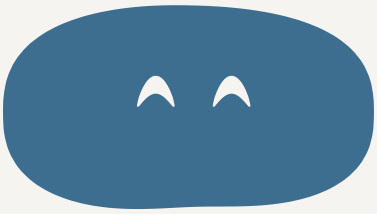
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Reason it through / the steps that make the answer work

Avoid the trap / why the alternatives fail

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Try. Explain. Repair.

Start with the paper or the signed-in simulator. Commit to an answer and a reason before opening the explanation. Then use this book to fix the step that went wrong.

01 / FIRST ATTEMPT

The simulator gives you 100 minutes for 60 questions. Both question order and option order change for each new attempt. Reloading resumes the saved order.

02 / REVIEW THE REASON

Each entry below refers to the original paper number, not the shuffled simulator position. The published key selects A for all questions. Printing issues are discussed in the relevant entries. In the simulator, follow the answer text instead of memorising a letter.

03 / RETURN TO THE IDEA

Read the explanation, name the trap, then cover the solution and explain the method aloud. A repeated score on a familiar paper is practice, not an independent prediction of your exam result.

Find your section

Reading Q1-4: pp. 3-4 · Logic Q5-9: pp. 5-7
Biology Q10-32: pp. 7-18 · Chemistry Q33-47: pp. 19-26
Maths Q48-54: pp. 26-29 · Physics Q55-60: pp. 30-32

Source: MUR, IMAT 2025, academic year 2025/2026. Original question paper: accessoprogrammato.mur.gov.it/compiti/CompitoInglese2025.pdf. File checked 4 October 2026. Independent explanations by Mito; not an official solution publication.

Q01 / READING

A possibility, not a certainty

Published answer A: Using this medication could lead to serious kidney problems.

The excerpt says serious kidney inflammation can occur and may progress to kidney failure. The supported interpretation is that the medication could lead to serious kidney problems.

Avoid the trap. "Could" does not mean "always". The passage neither mentions pancreatic problems nor presents the medicine as a treatment for kidney failure.



Mito says
For this reading task, track the words expressing possibility; do not turn the excerpt into medical advice.

Q02 / READING

Digital processes, not a new sector

Published answer A: the pandemic ensured the growth of the Apulian digital sector because companies in the sector transformed into digital companies.

The text describes an already-digital sector recovering after a decline. Companies improved processes through digitalisation; it does not say they became digital-sector companies for the first time or that growth was guaranteed.

Avoid the trap. The option claiming the pandemic "ensured" growth overstates the passage and changes its explanation.



Mito says
When asked which statement is not correct, test both its causal claim and its strength.

Q03 / READING

Crocodile tears

Published answer A: Crocodile

The image of an animal weeping while harming its victim evokes "crocodile tears", an expression for insincere sorrow. Leonardo uses it as a comparison for hypocrisy.

Avoid the trap. The tiger describes the hypocrite's cruel heart; it is not the animal identified by the tears.

Mito says
Separate the main subject of a metaphor from the comparison inside it.

Q04 / READING

Read what the excerpt supports

Published answer A: Kuru, Creutzfeldt-Jakob Disease and Alzheimer’s are diseases whose diagnoses can be confused with each other

The passage compares kuru with Creutzfeldt-Jakob disease and says the latter can be confused with diseases such as Alzheimer's. The published answer captures this diagnostic resemblance rather than asserting a shared cause.

Avoid the trap. A prion is an infectious protein, not a bacterium. The excerpt reports a discovery about causation, not a cure or Alzheimer's as a later stage of another disease.

Mito says
Answer this as passage interpretation. Similar symptoms do not establish identical causes.

Q05 / LOGIC

One example proves existence

Published answer A: At least one prime number exists.

If two is prime, then at least one prime exists. This is existential generalisation: a known example is enough to establish that the category is nonempty.

Avoid the trap. The premise alone neither makes every number prime nor establishes that a non-prime exists, even if outside knowledge tells you one does.



Mito says
Use only the stated premise in a deduction question.

Q06 / LOGIC

Modus tollens

Published answer A: Today is not Saturday.

