried out twice: once without a catalyst, and once with a **catalyst** added.

ENERGY PROFILE: CATALYSED VS. UNCATALYSED REACTION



Which of the following statements about the reaction is **supported** by the energy profile?

- A The catalyst reduces the energy change of the reaction, making it release less energy overall.
- B The catalyst provides an alternative pathway with a lower activation energy, without changing the energy change of the reaction.
- C The catalyst makes the reaction endothermic instead of exothermic.
- D The catalyst is itself converted into the reaction products.

5

NATURAL & PROCESSED · REASONING

In nuclear notation, an atom is written with its **mass number** (protons + neutrons) at the top left and its **atomic number** (number of protons) at the bottom left. The equation below shows the radioactive decay of uranium-238.

A NUCLEAR DECAY EQUATION



What is the correct notation for particle X?

A 4 2 He

B 1 0 n

C 0 -1 e

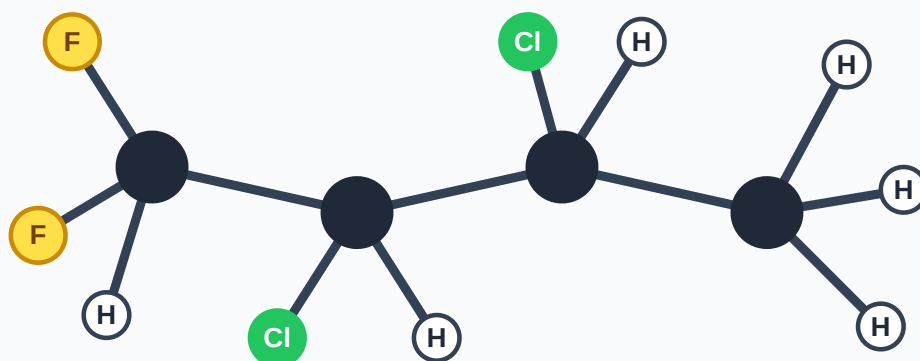
D 4 1 H

6

NATURAL & PROCESSED · REASONING

The diagram shows the ball-and-stick model of the compound 2,3-dichloro-1,1-difluorobutane. Its **empirical formula** is the simplest whole-number ratio of the atoms it contains.

BALL-AND-STICK MODEL OF 2,3-DICHLORO-1,1-DIFLUOROBUTANE



KEY

- C
- H
- Cl
- F

What is the **empirical formula** of this compound?

A C 4 H 6 Cl 2 F 2

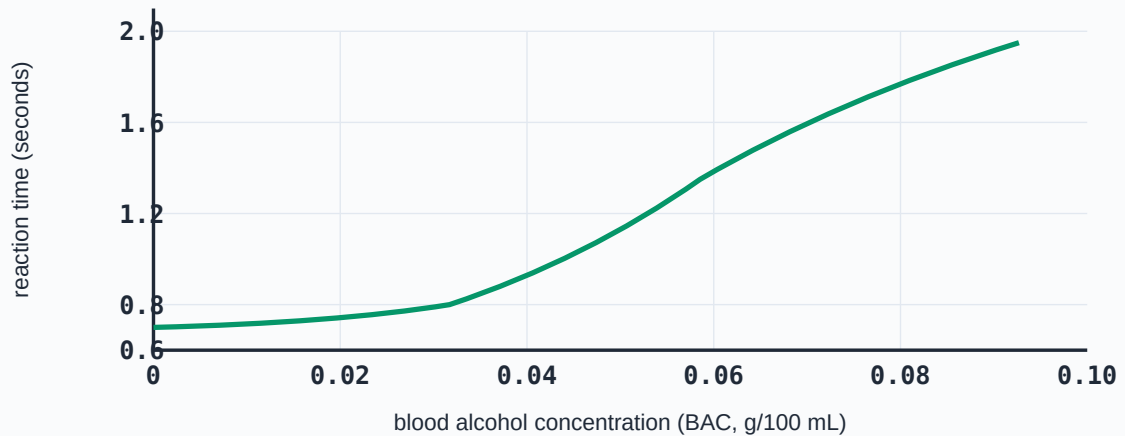
B C 2 H 3 ClF

C CHClF

D C 2 H 3 Cl 2 F 2

Alcohol slows the nervous system and lengthens a person's reaction time. For the same amount of alcohol consumed, a person of smaller body mass reaches a higher blood alcohol concentration (BAC). The graph shows how reaction time depends on BAC; the table gives the body masses of four students, each of whom drank the same amount of alcohol one hour ago.

REACTION TIME VS. BLOOD ALCOHOL CONCENTRATION



STUDENT	BODY MASS
P	55 kg
Q	75 kg
R	65 kg
S	95 kg

Which student is most likely to have the **slowest reaction time** now?

A Student P

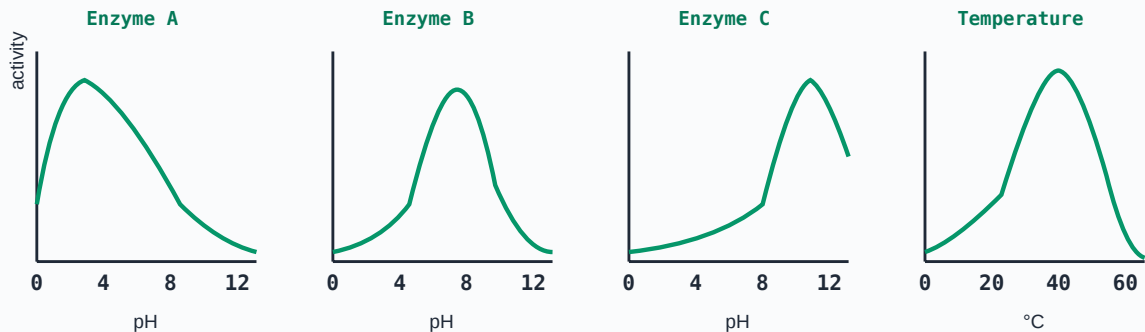
B Student Q

C Student R

D Student S

The first three graphs show how the activity of three different enzymes changes with pH. The fourth graph shows how enzyme activity in general changes with temperature.

ENZYME ACTIVITY VS. PH (THREE ENZYMES) AND VS. TEMPERATURE (GENERAL)



Rohan is planning an investigation that requires **high enzyme activity**. The mixture he must use is acidic, and the investigation must be carried out at human body temperature (about 37 °C).

Which combination should Rohan choose?

- A Enzyme A at 40 °C
- B Enzyme A at 10 °C
- C Enzyme B at 40 °C
- D Enzyme C at 10 °C

When a person touches a source of electricity, the current that flows through their body is given by Ohm's law, $I = V / R$. Human skin has a resistance of roughly $100\,000\ \Omega$ when dry, but only about $1000\ \Omega$ when wet. The table shows the effect of different currents on the human body.

EFFECTS OF ELECTRIC CURRENT ON THE HUMAN BODY

CURRENT THROUGH BODY	TYPICAL EFFECT
below 1 mA	no sensation
1 – 5 mA	tingling; threshold of perception
10 – 30 mA	painful muscle contraction; cannot let go
50 – 100 mA	ventricular fibrillation (heart); often fatal
above 1 A	severe burns; cardiac arrest

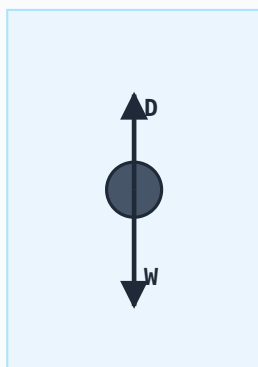
Aisha accidentally grips a faulty appliance connected to **24 V**. Her hands are wet from washing up.

What is the most likely effect on her body?

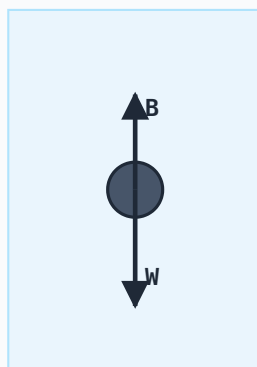
- A** No sensation; the voltage is too low to produce a current she can feel.
- B** Tingling only, at the threshold of perception.
- C** Painful muscle contraction; she may not be able to release the appliance.
- D** Ventricular fibrillation of the heart.

