

PRELIM REPAIR #01

G3 MATHEMATICS · INSPIRED BY NCHS 2026 P1

DID THE SAME MISTAKE HAPPEN AGAIN?

6 original Mentora questions
3 skills · 2 questions per skill

The Autopsy showed
where your working went wrong.

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and see if it happens again.

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Q1

Solve the inequality below and represent its solution on a number line.

$$\frac{x-2}{3} < \frac{5-2x}{4} \leq \frac{x+7}{2}$$

[4 marks]



WORKING SPACE

REPAIR A — COMPOUND INEQUALITIES

Q2

Solve the inequality below and represent its solution on a number line.

$$-1 \leq 3 - \frac{x-2}{2} < 4$$

[4 marks]



WORKING SPACE

REPAIR B — WITHOUT REPLACEMENT

Q3

A bag contains 7 red counters and n green counters. Two counters are drawn at random, one after the other without replacement. The probability that both counters are green is $\frac{5}{33}$. Find n .

[4 marks]

WORKING SPACE

REPAIR B — WITHOUT REPLACEMENT

Q4

A box contains 5 blue counters and 3 yellow counters. Two counters are selected at random without replacement. Find the probability that exactly ONE of the two counters is yellow.

[4 marks]

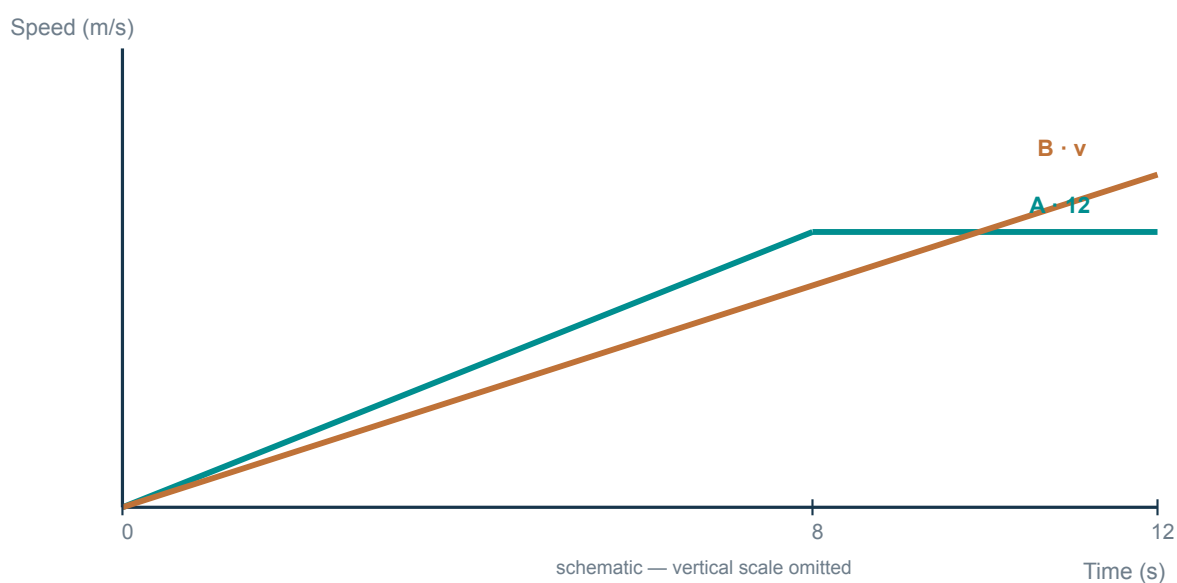
WORKING SPACE

REPAIR C — SPEED–TIME GRAPHS

Q5

Cyclist A starts from rest, accelerates uniformly to 12 m/s in 8 s, then continues at 12 m/s until $t = 12$ s. Cyclist B starts from the same point at the same time and accelerates uniformly from rest over 12 s. At $t = 12$ s, Cyclist B catches Cyclist A. Find v .

[3 marks]



