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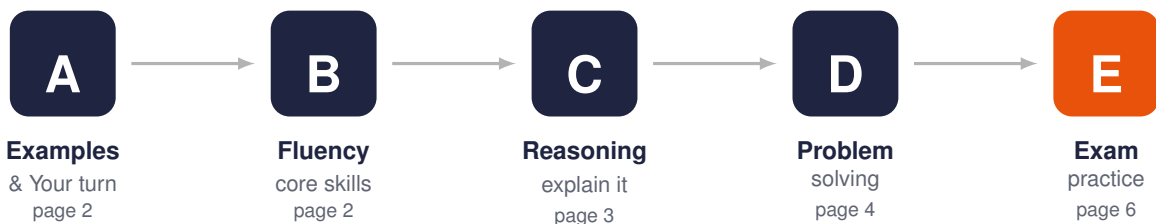
GCSE MATHEMATICS • PROBABILITY

Basic Probability

Worked Solutions

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

Full worked solutions for the free Basic Probability worksheet, GCSE and iGCSE Maths



Tap a section to jump straight to it

Full worked solutions for every question on the Basic Probability 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

Probability revision engine

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A**Your turn answers**

Compare each line of your working with the solution.

FOUNDATION**A1** 10 letters, and 3 of them are T

$$\frac{3}{10}$$

A2 $1 - 0.28 - 0.35 =$ $\boxed{0.37}$ **A3** Red is $1 - 0.35 = 0.65$ of the counters, and 0.65 is 26, so the total is $26 \div 0.65 = 40$ $40 - 26 =$ $\boxed{14}$ **HIGHER****A4** $x + (x + 0.1) + 3x + 0.25 = 1$ $5x + 0.35 = 1$, so $x = 0.13$ $P(C) = 3 \times 0.13 =$ $\boxed{0.39}$ **A5** $x + (x + 40) + 2x + 80 = 360$ $4x = 240$, so $x = 60$ Sectors 60° , 100° , 120° , 80° . Largest = 120°

$$\frac{120}{360} = \boxed{\frac{1}{3}}$$

A6 $0.55 - 0.15 = 0.4$ of the trials is 28, so there were 70 trials $P(C) = 0.3$, and $0.3 \times 70 =$ $\boxed{21}$ **A7** Circle area = 9π , square area = 36 $\frac{9\pi}{36} = \frac{\pi}{4}$ $\boxed{\frac{\pi}{4}}$, about 0.785**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) $\boxed{\frac{1}{2}}$ (c) 5 or 6: $\boxed{\frac{1}{3}}$ (d) $\boxed{0}$, impossible**B2** (a) 5, 10: $\boxed{\frac{1}{6}}$ (b) 2, 3, 5, 7, 11: $\boxed{\frac{5}{12}}$ (c) 1, 4, 9: $\boxed{\frac{1}{4}}$ (d) 5, 7, 8, 9, 10, 11: $\boxed{\frac{1}{2}}$ *1 is not a prime number. In (d) count the numbers that do **not** divide into 12*

B3 (a) 0.7 (b) $\frac{5}{8}$ (c) 55% (d) 0

$P(\text{not } A) = 1 - P(A)$, in whichever form the probability is given.

B4 (a) 0.5 (b) 0.35 (c) $1 - \frac{3}{12} - \frac{4}{12} = \frac{5}{12}$ (d) $2x = 0.8$, so $x = 0.4$

In (d) both missing values are x , so they must be equal: 0.3 and 0.5 would not do.

B5 (a) impossible (b) evens (c) certain (d) likely $(\frac{5}{6})$

B6 (a) $20 \times \frac{1}{4} = 5$ (b) blue is $\frac{3}{4}$, so the total is 20: 5 (c) 0.4 is twice 0.2 , so 24

In (c), doubling the probability doubles the number of cubes. Adding 2 to get 14 is wrong.

HIGHER

B7 (a) $2x = 0.6$ 0.3 (b) $6x = 0.6$ 0.1 (c) $4x + 0.3 = 1$ 0.175 (d) $3x = \frac{3}{4}$ $\frac{1}{4}$

B8 (a) 150° : $\frac{5}{12}$ (b) $6x = 360$, largest 180° : $\frac{1}{2}$ (c) $4x + 60 = 360$, $x = 75$, $\frac{135}{360} = \frac{3}{8}$ (d) $0.35 \times 360 = 126^\circ$

B9 (a) $0.3 \times 60 = 18$ (b) $15 \div 0.3 = 50$ (c) $\frac{2}{8}$ of the total is 9: 36 (d) 0.1 of the total is 18: 180

B10 (a) $\frac{25}{100} = \frac{1}{4}$ (b) $\frac{4\pi}{16} = \frac{\pi}{4}$ (c) $\frac{24}{120} = \frac{1}{5}$ (d) $\frac{9\pi - \pi}{9\pi} = \frac{8}{9}$

C

Reasoning solutions

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

FOUNDATION

C1 Jo divided by the number of blue counters. There are 8 counters altogether, so $\frac{3}{8}$

C2 The four colours might not be equally likely. For example, the red sector could be bigger or smaller than the others.



