

UPPER SEC G3 E-MATH

MIXED CHECK #01

25–30 minutes of mixed Upper Sec G3 E-Math.
Questions + worked answers included.

Suitable for	Sec 3–4
Time	~25–30 min
Questions	12
Format	Mixed
Answers	Included
Calculator	as needed

Mixed on purpose — the topic heading won't tell you which method to use.

BEFORE YOU START

Try every question before opening the solutions. Show your working, use a calculator as needed, and use degree mode for angles. Leave a question and return to it if you cannot start.

Give exact answers unless a question requests rounding. Keep full calculator values until the final step.

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This weekly mixed check is a free practice resource — not the personalised Mentora experience.

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QUESTIONS

Work through the questions in order. The solutions start on page 8.

01

3 marks

Simplify $3(4a + 6b) - 2(2a + 3b)$, then factorise your result fully.

02

3 marks

Triangle RST is right-angled at S. Angle R is 38° and $ST = 7$ cm. Find RT, correct to 3 significant figures.

03

2 marks

The marks of seven students are shown below. Find the mean mark, correct to 2 decimal places.

6	13	16	32	33	34	36
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QUESTIONS

Work through the questions in order. The solutions start on page 8.

04

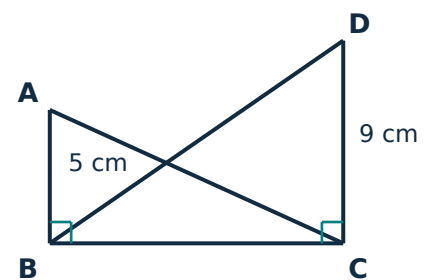
2 marks

Factorise $8mn - 12m$ fully.

05

4 marks

The diagram shows two right-angled triangles ABC and BCD in the same plane. The right angles are at B and C. $AC = 13$ cm, $AB = 5$ cm and $CD = 9$ cm. Find angle CBD, correct to 1 decimal place.



Not to scale

QUESTIONS

Work through the questions in order. The solutions start on page 8.

06

3 marks

Thirty identical tokens are numbered consecutively from 18 to 47. One token is chosen at random. Find the probability that its number is a multiple of 4. Give your answer in simplest form.

07

3 marks

Factorise $6p^2 - 24q^2$ fully.

QUESTIONS

Work through the questions in order. The solutions start on page 8.

08

3 marks

Factorise $3x^2 - 11x - 4$ fully.

09

4 marks

A box contains 81 identical cards. The numbers of red, blue and green cards are in the ratio 2 : 3 : 4, in that order. One card is chosen at random; every card is equally likely. Find the probability that it is red or green. Give your answer in simplest form.

QUESTIONS

Work through the questions in order. The solutions start on page 8.

10

3 marks

Find the simplified expression for the excess of $6(2t - 1)$ over $3t + 8$.

11

4 marks

For nonzero m and n , $E = 12/(mn)$. A student writes $n = 12m/E$. Explain the error, make n the subject, and state the value E cannot take.

12

4 marks

Six results are 2, 4, 4, 6, 9 and 11. One of the six result cards is chosen at random, with each card equally likely. Find the probability that the chosen result is greater than the mean of all six results.

ANSWERS + WORKED SOLUTIONS

Check where your working first differs from the steps below.

01

STEP 1 — Expand both brackets

$$\begin{aligned} & 3(4a + 6b) - 2(2a + 3b) \\ & = 12a + 18b - 4a - 6b \end{aligned}$$

STEP 2 — Collect like terms

$$= 8a + 12b$$

STEP 3 — Factorise fully

The greatest common factor is 4.

$$8a + 12b = 4(2a + 3b)$$

ANSWER → $4(2a + 3b)$

IF THIS BROKE, LOOK HERE FIRST →

check whether your expanded and simplified expression is correct before trying to factorise it.

02

STEP 1 — Identify the sides relative to 38°

ST = 7 cm is opposite angle R. RT is the hypotenuse.

STEP 2 — Choose the ratio

$\sin 38^\circ = \text{opposite} / \text{hypotenuse}$

$$\sin 38^\circ = 7 / RT$$

STEP 3 — Rearrange and calculate

$$\begin{aligned} RT &= 7 / \sin 38^\circ \\ &= 11.370... \text{ cm} \end{aligned}$$

ANSWER → 11.4 cm (3 s.f.)

IF THIS BROKE, LOOK HERE FIRST →

identifying the opposite side and hypotenuse before choosing the ratio.

ANSWERS + WORKED SOLUTIONS

Check where your working first differs from the steps below.

03

STEP 1 — Add all seven marks

$$6 + 13 + 16 + 32 + 33 + 34 + 36 = 170$$

STEP 2 — Divide by the number of students

$$\text{Mean} = 170 / 7 = 24.285714...$$

STEP 3 — Round only at the end

To 2 decimal places, 24.285714... becomes 24.29.

ANSWER → 24.29 (2 d.p.)

IF THIS BROKE, LOOK HERE FIRST →

checking that all seven marks are included in the total before dividing.

04

STEP 1 — Find the greatest common factor

$\text{HCF}(8, 12) = 4$. Both terms also contain m .

The greatest common monomial factor is $4m$.

STEP 2 — Divide each term

$$8mn \div 4m = 2n$$

$$-12m \div 4m = -3$$

$$8mn - 12m = 4m(2n - 3)$$

ANSWER → $4m(2n - 3)$

IF THIS BROKE, LOOK HERE FIRST →

including m in the common factor and dividing both terms.

ANSWERS + WORKED SOLUTIONS

Check where your working first differs from the steps below.