Saturday → philosopher. The speaker is not a philosopher, so the antecedent cannot hold: today is not Saturday.

Avoid the trap. The conclusion rules out one day; it does not identify Friday or any other specific day.



Mito says
If P implies Q and Q is false, P must be false.

Q07 / LOGIC

Seat everyone before deciding

Published answer A: Daniela is seated to the right of Carlo.

Use the usual assumption that everyone faces the table's centre. Put Beatrice at the top and Alberto to her left, on the diagram's right. Carlo cannot sit at the bottom, because Alberto would then be on his right. Carlo goes left and Daniela at the bottom, to Carlo's right.

Avoid the trap. Left and right belong to each seated person's perspective, not to the reader's view of the page.

Mito says
Rotate the person's viewpoint, not the meaning of left and right.

Q08 / LOGIC

Eliminate boxes systematically

Published answer A: The green pill is in the blue box, the red pill is in the green box, the blue pill is in the red box.

The blue pill cannot be in the blue box or the green box, so it must be in the red box. The green pill then cannot be in green or occupied red, so it goes in blue. The red pill goes in green.

Avoid the trap. Each box holds exactly one pill. An option placing two pills in one box violates the setup.

Mito says
Resolve the item with only one possible location first.

Q09 / LOGIC

A rotation is an hour

Published answer A: 4:45 PM

The minute hand completes one rotation in 60 minutes. 1.75 rotations take 105 minutes, or 1 hour 45 minutes. From 3:00 PM, that reaches 4:45 PM.

Avoid the trap. The decimal 0.75 is three quarters of an hour, not 75 minutes.



Mito says
Convert rotations to minutes before adding clock times.

Q10 / BIOLOGY

Fermentation regenerates NAD+

Published answer A: reduced

During lactic fermentation, pyruvate accepts electrons from NADH and is reduced to lactate. NADH is oxidised to NAD+, allowing glycolysis to continue.

Avoid the trap. Reduction of pyruvate does not require removal of CO_2; that belongs to other pathways.



Mito says
Name both partners: pyruvate gains electrons, NADH loses them.

Q11 / BIOLOGY

Glycolysis and electron carriers

Published answer A: When a molecule of glucose is converted to pyruvate in glycolysis, 2 NAD+ are reduced.

Each glucose produces two three-carbon intermediates, each of which reduces one NAD+ during oxidation. Thus two NAD+ become two NADH per glucose.

Avoid the trap. Glycolysis releases no CO2. Triose phosphate isomerase interconverts DHAP and glyceraldehyde-3-phosphate; it does not make 1,3-bisphosphoglycerate.



Mito says
Count the two parallel three-carbon pathways after glucose splits.

Q12 / BIOLOGY

One turn of the Krebs cycle

Published answer A: 3 NADH, 1 FADH2, 1 GTP and 2 molecules of CO2

Per acetyl-CoA, one cycle turn produces 3 NADH, 1 FADH2, 1 GTP (or its ATP equivalent) and 2 CO2. These reduced carriers later feed the respiratory chain.

Avoid the trap. Per glucose, two acetyl-CoA enter, so those totals double. Do not include pyruvate oxidation in a per-acetyl-CoA count.



Mito says
Always label the accounting unit: per glucose, pyruvate or acetyl-CoA.

Q13 / BIOLOGY

Couple electron transfer to ATP

Published answer A: through which the energy stored in reduced coenzymes is used for the synthesis of ATP

Oxidative phosphorylation uses energy from electrons carried by NADH and FADH2 to establish a proton gradient. ATP synthase uses that gradient to make ATP.

Avoid the trap. Fatty-acid breakdown is beta oxidation, while disposal of amino nitrogen involves different pathways.



Mito says
Follow the chain: electrons → proton gradient → ATP.

Q14 / BIOLOGY

Cytochromes transfer electrons

Published answer A: present in the respiratory chain

Cytochromes are haem-containing proteins involved in electron transfer, including within the respiratory chain. Their iron cycles between oxidation states.

Avoid the trap. They do not synthesise ATP and are not best described as carrying whole hydrogen atoms.



Mito says
Think of the haem iron as an electron-transfer station.