A steel ball, which is much denser than water, is dropped into a deep tank of water. After a short time it sinks at a *constant speed*; it has reached **terminal velocity**. The four diagrams below show possible combinations of forces acting on the ball as it sinks at constant speed (W = weight, B = buoyancy, D = drag).

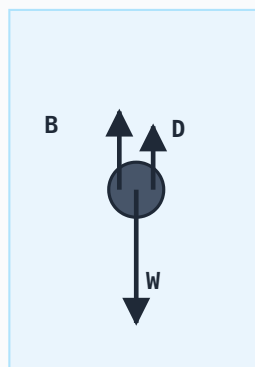
WHICH DIAGRAM SHOWS THE FORCES AT TERMINAL VELOCITY?



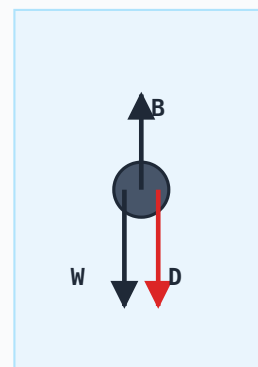
(A)



(B)



(C)



(D)

Which diagram correctly shows the forces acting on the steel ball at terminal velocity?

☐ A Diagram A

☐ B Diagram B

☐ C Diagram C

☐ D Diagram D



Mathematics

NUMBER · ALGEBRA · MEASUREMENT · GEOMETRY ·
CHANCE & DATA

12 questions

~20 min

Paper H Mathematics is the first paper in the series where almost every question asks you to *use* a technique rather than simply *recognise* it. Scientific notation, surds, quadratics, coordinate geometry, Pythagoras in three dimensions, trigonometry, the volume and surface area of curved solids, and two-step probability all appear. The questions are short; the working is often two or three steps; the traps are the sorts of small errors that look reasonable on the way past.

WHAT'S NEW AT PAPER H

- **Quadratics.** Expect at least one question where you have to set up and solve $x^2 + bx + c = 0$ from a word problem. Factorise first; the quadratic formula is a last resort, and if a solution is negative you usually have to reject it.
- **Trigonometry.** **SOH·CAH·TOA** is assumed knowledge. Check whether the side you want is opposite, adjacent, or the hypotenuse *before* you pick the function.
- **Curved solids.** The formulas for the volume of a cone ($\frac{1}{3}\pi r^2 h$) and the surface area of a sphere ($4\pi r^2$) are usually **not** given. Learn them; they cost you easy marks if you don't.
- **3-D Pythagoras.** A space diagonal of a rectangular prism satisfies $d^2 = l^2 + w^2 + h^2$. You do **not** need to compute the face diagonal separately.
- **Probability without replacement.** The second fraction has a different denominator from the first. This is the single most common slip at Paper H.
- **Scale factor for volume.** If linear sides scale by k , volumes scale by k^3 , not k . Always check which one the question wants.

1

NUMBER

A water treatment plant removes iron from drinking water. Each litre of untreated water contains 4.8×10^{-3} grams of iron. The plant treats 2.5×10^4 litres of water in one day.

SETTING UP THE CALCULATION

IRON PER LITRE

$$4.8 \times 10^{-3}$$

GRAMS

×

LITRES PER DAY

$$2.5 \times 10^4$$

LITRES

=

TOTAL PER DAY

?

What is the total mass of iron removed in one day, in scientific notation?

A 1.2×10^2 g

B 1.2×10^{-2} g

C 12×10^1 g

D 1.2×10^7 g

2

NUMBER · FINANCE

Dan invested an amount of money at **6% simple interest per year**. After **5 years**, the total interest he had earned was **\$1200**.

He then withdrew all of his money (principal plus interest) and re-invested it in a new account paying **4% simple interest per year**. He left it in the new account for **3 years**.

SIMPLE INTEREST FORMULA

$$I = P \times R \times T$$

where I = interest, P = principal, R = annual rate, T = time in years

What is the total amount in Dan's new account at the end of the 3 years?

A \$4480

B \$5200

C \$5824

D \$6136

3

NUMBER · SURDS

Simplify $\sqrt{75} + \sqrt{48} - \sqrt{12}$.

USEFUL FIRST STEP

$$\sqrt{(a \times b)} = \sqrt{a} \times \sqrt{b} \quad (\text{for } a, b \geq 0)$$

A $7\sqrt{3}$

B $11\sqrt{3}$

C $\sqrt{111}$

D $3\sqrt{7}$

4

ALGEBRA

Expand and simplify:

$$(2x - 3)(x + 4) - (x - 1)^2$$

A $x^2 + 7x - 13$

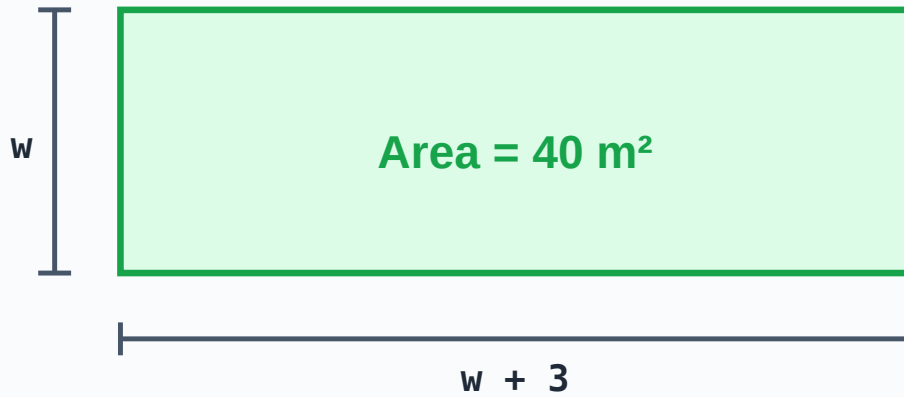
B $3x^2 + 3x - 11$

C $x^2 + 3x - 11$

D $x^2 + 7x - 11$

A rectangular garden bed has a **length that is 3 metres longer than its width**. The total area of the garden bed is **40 m^2** .

THE GARDEN BED



What is the **width** of the garden bed?

