

# Estimating a mean from grouped data

Year 8 About 60 minutes No calculator 47 marks



Hints online, answers free with an account:  
mathswariz.uk/worksheets/ks3-year-8-estimating-a-mean-from-grouped-data/

Date \_\_\_\_\_

## A Do Now

Quick questions to start.

**A1** Last lesson [1 mark] **A2** Needed today [1 mark]

A two-way table shows 28 students. 15 are boys. 8 of the girls have a pet. How many girls have no pet?

Answer .....

Answer .....

**A3** Needed today [1 mark] **A4** From chapter 3 [1 mark]

Work out the mean of 6, 9, 11 and 14.

Answer .....

Each exterior angle of a regular polygon is  $40^\circ$ . How many sides does it have?

Answer .....

## B Example, then your turn

Year 8

Your teacher works through each example with you. Then try the one beside it.

### EXAMPLE 1

The table shows the masses of 20 parcels. Work out an estimate of the mean mass.

| Mass $m$ (kg)    | Frequency |
|------------------|-----------|
| $0 < m \leq 4$   | 3         |
| $4 < m \leq 8$   | 7         |
| $8 < m \leq 12$  | 6         |
| $12 < m \leq 16$ | 4         |

**Hint** Use the mid-value of each class. Multiply it by the frequency, add up, then divide by 20.

**B1** The table shows the heights of 25 seedlings. Work out an estimate of the mean height. [3 marks]

| Height $h$ (cm)  | Frequency |
|------------------|-----------|
| $10 < h \leq 20$ | 4         |
| $20 < h \leq 30$ | 9         |
| $30 < h \leq 40$ | 8         |
| $40 < h \leq 50$ | 4         |

Answer ..... cm

**EXAMPLE 2**

The table shows how long 50 customers waited at a bank. The classes are not all the same width. Work out an estimate of the mean time.

| Time $t$ (min)   | Frequency |
|------------------|-----------|
| $0 < t \leq 10$  | 7         |
| $10 < t \leq 15$ | 12        |
| $15 < t \leq 20$ | 18        |
| $20 < t \leq 30$ | 13        |

**Hint** The mid-value of  $10 < t \leq 15$  is 12.5. Work out each mid-value with care.

**EXAMPLE 3**

The table shows how many books 20 students read in a term. Estimate (i) the total number of books read, (ii) the mean number of books.

| Books read | Frequency |
|------------|-----------|
| 0–4        | 5         |
| 5–9        | 8         |
| 10–14      | 4         |
| 15–19      | 3         |

**Hint** The class 0–4 holds 0, 1, 2, 3, 4, so its mid-value is 2.

- B2** The table shows the masses of 25 apples. Work out an estimate of the mean mass. [3 marks]

| Mass $m$ (g)       | Frequency |
|--------------------|-----------|
| $80 < m \leq 100$  | 3         |
| $100 < m \leq 110$ | 6         |
| $110 < m \leq 120$ | 9         |
| $120 < m \leq 150$ | 7         |

Answer ..... g

- B3** The table shows the number of people in each of 40 cars. Estimate the total number of people in the cars, and the mean number of people per car to 1 decimal place. [3 marks]

| People in car | Frequency |
|---------------|-----------|
| 1             | 14        |
| 2             | 10        |
| 3             | 6         |
| 4–6           | 7         |
| 7–9           | 3         |

Answer total ..... mean .....

**EXAMPLE 4**

The table shows the ages of 35 people at a party. Write down (i) the modal class, (ii) the class that contains the median.

| Age $a$ (years)  | Frequency |
|------------------|-----------|
| $0 < a \leq 10$  | 5         |
| $10 < a \leq 20$ | 9         |
| $20 < a \leq 30$ | 8         |
| $30 < a \leq 40$ | 11        |
| $40 < a \leq 50$ | 2         |

**Hint** The median is the 18th age in order. Add up the frequencies from the top until you pass 18.

- B4** The table shows the times of 27 runners. Write down the modal class and the class that contains the median. [2 marks]

| Time $t$ (min)   | Frequency |
|------------------|-----------|
| $20 < t \leq 25$ | 4         |
| $25 < t \leq 30$ | 9         |
| $30 < t \leq 35$ | 7         |
| $35 < t \leq 40$ | 5         |
| $40 < t \leq 45$ | 2         |

Answer .....