Q15 / BIOLOGY

Collagen outside the cell

Published answer A: extracellular

Collagen is a major structural protein of the extracellular matrix. Cells make and secrete it to support tissues such as skin, tendon and bone.

Avoid the trap. The thick filament of muscle is mainly myosin. "Extracellular" describes collagen's main working location, not where it is initially synthesised.



Mito says
Separate where a protein is made from where it performs its function.

Q16 / BIOLOGY

Calcium exposes actin's binding sites

Published answer A: troponin

In skeletal muscle, calcium binds troponin. This moves the troponin-tropomyosin system so that myosin-binding sites on actin become accessible.

Avoid the trap. Calcium does not trigger this step by binding directly to myosin or tropomyosin.



Mito says
Calcium → troponin → tropomyosin moves → actin sites exposed.

Q17 / BIOLOGY

ATP releases the cross-bridge

Published answer A: The binding of ATP to the actin-myosin complex promotes the dissociation of the complex.

Binding of ATP to myosin reduces its affinity for actin, allowing the actin-myosin cross-bridge to detach. ATP hydrolysis then helps prime the myosin head for another cycle.

Avoid the trap. ATP binding and ATP hydrolysis are distinct steps. Binding does not lock the head onto actin.



Mito says
Remember the order: ATP binds, myosin detaches, then the head resets.

Q18 / BIOLOGY

Working tissues unload oxygen

Published answer A: a decrease in oxygenated haemoglobin molecules

In metabolically active tissues, increased CO_2 and H^+ reduce haemoglobin's affinity for oxygen. Oxygen is released more readily, decreasing the fraction of oxygenated haemoglobin.

Avoid the trap. This is a reversible affinity change, not haemoglobin denaturation or a rapid rise in red-cell number.



Mito says
Lower pH helps deliver oxygen where metabolism needs it.

Q19 / BIOLOGY

A catalyst is regenerated

Published answer A: Catalyst

A catalyst speeds a reaction by providing a pathway with a lower activation barrier and is regenerated overall. It does not change the equilibrium position.

Avoid the trap. A catalyst can take part in intermediate steps even though it is not consumed in the overall reaction.

Mito says
Faster approach to equilibrium does not mean a different equilibrium.

Q20 / BIOLOGY

Competition for the active site

Published answer A: the inhibitor and the substrate compete for the active site of the enzyme

A competitive inhibitor and the substrate compete for the enzyme's active site. In the simple reversible model, raising substrate concentration can reduce the inhibitor's effect.

Avoid the trap. Binding to a separate allosteric site is not the defining mechanism of competitive inhibition.

Mito says
Picture two molecules trying to use the same seat.

Q21 / BIOLOGY

Digesting peptide bonds

Published answer A: Peptidase

Peptidases hydrolyse peptide bonds, breaking proteins and peptides into smaller peptides or amino acids. Proteases are part of this enzyme group.

Avoid the trap. Amylases act on carbohydrates; lipases act on lipids. Transaminases transfer amino groups rather than digesting protein chains.



Mito says
Match the bond or substrate to the enzyme's name.

Q22 / BIOLOGY

Fixed complexes and mobile carriers

Published answer A: both membrane proteins and mobile molecules

Oxidative phosphorylation includes inner-membrane protein complexes and mobile electron carriers such as coenzyme Q and cytochrome c. ATP synthase also works in the membrane.

Avoid the trap. The process is not confined to soluble matrix proteins or to one class of integral membrane protein.



Mito says
Distinguish the fixed stations from the carriers moving between them.

Q23 / BIOLOGY

Reoxidising reduced coenzymes

Published answer A: Through the respiratory chain

NADH and FADH2 donate electrons to the respiratory chain and become oxidised. Electrons pass through carriers before ultimately reducing oxygen.

Avoid the trap. ATP synthase uses proton flow; electrons do not pass through it as the route for coenzyme oxidation.



Mito says
Trace electrons through the chain and protons through ATP synthase.

Q24 / BIOLOGY

A rapid phosphate reserve

Published answer A: Creatine phosphate

Creatine phosphate can transfer a phosphate group to ADP via creatine kinase, rapidly replenishing ATP during muscle activity.