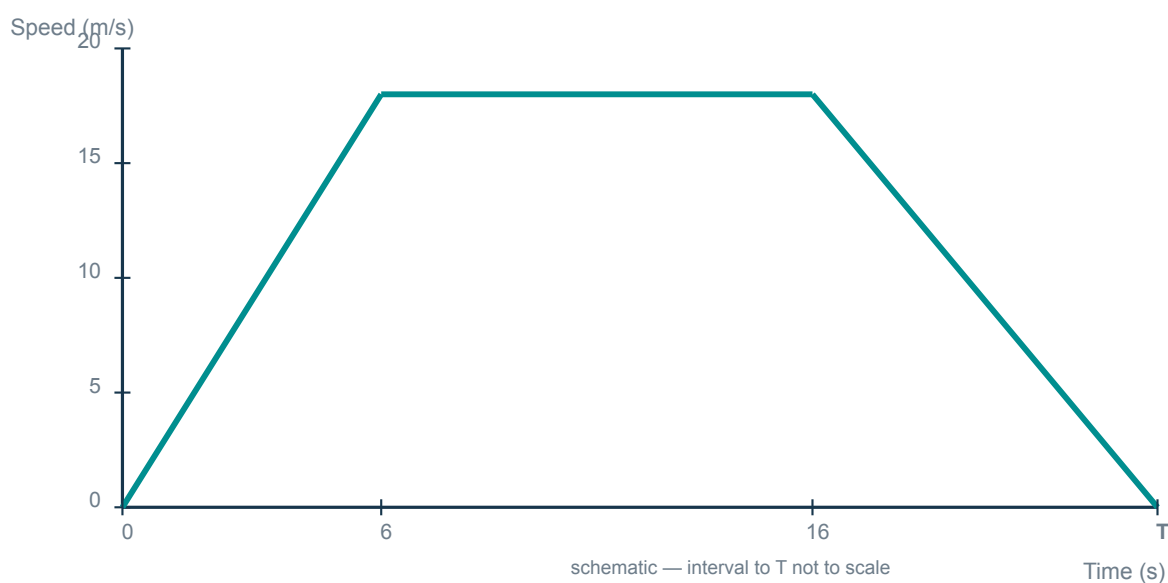
WORKING SPACE

REPAIR C — SPEED–TIME GRAPHS

Q6

A vehicle accelerates uniformly from rest to 18 m/s in 6 s, travels at 18 m/s for the next 10 s, then decelerates uniformly to rest. The total distance travelled is 270 m. Find (a) the time spent decelerating; (b) the total journey time.

[4 marks]



WORKING SPACE

ANSWERS + WORKED SOLUTIONS

Check where your working first differs from the steps below.

Try all six questions first. Then follow each solution in order and use the breakpoint note to identify the first step that diverged.

Q1–2 · COMPOUND INEQUALITIES

Q3–4 · WITHOUT REPLACEMENT

Q5–6 · SPEED–TIME GRAPHS

Q1

Check where your working first differs from the steps below.

STEP 1 — Split the compound inequality

$$\frac{x-2}{3} < \frac{5-2x}{4} \quad \text{and} \quad \frac{5-2x}{4} \leq \frac{x+7}{2}$$

STEP 2 — Multiply the first inequality by 12

$$4(x-2) < 3(5-2x)$$

STEP 3 — Expand

$$4x - 8 < 15 - 6x$$

STEP 4 — Collect x terms

$$10x < 23$$

STEP 5 — Upper bound

$$x < \frac{23}{10}$$

STEP 6 — Multiply the second inequality by 4

$$5 - 2x \leq 2x + 14$$

STEP 7 — Collect x terms

$$-9 \leq 4x$$

STEP 8 — Lower bound

$$-\frac{9}{4} \leq x$$

STEP 9 — Combine both conditions

$$-\frac{9}{4} \leq x < \frac{23}{10}$$

ANSWER → $-\frac{9}{4} \leq x < \frac{23}{10}$

IF THIS BROKE, LOOK HERE FIRST →

- First inequality differs before $x < 23/10$ → multiplying through by 12 or collecting x terms; 12 is positive, so the sign direction stays unchanged.
- Second inequality differs before $x \geq -9/4$ → expanding $5 - 2x \leq 2x + 14$ and dividing by +4; the endpoint is included.
- Both bounds correct but endpoint/number line differs → $-9/4$ is closed ($\leq$) and $23/10$ is open ($<$).

Q2

Check where your working first differs from the steps below.

STEP 1 — Split into two inequalities

$$-1 \leq 3 - \frac{x-2}{2} \quad \text{and} \quad 3 - \frac{x-2}{2} < 4$$

STEP 2 — Subtract 3

$$-4 \leq -\frac{x-2}{2}$$

STEP 3 — Multiply by -2 and reverse the sign

$$8 \geq x - 2$$

STEP 4 — Isolate x

$$x \leq 10$$

STEP 5 — Solve the upper condition separately

$$3 - \frac{x-2}{2} < 4$$

STEP 6 — Multiply by -2 and reverse the sign

$$x - 2 > -2$$

STEP 7 — Isolate x

$$x > 0$$

STEP 8 — Combine both conditions

$$0 < x \leq 10$$

ANSWER → $0 < x \leq 10$

IF THIS BROKE, LOOK HERE FIRST →

- Lower condition first diverges when multiplying by -2 → reverse $\leq$ to $\geq$; that gives $x \leq 10$.
- Upper condition first diverges when multiplying by -2 → reverse $<$ to $>$; that gives $x > 0$.
- One condition is absent or the interval is joined incorrectly → solve both parts and take their intersection.
- Endpoint at 0 or 10 differs → 0 is open, 10 is closed.

Q3

Check where your working first differs from the steps below.

