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GCSE MATHEMATICS • PROBABILITY

Relative Frequency

Worked Solutions

Pearson Edexcel GCSE (1MA1) & International GCSE (4MA1) • Calculator allowed

Full worked solutions for the free Relative Frequency worksheet, GCSE and iGCSE Maths



Tap a section to jump straight to it

Full worked solutions for every question on the Relative Frequency 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 $51 \div 120 = \boxed{0.425}$

A2 $0.35 \times 400 = \boxed{140}$

A3 Adults who do not drive and have no dog: $36 - 30 = 6$ $\frac{6}{60} = \boxed{\frac{1}{10}}$

HIGHER

A4 In: $300 \times 0.50 = £150$ Out: $0.1 \times 300 \times 3 = £90$ Profit = $\boxed{£60}$

A5 Red is 0.6 of the bag, and that is 15, so the total is 25 $25 - 15 = \boxed{10}$

A6 Spam: 100, of which 90 are flagged. Other: 400, of which 20 are flagged. Flagged: 110 $\frac{90}{110} = \boxed{\frac{9}{11}}$

A7 Fair: expect $500 \times \frac{1}{2} = 250$ heads. 262 is close to 250 (relative frequency 0.524) **It could be fair**

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

B1 (a) $\boxed{0.4}$ (b) $\boxed{0.3}$ (c) $\boxed{0.2}$ (d) $\boxed{0.1}$ *They add up to 1*

B2 (a) $\boxed{60}$ (b) $\boxed{25}$ (c) $\boxed{15}$ (d) $\boxed{10}$

B3 (a) $12 \div 60 = \boxed{0.2}$ (b) $0.2 \times 450 = \boxed{90}$ (c) $\boxed{0.8}$ (d) $0.8 \times 450 = \boxed{360}$



B4 (a) $\boxed{55}$ (b) $45 - 6 = \boxed{39}$ (c) $55 - 50 = \boxed{5}$ (d) $6 + 5 = \boxed{11}$

B5 (a) $\boxed{0.7}$ (b) $\boxed{0.46}$ (c) $\boxed{0.508}$

Cal's estimate is the most reliable because it uses the most throws, not because it is nearest to 0.5

B6 (a) $\boxed{62}$ (b) $\boxed{200}$ (c) $62 \div 200 = \boxed{0.31}$ (d) $0.31 \times 1000 = \boxed{310}$

Pool the counts. Averaging the four relative frequencies would give the wrong answer, because the numbers of spins are different.

HIGHER

B7 (a) $\boxed{£100}$ (b) $0.2 \times 200 \times 2 = \boxed{£80}$ (c) $\boxed{£20}$ (d) 40 wins share £100: $\boxed{£2.50}$

B8 (a) $45 \div 150 = \boxed{0.3}$ (b) $30 \div 0.2 = \boxed{150}$ (c) not red is 0.6, so 20 in all: $\boxed{8}$ (d) not blue is 0.55, so 40 in all: $\boxed{18}$

B9 100 own a dog. (a) $0.6 \times 100 = \boxed{60}$ (b) $0.2 \times 300 = \boxed{60}$ (c) $\frac{120}{400} = \boxed{0.3}$ (d) $\frac{60}{120} = \boxed{\frac{1}{2}}$

In (d) the whole group is the 120 walkers, not all 400 people.

B10 (a) $\boxed{100}$ (b) $\boxed{50}$ (c) $\boxed{120}$ (d) 1, 2, 3 are $\frac{3}{10}$: $\boxed{75}$

C

Reasoning solutions

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

FOUNDATION

C1 10 throws is too few. A fair coin could easily land on heads 7 times in 10 throws. He needs many more throws.

C2 No. 10 sixes is the expected number, but the results are random. She could get more or fewer than 10

C3 (a) $30 + 25 = 55$, but there are only 50 people.
(b) Adults = $12 + 18 = 30$, so children = $50 - 30 = \boxed{20}$



C4 Pool the results: $7 + 30 = 37$ heads in $10 + 50 = 60$ throws $\frac{37}{60} = 0.616\ldots$ $\frac{37}{60}$

Averaging 0.7 and 0.6 gives Stuart's 10 throws as much weight as Maxine's 50

HIGHER

C5 Expected winnings per game = $0.18 \times 5 = \text{£}0.90$, but each game costs £1
No. On average you lose 10p per game, so over many games you lose money.

C6 Spinner A: 0.25 from only 40 spins. Spinner B: 0.3 from 1000 spins.
Spinner A's estimate may be far from its true probability, so Jo cannot be sure. Spinner B's estimate is more reliable.

