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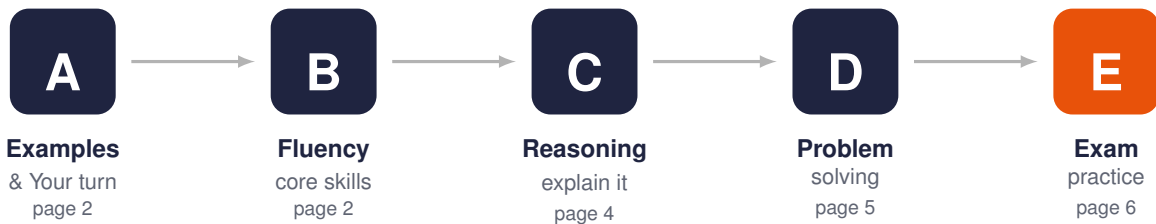
GCSE MATHEMATICS • PROBABILITY

Mixed Sample Space

Worked Solutions

Pearson Edexcel GCSE (1MA1) & International GCSE (4MA1) • No calculator

Full worked solutions for the free Mixed Sample Space worksheet, GCSE and iGCSE Maths



Tap a section to jump straight to it

Full worked solutions for every question on the Mixed Sample Space worksheet, in the same order and with the same question numbers.

How to mark your work. Tick each step you got right, not just the final answer. In the exam, method marks are given for correct working even when the final answer is wrong. If you lost marks, find the *first* line where your working is different from ours. That is the thing to fix.

In Section E: **M** = method mark, **P** = process mark, **A** = accuracy mark, **B** = independent mark, **C** = communication mark.

Question sheet

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A**Your turn answers**

Compare each line of your working with the solution.

FOUNDATION

A1 8 outcomes: H1, H2, H3, H4, T1, T2, T3, T4 T3 and T4 $\frac{2}{8} = \boxed{\frac{1}{4}}$

A2 Totals of 4: (1,3), (2,2), (3,1) $\frac{3}{36} = \boxed{\frac{1}{12}}$

A3 15 outcomes. Prime totals: from A = 1: 2, 3, 5 from A = 2: 3, 5, 7 from A = 3: 5, 7 $\boxed{\frac{8}{15}}$

HIGHER

A4 Difference 4: (1,5), (2,6) and the reverse, 4 outcomes. Difference 5: (1,6), (6,1), 2 outcomes $\frac{6}{36} = \boxed{\frac{1}{6}}$

A5 $6n$ outcomes and only one is (1,1): $\frac{1}{6n} = \frac{1}{30}$ $\boxed{n = 5}$

A6 At least one 5: 11 outcomes. Total 10 among them: only (5,5) $\boxed{\frac{1}{11}}$
(4,6) and (6,4) also total 10, but they have no 5

A7 8 outcomes. All the same: HHH and TTT $\frac{2}{8} = \boxed{\frac{1}{4}}$

B**Fluency solutions**One mark for each correct part. The notes in *italics* explain why each sequence was chosen.**FOUNDATION**

B1 (a) $\boxed{\frac{1}{6}}$ (b) $\boxed{\frac{1}{36}}$ (c) $\boxed{0}$ (d) totals 2 and 3: $\boxed{\frac{3}{36} = \frac{1}{12}}$

B2 (a) (1,4), (2,2), (4,1): $\boxed{\frac{3}{16}}$ (b) $\boxed{\frac{4}{16} = \frac{1}{4}}$ (c) (3,4), (4,3): $\boxed{\frac{2}{16} = \frac{1}{8}}$ (d) 1, 4, 4, 4, 9, 16: $\boxed{\frac{6}{16} = \frac{3}{8}}$



B3 (a) $\boxed{12}$ (b) $\boxed{\frac{1}{12}}$ (c) T2, T4, T6: $\boxed{\frac{3}{12} = \frac{1}{4}}$ (d) 6 heads and T6: $\boxed{\frac{7}{12}}$

In (d) count each outcome once: H6 is only counted once.

