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

GCSE Mathematics – Higher Tier

Spot the Mistake

Probability

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) A spinner can land on red, blue, green or yellow.

P(red) = 0.3, P(blue) = 0.25, P(green) = x and P(yellow) = $2x$. Find the value of x.

Adam's working

Line 1	$0.3 + 0.25 = 0.55$
Line 2	$x + 2x = 3x$
Line 3	$3x = 0.55$
Line 4	$x = 0.183$

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

.....

(1)

(b) Explain the mistake.

.....

.....

(1)

(c) Write out a correct solution.

.....

(2)

[Question 1: 4 marks]

2) A biased coin has P(heads) = 0.35. The coin is flipped 400 times.
How many times would you expect it to land on tails?

Beth's working

Line 1	Expected number = probability × number of trials
Line 2	= 0.35 × 400
Line 3	= 140 tails

(a) Write down the line where Beth 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 2: 4 marks]

3) *A* and *B* are independent events. P(*A*) = 0.4 and P(*B*) = 0.7
Work out the probability that exactly one of the events happens.

Charlie's working

Line 1	P(not B) = 1 − 0.7 = 0.3
Line 2	P(A and not B) = 0.4 × 0.3 = 0.12
Line 3	P(exactly one) = 0.12

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

.....

(1)

(b) Explain the mistake.

.....

.....

(1)

(c) Write out a correct solution.

.....

(2)

[Question 3: 4 marks]

4) A bag has 5 red and 3 blue counters. Two counters are taken at random without replacement. Work out the probability that both counters are red.

Daisy's working

Line 1	$P(\text{first red}) = \frac{5}{8}$
Line 2	$P(\text{second red}) = \frac{5}{8}$
Line 3	$P(\text{both red}) = \frac{5}{8} \times \frac{5}{8} = \frac{25}{64}$

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

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(1)

(b) Explain the mistake.

.....

.....

(1)

(c) Write out a correct solution.

.....

(2)

[Question 4: 4 marks]

5) A fair dice is rolled twice.
Work out the probability of getting at least one six.

Eli's working

Line 1	$P(\text{six on first roll}) = \frac{1}{6}$
Line 2	$P(\text{six on second roll}) = \frac{1}{6}$
Line 3	$P(\text{at least one six}) = \frac{1}{6} + \frac{1}{6} = \frac{1}{3}$

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

.....

(1)

(b) Explain the mistake.

.....

.....

(1)

(c) Write out a correct solution.

.....

(2)

[Question 5: 4 marks]

6) In a class of 40 students, 22 play football, 15 play tennis and 8 play both.
A student is picked at random. Find the probability that they play neither sport.

Fatima's working

Line 1	Number who play a sport = 22 + 15 = 37
Line 2	Number who play neither = 40 − 37 = 3
Line 3	$P(\text{neither}) = \frac{3}{40}$

(a) Write down the line where Fatima 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 6: 4 marks]

7) The table shows how 60 students travel to school.

	Walk	Bus	Total
Boys	12	18	30
Girls	14	16	30
Total	26	34	60

A girl is chosen at random. Find the probability that she walks.

Gabe's working

Line 1 Number of girls who walk = 14

Line 2 Total number of students = 60

Line 3 $P(\text{walks}) = \frac{14}{60} = \frac{7}{30}$

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

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(1)

(b) Explain the mistake.

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(1)

(c) Write out a correct solution.

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(2)

[Question 7: 4 marks]

8) A bag has 5 red and 3 blue counters. Two counters are taken at random without replacement. Given that the counters are the same colour, find the probability that both are red.

Holly's working

Line 1 $P(\text{both red}) = \frac{5}{8} \times \frac{4}{7} = \frac{20}{56}$

Line 2 $P(\text{both blue}) = \frac{3}{8} \times \frac{2}{7} = \frac{6}{56}$

Line 3 $P(\text{same colour}) = \frac{26}{56}$

Line 4 $P(\text{both red given same colour}) = \frac{20}{56} = \frac{5}{14}$

(a) Write down the line where Holly 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 8: 4 marks]

9) Spinner A is numbered 1 to 4. Spinner B is numbered 1 to 3.
Both spinners are spun and the scores are added. Find the probability that the total is 5.

Ibrahim's working

Line 1	Possible totals: 2, 3, 4, 5, 6, 7
Line 2	There are 6 possible totals
Line 3	P(total of 5) = $\frac{1}{6}$

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

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(1)

(b) Explain the mistake.

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(1)

(c) Write out a correct solution.

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(2)

[Question 9: 4 marks]

10) $\xi = \{1, 2, 3, \ldots, 12\}$. $A = \{\text{multiples of } 3\}$. $B = \{\text{multiples of } 4\}$.
A number is chosen at random from ξ. Find $P(A \cap B')$.

Jasmine's working

Line 1	$A = \{3, 6, 9, 12\}$
Line 2	$B = \{4, 8, 12\}$
Line 3	$A \cap B' = \{12\}$
Line 4	$P(A \cap B') = \frac{1}{12}$

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

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(1)

(b) Explain the mistake.

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(1)

(c) Write out a correct solution.

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(2)

[Question 10: 4 marks]

End of paper – 40 marks in total