A 4 m

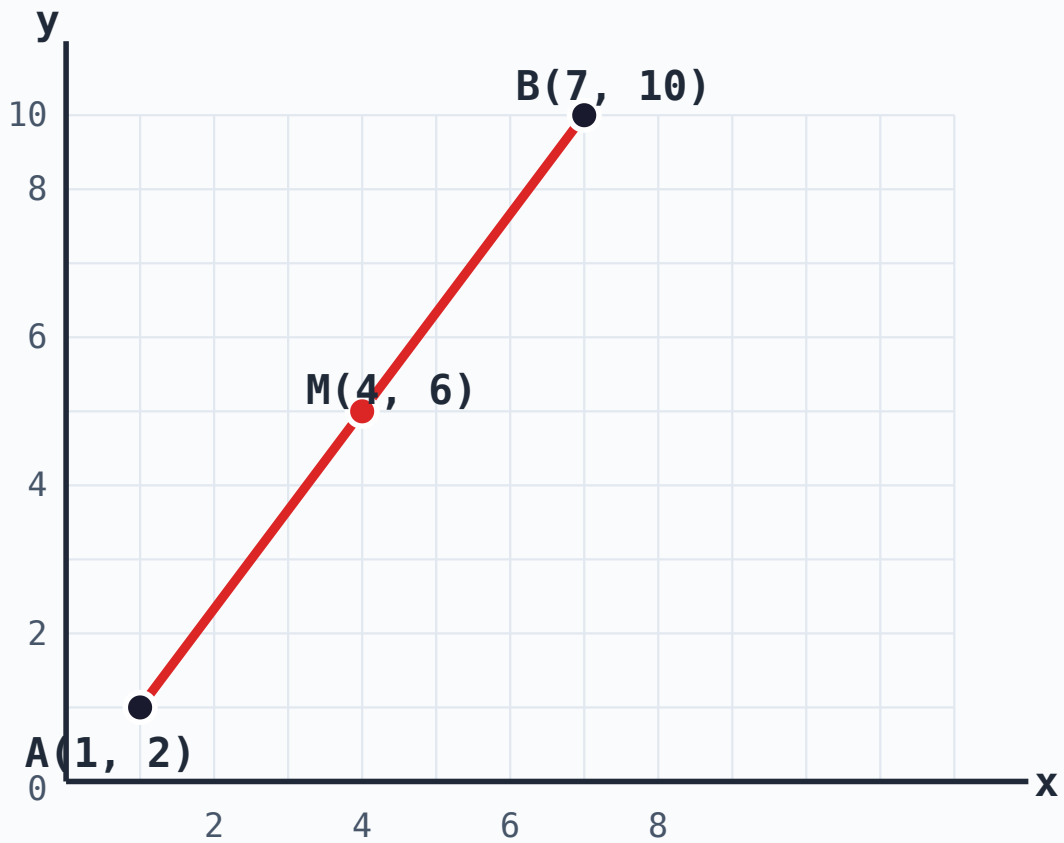
B 5 m

C 8 m

D -8 m

A line segment has endpoints **A(1, 2)** and **B(7, 10)**. A new line passes through the midpoint of AB and is perpendicular to AB.

LINE SEGMENT AB ON THE COORDINATE PLANE



What is the equation of the new line?

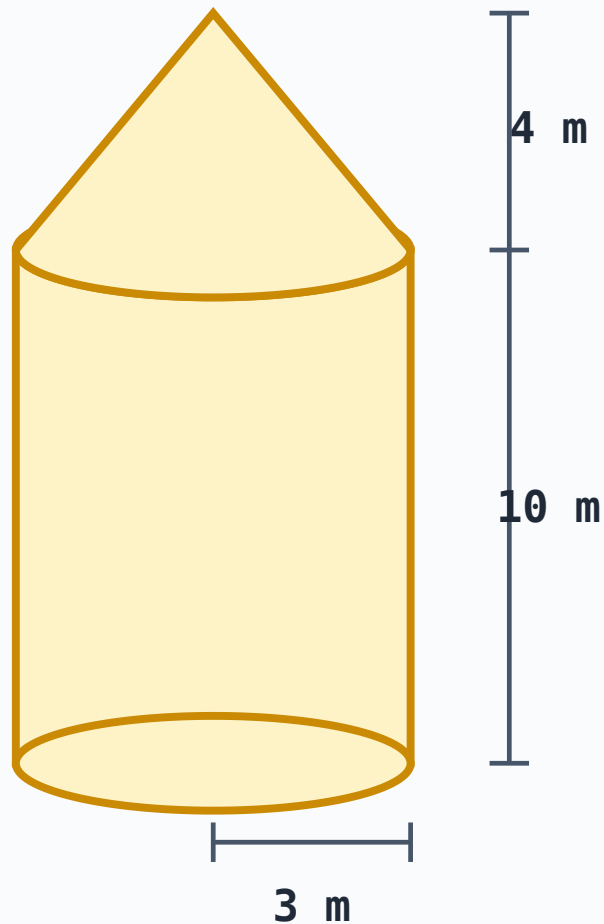
- ☐ A $y = -\frac{3}{4}x + 9$
- ☐ B $y = \frac{4}{3}x + 6$
- ☐ C $y = -\frac{4}{3}x + 6$
- ☐ D $y = \frac{3}{4}x + 3$

A farm grain silo is made from a **cylinder** with a **cone** on top. The cylinder has radius 3 m and height 10 m. The cone has the same radius as the cylinder and a height of 4 m.

GRAIN SILO

$$V(\text{cone}) \\ = \frac{1}{3}\pi r^2 h$$

$$V(\text{cylinder}) \\ = \pi r^2 h$$



What is the **total volume** of the silo?

A $90\pi \text{ m}^3$

B $96\pi \text{ m}^3$

C $102\pi \text{ m}^3$

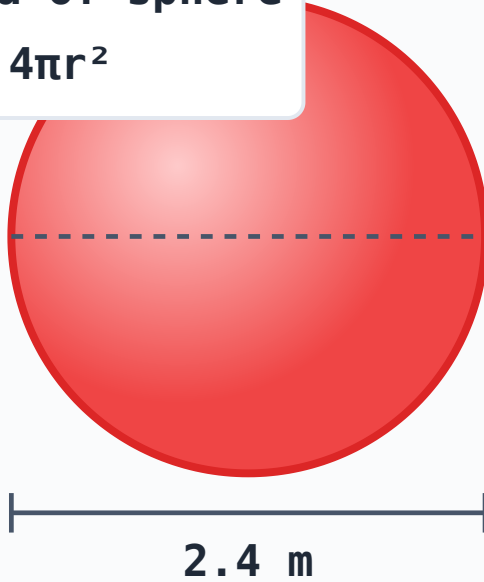
D $126\pi \text{ m}^3$

A weather balloon is approximately spherical and has a **diameter of 2.4 m**.

WEATHER BALLOON

Surface area of sphere

$$SA = 4\pi r^2$$



What is the **surface area** of the balloon?

A $2.88\pi \text{ m}^2$

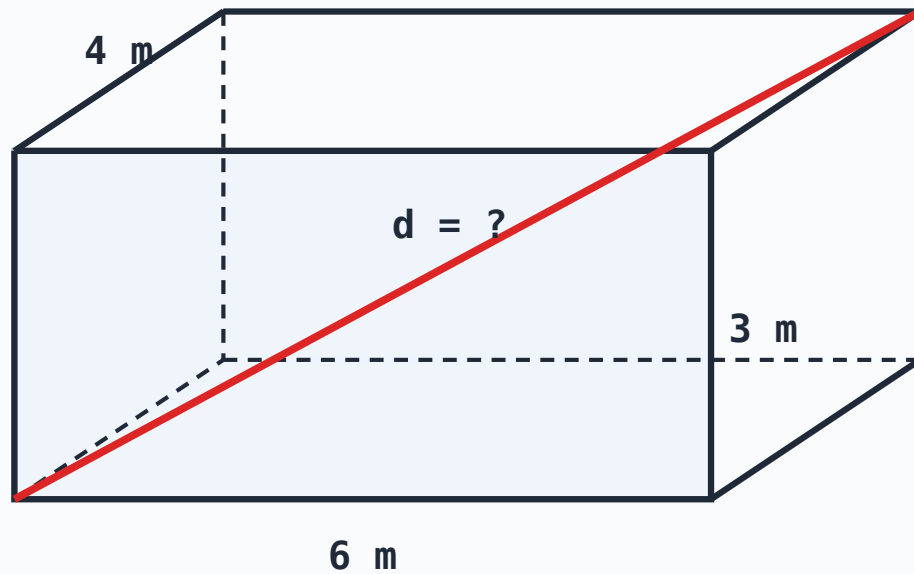
B $5.76\pi \text{ m}^2$

C $9.6\pi \text{ m}^2$

D $23.04\pi \text{ m}^2$

A storage box is in the shape of a rectangular prism with length 6 m, width 4 m, and height 3 m. A thin rod is to be placed inside the box, running from one bottom corner to the **opposite top corner**.

RECTANGULAR STORAGE BOX



What is the **length of the rod**?