B4 (a) $\boxed{\frac{6}{36} = \frac{1}{6}}$ (b) $\boxed{\frac{2}{36} = \frac{1}{18}}$ (c) $\boxed{\frac{10}{36} = \frac{5}{18}}$ (d) $6 + 10 + 8 = 24$: $\boxed{\frac{2}{3}}$

B5 (a) $\frac{1}{6} \times 360 = \boxed{60}$ (b) $\frac{1}{36} \times 360 = \boxed{10}$ (c) $\boxed{20}$

B6 8 outcomes: totals 2, 3, 3, 4, 3, 4, 4, 5 (a) $\boxed{\frac{3}{8}}$ (b) $\boxed{\frac{3}{8}}$ (c) $\boxed{\frac{1}{8}}$ (d) $\boxed{\frac{1}{2}}$

The two sections showing 2 are different outcomes, so each is counted.

HIGHER

B7 (a) (3,3) of 5: $\boxed{\frac{1}{5}}$ (b) (4,4), (5,5), (6,6) of 6: $\boxed{\frac{1}{2}}$ (c) (6,6) of 11: $\boxed{\frac{1}{11}}$ (d) 5 of 6: $\boxed{\frac{5}{6}}$

"Given that" shrinks the sample space to the outcomes you are told about.

B8 (a) $2n = 20$: $\boxed{10}$ (b) $6n = 48$: $\boxed{8}$ (c) $\frac{n}{n^2} = \frac{1}{n}$: $\boxed{5}$ (d) only (1, 1), so $6n = 42$: $\boxed{7}$

B9 (a) $\boxed{8}$ (b) $\boxed{\frac{1}{8}}$ (c) $1 - \frac{1}{8} = \boxed{\frac{7}{8}}$ (d) $2 \times 2 \times 6 = \boxed{24}$

B10 (a) $\boxed{\frac{1}{6}}$ (b) $\boxed{\frac{1}{10}}$ (c) $\boxed{\frac{1}{100}}$ (d) $\frac{100 - 10}{2} = 45$: $\boxed{\frac{45}{100} = \frac{9}{20}}$

For two fair n -sided dice, $P(\text{double}) = \frac{1}{n}$



C

Reasoning solutions

Your wording can be different. Check that your reason makes the same point.

FOUNDATION

- C1 The 11 totals are not equally likely. There are 36 equally likely outcomes, and 6 of them total 7

$$\frac{1}{6}$$

- C2 The two cases are not equally likely. HH, HT, TH, TT are equally likely, and 3 of the 4 have a head

$$\frac{3}{4}$$

- C3 Totals in the 36-outcome grid: 2 once, 3 twice, 4 three times, 5 four times, 6 five times, 7 six times, then 8 five times down to 12 once

7 appears on the most outcomes, 6 of 36, so 7 is the most likely total

- C4 (a) 3T (b) 6 outcomes, and 1T and 3T are odd with tails:

$$\frac{2}{6} = \frac{1}{3}$$

HIGHER

- C5 Jo used all 36 outcomes. She knows the total is 8, so only 5 outcomes are possible, and 1 is a double

$$\frac{1}{5}$$

- C6 At least one 6: 11 outcomes, so $\frac{11}{36}$ Total 7: $\frac{6}{36}$ At least one 6 is more likely.

- C7 The product is odd only when both are odd: $3 \times 3 = 9$ outcomes $P(\text{even}) = 1 - \frac{9}{36} = \frac{3}{4}$, as required

- C8 (a) There are n^2 outcomes. For first number a , the second must be more than $n - a$, which gives a choices

$$\text{Total} = 1 + 2 + \dots + n = \frac{n(n+1)}{2} \quad P = \frac{n(n+1)}{2n^2} = \frac{n+1}{2n}$$

as required

(b) $\frac{n+1}{2n} = \frac{9}{16} \quad 16n + 16 = 18n \quad n = 8$



D**Problem solving solutions**

There is often more than one correct method. Any complete, correct method scores full marks.

FOUNDATION

D1 Heads: scores 2, 4, 6, 8, 10, 12 Tails: 2, 3, 4, 5, 6, 7 8 or more: 8, 10, 12 (all heads)

$$\frac{3}{12} = \frac{1}{4}$$

D2

	1	2	3	4	5	6
1	1	2	3	4	5	6
2	2	2	3	4	5	6
3	3	3	3	4	5	6
4	4	4	4	4	5	6
5	5	5	5	5	5	6
6	6	6	6	6	6	6

$$P(\text{score} = 6) = \frac{11}{36}$$

$$P(\text{score} = 3) = \frac{5}{36}$$

D3 16 outcomes, and 4 of them are the same colour $1 - \frac{4}{16} = \frac{3}{4}$

