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GCSE MATHEMATICS • DATA & STATISTICS

Frequency Tables

Worked Solutions

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

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



Tap a section to jump straight to it

Full worked solutions for every question on the Frequency Tables 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 $\Sigma fx = 0 + 8 + 12 + 6 + 4 = 30$ $\Sigma f = 20$ Mean = $30 \div 20 = 1.5$

A2 20 values: the median is halfway between the 10th and 11th. Running totals 5, 11: both are 1 **1**

A3 Midpoints 25, 35, 45, 55: $150 + 350 + 135 + 55 = 690$ $690 \div 20 = 34.5$ kg

HIGHER

A4 23 values: LQ is the 6th, UQ the 18th. Running totals 4, 10, 17, 21 LQ = **1**, UQ = **3**, IQR = **2**

A5 $\Sigma f = 15 + x$, $\Sigma fx = x + 14 + 9 = 23 + x$ $23 + x = 1.4(15 + x) = 21 + 1.4x$ $2 = 0.4x$ **$x = 5$**

A6 16 is $\frac{6}{10}$ of the way through $10 < t \leq 20$: about $0.6 \times 15 = 9$ $7 + 9 = 16$

A7 $(y+2) + 3y + (2y+4) + y = 48$, so $7y + 6 = 48$ and **$y = 6$** Frequencies 8, 18, 16, 6: modal class **$5 < v \leq 10$**

B**Fluency solutions**

One mark for each correct part. The notes in italics explain why each sequence was chosen.

FOUNDATION

B1 (a) **20** (b) **2** (c) $4 - 0 = 4$ (d) $0 + 5 + 16 + 12 + 4 = 37$ *The mode is a value (2 books), not a frequency (8).*

B2 (a) $37 \div 20 = 1.85$ (b) 10th and 11th values; running totals 2, 7, 15: **2** (c) $4 + 1 = 5$ (d) **$\frac{7}{20}$**

Divide by the total frequency, 20, not by the number of columns.

B3 (a) **$30 < a \leq 40$** (b) **25** (c) 15.5th value; running totals 3, 11, 23: **$30 < a \leq 40$** (d) $12 + 7 = 19$



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B4 (a) $15 \times 3 = 45$ (b) $25 \times 8 = 200$ (c) $45 + 200 + 420 + 315 = 980$ (d) $980 \div 30 \approx 32.7$

B5 Table: 0: 2, 1: 4, 2: 8, 3: 4, 4: 2 (a) 8 (b) 2 (c) $(0 + 4 + 16 + 12 + 8) \div 20 = 2$

B6 (a) $30 - 19 = 11$ (b) $3 + 10 + 3x = 31$: $x = 6$ (c) $45 \div 18 = 2.5$ (d) $64 \div 3.2 = 20$

HIGHER

B7 23 values; running totals 2, 8, 15, 19, 23 (a) 6th value: 2 (b) 12th: 3 (c) 18th: 4 (d) 2

B8 (a) $8 + \frac{5}{10} \times 12 = 14$ (b) $\frac{5}{10} \times 15 + 5 = 12.5$ (c) $0.8 \times 12 + 15 + 0.2 \times 5 = 25.6$ (d) 20th value: $8 + 12 = 20$, so 20 minutes

Assuming values are evenly spread, take the matching fraction of each class.

B9 (a) $4 + 2x + 6 = 1.8(6 + x)$: $x = 4$ (b) $6 + 8 = 10 + x$: $x = 4$ (c) $30 + 15x + 50 = 13(8 + x)$: $x = 12$

(d) The median is the $\frac{17+x}{2}$ th value; it must be past the first 7 values and within the first $7 + x$, so $17 + x \leq 14 + 2x$: $x = 3$

B10 (a) $30 + 125 + 105 = 260$ (b) $260 \div 10 = 26$ (c) upper ends: $40 + 150 + 120 = 310$ (d) lower ends: $20 + 100 + 90 = 210$

C

Reasoning solutions

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

FOUNDATION

C1 Sam added the frequencies and divided by 5. The mean is $\Sigma fx \div \Sigma f = (0 + 6 + 10 + 12 + 8) \div 20 = 36 \div 20 = 1.8$

C2 The modal class is the class with the highest frequency, $20 < t \leq 30$, not the frequency 12 itself.

C3 The exact values are not known, so each value is replaced by its class midpoint. Using the upper ends instead would make every value as large as possible, so the answer would be higher.



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C4 $\Sigma fx = 4 + 12 + 9 + 8 = 33$ $\Sigma f = 15$ $33 \div 15 = 2.2$, as required

HIGHER

C5 The median is the middle value, not the middle row. 20 values: the 10th and 11th. Running totals 10, 12: the 10th is 1 and the 11th is 2 **1.5**

C6 Each estimate uses the midpoint of the class a value is in. With different classes, the same value is replaced by a different midpoint, so the estimates change.