A $\sqrt{25}$ m

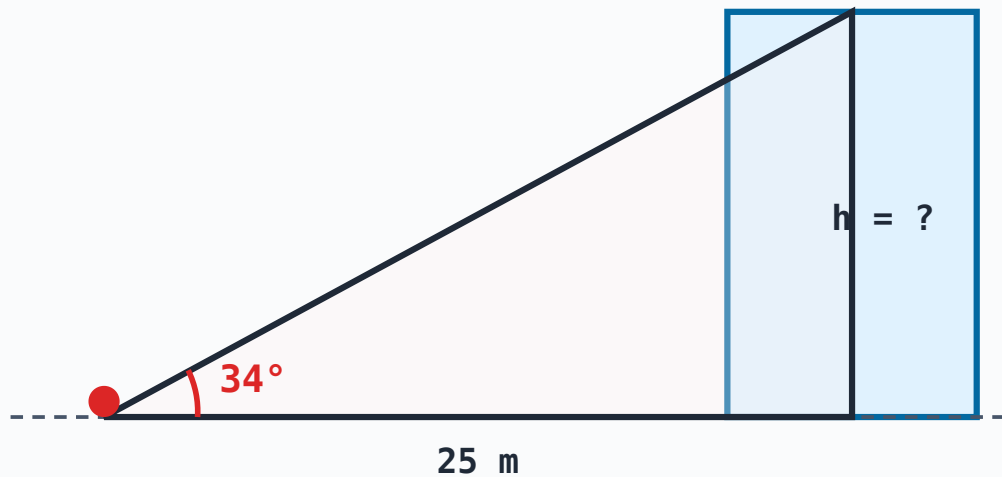
B $\sqrt{52}$ m

C $\sqrt{61}$ m

D 13 m

A surveyor stands 25 m from the base of a vertical building. The angle of elevation from her eye to the top of the building is 34° . (Assume she sights horizontally from ground level.)

ANGLE OF ELEVATION



What is the **height of the building**, correct to the nearest 0.1 m? (Use $\tan 34^\circ \approx 0.6745$)

A 14.0 m

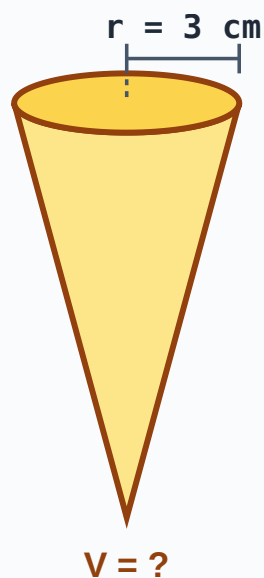
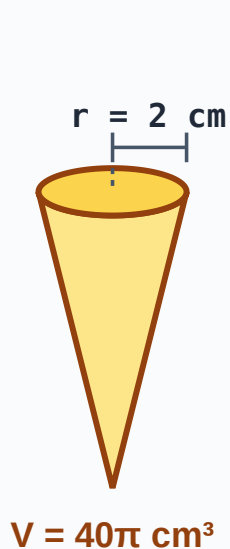
B 16.9 m

C 20.7 m

D 37.1 m

Two ice-cream cones are **similar in shape**. The smaller cone has a radius of **2 cm** and a volume of **$40\pi \text{ cm}^3$** . The larger cone has a radius of **3 cm**.

TWO SIMILAR CONES



What is the **volume of the larger cone**?

A $60\pi \text{ cm}^3$

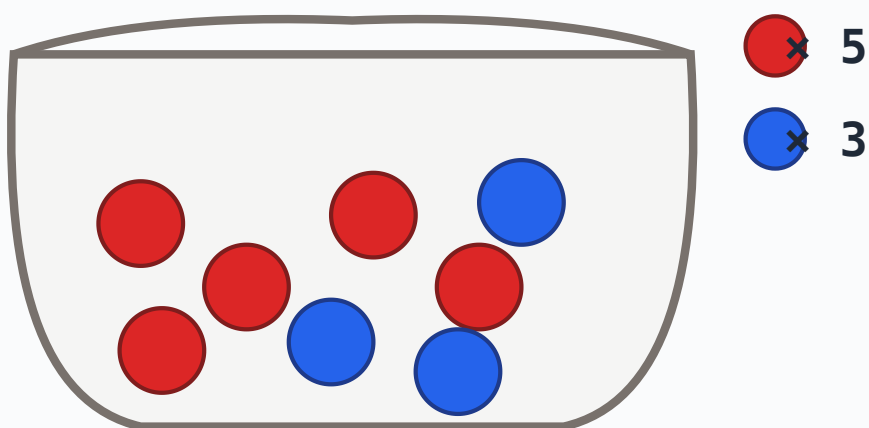
B $90\pi \text{ cm}^3$

C $135\pi \text{ cm}^3$

D $1080\pi \text{ cm}^3$

A bag contains **5 red marbles** and **3 blue marbles**, all identical apart from colour. Two marbles are drawn from the bag, one after the other, **without replacement**.

CONTENTS OF THE BAG



What is the probability that **both marbles drawn are the same colour**?

A $13/28$

B $17/32$

C $15/28$

D $1/2$

Answers & Explanations

WHY THE RIGHT ANSWER IS RIGHT, AND WHY EACH WRONG ANSWER IS WRONG

● English

Q1 **A**

The phrasing "a question we have stopped asking" folds the reader into the subject of the essay before the argument begins. The effect is intimate: by the end of the first sentence you are already included in the problem. It is an opening gambit, not a conclusion or a factual claim.

Why not B, C, D?

- **B: "Factual claim"**. Mistakes the *form* of the sentence (it sounds like a statement) for its function (it is a rhetorical opening). The student has not separated what the sentence says from what the sentence does.
- **C: "Uncertainty"**. Confuses a strategic opening move with genuine hesitation. The writer is in control; the tentative tone is deliberate craft.
- **D: "Summarises the conclusion"**. It does not. The essay's conclusion is that the hour saved is "an hour not spent"; the opening is a separate set-up.

Q2 **A**

The third paragraph explicitly attributes to "those who defend the compression" the argument that "the time saved is not, in fact, lost; it is available... for better uses." That is option A, almost verbatim.

Why not B, C, D?

- **B: "Cost close to zero"**. The writer's own analysis, not the opposing side's.
- **C: "Freedom to decide"**. This appears in the essay but as a position *the writer raises in order to qualify*, not as the main counter-argument attributed to defenders of compression.
- **D: "Return to slower practices would be impractical"**. This is the writer's position, not the defenders'.

Q3 **A**

The two examples (quick meal, freed ninety minutes) are the *opposition's* examples, laid out in their best form. Giving the other side its strongest case before answering it is a mark of persuasive writing at H-level. That is why the writer bothers with them.

Why not B, C, D?

- **B: "Writer uses time-saving technologies too".** The essay is not autobiographical at this point.
- **C: "Dismiss without discussion".** The opposite: the writer is careful to take the opposing view seriously.
- **D: "Prove most people use time well".** The essay argues the exact opposite.

Q4 **B**

"Aggregate" means taken together, combined, added up as a total. The writer is talking about the *combined* effect of many small time-savings.

Why not A, C, D?

- **A: "Immediate".** Confuses "aggregate" with "urgent" or "present".
- **C: "Disputed".** Wrong word sense entirely.
- **D: "Uncertain".** Unrelated meaning.

Q5 **B**

The widened road carries the same traffic at higher volume; the household finds itself eating and shopping for longer. Both examples show that when something becomes cheaper (in time or effort), the quantity demanded expands. That is exactly option B.

Why not A, C, D?

- **A: "Technology solves most problems".** The reverse of the writer's argument.
- **C: "Individuals responsible".** The writer mentions this view only to reject it.
- **D: "Meal prep and commuting wasteful".** Misses the structural point; the examples illustrate a principle, not a specific complaint.

Q6

C

The decisive insight is in paragraph three: Mr Harcourt's attention has "a particular artistry... which might have been indistinguishable from real interest were it not for the fact that real interest had no such precision." Evelyn discovers not that he is genuine and not that he is fake, but that his attention has a crafted, trained quality that mimics real interest closely.

Why not A, B, D?

- **A: "Genuinely interested"**. The passage explicitly rejects this: "This was not quite the same as listening to her."
- **B: "Less clever"**. The opposite; she finds him harder to dislike than expected.
- **D: "Shy"**. Nothing in the passage supports this reading.

Q7

B

"Artistry" here means a crafted, skilful quality in the performance: attention delivered with the precision of a practised technique. The word carries the sense of mastery, not of painting or music.

Why not A, C, D?

- **A: "Creativity or originality"**. Artistry is closer to polished execution than to originality.
- **C: "Visual arts"**. Reading the word too literally.
- **D: "Natural, untrained"**. The exact opposite; artistry implies trained, deliberate craft.