Avoid the trap. Creatinine is a breakdown product, while phosphofructokinase is an enzyme. Similar names do not imply the same role.



Mito says
Creatine phosphate buffers ATP demand over short bursts.

Q25 / BIOLOGY

Detoxifying nitrogen in the liver

Published answer A: Urea cycle

The urea cycle operates mainly in the liver, converting nitrogen from amino-acid breakdown into urea for excretion. Its reactions span mitochondria and cytosol.

Avoid the trap. Glycolysis and the Krebs cycle are used widely in tissues; they are not principally liver-specific processes.



Mito says
Connect liver, nitrogen handling and urea.

Q26 / BIOLOGY

Energy-dense, relatively dry storage

Published answer A: more calories and less water

Triglycerides contain highly reduced carbon and yield more energy per gram than protein. They are also stored with little associated water, making fat an efficient energy reserve.

Avoid the trap. Water adds mass without supplying metabolic energy. Muscle proteins also perform essential structural and functional roles.



Mito says
Compare both chemical energy per gram and the water carried with storage.

Q27 / BIOLOGY

Lysosomes and the Golgi pathway

Published answer A: that form by budding from the Golgi apparatus

Lysosomal enzymes are processed and sorted through the Golgi. The published answer describes Golgi-derived vesicles contributing to lysosome formation; actual biogenesis also involves endosomes and maturation.

Avoid the trap. Lysosomal hydrolases work best in an acidic interior, not above pH 7. Lysosomal defects can cause disease.



Mito says
Learn the route: ER synthesis → Golgi sorting → endosomal/lysosomal delivery.

Q28 / BIOLOGY

DNA is not only nuclear

Published answer A: The nucleus, mitochondria and chloroplasts all contain DNA.

In eukaryotic cells, the nucleus contains chromosomes; mitochondria and chloroplasts also carry their own DNA. Not every cell contains all three structures, but each named structure can contain DNA.

Avoid the trap. The ER and Golgi have no separate genome. Prokaryotes have DNA without a membrane-bound nucleus.



Mito says
Recall the organelles with their own genomes and their endosymbiotic origins.

Q29 / BIOLOGY

A selective boundary

Published answer A: Regulating exchanges between the inside and outside of the cell

The plasma membrane regulates exchange between the cell and its surroundings through its lipid bilayer, channels, carriers and other proteins.

Avoid the trap. Protein synthesis occurs on ribosomes; most cellular energy conversion is not the plasma membrane's universal main function.



Mito says
Boundary plus selective transport is the central idea.

Q30 / BIOLOGY

Exergonic means negative free-energy change

Published answer A: Reactions that release energy and occur spontaneously

An exergonic reaction has a negative Gibbs free-energy change under the stated conditions and is thermodynamically favourable. It can provide free energy for coupled processes.

Avoid the trap. Spontaneous does not mean fast. A favourable reaction may still face a substantial activation barrier.



Mito says
Separate thermodynamics (favourability) from kinetics (speed).

Q31 / BIOLOGY

Osteoblasts build bone

Published answer A: Producing collagen and minerals for the bone matrix

Osteoblasts secrete osteoid, including collagen, and promote mineralisation of the bone matrix. They are bone-forming cells.

Avoid the trap. Osteoclasts resorb bone. The similar names refer to opposing roles in remodelling.



Mito says
Blasts build; clasts break down.

Q32 / BIOLOGY

Insulin promotes glucose uptake

Published answer A: stimulates glucose uptake in muscle

Insulin stimulates glucose uptake in skeletal muscle, notably by promoting GLUT4 transporter movement to the membrane. It also favours nutrient storage.

Avoid the trap. Insulin is a peptide hormone from pancreatic beta cells, not a steroid from the adrenal gland. It generally promotes glycogen and fat synthesis.



Mito says
After a meal, insulin helps move glucose into storage and use.

Q33 / CHEMISTRY

The ideal gas equation

Published answer A: PV = nRT

The ideal gas law relates pressure, volume, amount and absolute temperature: PV = nRT. R is the gas constant in units compatible with the other quantities.

