

9702 Paper 3

Practical Prediction & Practice Guide

October / November 2026 | Updated with mark-scheme-backed evaluation + Prosperity Academy videos

IMPORTANT - prediction, not certainty. The apparatus strongly identifies the practical families and the skills students should revise, but it does not reveal the exact unreleased question or equation. Use this guide for targeted practice rather than memorising a guessed method.

Quick prediction

Question	Most likely theme	Confidence	Highest-priority preparation
Q1	Mechanics: moments / equilibrium of a loaded metre rule	Very high	Balance, moments, angle & distance readings, table, graph, gradient/intercept
Q2	Mechanics: suspended table-tennis ball; rebound / collision / oscillation / relationship test	High for theme; exact setup less certain	Two-value test, uncertainty, rebound/maximum position, release, angle/timing, limitations & improvements

If time is limited, prioritise the 5/5 papers and the highlighted Q2 evaluation section.

Question 1 - Loaded metre rule / moments & equilibrium

Strongest prediction

Q1 is very likely to be a mechanics investigation based on equilibrium of a loaded metre rule. The fixed 200 g end-load, triangular prism pivot and several known masses are classic moments apparatus. The protractor suggests that an angle may also be measured or used in the relationship.

Why the apparatus points here

Apparatus clue	What it suggests
Wooden metre rule + fixed 200 g load	A deliberately shifted centre of mass / known turning effect.
Triangular prism	Low-contact-area pivot for balancing.
4 x 100 g masses + 50 g hanger + 50 g mass	Several known loads or mass combinations can be varied.
Second metre rule	A position, separation, height or geometric quantity may need to be measured.
120 degree protractor	An angle is very likely to be measured at some stage.

Likely question structure

1. Initial measurement of a length / balance position, and possibly an angle.
2. Vary a known mass, mass position or geometry variable and restore a specified balance condition.
3. Collect about six sets of readings in a table, including any calculated column requested by the paper.
4. Plot a straight-line graph, draw a best-fit line, and determine gradient and y-intercept.
5. Use the gradient/intercept with the supplied relationship to determine an unknown quantity.

What students should revise for Q1

- Moments: clockwise moment = anticlockwise moment; moment = force x perpendicular distance.
- Weight: $W = mg$ and consistent conversion between g and kg when SI units are required.
- Centre of mass and balance conditions.
- Reading a metre rule at millimetre resolution and recording consistent decimal places.
- Angle measurement using a 1 degree protractor.
- Paper 3 table construction, graph scales, small plotted crosses, best-fit line, large gradient triangle and y-intercept.
- Matching a supplied equation to $y = mx + c$ and identifying the physical meaning / units of the gradient and intercept.

Q1 correction. There is no standard limitations-and-improvements section in Question 1, so the previous Q1 errors/fixes table has been removed. Spend that revision time on measurement quality, tabulation, graphing and gradient/intercept work instead.

Prosperity Academy videos for Q1

Video	Why it helps	Link
Forces on a wooden beam + angle measurements	Strongest direct mechanics reference for the predicted Q1: forces on a beam, angle measurement and practical setup.	WATCH VIDEO
Oscillation timing + full Q1 technique	Excellent general Q1 skills practice: timing, table construction, graphing and the full Paper 3 Q1 workflow.	WATCH VIDEO

Best past papers for Question 1

Do these in roughly this order. The first three are the strongest matches for the present apparatus and Q1 skill pattern.

Priority	Paper	Why practise it	Question paper	Mark scheme
5/5	9702/35 O/N 2024 - Q1	Balancing a metre rule with a pivot and masses. Closest direct match to the core mechanics skill.	OPEN QP	OPEN MS
5/5	9702/33 M/J 2024 - Q1	Balanced metre rule; masses moved and balance point found repeatedly. Excellent graph practice.	OPEN QP	OPEN MS
4/5	9702/35 M/J 2018 - Q1	Equilibrium of a metre rule with masses and measured distances; six readings and a graph.	OPEN QP	OPEN MS
4/5	9702/31 M/J 2023 - Q1	Balanced metre-rule mechanics with repeated readings and graph analysis.	OPEN QP	OPEN MS
4/5	9702/35 O/N 2010 - Q2	Equilibrium of a wooden strip with known masses and a measured angle. Useful mechanics + protractor reference.	OPEN QP	OPEN MS

Q1 short route. 9702/35 O/N 2024 Q1 -> 9702/33 M/J 2024 Q1 -> 9702/35 M/J 2018 Q1. After each attempt, mark the table/graph/gradient carefully.