STEP 1 — Probability first green

$$\frac{n}{n+7}$$

STEP 2 — Update counts after one green is drawn

$$\frac{n-1}{n+6}$$

STEP 3 — Set equal to the given probability

$$\frac{n}{n+7} \times \frac{n-1}{n+6} = \frac{5}{33}$$

STEP 4 — Cross-multiply

$$33n(n-1) = 5(n+7)(n+6)$$

STEP 5 — Expand both sides

$$33n^2 - 33n = 5n^2 + 65n + 210$$

STEP 6 — Collect terms

$$28n^2 - 98n - 210 = 0$$

STEP 7 — Simplify by 14

$$2n^2 - 7n - 15 = 0$$

STEP 8 — Factorise

$$(2n+3)(n-5) = 0$$

STEP 9 — Solve and check the context

$$n = -\frac{3}{2} \quad \text{or} \quad n = 5$$

ANSWER → $n = 5$

IF THIS BROKE, LOOK HERE FIRST →

- Second denominator is $n+7$ → after one green is removed, $n+6$ counters remain.
- Second numerator is n → after one green is removed, $n-1$ green counters remain.
- The negative root $n = -3/2$ is impossible for a counter count; keep $n = 5$.

Q4

Check where your working first differs from the steps below.

STEP 1 — Count Yellow then Blue

$$P(\text{Y then B}) = \frac{3}{8} \times \frac{5}{7} = \frac{15}{56}$$

STEP 2 — Count Blue then Yellow

$$P(\text{B then Y}) = \frac{5}{8} \times \frac{3}{7} = \frac{15}{56}$$

STEP 3 — Add the mutually exclusive orders

$$P(\text{exactly one yellow}) = \frac{15}{56} + \frac{15}{56} = \frac{15}{28}$$

ANSWER → $P(\text{exactly one yellow}) = \frac{15}{56} + \frac{15}{56} = \frac{15}{28}$

IF THIS BROKE, LOOK HERE FIRST →

- Only one order is present → exactly one yellow can occur as Y-B or B-Y.
- Second denominator is still 8 → after the first selection, 7 counters remain.
- Second numerator does not reflect the first selection → update the remaining colour counts.

Q5

Check where your working first differs from the steps below.

STEP 1 — Same start; at catch-up they are together, so distances are equal

$$s_A = s_B$$

STEP 2 — Find Cyclist A's distance: triangle plus rectangle

$$s_A = \frac{1}{2}(8)(12) + (12 - 8)(12) = 48 + 48 = 96 \text{ m}$$

STEP 3 — Find Cyclist B's distance: triangle

$$s_B = \frac{1}{2}(12)v = 6v$$

STEP 4 — Equate distances and solve

$$6v = 96 \implies v = 16 \text{ m/s}$$

ANSWER $\rightarrow 6v = 96 \implies v = 16 \text{ m/s}$

IF THIS BROKE, LOOK HERE FIRST $\rightarrow$

- Set $v = 12$ immediately $\rightarrow$ catch-up means equal distance at that instant, not equal speed; B's speed is v while A's is 12 m/s .
- Used graph height as distance $\rightarrow$ distance is area under each speed–time graph.
- A's area differs $\rightarrow$ split at 8 s into a triangle and a 4 s rectangle.

Q6

Check where your working first differs from the steps below.

STEP 1 — Acceleration triangle area

$$s_1 = \frac{1}{2}(6)(18) = 54 \text{ m}$$

STEP 2 — Constant-speed rectangle area

$$s_2 = (10)(18) = 180 \text{ m}$$

STEP 3 — Find the remaining distance

$$s_{\text{remaining}} = 270 - 54 - 180 = 36 \text{ m}$$

STEP 4 — Use the deceleration triangle

$$\frac{1}{2}(t)(18) = 36 \implies 9t = 36 \implies t = 4 \text{ s}$$

STEP 5 — Add the three time intervals

$$T = 6 + 10 + 4 = 20 \text{ s}$$

ANSWER → (a) 4 s (b) 20 s

IF THIS BROKE, LOOK HERE FIRST →

- Treated 18 m/s as a distance → use area under the graph.
- Rectangle width is 16 s → the constant-speed interval is the next 10 s; deceleration begins at $t = 16$ s.
- Did not subtract the first two areas from 270 m → 36 m remains for the deceleration triangle.
- Final time differs → add 6 s + 10 s + deceleration time.

DID IT BREAK AGAIN?

AUTOPSY Q12

↓ REPAIR · Q1 · Endpoint logic

Q2 · Negative sign reversal

AUTOPSY Q15

↓ REPAIR · Q3 · Update counts without replacement

Q4 · Include both colour orders

AUTOPSY Q22

↓ REPAIR · Q5 · Catch-up means equal distance

Q6 · Graph area + interval lengths

**If the mistake happened again,
you've found something worth revisiting.**

If it didn't, try the skill again later
in a mixed paper.

One correct retry doesn't prove
you've mastered the topic.

Original Mentora practice inspired by selected breakpoints from NCHS 2026 Prelim Paper 1 (Mathematics 4052). Mentora is not affiliated with NCHS.

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