Avoid the trap. Algebraic rearrangements must preserve both units and the placement of n. Temperature must be in kelvin.

Mito says
Check dimensions if the formula's arrangement looks unfamiliar.

Q34 / CHEMISTRY

Solve the oxidation-number sum

Published answer A: HClO2

In neutral HClO2, hydrogen contributes +1 and two oxygens contribute -4. Chlorine must therefore be +3 to make the total zero.

Avoid the trap. Elemental Cl2 has oxidation number zero. HCl, HClO and HClO3 give different balances.

Mito says
Write a short charge-balance equation instead of memorising every oxyacid.

Q35 / CHEMISTRY

Fractional does not mean irrational

Published answer A: an irrational number

Oxidation numbers arise from formal electron accounting. Values assigned to individual atoms are usually integers; an average over equivalent elements in a formula can be fractional, hence rational. An irrational value is not obtained by this accounting.

Avoid the trap. A decimal can represent a rational fraction. For example, an average oxidation state need not be a whole number.



Mito says
Distinguish an atom's formal assignment from an average over several atoms.

Q36 / CHEMISTRY

An ionic lattice

Published answer A: Ionic

Solid sodium chloride is an extended lattice of Na+ and Cl- ions held by electrostatic attraction. It is therefore an ionic solid.

Avoid the trap. It is not made of isolated NaCl molecules in the solid, nor of a metallic electron sea or a covalent network.



Mito says
Identify the particles occupying the lattice.

Q37 / CHEMISTRY

Two atomic-radius trends

Published answer A: from right to left and from top to bottom

Across a period, increasing effective nuclear attraction generally pulls electrons inward, so radii grow toward the left. Down a group, additional shells generally increase radius.

Avoid the trap. These are broad main-group trends, not a claim that every measured radius changes perfectly monotonically.

Mito says
Across: stronger pull. Down: more shells.

Q38 / CHEMISTRY

Equal electronegativity, equal sharing

Published answer A: two atoms of the same element

A pure nonpolar covalent bond is formed by identical atoms with equal electronegativity, so neither pulls the shared electrons more strongly.

Avoid the trap. Different atoms with similar electronegativities may be approximately nonpolar, but "pure" points to equal sharing between identical atoms.

Mito says
Use identical atoms as the clean reference case for no bond polarity.

Q39 / CHEMISTRY

A weak-acid estimate

Published answer A: 4

For HA, [H+] is approximately √(Ka × C) = √(10^-5 × 10^-3) = 10^-4 M, giving pH ≈ 4. Solving the quadratic gives about 4.02, still matching the listed answer.

Avoid the trap. Only about a tenth dissociates; treating this as a fully dissociated 0.001 M acid would give pH 3.

Mito says
Use the approximation, then check whether its accuracy fits the answer choices.

Q40 / CHEMISTRY

A neutral salt in the usual model

Published answer A: 7

KBr comes from strong base KOH and strong acid HBr. Neither K+ nor Br- appreciably hydrolyses water, so the standard dilute-solution model at 25 °C gives pH approximately 7.

Avoid the trap. A salt's concentration alone is not its hydrogen-ion concentration. Neutral pH also depends on temperature.

Mito says
Identify the parent acid and base before calculating anything.

Q41 / CHEMISTRY

Push back with a gaseous product

Published answer A: to shift the equilibrium to the left, it is necessary to increase the concentration of Cl2.

Adding Cl2 increases the activity of a gaseous product, shifting equilibrium to the left. Pure solids have effectively constant activity while present, so simply adding more solid does not have the same effect.

Avoid the trap. Heat is on the reactant side: cooling favours the reverse direction, not the forward endothermic reaction.

Mito says
Distinguish gases and solutes from pure solids in an equilibrium expression.

Q42 / CHEMISTRY

The barrier, not the net change

Published answer A: the energy barrier that the reactants must overcome to transform into products

Activation energy is the energy barrier between reactants and the transition-state region along a reaction pathway. It controls how readily reaction events occur.

Avoid the trap. The difference between reactant and product energies is the reaction's overall energy change, not its activation energy.