- C3** (a) $0.4 + 0.35 + 0.3 = 1.05$. The probabilities of all the outcomes must add up to 1, not more.
 (b) $1 - 0.4 - 0.35 = 0.25$

- C4** A: $\frac{3}{8} = \frac{21}{56}$ B: $\frac{5}{14} = \frac{20}{56}$ $\frac{21}{56} > \frac{20}{56}$, so **Bag A** gives the better chance, as required

HIGHER

- C5** With $x = 0.2$ the total is $0.2 + 0.4 + 0.6 + 0.5 = 1.7$, which is more than 1

$$6x + 0.5 = 1$$

$$6x = 0.5$$

$$x = \frac{1}{12}$$

- C6** (a) 15 heads is the most likely number, but the results are random. He could get 14, 16, or any other number of heads.
 (b) The coin has no memory. Each throw is independent, so the next throw still has $P(\text{tails}) = \frac{1}{2}$

- C7** $P(\text{red}) + P(\text{blue}) = \frac{r}{r+b} + \frac{b}{r+b} = \frac{r+b}{r+b} = 1$ **proved**

- C8** There are k square numbers from 1 to n when $k^2 \leq n < (k+1)^2$. We need $\frac{k}{n} = \frac{1}{5}$, so $n = 5k$

$$k^2 \leq 5k \text{ gives } k \leq 5. \quad 5k < (k+1)^2 \text{ gives } k^2 - 3k + 1 > 0, \text{ which fails for } k = 1 \text{ and } k = 2$$

$$\text{So } k = 3, 4 \text{ or } 5: \quad n = 15, n = 20 \text{ or } n = 25$$

$$\text{Check: } 15 \text{ has 3 squares, } 20 \text{ has 4 squares, } 25 \text{ has 5 squares. Each gives } \frac{1}{5}$$

D

Problem solving solutions

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

FOUNDATION

- D1** Milk and dark are $1 - \frac{1}{3} = \frac{2}{3}$ of the box, and $8 + 6 = 14$

$$\frac{1}{3} \text{ of the box is 7, so there are } 7 \text{ white chocolates. Check: } \frac{7}{21} = \frac{1}{3}$$



D2 (a) 2, 12, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29: 12 numbers $\frac{12}{30} = \frac{2}{5}$

(b) 7, 16, 25: 3 numbers $\frac{3}{30} = \frac{1}{10}$

D3 Even: 2, 2, 4, 6, 6, so $P(\text{Sam wins}) = \frac{5}{8}$ Odd: $\frac{3}{8}$

The game is not fair, because Sam is more likely to win.

D4 (a) Odd: 1, 3, 3, 5, 5, 5 $\frac{6}{10} = \frac{3}{5}$

(b) Mean = $42 \div 10 = 4.2$. Greater than 4.2: 5, 5, 5, 6, 8 $\frac{5}{10} = \frac{1}{2}$

HIGHER

D5 $2 + 3 + 4 = 9$ parts of 360° , so 1 part is 40°

Red 80° Blue 120° Green 160°

D6 Total = $3x + 2x + 5 + 10 = 5x + 15$ $\frac{10}{5x + 15} = \frac{1}{5}$, so $5x + 15 = 50$ and $x = 7$

Red = 21 out of 50 $\frac{21}{50}$

D7 $x^2 - 3x - 4 = (x + 1)(x - 4) < 0$ when $-1 < x < 4$ Integers: 0, 1, 2, 3

There are 11 integers from -5 to 5 $\frac{4}{11}$

D8 (a) $\frac{2}{x+1} + \frac{3}{x+3} = 1 - \frac{7}{24} = \frac{17}{24}$

$\times 24(x+1)(x+3): 48(x+3) + 72(x+1) = 17(x+1)(x+3)$

$120x + 216 = 17x^2 + 68x + 51$, so $17x^2 - 52x - 165 = 0$ as required

(b) $(x - 5)(17x + 33) = 0$. A probability must be positive, so $x = 5$ $P(A) = \frac{2}{6} = \frac{1}{3}$





Exam practice solutions

Marks are shown on the right of each line.

FOUNDATION

Foundation and Higher crossover

- E1** (a) $\frac{3}{8}$ B1
- (b) $\frac{7}{8}$ B1
- (c) green B1

- E2** (a) $1 - (0.25 + 0.3 + 0.15)$ M1
- 0.3 A1
- (b) 0.75 B1

- E3** $P(\text{blue}) = \frac{5}{8}$ P1
- $\frac{5}{8}$ is 15, so the total is 24 P1
- 9 A1

- E4** (a) Boys: Spanish 15. Girls: French 13, total 44. Totals: Spanish 38, German 17 B2
- B1 for at least three correct values.
- (b) $\frac{13}{80}$ B1

- E5** It can rain and snow on the same day, so the two events can overlap. C1
- Kim can only subtract both from 1 if rain and snow cannot happen together. C1

- E6** A at $\frac{1}{2}$ B1
- B at $\frac{1}{5}$ (0.2) B1

HIGHER

- E7** $2x + 3x + x + 0.1 + 0.3 = 1$ M1
- $6x = 0.6$, so $x = 0.1$ M1
- $3 \times 0.1 = 0.3$ A1



E8	$90 + x + 2x + x + 30 = 360$	<i>M1</i>
	$4x = 240$, so $x = 60$ and green is 120°	<i>M1</i>
	$\frac{120}{360} = \boxed{\frac{1}{3}}$	<i>A1</i>

E9	$P(\text{blue}) = 1 - 0.35 - 0.25 = 0.4$	<i>P1</i>
	$0.4 - 0.25 = 0.15$ of the total is 18, so the total is 120	<i>P1</i>
	Red = $0.35 \times 120 = \boxed{42}$	<i>A1</i>

E10	(a) $\frac{x^2}{(x+2)(x+4)} = \frac{1}{3}$	<i>M1</i>
	$3x^2 = x^2 + 6x + 8$	<i>M1</i>
	$2x^2 - 6x - 8 = 0$, so $x^2 - 3x - 4 = 0$ as required	<i>A1</i>
	(b) $(x-4)(x+1) = 0$, and $x > 0$, so $x = 4$	<i>M1</i>
	Area = $6 \times 8 = \boxed{48} \text{ cm}^2$	<i>A1</i>