Q8

B

The instrument metaphor captures the central paradox: Mr Harcourt's skilful attention has elicited from Evelyn a performance better than she could produce on her own. The unsettling implication, which the essay develops in the next paragraph, is that such eliciting may not itself be sincere.

Why not A, C, D?

- **A: "Musician"**. Reads the metaphor as literal.
- **C: "Evelyn wants to be more interesting"**. Not what the passage says about her.
- **D: "Attention is entirely sincere"**. Directly contradicted by paragraph five.

Q9

C

The reflection is about a *kind* of charm that is harder to detect than ordinary lying: one that does not lie to you, but arranges for you to be more truthful than you would otherwise be. The insight is that being flattered into one's best self is not proof that the flatterer is trustworthy.

Why not A, B, D?

- **A: "Most people untruthful"**. Generalises beyond the passage.
- **B: "Specific lie"**. No specific lie has been told in the passage.
- **D: "Can't trust her judgment"**. She continues to trust her judgment; that is why she is unsettled.

Q10

B

The closing scene, in which Mr Harcourt adopts the same posture with another woman whose "faint flush" suggests she too is being drawn out, provides the confirming evidence that this is not a one-off exchange but a repeated technique. That is what unsettles Evelyn further.

Why not A, C, D?

- **A: "Disagreed about library"**. No disagreement is recorded.
- **C: "Number of people warning"**. Mentioned but not the moment of unsettling.
- **D: "Longer than expected"**. Not in the passage.

Q11

C

The passage deliberately refuses to settle the question. The final sentence ("a kindness delivered with exceptional skill, or a cruelty so refined it had learned to pass... for the opposite") preserves the ambiguity as the point of the passage, not a failure to resolve it.

Why not A, B, D?

- **A: "Straightforwardly cruel"**. Too simple; the passage rejects this reading.
- **B: "Genuinely kind"**. Also too simple; Evelyn's apprehension is not dismissed.
- **D: "Clumsy and easily read"**. The passage stresses his unusual skill.

Q12

C

The review describes the film as "a work of unusual conviction partially undone by a writer's unwillingness to trust any voice but one." That is precisely option C: a film of real conviction whose imbalance between the two leads is the central weakness, with the script identified as the cause.

Why not A, B, D?

- **A: "Great, marred by small technical weaknesses".** Understates the problem; the reviewer calls it "the real weakness".
- **B: "Nothing to recommend".** The opposite: the reviewer praises cinematography, score, and lead performance.
- **D: "Conventional drama".** The reviewer calls it "defiantly held" and unusually patient.

Q13

A

The very short second paragraph creates a clean pivot without softening what came before. The reviewer remains critical but now begins the defence; the short paragraph dramatises the shift in tone without argumentative retreat.

Why not B, C, D?

- **B: "Lost the thread".** The opposite; it is a controlled structural choice.
- **C: "No particular function".** Wrong; short paragraphs at the pivot of a review are a deliberate craft move.
- **D: "Dislikes but polite".** The review's position is more nuanced; it is ambivalent, not merely polite.

Q14

C

The review's structural imbalance, with its long discussion of Lindqvist and short discussion of Sjöberg, *mirrors* the structural imbalance in the film, which is the reviewer's central complaint. Form matches argument. That mirroring is an H-level craft observation.

Why not A, B, D?

- **A: "Dislikes women actors".** An uncharitable reading with no support in the text.
- **B: "Nothing to say".** The reviewer explicitly says she was "sometimes more than competent"; there is something to say.
- **D: "Ran out of space".** Reviewers of this calibre do not run out of space; they plan.

Q15

B

The opening rhetorical question names the central problem of the review, namely how to judge a film that seems too slow, in one sharp sentence. It earns the reader's attention and announces the question the whole review will try to answer.

Why not A, C, D?

- **A: "Genuine uncertainty about qualification".** A reviewer's opening is rarely a confession.
- **C: "Humorous approach".** The review is serious, not humorous.
- **D: "Expects written answer".** Rhetorical questions are not literal.

Q16

A

The camera is unforgiving of visible exertion; understatement registers as truthful. This is a recognisable principle of screen acting and the reviewer states it plainly. Option A captures the implication exactly.

Why not B, C, D?

- **B: "Equipment too sensitive".** Misreads "rewards" as "penalises"; the remark is aesthetic, not technical.
- **C: "Audiences prefer lazy".** Confuses stillness with laziness.
- **D: "Lindqvist didn't work hard".** The opposite; restraint at this level requires great discipline.

Q17

B

The article sets out a pattern in four stages: low confidence and low ability at the very start; confidence overshooting ability after a little practice; confidence falling below ability in the middle; the two lines eventually converging in genuine expertise. That is option B.

Why not A, C, D?

- **A: "Rise together, confidence lagging".** Common sense but not the article's finding.
- **C: "Unrelated".** They are related; the article argues for a specific shape.
- **D: "Both peak at start".** Neither peaks at the start in the article.

Q18

A

Graph A shows the characteristic shape: starts low, rises sharply to an early peak (novice overconfidence), falls to a trough in the middle (the humbled intermediate), then rises and plateaus as genuine expertise accumulates.

Why not B, C, D?

- **B: "Steady rise"**. Ignores the middle trough and the early overshoot.
- **C: "Early peak, steady decline"**. Has the early peak but misses the recovery at expert level.
- **D: "Monotonic fall"**. Contradicts the pattern entirely.

Q19

B

"Novel" has two meanings in English: (i) new, unexpected; (ii) a long piece of prose fiction. The writer is using it in both senses at once as a pun: the finding is new *and* it has the shape of a narrative with a beginning, middle, and end.

Why not A, C, D?

- **A: "Book-length story" and "fiction"**. Only one sense, the fiction sense, doubled.
- **C: "Well known" and "unfamiliar"**. Neither of these is a sense of "novel".
- **D: "Surprising" and "unprecedented"**. Two versions of the same sense.

Q20

C

The writer does use A (experimental reference), B (inclusive "we"), and D (analogies). There is no extended direct quotation of any researcher in the article. C is the one tactic *not* used.

Why not A, B, D?

- All three are present in the text. A appears in paragraph two ("experiments first reported..."); B in the opening paragraph ("When we first learn..."); D in the chess and cyclist examples.

Q21 **A**

The final sentence turns the article's own finding back on its popular use: the research warns us about confidence in what we do not fully understand, and the writer suggests, with a light touch of irony, that popular applications of the research may themselves be a case in point.

Why not B, C, D?

- **B: "Straightforward condemnation"**. The tone is ironic, not condemnatory.
- **C: "Stop writing in comment sections"**. Over-literal reading.
- **D: "Writer hasn't understood the research"**. Misreads the self-aware close as a confession.

Q22 **A**

The first paragraph gives a precise, visual description of the embroidered panel. The rest of the essay depends on the reader being able to see that panel clearly: its detail, its incompleteness, the single threaded needle. This is scene-setting as a load-bearing craft choice.

Why not B, C, D?

- **B: "How to embroider"**. No technique is taught.
- **C: "Not skilled"**. The opposite; "painstaking detail" signals skill.
- **D: "Childhood home"**. Too general; the paragraph is specifically about the panel.

Q23 **B**

"Painstaking" means done with extreme care and attention to detail. "Meticulous" is the nearest synonym from the options.

Why not A, C, D?

- **A: "Sorrowful"**. Confuses "pain" in "painstaking" with emotional pain.
- **C: "Hurried"**. The opposite meaning.
- **D: "Medical"**. Word-sound misreading of "pain".

Q24

D

The question asks which is **LEAST** likely. A, B, and C are all plausible craft reasons. D treats the short paragraph as an accident of emotion rather than a deliberate structural choice, an interpretation the essay's careful control makes implausible.

Why A, B, C are likely reasons:

- **A** refusing to dwell on the death matches the essay's restraint throughout.
- **B** the short paragraph clearly marks a pivot in time.
- **C** a short paragraph creates a deliberate pause for the reader.

Q25

B

The title operates on three levels at once: the panel itself, the other unfinished works the writer goes on to discuss, and the writer's own explicit admission that her understanding of the idea is still forming. That layered reading is what a one-word title at this level rewards.

Why not A, C, D?