C7 With discrete values, every value is known, so the middle value can be counted exactly. In a grouped table, we only know which class it is in, not its exact value.

C8 (a) $\frac{0 \times a + 1 \times b + 2 \times c}{a + b + c} = 1$, so $b + 2c = a + b + c$, which gives $c = a$

(b) There are a zeros and a twos, with b ones in the middle. The middle of the ordered list falls in the ones, or exactly between a 0 and a 2 when $b = 0$; either way the median is 1

D

Problem solving solutions

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

FOUNDATION

D1 $x = 30 - 24 = \mathbf{6}$ $\Sigma fx = 0 + 11 + 16 + 18 = 45$ Mean = $45 \div 30 = \mathbf{1.5}$

D2 The mode: the shop orders the size sold most often. Mode = **7**

Mean = $\frac{20 + 54 + 105 + 88 + 54 + 20}{47} = \frac{341}{47} \approx 7.26$, which is not a shoe size, so it is less useful here.

D3 Midpoints 15, 25, 35, 45: $90 + 600 + 280 + 90 = 1060$ $1060 \div 40 = \mathbf{26.5}$ mph

Speeding: $8 + 2 = 10$ of 40 **25**%

D4 $0 < t \leq 5$: 3, $5 < t \leq 10$: 5, $10 < t \leq 15$: 3, $15 < t \leq 20$: 1 Modal class **$5 < t \leq 10$**



HIGHER

- D5** 30 values: the median is about the 15th. The first class holds 6, so 9 more are needed from $10 < t \leq 20$, which holds 10

$$10 + \frac{9}{10} \times 10 = \boxed{19} \text{ minutes}$$

- D6** $\Sigma fx = 0 + 4 + 14 + 12 + 8 = 38$ from 20 matches After 21 matches the total must be $21 \times 2 = 42$ goals **4**

- D7** There are $15 + x$ values. The first $5 + x$ are 1s and 2s, and the 3s run up to the $(9 + x)$ th value. The median is 3 when the middle position is past $5 + x$ and within $9 + x$. Checking: $x = 0, 1, 2, 3, 4$ work, and $x = 5$ gives a median of 2.5 **0, 1, 2, 3, 4**

- D8** $4 + x + y + 3 = 20$, so $x + y = 13$
 $5 \times 4 + 15x + 25y + 35 \times 3 = 19.5 \times 20$, so $15x + 25y = 265$, which gives $3x + 5y = 53$
 $3x + 3y = 39$, so $2y = 14$ **y = 7, x = 6**

E**Exam practice solutions**

Marks are shown on the right of each line.

FOUNDATION

Foundation and Higher crossover

- E1** (a) **1** B1
 (b) $\Sigma fx = 0 + 7 + 12 + 6 + 4 = 29$ M1
 $\Sigma f = 20$ M1
 $29 \div 20 = \boxed{1.45}$ A1
- E2** (a) **$160 < h \leq 165$** B1
 (b) 13th value; running totals 3, 10, 19: **$160 < h \leq 165$** B1
- E3** (a) Midpoints 5, 15, 25, 35 M1
 $30 + 120 + 100 + 70 = 320$ M1
 $320 \div 20 = \boxed{16}$ minutes A1
 (b) The exact times are not known; the midpoints are used instead C1



- E4** (a) $40 - 28 = 12$ B1
 (b) $0 + 12 + 24 + 24 + 8 = 68$ M1
 $68 \div 40 = 1.7$ A1

- E5** Sam divided by the number of columns, 5, instead of the number of values, 20 C1
 $48 \div 20 = 2.4$ B1

HIGHER

- E6** 23 values: LQ is the 6th, UQ the 18th M1
 Running totals 3, 8, 16, 20: LQ = 1, UQ = 3 M1
 IQR = 2 A1

- E7** 50 is halfway through $40 < w \leq 60$ M1
 About $\frac{1}{2} \times 12 = 6$ from that class M1
 $6 + 4 = 10$ A1

- E8** (a) Midpoints 10, 30, 50, 70 M1
 $40 + 300 + 600 + 280 = 1220$ M1
 $1220 \div 30 \approx 40.7$ kg A1
 (b) The median is the 15.5th value; running totals 4, 14, 26, so it is in $40 < w \leq 60$. The estimated mean, 40.7, is also in that class C1

- E9** (a) $\Sigma fx = k + 2(k + 1) + 3(k + 2) + 4(k + 3) = 10k + 20$ M1
 $\Sigma f = 4k + 6$, so the mean is $\frac{10k + 20}{4k + 6}$ A1 as required
 (b) $\frac{10k + 20}{4k + 6} - 2.5 = \frac{10k + 20 - (10k + 15)}{4k + 6} = \frac{5}{4k + 6}$ M1
 This is positive, so the mean is greater than 2.5 C1
 (c) $\frac{5}{4k + 6}$ gets smaller and smaller, so the mean gets closer and closer to 2.5 C1