Question 2 - Suspended table-tennis ball / dynamic mechanics

Best-supported prediction

Q2 is very likely to be a mechanics relationship-test experiment involving a light table-tennis ball, string, an angle and a timed or maximum-position measurement. The closest past-paper families are suspended-ball rebound/collision experiments and pendulum-style timing/angle experiments. The exact equation cannot be recovered confidently from the apparatus list, so prepare the shared measurement and evaluation skills rather than one memorised method.

What each item suggests

Apparatus	Likely role
Stand + boss + clamp	Suspended/elevated arrangement and a fixed reference point.
String with two loops about 9 cm apart	Repeatable attachment/suspension geometry.
Table-tennis ball + about 0.15 g adhesive putty	Very light moving object; the putty may attach/mark the ball and its mass may matter.
10 g hanger + two 50 g masses	Two or more load/mass conditions can be compared.
180 degree protractor	Angle likely measured or set.
Stopwatch to 0.1 s	A period/time interval is likely to be measured somewhere.
Metre rule + 10 cm block	Length/displacement/height or a rebound/impact reference surface.

Most plausible practical families

- Suspended-ball rebound: release a ball and measure a rebound distance/height/angle against or near the block.
- Collision / recoil: a suspended ball is struck or released into another object; the resulting displacement/angle is measured.
- Pendulum / oscillation: measure a time/period and angle/length, then repeat for a changed mass or geometry.
- Two-value relationship test: calculate a constant twice, compare quantitatively, then discuss limitations and improvements.

Do not overfit the apparatus. The exact Q2 arrangement is less certain than Q1. The safest revision is rebound/maximum-position measurement + timing + angle measurement + two-value calculations + mark-scheme-quality evaluation.

Q2 measurement skills to drill

- If timing periodic motion, time several oscillations (not one), repeat and average.
- Release without an extra push. A hand release often creates a systematic problem in these experiments.
- For a maximum height/displacement, the object may only be at the maximum for a very short time; a video with a scale in view is a strong improvement.
- For angle measurements, do not try to hold the protractor and moving/string apparatus in one hand if a fixed mounting is possible.
- Percentage uncertainty = $(\text{absolute uncertainty} / \text{measured value}) \times 100\%$.
- For a relationship test, calculate the requested constant for both data sets and apply the criterion stated by the question / your percentage comparison.

Q2 - High-value limitations & improvements

WRITE THIS FIRST WHEN Q2 USES ONLY TWO DATA SETS. Two readings alone are not enough to establish a valid relationship. Improvement: take several values of the independent variable and plot a suitable graph, or calculate and compare more values of the constant. This pair appears across every one of the recommended Q2 mark schemes below and is typically worth one limitation mark + one improvement mark.

The table below has been rebuilt from the actual mark schemes of the recommended Q2 papers. The wording is intentionally specific: Cambridge does not reward vague statements such as "human error" or generic fixes that do not solve the stated problem.