D4 $P(\text{total 10 or more}) = \frac{6}{36} = \frac{1}{6}$, so about 30 wins in 180 games

In: $180 \times 0.50 = £90$ Out: $30 \times 2 = £60$ Profit = **£30**

HIGHER

D5 (a) Total 3: A= 3 and B= 0 ($2 \times 3 = 6$ ways), or A= 1 and B= 2 (6 ways) $\frac{12}{36} = \frac{1}{3}$

(b) B is always even, so the total is even only when A is 2 $\frac{1}{3}$

D6 12 pairs. A bigger: B= 1 (3), B= 2 (2), B= 3 (1): $\frac{6}{12} = \frac{1}{2}$

Equal: 3 pairs, $\frac{1}{4}$ B bigger: $1 - \frac{1}{2} - \frac{1}{4} = \frac{1}{4}$



D7 (a) Total 10: (4,6), (5,5), (6,4)

$$\frac{1}{3}$$

(b) At least one 5: 11 outcomes, one of them is (5,5)

$$\frac{1}{11}$$

D8 (a) Score 0 needs the same number. If $k \geq 6$ there are 6 such outcomes out of $6k$, so $P = \frac{1}{k} = \frac{1}{8}$ and $k = 8$

If $k < 6$, $P = \frac{k}{6k} = \frac{1}{6}$, which is not $\frac{1}{8}$ $k = 8$

(b) Dice 1: spinner 6, 7, 8 Dice 2: 7, 8 Dice 3: 8 Dice 6: 1 7 of the 48 outcomes

$$\frac{7}{48}$$

E

Exam practice solutions

Marks are shown on the right of each line.

FOUNDATION

Foundation and Higher crossover

E1

(a)

	1	2	3	4
1	2	3	4	5
2	3	4	5	6
3	4	5	6	7

B2

(b)

$$\frac{3}{12} = \frac{1}{4}$$

B1

E2

(a) H1, H4 of 12:

$$\frac{2}{12} = \frac{1}{6}$$

B1

(b) 6 tails and H1, H3, H5

M1

$$\frac{9}{12} = \frac{3}{4}$$

A1

E3

(a) (2,6), (3,4), (4,3), (6,2)

M1

$$\frac{4}{36} = \frac{1}{9}$$

A1

(b) (1,1), (2,2), (3,3), (4,4), (5,5), (6,6), (1,4), (4,1):

$$\frac{8}{36} = \frac{2}{9}$$

B1



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E4 Sam: $P(\text{total } 7) = \frac{6}{36}$ M1

Jo: $P(6 \text{ or } 8) = \frac{5+5}{36} = \frac{10}{36} = \frac{5}{18}$ M1

Not fair: Jo is more likely to win. C1

E5 $P(\text{two heads}) = \frac{1}{4}$ M1

$200 \times \frac{1}{4} = 50$ A1

E6 15 outcomes. Difference 0: 3, difference 1: 5, difference 2: 4, difference 3: 2, difference 4: 1 M1

Most likely score is 1 A1

$\frac{5}{15} = \frac{1}{3}$ A1

HIGHER

E7 Difference 0: 6 outcomes. Difference 1: 10 outcomes M1

$6 + 10 = 16$ of 36 M1

$\frac{16}{36} = \frac{4}{9}$ A1

E8 With 2 or 4 on B, the most is $3 + 4 = 7$, not more than 7 P1

So 2 of the 9 outcomes use x and are more than 7: $a + x > 7$ for exactly two of $a = 1, 2, 3$ P1

$2 + x > 7$ and $1 + x \leq 7$, so $x > 5$ and $x \leq 6$ P1

$x = 6$ A1

E9 (a) 8 outcomes. Exactly two heads: HHT, HTH, THH M1

$\frac{3}{8}$ A1

(b) $1 - \frac{1}{8} = \frac{7}{8}$ B1



E10 (a)

B2

×	1	2	3	4
1	1	2	3	4
2	2	4	6	8
3	3	6	9	12
4	4	8	12	16
5	5	10	15	20

(b) Odd: 1, 3, 3, 9, 5, 15

$$\frac{6}{20} = \frac{3}{10}$$

B1

(c) 14 even products, and 12, 12, 16, 20 are more than 10

M1

$$\frac{4}{14} = \frac{2}{7}$$

A1