**c Practice**

Year 8

- C1** The table shows the scores of 40 players in a quiz. Work out an estimate of the mean score. [3 marks]

| Score | Frequency |
|-------|-----------|
| 1–5   | 7         |
| 6–10  | 13        |
| 11–15 | 15        |
| 16–20 | 5         |

Answer .....

- C2** The table shows the test marks of 30 students. Work out the smallest possible range and the largest possible range of the marks. [2 marks]

| Mark  | Frequency |
|-------|-----------|
| 11–20 | 4         |
| 21–30 | 9         |
| 31–40 | 12        |
| 41–50 | 5         |

Answer smallest ..... largest .....

- C3** Ana works out the mean of some grouped data. Explain why her answer is only an estimate, and why she uses the mid-value of each class. [2 marks]

- C4** The times of 50 runners are grouped in a table. Every time is between 10 and 25 minutes. Max says his estimate of the mean time is 27.5 minutes. Explain how you know Max is wrong. [2 marks]

**D1**

The table shows the weekly pocket money of 40 students. Mia says, "The mid-values are 2, 6, 10 and 14.  $(2 + 6 + 10 + 14) \div 4 = 8$ , so an estimate of the mean is £8."

[3 marks]

Show that Mia is wrong. Work out an estimate of the mean.

Answer £ .....

| Money p (£)      | Frequency |
|------------------|-----------|
| $0 < p \leq 4$   | 8         |
| $4 < p \leq 8$   | 14        |
| $8 < p \leq 12$  | 12        |
| $12 < p \leq 16$ | 6         |

**D2** The table shows the time 60 students spent on homework one evening.

(a) Write down the modal class.

[1 mark]

Answer .....

(b) Write down the class that contains the median.

[1 mark]

Answer .....

(c) Work out an estimate of the mean time.

[3 marks]

Answer ..... minutes

Total for D2: 5 marks

**D3** The table shows the times of 20 students in Year 7 and 20 students in Year 8 to run 400 m.

(a) Work out an estimate of the mean time for each year group.

[4 marks]

| Time t (s)        | Year 7 | Year 8 |
|-------------------|--------|--------|
| $60 < t \leq 70$  | 2      | 4      |
| $70 < t \leq 80$  | 5      | 8      |
| $80 < t \leq 90$  | 8      | 6      |
| $90 < t \leq 100$ | 5      | 2      |

Answer Year 7 ..... s    Year 8 ..... s

(b) Which year group was faster? Give two reasons for your answer.

[2 marks]

Total for D3: 6 marks

- D4** 30 people did a sponsored walk. The table shows how far they walked. Each person raised £3 for every kilometre they walked. Work out an estimate of the total money raised. You must show your working.

[4 marks]

Answer £.....

| Distance $d$ (km) | Frequency |
|-------------------|-----------|
| $0 < d \leq 5$    | 4         |
| $5 < d \leq 10$   | 11        |
| $10 < d \leq 15$  | 9         |
| $15 < d \leq 20$  | 6         |

## E Extension

Stretch

No route is given. The hints are at the end of the sheet. Use one at a time.

- E1** The table shows how long some people waited for a train. One frequency is missing. An estimate of the mean waiting time is exactly 19 minutes. Work out the value of  $x$ .

[5 marks]

| Time $t$ (min)   | Frequency |
|------------------|-----------|
| $0 < t \leq 10$  | 3         |
| $10 < t \leq 20$ | $x$       |
| $20 < t \leq 30$ | 9         |
| $30 < t \leq 40$ | 4         |

Answer .....

### Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** Write the estimated total time and the total frequency in terms of  $x$ .
- Hint 2** Total time  
 $= 5 \times 3 + 15x + 25 \times 9 + 35 \times 4 = 380 + 15x$ . Total frequency  $= 16 + x$ .
- Hint 3** Solve  $380 + 15x = 19(16 + x)$ , so  
 $380 + 15x = 304 + 19x$ .

### How did it go?

Colour one circle on each line: not yet, nearly, yes.

I can estimate the mean of grouped data using mid-values.



I can find the modal class and the class that contains the median.



I can use an estimated mean or total to answer a question.