- **A: "Only the panel".** Too narrow.
- **C: "Grandmother's life".** Present but not the only referent.
- **D: "Sewing technique".** A misreading of the title's purpose.

Q26

B

"Tender and quietly reflective" captures both the affection for the grandmother and the restrained, thinking-aloud quality of the prose. Both words in the pair must fit.

Why not A, C, D?

- **A: "Mournful and resigned".** Partly right (there is grief), but "resigned" understates the essay's final gratitude.
- **C: "Scholarly and detached".** "Detached" is the wrong word for so personal a piece.
- **D: "Ironic and dismissive".** Neither word fits.

Q27

B

The sentence sets up a contrast: latitude can be found easily; longitude cannot. "By contrast" marks the contrast cleanly.

Why not A, C, D?

- **A: "Furthermore".** Signals addition, not contrast.
- **C: "For example".** Longitude is not an example of latitude.
- **D: "As a result".** Nothing causal here.

Q28

A

The clause expresses purpose: *in order to* know London time, the navigator needed an accurate clock. "In order to know" is the natural fit at the start of a sentence that describes what is required for a purpose.

Why not B, C, D?

- **B: "Knowing".** Creates a dangling participle unconnected to "the navigator needed".
- **C: "To have known".** Perfect infinitive; it implies the knowing is already completed, which breaks the logic.
- **D: "Known".** Past participle alone cannot open the clause.

Q29

C

The clause sets up a concession: most of the establishment preferred astronomy, but Harrison chose the mechanical route. "Although" signals the concession correctly.

Why not A, B, D?

- **A: "Because".** Wrong logic; Harrison did not work mechanically *because* others preferred astronomy.
- **B: "So that".** Signals purpose, which is not present.
- **D: "Whereas".** Close, but "whereas" introduces a parallel contrast between two subjects and reads less naturally here than "although".

Q30

B

The sentence is in simple past: "would produce... the fourth of which... *survived* the ocean crossing to Jamaica in 1761". A fixed past event calls for the simple past.

Why not A, C, D?

- **A: "Has survived"**. Present perfect; wrong for an event fixed in 1761.
- **C: "Is surviving"**. Present continuous; the crossing is not ongoing.
- **D: "Had survived"**. Past perfect; it would need an even earlier reference point.

● Writing · Rubric

Writing is marked on a common scale. The same three columns (Genre, Textual Grammar, and Syntax & Punctuation) apply to every piece. At Paper H, the same band wording applies as at earlier levels, but the **STRONG band** expects more: not just correct and clear, but considered; not just acknowledging the other side, but engaging its strongest form; not just showing feeling, but handling it obliquely.

PERSUASIVE TASK (THE COST OF SPEED): H-LEVEL DESCRIPTORS

GENRE

STRONG

Engages the opposing view in its *strongest* form. Position is unmistakable and sustained. Real concessions are granted and then answered; the rebuttal addresses the concession directly, not a weaker proxy.

SOUND

States the opposing view clearly and responds to it. Position is clear throughout; arguments connect.

EMERGING

Names the opposing view but responds to a weakened version. Position occasionally drifts.

BASIC

Asserts a position without engaging opposing views. Reasons are given as lists rather than arguments.

TEXTUAL GRAMMAR

STRONG

Paragraphs build the argument. Sentence length varies for rhythm and emphasis; short sentences land after longer ones. Transitions are precise.

SOUND

Paragraphs organise ideas logically. Some variation in sentence length. Clear transitions.

EMERGING

Paragraphs present, not always building. Sentences tend to one length.

BASIC

Little paragraphing; sentences uniform; transitions absent or repetitive.

SYNTAX & PUNCTUATION

STRONG

Confident use of colon, semicolon, and dash, each earning its place. Subordinate clauses manage complex ideas without losing the reader. Vocabulary reaches beyond the everyday.

SOUND

Full range of basic punctuation handled correctly. Some subordinate clauses. Vocabulary accurate.

EMERGING

Mostly accurate punctuation; occasional slips. Mostly simple and compound sentences.

BASIC

Frequent punctuation errors; simple sentences dominate; vocabulary restricted.

NARRATIVE TASK (THE MISTAKEN BELIEF): H-LEVEL DESCRIPTORS

GENRE

STRONG

Complication stage handled with oblique interiority. The belief and its overturning are never stated directly; the reader reconstructs both from what the character notices, remembers, and does. What is left unsaid carries weight.

SOUND

Clear complication stage. Some indirect characterisation, with occasional telling where showing would suffice.

EMERGING

Complication present but belief stated too directly. Interiority told more than shown.

BASIC

Structure unclear; belief stated outright; feelings named directly.

TEXTUAL GRAMMAR

STRONG

Pace is controlled, quickening and slowing deliberately. Tense and viewpoint shifts are purposeful and audible. Paragraph breaks create narrative beats.

SOUND

Pace generally well-managed. Tense consistent. Paragraphs organise the narrative.

EMERGING

Some pacing control; occasional tense slips.

BASIC

Little pace variation; tense unstable.

SYNTAX & PUNCTUATION

STRONG

Dialogue punctuation correct. Fragments used deliberately for effect. Vocabulary specific and precise (objects, gestures, weather) rather than abstract adjectives of feeling.

SOUND

Full range of basic punctuation. Vocabulary accurate and varied.

EMERGING

Most punctuation correct; vocabulary adequate but general.

BASIC

Frequent punctuation errors; vocabulary restricted; abstract feeling-words dominate.

● Science

Q1 **B**

Beta has the same apparent magnitude as Alpha (both mag 3) but is **10 times farther away** (500 ly vs 50 ly). For Beta to appear just as bright from Earth as Alpha despite being 10× farther, it must produce far more light. A star whose light travels 10× farther but reaches us at the same apparent brightness is, by the inverse-square rule, about 100 times more luminous than the closer star. Beta is therefore intrinsically the most luminous of the four.

Why not A, C, D?

- **A: Alpha.** Same apparent magnitude as Beta but 10× closer; it does not need to be as luminous to appear as bright.
- **C: Gamma.** Appears dimmer than Alpha (mag 5 vs mag 3) at the same distance, so gives off less light than Alpha, let alone Beta.
- **D: Delta.** *Appears* brightest (mag 1) but is extremely close (25 ly). Its apparent brightness is "cheap" because it is close. Intrinsic luminosity is far lower than Beta's. Picking Delta is the classic trap: confusing apparent brightness with intrinsic luminosity.

Q2 **D**

Jupiter has all three requirements at maximum strength: an extremely powerful magnetic field (about 14× Earth's), a thick atmosphere with many molecules for charged particles to collide with, and exposure to the solar wind. Jupiter's auroras are, in fact, the brightest and most regular in the solar system after Earth's.

Why not A, B, C?

- **A: the Moon.** No magnetic field and almost no atmosphere. The student who picks this has not checked the requirements against the table.
- **B: Mars.** Very weak magnetic field (only local patches of crustal magnetism) and a very thin atmosphere. Auroras do occur but are faint and patchy.
- **C: Venus.** Has a thick atmosphere but no intrinsic magnetic field. Without a magnetic field to steer charged particles, only weak, transient auroras are possible.

Q3 **A**

Because pH is logarithmic, W at pH 3 contains $10^6 = \text{one million times}$ as many acidic particles as Y at pH 9 has basic particles. (W has 10^{-3} mol/L of H^+ ; Y has only 10^{-5} mol/L of OH^- .) The tiny amount of base in Y cancels only a tiny fraction of the acid in W. Even after mixing and dilution, the excess acid dominates and the pH of the mixture stays close to 3.

Why not B, C, D?

- **B: 6.** Taking the arithmetic average of 3 and 9. This is the single most common error; it ignores that pH is logarithmic.
- **C: 7.** Assumes any mix of acid and base gives a neutral result. Would only be true if the numbers of acidic and basic particles were equal; here the acid is a million times stronger.
- **D: 9.** Assumes the basic solution dominates, which is the opposite of what the numbers show.