C7 Expected reds = nr and expected not red = $n(1 - r)$ $n(1 - r) = 3nr$ $1 - r = 3r$ $r = \frac{1}{4}$

C8 (a) Take N people. Positive with the condition: $0.9pN$. Positive without it: $0.1(1 - p)N$

$$\frac{0.9pN}{0.9pN + 0.1(1 - p)N} = \frac{0.9p}{0.9p + 0.1} = \frac{9p}{9p + 1} \quad \text{as required}$$

(b) $\frac{9p}{9p + 1} = \frac{1}{2}$ $18p = 9p + 1$ $p = 0.1$

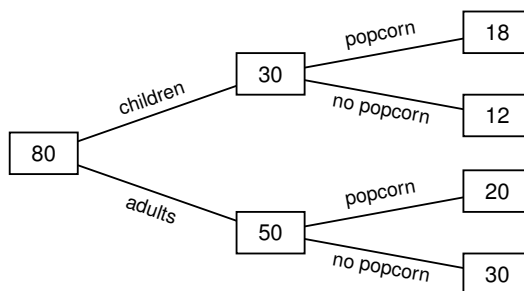
D

Problem solving solutions

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

FOUNDATION

D1 $6 \div 40 = 0.15$ $0.15 \times 190 = \text{28.5}$, so about 28 or 29 days



D2

Adults without popcorn: 30 $\frac{30}{80} = \frac{3}{8}$



D3 $15 \div 0.02 = \boxed{750}$ bulbs

D4 A: $18 \div 60 = \boxed{0.3}$ B: $27 \div 100 = \boxed{0.27}$ Spinner A is more likely to land on red (though B's estimate uses more spins).

HIGHER

D5 (a) $\boxed{0.4}$ (the value it settles at after many throws) (b) $0.4 \times 250 = \boxed{100}$
(c) Probably not. After 400 throws the relative frequency is 0.4, not close to 0.5

D6 $14 \div 400 = 0.035$ $0.035 \times 25\,000 = 875$ faulty $875 \times 2.40 = \boxed{\pounds 2100}$

D7 $P(3) = P(4) = \frac{1 - 0.3 - 0.2}{2} = 0.25$

(a) $0.25 \times 500 = \boxed{125}$ (b) $150 \div 0.25 = \boxed{600}$

D8 Expected profit per game $= c - (c + 4) \times \frac{c}{20} = 2.4$

$\times 20$: $20c - c^2 - 4c = 48$ $c^2 - 16c + 48 = 0$ $(c - 4)(c - 12) = 0$

$c = 12$ gives $P(\text{win}) = 0.6$, more than $\frac{1}{2}$ So $\boxed{c = 4}$, which gives 0.2

E

Exam practice solutions

Marks are shown on the right of each line.

FOUNDATION

Foundation and Higher crossover

E1 (a) $15 \div 50 = \boxed{0.3}$

B1

(b) $\frac{18}{50} \times 400$

M1

$\boxed{144}$

A1

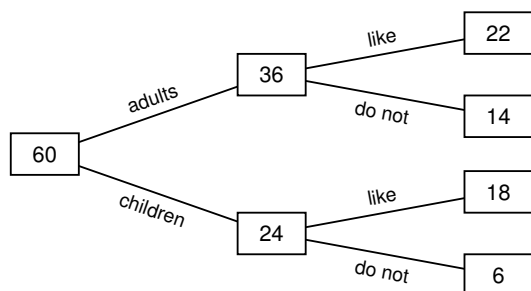


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E2 (a)

B2



B1 for at least two correct numbers.

(b) $\frac{18}{60} = \frac{3}{10}$

B1

E3 Ben, because he rolled the dice many more times (300 compared with 20).

C2

E4 (a) $150 \div 6 = 25$

B1

(b) 41 is far more than 25, so the dice is probably biased towards 6

C1

E5 (a) 0.28×250

M1

70

A1

(b) 0.28 is only an estimate from an experiment. The true probability may be different.

C1

E6 $P(\text{draw}) = 1 - 0.35 - 0.4 = 0.25$

M1

0.25×60

M1

15

A1

HIGHER

E7 $\frac{8}{50}$ of the fish are tagged, so $\frac{8}{50}$ of the population is 40

M1

$40 \times \frac{50}{8}$

M1

250

A1

E8 $2x + 3x + 5 + x + 45 = 200$

P1

$6x = 150$, so $x = 25$

P1

Frequency of 2 = 80, relative frequency = 0.4

P1

$0.4 \times 750 = 300$

A1



E9 Relative frequency of red = $32 \div 80 = 0.4$

P1

Blue is 0.6 of the bag, and that is 12, so the total is 20

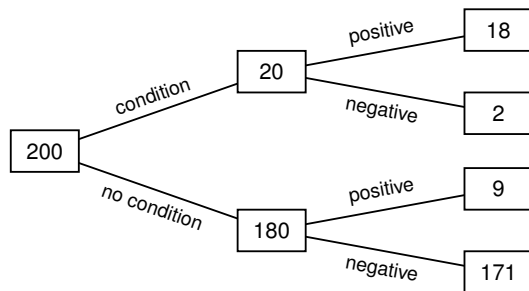
P1

Red = $20 - 12 = 8$

A1

E10 (a)

B2



(b) Positive: $18 + 9 = 27$

M1

$$\frac{18}{27} = \frac{2}{3}$$

A1

(c) Most people do not have the condition, so the 5% of them who test positive (9 people) are a large part of all positive results.

C1