05

STEP 1 — Find BC in triangle ABC

ABC is right-angled at B; AC = 13 cm is the hypotenuse.

$$BC^2 = AC^2 - AB^2 = 13^2 - 5^2$$

$$BC^2 = 169 - 25 = 144, \text{ so } BC = 12 \text{ cm.}$$

STEP 2 — Move to triangle BCD

For angle CBD, opposite = CD = 9 cm.

Adjacent = BC = 12 cm.

STEP 3 — Choose the ratio

$$\tan(\text{CBD}) = 9 / 12$$

STEP 4 — Find the angle

$$\text{CBD} = \tan^{-1}(9/12) = 36.869\dots^\circ$$

ANSWER → 36.9° (1 d.p.)

IF THIS BROKE, LOOK HERE FIRST →

finding the shared side with Pythagoras before selecting the angle ratio.

06

STEP 1 — Count all possible tokens

The endpoints are included: $47 - 18 + 1 = 30$.

STEP 2 — List valid multiples of 4

20, 24, 28, 32, 36, 40, 44

There are 7 favourable tokens.

STEP 3 — Form the probability

$$P(\text{multiple of 4}) = 7/30$$

ANSWER → 7/30

IF THIS BROKE, LOOK HERE FIRST →

counting both endpoints in the total, then listing multiples inside the range.

ANSWERS + WORKED SOLUTIONS

Check where your working first differs from the steps below.

07

STEP 1 — Take out the greatest common factor

$$6p^2 - 24q^2 = 6(p^2 - 4q^2)$$

STEP 2 — Recognise the difference of squares

$$p^2 - 4q^2 = p^2 - (2q)^2$$

STEP 3 — Factorise the bracket

$$p^2 - (2q)^2 = (p - 2q)(p + 2q)$$

ANSWER → $6(p - 2q)(p + 2q)$

IF THIS BROKE, LOOK HERE FIRST →

taking out the common factor before checking the bracket for two squares.

08

STEP 1 — Find two terms for the middle

$$\text{Product} = 3 \times (-4) = -12; \text{sum} = -11.$$

Use -12 and +1.

STEP 2 — Split the middle term

$$3x^2 - 11x - 4 = 3x^2 - 12x + x - 4$$

STEP 3 — Factor by grouping

$$= 3x(x - 4) + 1(x - 4)$$

STEP 4 — Take out the common bracket

$$= (3x + 1)(x - 4)$$

ANSWER → $(3x + 1)(x - 4)$

IF THIS BROKE, LOOK HERE FIRST →

finding two numbers with product -12 and sum -11 before splitting the middle term.

ANSWERS + WORKED SOLUTIONS

Check where your working first differs from the steps below.

09

STEP 1 — Count the ratio parts

$$2 + 3 + 4 = 9 \text{ parts}$$

STEP 2 — Find one part

$$81 \div 9 = 9 \text{ cards per part}$$

STEP 3 — Count favourable cards

$$\text{Red: } 2 \times 9 = 18; \text{ green: } 4 \times 9 = 36.$$

$$\text{Red or green: } 18 + 36 = 54 \text{ cards.}$$

STEP 4 — Form the probability

$$P(\text{red or green}) = 54/81 = 2/3$$

ANSWER → **2/3**

IF THIS BROKE, LOOK HERE FIRST →

using the ordered ratio to identify the two favourable colours.

10

STEP 1 — Translate the wording

“The excess of A over B” means $A - B$.

Write $6(2t - 1) - (3t + 8)$.

STEP 2 — Expand carefully

$$= 12t - 6 - 3t - 8$$

STEP 3 — Collect like terms

$$= 9t - 14$$

ANSWER → **9t - 14**

IF THIS BROKE, LOOK HERE FIRST →

translating “excess of A over B” as $A - B$, with brackets around B.

ANSWERS + WORKED SOLUTIONS

Check where your working first differs from the steps below.

11

STEP 1 — Identify the student's error

m is in the original denominator. It must stay in the denominator when n is isolated.

STEP 2 — Clear the fraction

$$E = 12/(mn)$$

Multiply both sides by mn : $Emn = 12$.

STEP 3 — Make n the subject

Divide both sides by Em : $n = 12/(Em)$.

STEP 4 — State the restriction on E

Since m and n are nonzero, $12/(mn)$ cannot be 0.

Therefore $E \neq 0$.

ANSWER → $n = 12/(Em)$, $E \neq 0$

IF THIS BROKE, LOOK HERE FIRST →

checking where m belongs when isolating n from $Emn = 12$.

12

STEP 1 — Find the mean

$$\text{Total} = 2 + 4 + 4 + 6 + 9 + 11 = 36.$$

$$\text{Mean} = 36 \div 6 = 6.$$

STEP 2 — Apply the condition

Only 9 and 11 are greater than 6.

The result equal to 6 does not qualify.

STEP 3 — Form the probability

$$2 \text{ favourable cards out of } 6: 2/6 = 1/3$$

ANSWER → $1/3$

IF THIS BROKE, LOOK HERE FIRST →

finding the mean first, then treating "greater than" as a strict condition.

HOW TO USE THIS

A score is a starting point. Your working tells you more.

Don't only count your score.

- Which question could you not start?
- Where did the same type of mistake appear again?
- Did you recognise the method before seeing the solution?

One mixed check cannot diagnose your whole syllabus.
It can tell you where to look next.

Choose one missed question. Use its “look here first” line, then try the question again without looking at the working. A successful retry is useful practice; it is not proof that the whole topic is secure.

KEEP GOING

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