Mito says
Draw a hill: barrier height and start-to-finish difference are different quantities.

Q43 / CHEMISTRY

Benzene's planar carbon framework

Published answer A: all the carbon atoms are sp² hybridized and the molecule has a planar structure

Each benzene carbon is sp² hybridised with approximately trigonal-planar geometry. Remaining p orbitals overlap to form the delocalised π system of the planar ring.

Avoid the trap. Chair and boat conformations belong to saturated rings such as cyclohexane, not benzene.



Mito says
Three sigma directions plus one p orbital suggests sp².

Q44 / CHEMISTRY

One kind of building block

Published answer A: is a homopolysaccharide

Glycogen is a branched polymer of glucose, so it is a homopolysaccharide. It uses alpha-1,4 links in chains and alpha-1,6 links at branch points.

Avoid the trap. Two linkage types do not make it a heteropolysaccharide: the monomer is still glucose. Plants chiefly use starch for comparable storage.



Mito says
Classify by the monomers, not by the number of linkage patterns.

Q45 / CHEMISTRY

Name the iron's charge

Published answer A: ferrous carbonate

Carbonate is CO_3^{2-}. Neutral $FeCO_3$ therefore contains Fe^{2+}, giving iron(II) carbonate, traditionally called ferrous carbonate.

Avoid the trap. Ferric means iron(III), not iron(II). Carbonate is different from carbonyl ligands in metal carbonyl compounds.



Mito says
Balance the anion charge before choosing the metal's oxidation state.

Q46 / CHEMISTRY

Two electrons, opposite spins

Published answer A: Two with antiparallel spins

One orbital can hold at most two electrons, and their spins must be opposite. This follows the Pauli exclusion principle: no two electrons in an atom share all four quantum numbers.

Avoid the trap. Hund's rule concerns filling different orbitals of equal energy; it does not permit parallel spins within the same orbital.



Mito says
One box, at most two arrows, pointing opposite ways.

Q47 / CHEMISTRY

Amino and carboxyl groups

Published answer A: They contain an amine group and a carboxyl group

Amino acids contain an amino group and a carboxyl group. Protein amino acids typically have these attached to the alpha carbon and can act as acids or bases.

Avoid the trap. They are protein building blocks, not the main monomers of carbohydrates. Many exist as zwitterions in water.



Mito says
Connect the name to both functional groups: amino plus acid.

Q48 / MATHS

Keep the square-root domain

Published answer A: Every $x \geq 0$

The printed inequality is $\sqrt{(2x)} < 1 + x$. Its real domain is $x \geq 0$, making the right side positive. Squaring gives $2x < 1 + 2x + x^2$, or $0 < 1 + x^2$, which always holds. The solution is every $x \geq 0$.

Avoid the trap. Dropping the square-root sign produces a different inequality. Excluding $x = 0$ would also lose a valid solution.



Mito says
Check the domain and signs before squaring an inequality.

Q49 / MATHS

Use sine's allowed range

Published answer A: $\sin^2 x + \sin x - 2 \leq 0$

Put $s = \sin x$, so $-1 \leq s \leq 1$. Then $s^2 + s - 2 = (s + 2)(s - 1)$. The first factor is positive and the second nonpositive throughout that interval, so the product is always ≤ 0.

Avoid the trap. Do not treat sin x as an unrestricted real number. Tangent is also undefined at some real x, so it cannot automatically support an every-real-x claim.



Mito says
Turn the trigonometric expression into an algebra problem on a bounded interval.

Q50 / MATHS

Ordered pairs, not multiplication

Published answer A: The set of all possible ordered pairs having as the first component an element of A and as the second component an element of B

$A \times B$ contains all ordered pairs (a,b) with a from A and b from B. For finite sets its size is the product of their sizes.

Avoid the trap. The Cartesian product is neither intersection nor union; its elements are pairs rather than the original individual elements.



Mito says
Try A = {1,2} and B = {red}: list the two pairs.

Q51 / MATHS

A perfect-square trinomial

Published answer A: $(a - 2b)^2$

Expand $(a - 2b)^2$: $a^2 - 2(a)(2b) + (2b)^2 = a^2 - 4ab + 4b^2$. This matches the given trinomial.