Limitation	Mark-scheme-quality wording	Matched improvement	Seen in MS
Two data sets only	Two values are insufficient to draw a valid conclusion about the proposed relationship.	Take several values and plot the appropriate graph, or obtain more values of the constant and compare them.	W09/31, W09/32, W14/33, S07/32, W24/33
Maximum rebound/height is hard to judge	The ball is moving and remains at the maximum position only briefly, so the maximum height/displacement is difficult to judge.	Record video with a metre rule / scale in view and inspect frame-by-frame; a fixed grid or marker can also be used when appropriate.	W09/31, W09/32, W14/33, S07/32, W24/33
Release gives the ball an unwanted push	It is difficult to release the ball/object from rest without exerting an extra force; hand motion can change the result.	Use a mechanical release, clamp/card gate/stop mechanism, or another realistic no-push release method.	W09/31, W09/32, W14/33, S07/32
Collision / rebound alignment varies	A collision may not be head-on / objects may not meet at the same height / the ball may glance sideways, so results vary.	Fix the geometry: use separate clamps or guides so impact heights/paths are aligned; use a smooth/flat impact surface where relevant.	W24/33, W09/31, W09/32, W14/33
Ball centre / reference position is difficult to locate	When measuring a distance to a ball, the centre can be difficult to locate, especially while the ball is being held or moving.	Clamp the rule in a fixed position; measure to the top and bottom and infer the centre, or measure the diameter and correct the length.	W24/33, W09/31, W09/32
Angle measurement while holding the apparatus	The angle is difficult to measure because the protractor is hand-held / the hand or string moves / the string is thick / it is hard to hold the protractor steady.	Clamp or otherwise fix the protractor; alternatively photograph/video with the protractor in view, or determine the angle from measured lengths using trigonometry.	S18/33 (extra high-value analogue)
Parallax / position measurement	A rebound distance/height can suffer parallax or the ruler/reference may not be in the same plane as the motion.	Use a fixed grid/scale in the plane of motion, shadow projection, or another fixed reference method specified to the setup. Do not rely on "view at eye level" alone where the mark scheme rejects it.	W09/31, W09/32, S07/32, W14/33
Air currents disturb a very light ball	The table-tennis ball can swing around or have its motion altered by draughts.	Turn off fans / air conditioning and shield the apparatus from draughts.	W09/31, W09/32
Adhesive putty changes the effective mass	The added putty mass may not be accounted for or may be uneven / off-centre, changing the dynamics.	Measure the putty or total ball-plus-putty mass and include it; place it consistently/centrally if the setup requires this.	W24/33
Rule not vertical / no fixed reference	A height reading is unreliable if the rule is tilted or there is no clear horizontal/vertical reference.	Use a set square/plumb line/grid or clamp a rule/reference so its orientation is fixed.	S07/32, W14/33

Important wording correction. The earlier "measure to the edge of a large ball" wording has been replaced. The actual mark schemes instead describe difficulty locating the centre of the ball / holding the ball while measuring, with fixes such as a clamped rule and top-bottom/diameter measurements. Likewise, the angle issue is now phrased as difficulty holding the protractor steady while the hand/string moves, with the protractor clamped or otherwise fixed.

Best past papers for Question 2

DO NOT JUST SOLVE THESE PAPERS. After attempting each Q2, open its MARK SCHEME and study the limitations + improvements section. For this sitting, that evaluation section is one of the most valuable things you can revise. Pay attention to exactly what Cambridge credits and what it explicitly does not credit.

Priority	Paper	Why it is relevant	MS evaluation focus	QP	MS
5/5	9702/32 O/N 2009 - Q2	Suspended table-tennis ball beside a solid surface; rebound distance. Very close family.	Rebound point brief; no-push release; parallax; inconsistent bounce; air movement; centre of ball.	OPEN QP	OPEN MS
5/5	9702/33 O/N 2024 - Q2	Suspended table-tennis-ball collision with added mass. Excellent for ball motion and evaluation.	Only two values; locating ball centre; maximum height brief; collision alignment; putty mass.	OPEN QP	OPEN MS
4/5	9702/31 O/N 2009 - Q2	Suspended table-tennis ball struck by a moving marble; recoil distance vs thread length.	Fast-moving ball; release consistency; collision alignment/path; air currents; centre measurement.	OPEN QP	OPEN MS
4/5	9702/33 O/N 2014 - Q2	Table-tennis-ball rebound from an inclined board as angle changes.	Angle uncertainty; hand release; brief maximum height; parallax/reference; sideways rebound.	OPEN QP	OPEN MS
4/5	9702/32 M/J 2007 - Q2	Classic table-tennis-ball rebound-height experiment.	Two values; judging rebound height; parallax; release; vertical rule; inconsistent bounce.	OPEN QP	OPEN MS
4/5	9702/33 M/J 2018 - Q2	Extra analogue for string + angle + oscillation timing; particularly useful because the present apparatus includes a protractor and stopwatch.	Hard to hold protractor steady / string thick / hand moves; release; oscillation timing; two-value test.	OPEN QP	OPEN MS

Q2 short route. 9702/32 O/N 2009 Q2 -> 9702/33 O/N 2024 Q2 -> 9702/33 O/N 2014 Q2 -> 9702/32 M/J 2007 Q2. Then do 9702/33 M/J 2018 Q2 specifically for the protractor/string/oscillation evaluation language.

