Name	.....
Class	.....

GCSE Mathematics – Higher Tier

Spot the Mistake

Number

Calculator allowed

Suggested time: 45 minutes

Equipment needed: a pen, a pencil, a rubber, a ruler and a scientific calculator.

How this paper works

- Each question shows a student's worked solution, set out in numbered lines.
- Every solution contains **exactly one** mistake.
- For each question: (a) find the line with the mistake, (b) explain what went wrong, and (c) write a correct solution.

Before you start

- Fill in your name and class at the top of this page.
- Write in black pen. Attempt every question.
- Set out your method clearly in part (c). Marks are given for correct working.
- Diagrams are sketches and are not drawn to scale.

About this paper

- There are 10 questions, worth 40 marks altogether.
- The number in brackets, for example (2), tells you how many marks a part is worth.

Solutions are provided separately.

1) Work out $(3 \times 10^4) \times (5 \times 10^7)$. Give your answer in standard form.

Amir's working

Line 1	$3 \times 5 = 15$
Line 2	$10^4 \times 10^7 = 10^{11}$
Line 3	15×10^{11}
Line 4	$= 1.5 \times 10^{10}$

(a) Write down the line where Amir makes the mistake.

.....

(1)

(b) Explain the mistake.

.....

.....

(1)

(c) Write out a correct solution.

.....

(2)

[Question 1: 4 marks]

2) Work out the value of $27^{-\frac{2}{3}}$

Bella's working

Line 1	The cube root of 27 is 3
Line 2	$3^2 = 9$
Line 3	The power is negative, so the answer is -9

(a) Write down the line where Bella makes the mistake.

.....

(1)

(b) Explain the mistake.

.....

.....

(1)

(c) Write out a correct solution.

.....

(2)

[Question 2: 4 marks]

3) Expand and simplify $(3 + \sqrt{5})^2$

Callum's working

Line 1	$(3 + \sqrt{5})(3 + \sqrt{5})$
Line 2	$= 9 + 3\sqrt{5} + 3\sqrt{5} + \sqrt{5} \times \sqrt{5}$
Line 3	$= 9 + 6\sqrt{5} + 25$
Line 4	$= 34 + 6\sqrt{5}$

(a) Write down the line where Callum makes the mistake.

.....

(1)

(b) Explain the mistake.

.....

.....

(1)

(c) Write out a correct solution.

.....

(2)

[Question 3: 4 marks]

4) Rationalise the denominator of $\frac{10}{\sqrt{5}}$. Simplify your answer.

Deepa's working

Line 1 Multiply the top and bottom by $\sqrt{5}$

Line 2 $= \frac{10\sqrt{5}}{\sqrt{5} \times \sqrt{5}}$

Line 3 $= \frac{10\sqrt{5}}{25}$

Line 4 $= \frac{2\sqrt{5}}{5}$

(a) Write down the line where Deepa makes the mistake.

.....

(1)

(b) Explain the mistake.

.....

.....

(1)

(c) Write out a correct solution.

.....

(2)

[Question 4: 4 marks]

5) Show that $0.\dot{4}\dot{5}$ can be written as a fraction in its simplest form.

Ethan's working

Line 1 Let $x = 0.454545...$

Line 2 $10x = 4.545454...$

Line 3 $10x - x = 9x = 4.1$

Line 4 $x = \frac{4.1}{9} = \frac{41}{90}$

(a) Write down the line where Ethan makes the mistake.

.....

(1)

(b) Explain the mistake.

.....

.....

(1)

(c) Write out a correct solution.

.....

(2)

[Question 5: 4 marks]

6) A number, y, is **truncated** to 1 decimal place. The result is 7.4
Write down the error interval for y.

Freya's working

Line 1	*Truncating chops off the digits after the first decimal place*
Line 2	*Half of 0.1 is 0.05*
Line 3	$7.35 \leq y < 7.45$

(a) Write down the line where Freya makes the mistake.

.....

(1)

(b) Explain the mistake.

.....

.....

(1)

(c) Write out a correct solution.

.....

(2)

[Question 6: 4 marks]

7) $a = 8.4$ and $b = 2.1$, both correct to 1 decimal place.
Work out the upper bound for $a \div b$. Give your answer to 3 significant figures.

George's working

Line 1	Upper bound of $a = 8.45$
Line 2	Upper bound of $b = 2.15$
Line 3	Upper bound of $a \div b = 8.45 \div 2.15$
Line 4	$= 3.93$ (3 s.f.)

(a) Write down the line where George makes the mistake.

.....

(1)

(b) Explain the mistake.

.....

.....

(1)

(c) Write out a correct solution.

.....

(2)

[Question 7: 4 marks]

8) Find the highest common factor (HCF) and the lowest common multiple (LCM) of 84 and 90.

Hana's working

Line 1	$84 = 2^2 \times 3 \times 7$
Line 2	$90 = 2 \times 3^2 \times 5$
Line 3	$HCF = 2 \times 3 = 6$
Line 4	$LCM = 2 \times 3 \times 5 \times 7 = 210$

(a) Write down the line where Hana makes the mistake.

.....

(1)

(b) Explain the mistake.

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.....

(1)

(c) Write out a correct solution.

.....

(2)

[Question 8: 4 marks]

9) A 4-digit code uses the digits 0 to 9. The first digit cannot be 0 and no digit can be repeated. How many different codes are possible?

Isaac's working

Line 1	First digit: 9 choices (1 to 9)
Line 2	Second digit: 8 choices
Line 3	Third digit: 7 choices, fourth digit: 6 choices
Line 4	9 × 8 × 7 × 6 = 3024 codes

(a) Write down the line where Isaac makes the mistake.

.....

(1)

(b) Explain the mistake.

.....

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(1)

(c) Write out a correct solution.

.....

(2)

[Question 9: 4 marks]

10) Work out an estimate for $\dfrac{6.87 \times 41.3}{0.192}$

Jade's working

Line 1	*Round each number to 1 significant figure: 7, 40, 0.2*
Line 2	*7 × 40 = 280*
Line 3	*280 ÷ 0.2 = 56*

(a) Write down the line where Jade makes the mistake.

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(1)

(b) Explain the mistake.

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(1)

(c) Write out a correct solution.

.....

(2)

[Question 10: 4 marks]

End of paper – 40 marks in total