Q4 **B**

The catalysed curve (red dashed) reaches a lower peak than the uncatalysed curve (green) but *returns to the same product energy level*. Lower peak = lower activation energy. Same start and end points = same energy change overall. This is exactly what a catalyst does: provides an alternative pathway with a smaller barrier, without altering the overall energy change of the reaction.

Why not A, C, D?

- **A: "Reduces energy change".** The end points (reactants at E_1 , products at E_2) are the same on both curves. The energy change is unchanged.
- **C: "Makes reaction endothermic".** Both curves end with products below reactants, so the reaction is exothermic on both pathways.
- **D: "Catalyst converted into products".** A catalyst is not consumed in the reaction it speeds up; it is recovered unchanged at the end.

Q5 **A**

The mass numbers must balance: $238 = 234 + (\text{mass of X})$, so X has mass number **4**. The atomic numbers must balance: $92 = 90 + (\text{charge of X})$, so X has atomic number **2**. A particle with mass 4 and charge 2 is a helium-4 nucleus, an alpha particle, written ${}^4_2\text{He}$.

Why not B, C, D?

- **B: ${}^1_0\text{n}$ (a neutron).** Mass 1 and charge 0; neither balances the equation. The mass drops by 4, not 1.
- **C: ${}^0_{-1}\text{e}$ (a beta particle).** Mass 0; this does not account for the 4-unit mass drop.
- **D: ${}^4_1\text{H}$ (hydrogen-4).** Right mass but wrong atomic number, which should be 2, not 1. This is the classic trap: remembering "mass of 4" but forgetting to balance the charge.

Q6 **B**

Count the atoms in the diagram: 4 C, 6 H, 2 Cl, 2 F. Molecular formula = $C_4H_6Cl_2F_2$. The greatest common factor of 4, 6, 2, 2 is **2**. Divide each subscript by 2: C_2H_3ClF . That is the empirical formula.

Why not A, C, D?

- **A: $C_4H_6Cl_2F_2$.** The molecular formula, not simplified. A student who forgot what "empirical" means.
- **C: $CHClF$.** Over-simplified. The GCF of 4, 6, 2, 2 is 2, not 6; you cannot divide 6 by 6 and 4 by 4 using different divisors.
- **D: $C_2H_3Cl_2F_2$.** Divided carbons and hydrogens by 2 but forgot to divide chlorines and fluorines. Half-done simplification.

Q7 **A**

For the same amount of alcohol consumed, a *lighter* person reaches a *higher* blood alcohol concentration. Student P is the lightest (55 kg) and will therefore have the highest BAC one hour later. The graph shows that higher BAC → slower reaction time. So P has the slowest reaction time.

Why not B, C, D?

- **B: Student Q.** At 75 kg, Q would have a moderate BAC, not the highest.
- **C: Student R.** Middle mass, middle BAC, middle reaction time.
- **D: Student S.** The heaviest student, at 95 kg, would have the lowest BAC and the *fastest* reaction time, the opposite of the answer. Students who pick S have inverted the body-mass relationship.

Q8 **A**

This is a two-variable optimisation. Rohan needs *two* things at once: (1) an enzyme that works in acidic solution, and (2) a temperature near 37 °C. Enzyme A peaks at low pH (around pH 2–3), so it handles the acidic requirement. The temperature curve peaks at about 40 °C, which is close to 37 °C, a temperature near the optimum. Both requirements are satisfied only by **Enzyme A at 40 °C**.

Why not B, C, D?

- **B: Enzyme A at 10 °C.** Right enzyme (acidic), wrong temperature; activity at 10 °C is far below the peak.
- **C: Enzyme B at 40 °C.** Right temperature, wrong enzyme; B peaks at neutral pH, not in acid.
- **D: Enzyme C at 10 °C.** Wrong on both counts; C peaks at high pH, and 10 °C is below the optimum.

Q9

C

Apply Ohm's law with wet-skin resistance: $I = V / R = 24 / 1000 = \mathbf{0.024\ A = 24\ mA}$. From the table, 24 mA falls squarely within the 10–30 mA band, so painful muscle contraction is the expected effect, and the person may be unable to release the source. Not yet at fibrillation levels (50–100 mA), but well beyond tingling.

Why not A, B, D?

- **A: "No sensation"**. Only for currents below 1 mA. 24 mA is far above this.
- **B: "Tingling only"**. Forgets that skin is wet. With dry skin ($100\ 000\ \Omega$) the current would be 0.24 mA, the tingling threshold, but wet skin gives 100× more current.
- **D: "Ventricular fibrillation"**. Overstates the effect. 24 mA is below the 50–100 mA fibrillation range.

Q10

C

At terminal velocity the ball is not accelerating, so the net force must be zero. Three forces act: weight (down), buoyancy (up, equal to the weight of the water displaced), and drag (up, since the ball moves *down* and drag opposes motion). For equilibrium: $\mathbf{W = B + D}$. Diagram C is the only diagram showing all three forces with weight downwards balanced by buoyancy and drag together upwards.

Why not A, B, D?

- **A: W down, D up (no B)**. Missing buoyancy. Buoyancy acts on any object in a fluid, whether it floats or sinks.
- **B: W down, B up (no D)**. Missing drag. For a dense steel ball in water, buoyancy alone cannot balance weight, so the ball would accelerate. Drag provides the rest.
- **D: W down, B up, D also down**. Drag always opposes *motion*. The ball is moving down, so drag must point up.

● Mathematics

Q1 **A**

Total iron = (mass per litre) $\times$ (litres) = $(4.8 \times 10^{-3}) \times (2.5 \times 10^4)$. Multiply the coefficients: $4.8 \times 2.5 = 12$. Add the exponents: $-3 + 4 = +1$. So the product is $12 \times 10^1 = \mathbf{1.2 \times 10^2}$ g. Remember to shift one place to keep the coefficient between 1 and 10.

Why not B, C, D?

- **B: 1.2×10^{-2}** . Subtracted exponents ($-3 - 4 = -7$) and then shifted incorrectly. Multiplying adds exponents; does not subtract them.
- **C: 12×10^1** . Numerically correct but *not in standard scientific notation*; the coefficient must lie between 1 and 10.
- **D: 1.2×10^7** . Multiplied the exponents ($-3 \times 4 = -12$, then sign-flipped). Exponents are added when multiplying, not multiplied.

Q2 **C**

Stage 1: Use $I = PRT$ to find the original principal. $1200 = P \times 0.06 \times 5$, so $P = 1200 / 0.30 = \$4000$. Total after 5 years = $4000 + 1200 = \mathbf{\$5200}$.

Stage 2: The *whole* \$5200 is re-invested. Interest earned over 3 years at 4% = $5200 \times 0.04 \times 3 = \$624$. Final amount = $5200 + 624 = \mathbf{\$5824}$.

Why not A, B, D?

- **A: \$4480**. Re-invested only the original \$4000 principal at 4% for 3 years ($\$4000 + \$4000 \times 0.04 \times 3 = \$4480$), forgetting to roll the \$1200 of interest from stage 1 into the new investment.
- **B: \$5200**. Stopped at the end of stage 1 and forgot about stage 2 entirely.
- **D: \$6136**. Used 6% (the first-stage rate) instead of 4% in the second stage: $\$5200 + \$5200 \times 0.06 \times 3 = \$6136$. Read the question more carefully.

Q3 **A**

Factor each surd to pull out perfect squares:

$$\sqrt{75} = \sqrt{(25 \times 3)} = 5\sqrt{3}$$

$$\sqrt{48} = \sqrt{(16 \times 3)} = 4\sqrt{3}$$

$$\sqrt{12} = \sqrt{(4 \times 3)} = 2\sqrt{3}$$

$$\text{So } 5\sqrt{3} + 4\sqrt{3} - 2\sqrt{3} = \mathbf{7\sqrt{3}}.$$

Why not B, C, D?

- **B: $11\sqrt{3}$.** Added all three ($5 + 4 + 2 = 11$). Forgot the minus sign on $\sqrt{12}$.
- **C: $\sqrt{111}$.** Added the numbers under the root ($75 + 48 - 12 = 111$). You cannot combine surds by adding the radicands.
- **D: $3\sqrt{7}$.** Mis-factorised. There is no common surd $\sqrt{7}$ here; all three simplify to multiples of $\sqrt{3}$.