Prosperity Academy - Practical videos to watch

These are the exact videos supplied for this revision guide. The links below are clickable in the PDF.

#	Video	What it teaches	Best use	Link
1	Q1 oscillation timing + complete Q1 technique	Teaches how to time oscillations and goes through the full Q1 workflow: table construction, graphing and related details. Very useful general Paper 3 technique; also relevant if Q2 includes timing.	General Q1 skills / timing	WATCH
2	Q2 cone-drop timing practical	A more complicated Q2: drop a cone, measure the fall time, change cone diameter and repeat. Excellent for timing limitations/improvements and Q2 calculations.	Q2 timing + evaluation	WATCH
3	Q2 ping-pong rebound-height practical	Measures rebound height of a dropped ping-pong ball. This is the closest Prosperity Academy video to the predicted rebound/collision family and contains useful limitations, fixes and Q2 calculations.	MOST RELEVANT FOR Q2	WATCH
4	Q1 wooden beam - forces + angles	Different forces act on a wooden beam and angles are measured. Strong mechanics reference for the predicted loaded-rule / equilibrium Q1.	MOST RELEVANT FOR Q1	WATCH

If students can watch only two videos: Watch the wooden-beam forces/angles video for Q1 and the ping-pong rebound-height video for Q2. Add the oscillation-timing video if the Q2 setup turns out to use the stopwatch heavily.

Suggested combined practice sequence

1. Watch the wooden-beam mechanics video, then attempt 9702/35 O/N 2024 Q1.
2. Attempt 9702/33 M/J 2024 Q1 under timed conditions and mark the table/graph/gradient carefully.
3. Watch the ping-pong rebound Q2 video, then attempt 9702/32 O/N 2009 Q2.
4. Read the O/N 2009 MS limitations/improvements before attempting O/N 2024 Q2.
5. Watch the cone-drop Q2 video for timing/evaluation technique.
6. Finish with O/N 2014 Q2 and M/J 2018 Q2 to cover angle measurement, release and timing evaluation.

Paper 3 technique checklist for this sitting

Q1 - measurements, table & graph

- Units belong in table headings, not after every numerical entry.
- Use consistent decimal places for repeated raw readings made with the same instrument.
- Use sensible graph scales occupying at least half the available grid in both directions.
- Plot small crosses; draw one thin best-fit line rather than joining points dot-to-dot.
- Use a large gradient triangle and points on the best-fit line, not necessarily raw data points.
- Give gradient/intercept to sensible significant figures and include the correct derived units.

Q2 - calculations & evaluation

- Calculate both values of the requested constant carefully and compare them quantitatively.
- If the question gives a percentage criterion, calculate percentage difference and use that criterion explicitly in the conclusion.
- If repeated readings are taken, half the range may be used as an absolute uncertainty when appropriate and clearly shown.
- For limitations, state what is difficult AND why it affects the measurement. For the improvement, state exactly what apparatus/method fixes that problem.
- Never write only "human error", "reaction time" or "take repeats" unless the mark scheme for that exact issue supports the qualified version.

The Q2 mark-scheme habit to build. Always check the evaluation section after practising a Paper 3 Q2. Cambridge often lists both credited ideas and ideas that are specifically not credited. Learning that distinction is more useful than memorising a generic list of errors.

Mark schemes checked for the updated evaluation table

- 9702/32 O/N 2009 - [open mark scheme](#)
- 9702/31 O/N 2009 - [open mark scheme](#)
- 9702/33 O/N 2014 - [open mark scheme](#)
- 9702/32 M/J 2007 - [open mark scheme](#)
- 9702/33 O/N 2024 - [open mark scheme](#)
- 9702/33 M/J 2018 - [open mark scheme](#)

Prepared as a targeted revision aid from the supplied confidential apparatus instructions and published past-paper mark schemes. Not affiliated with Cambridge International Education.