Avoid the trap. The middle term is essential. The printed paper repeats the same incorrect expression in two options; neither becomes correct because it appears twice.

Mito says
Check first square, twice the product, then last square.

Q52 / MATHS

A ratio plus a perimeter

Published answer A: AB = 20 m; BC = 16 m

Write BC = 4k and AB = 5k. The perimeter is 2(4k + 5k) = 18k = 72 cm, so k = 4 cm. The dimensions are 20 cm and 16 cm. The published key selects the matching numbers but prints metres in the options.

Avoid the trap. The source has inconsistent units: a 72 cm perimeter cannot yield sides of 20 m and 16 m.

Mito says
Keep the calculation's units even when a printed option contains a typo.

Q53 / MATHS

A coefficient that never vanishes

Published answer A: For any value of a

In 3x + a = 3, the coefficient of x is always 3, which is nonzero. Thus x = (3 - a)/3 gives a unique solution for every real a.

Avoid the trap. The parameter is in the constant term, not in the coefficient of x. Values a = 3 or -3 do not remove the solution.

Mito says
Identify which coefficient would have to be zero to change solvability.

Q54 / MATHS

When the coefficient is zero

Published answer A: a = −3

If a = -3, the equation (a + 3)x = 5 becomes 0x = 5, which has no solution. For all other a, x = 5/(a + 3).

Avoid the trap. Zero times x cannot equal five. Do not divide by a + 3 without first checking whether it vanishes.

Mito says
Check the forbidden denominator before writing the solution formula.

Q55 / PHYSICS

Close the gap with relative speed

Published answer A: A has overtaken B

A gains on B at 120 - 80 = 40 km/h, about 11.11 m/s. It closes 500 m in 45 seconds. After one minute it has already overtaken B.

Avoid the trap. Use the speed difference, not A's full speed, because B keeps moving too.



Mito says
Gap divided by relative speed gives catch-up time.

Q56 / PHYSICS

Series inside, parallel outside

Published answer A: R/10

Each branch contains ten series resistors, so its resistance is 10R. One hundred identical branches in parallel give (10R)/100 = R/10.

Avoid the trap. Do not combine all 1000 resistors as if they were in the same series chain.



Mito says
Simplify one branch first, then combine the branches.

Q57 / PHYSICS

Electron drift opposes conventional current

Published answer A: Only the electrons moving from right to left

In a metal, mobile electrons carry the current. Their net drift is opposite to conventional current, so a left-to-right current corresponds to right-to-left electron drift.

Avoid the trap. Positive ions remain in the lattice rather than flowing down the wire. Electrons also have random thermal motion; the direction here means net drift.



Mito says
Current direction is defined for positive charge, so electrons drift the other way.

Q58 / PHYSICS

Measure from Earth's centre

Published answer A: 1/16

The astronaut is 3R above the surface, so the distance from Earth's centre is 4R. Gravitational acceleration scales as $1/r^2$: $g' = g(R/4R)^2 = g/16$.

Avoid the trap. Using 3R as the centre-to-astronaut distance gives the incorrect 1/9.



Mito says
Add Earth's radius to the altitude before applying inverse-square scaling.

Q59 / PHYSICS

Engine force must also balance friction

Published answer A: F1 = 2000 N, F2 = 6000 N

At constant speed, net force is zero, so the engine supplies 2000 N to balance friction. During acceleration, net force must be ma = 2000 × 2 = 4000 N. The engine then supplies 4000 + 2000 = 6000 N.

Avoid the trap. ma is the net force, not automatically the engine force. Friction remains present in both phases.



Mito says
Draw the two opposing forces before applying Newton's second law.

Q60 / PHYSICS

Hydrostatic pressure acts normally

Published answer A: forces always perpendicular to the walls at every point

A stationary liquid cannot sustain a static shear stress. Its pressure therefore exerts a force perpendicular to each small area of the container wall.

Avoid the trap. Pressure is force per area; saying there is pressure but no force is not consistent. The local normal direction changes around a curved container.



Mito says
Normal means perpendicular to the local surface, not necessarily vertical.