Q4 **A**

Expand each piece separately:

$$(2x - 3)(x + 4) = 2x^2 + 8x - 3x - 12 = 2x^2 + 5x - 12$$

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

$$\text{Subtract: } (2x^2 + 5x - 12) - (x^2 - 2x + 1) = 2x^2 - x^2 + 5x + 2x - 12 - 1 = \mathbf{x^2 + 7x - 13}.$$

Key move: remember the minus sign distributes *over all three* terms of $(x - 1)^2$.

Why not B, C, D?

- **B: $3x^2 + 3x - 11$.** Added $(x - 1)^2$ instead of subtracting it. Ignored the minus sign.
- **C: $x^2 + 3x - 11$.** Sign error on the $-2x$ term: subtracting $-2x$ gives $+2x$, so the middle term is $5x + 2x = 7x$, not $3x$.
- **D: $x^2 + 7x - 11$.** Almost correct, but subtracted $+1$ incorrectly: $-12 - 1 = -13$, not -11 . Arithmetic slip.

Q5 **B**

Let width = w metres. Length = $w + 3$. Area = $w(w + 3) = 40$, so $w^2 + 3w - 40 = 0$. Factorise: $(w + 8)(w - 5) = 0$, giving $w = -8$ or $w = 5$. A width cannot be negative, so reject -8 . Width = **5 m**. (Length = 8 m, area = $5 \times 8 = 40 \text{ m}^2$ ✓.)

Why not A, C, D?

- **A: 4 m.** Guessed from $w(w + 3) = 40 \rightarrow 4 \times 7 = 28$, which is not 40. Did not actually solve the quadratic.
- **C: 8 m.** Gave the *length* rather than the width.
- **D: -8 m.** Picked the negative root. Widths cannot be negative; this root must be rejected.

Q6

A

Step 1, Midpoint. $M = ((1 + 7)/2, (2 + 10)/2) = (4, 6)$.

Step 2, Gradient of AB. $m_{AB} = (10 - 2) / (7 - 1) = 8/6 = 4/3$.

Step 3, Perpendicular gradient. Flip and negate: $m = -3/4$.

Step 4, Equation through M(4, 6) with gradient $-3/4$.

$$y - 6 = -\frac{3}{4}(x - 4) \rightarrow y - 6 = -\frac{3}{4}x + 3 \rightarrow y = -\frac{3}{4}x + 9.$$

Why not B, C, D?

- **B: $y = (4/3)x + 6$.** Used the gradient of AB itself instead of the perpendicular gradient. Forgot to flip-and-negate.
- **C: $y = -(4/3)x + 6$.** Negated without flipping. Perpendicular = negative reciprocal, not just negative.
- **D: $y = \frac{3}{4}x + 3$.** Flipped the gradient but failed to negate it.

Q7

C

Cylinder: $V = \pi r^2 h = \pi \times 3^2 \times 10 = 90\pi \text{ m}^3$.

Cone: $V = \frac{1}{3}\pi r^2 h = \frac{1}{3} \times \pi \times 3^2 \times 4 = (36/3)\pi = 12\pi \text{ m}^3$.

Total: $90\pi + 12\pi = 102\pi \text{ m}^3$.

Why not A, B, D?

- **A: $90\pi \text{ m}^3$.** Counted only the cylinder; forgot the cone on top.
- **B: $96\pi \text{ m}^3$.** Forgot the $\frac{1}{3}$ in the cone formula? That gives $90\pi + 36\pi = 126\pi$. Wrong but in the other direction. 96π corresponds to yet another small slip.
- **D: $126\pi \text{ m}^3$.** Used $V = \pi r^2 h$ for the cone (forgot the $\frac{1}{3}$). Got $90\pi + 36\pi = 126\pi$. The single most common error in this type of question.

Q8

B

Diameter = 2.4 m, so radius $r = 1.2$ m. Surface area of a sphere = $4\pi r^2 = 4\pi \times (1.2)^2 = 4\pi \times 1.44 = 5.76\pi \text{ m}^2$.

Why not A, C, D?

- **A: $2.88\pi \text{ m}^2$.** Used $2\pi r^2$ (half the sphere surface). The formula for a full sphere is $4\pi r^2$.
- **C: $9.6\pi \text{ m}^2$.** Used $4\pi r$ with diameter ($4\pi \times 2.4$), skipping the square.
- **D: $23.04\pi \text{ m}^2$.** Used the diameter (2.4) as the radius by mistake: $4\pi \times 2.4^2 = 4\pi \times 5.76 = 23.04\pi$. Classic slip; always check whether the number given is diameter or radius.

Q9

C

The space diagonal of a rectangular prism satisfies:

$$d^2 = l^2 + w^2 + h^2 = 6^2 + 4^2 + 3^2 = 36 + 16 + 9 = 61$$

So $d = \sqrt{61} \text{ m}$ (approximately 7.8 m).

No need to compute a face diagonal first; the 3-D Pythagoras rule handles all three dimensions in one step.

Why not A, B, D?

- **A: $\sqrt{25} \text{ m}$.** Used only two of the three dimensions ($4^2 + 3^2 = 25$).
- **B: $\sqrt{52} \text{ m}$.** Used the other two dimensions ($6^2 + 4^2 = 52$); this is the face diagonal of the base, not the space diagonal.
- **D: 13 m.** Simply added the three side lengths ($6 + 4 + 3$). Pythagoras does not work by addition of sides.

Q10

B

The opposite side is the unknown height (h); the adjacent side is 25 m; the angle is 34° . Use **TOA**: $\tan \theta = \text{opposite} / \text{adjacent}$.

$$\tan 34^\circ = h / 25$$

$$h = 25 \times \tan 34^\circ = 25 \times 0.6745 = 16.86 \text{ m} \approx \mathbf{16.9 \text{ m}}.$$

Why not A, C, D?

- **A: 14.0 m.** Used $\sin 34^\circ$ instead of $\tan$. $25 \times \sin 34^\circ \approx 14.0$. Picked the wrong trig function; check what the 25 m side *is* before choosing.
- **C: 20.7 m.** Used $\cos 34^\circ$ instead of $\tan$. $25 \times \cos 34^\circ \approx 20.7$. Same mistake in the other direction.
- **D: 37.1 m.** Divided 25 by $\tan 34^\circ$ instead of multiplying. Happens when students set up the ratio upside down.

Q11

C

The cones are similar with linear scale factor $k = 3/2$ (from radius 2 to radius 3). For **volumes** of similar solids, the scale factor is **cubed**: $V_{\text{large}} / V_{\text{small}} = (3/2)^3 = 27/8$. So $V_{\text{large}} = 40\pi \times 27/8 = (40/8) \times 27\pi = 5 \times 27\pi = \mathbf{135\pi \text{ cm}^3}$.

Why not A, B, D?

- **A: $60\pi \text{ cm}^3$.** Used the linear ratio $3/2$ directly on volume ($40\pi \times 3/2$). Forgot to cube.
- **B: $90\pi \text{ cm}^3$.** Used the squared ratio ($9/4$) on volume. This would be correct for surface area, not volume.
- **D: $1080\pi \text{ cm}^3$.** Multiplied 40π by 27 without dividing by 8. Forgot that the ratio is $(3/2)^3$, not 3^3 .

Q12

A

$P(\text{both same colour}) = P(RR) + P(BB)$.

$P(RR) = (5/8) \times (4/7) = 20/56$. *Second fraction has 4/7 because one red is already drawn, leaving only 4 reds out of 7 remaining marbles.*

$P(BB) = (3/8) \times (2/7) = 6/56$. *Same logic.*

Total = $20/56 + 6/56 = 26/56 = \mathbf{13/28}$.

Why not B, C, D?

- **B: 17/32.** Computed as though marbles were replaced: $(5/8)^2 + (3/8)^2 = 25/64 + 9/64 = 34/64 = 17/32$. Forgot "without replacement"; the classic Paper H trap.
- **C: 15/28.** Wrong combination of fractions during addition.
- **D: 1/2.** Guess from intuition ("about half").

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