

Averages from grouped data

About 55 minutes Calculator allowed 44 marks



Hints online, answers free with an account:
mathswariz.uk/worksheets/stats-averages-from-grouped-data/

Date _____

A Do Now

The first question is what today's lesson needs. The others bring back earlier topics.

- A1** Needed today [2 marks] **A2** From chapter 4 [2 marks]
The 27 boxes in van A have a mean mass of 53 kg. The 18 boxes in van B have a mean mass of 30 kg. Work out the mean mass of all the boxes in the two groups together.
- Town R has 15\,000 people and 14% of them are aged 65 and over. Town S has 50\,000 people and 6% of them are aged 65 and over. Kemi says, "The bar for people aged 65 and over is longer on Town R's pyramid, so more people aged 65 and over live in Town R." Is Kemi correct?

Answer

- A3** Maths skill [2 marks] **A4** Maths skill [2 marks]
A car is worth £1900. Its value falls by 30% each year. Find its value after 2 years.
- A bag holds only red, blue and green counters. $P(\text{red}) = 0.15$ and $P(\text{blue}) = 0.55$. There are 140 counters in the bag. How many are green?

Answer

Answer

B Example, then your turn

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

EXAMPLE 1

The table shows the times, t minutes, that 40 people waited at a clinic. Work out an estimate of the mean waiting time. Explain why your answer is only an estimate.

Time, t (minutes)	Frequency
$0 < t \leq 10$	4
$10 < t \leq 20$	10
$20 < t \leq 30$	14
$30 < t \leq 40$	8
$40 < t \leq 60$	4

Hint Use the midpoint of each class.

EXAMPLE 2

The table shows the heights, h cm, of 35 plants. Write down the modal class. Find the class that contains the median.

Height, h (cm)	Frequency
$0 < h \leq 5$	3
$5 < h \leq 10$	12
$10 < h \leq 15$	9
$15 < h \leq 20$	7
$20 < h \leq 25$	4

Hint Half of 35 is 17.5. Add up the frequencies until you pass it.

EXAMPLE 3

The table shows the distances, d km, that 60 people travel to work. Estimate the median distance.

Distance, d (km)	Frequency
$0 < d \leq 10$	6
$10 < d \leq 20$	15
$20 < d \leq 30$	20
$30 < d \leq 40$	13
$40 < d \leq 50$	6

Hint Find how far into the median class the 30th value is.

- B1** The table shows the masses, m grams, of 50 apples. Work out an estimate of the mean mass. [3 marks]

Mass, m (grams)	Frequency
$100 < m \leq 120$	6
$120 < m \leq 140$	14
$140 < m \leq 160$	18
$160 < m \leq 180$	9
$180 < m \leq 200$	3

Answer

- B2** The table shows the ages, a years, of 60 people at a gym class. Write down the modal class and the class that contains the median. [2 marks]

Age, a (years)	Frequency
$10 < a \leq 20$	5
$20 < a \leq 30$	18
$30 < a \leq 40$	16
$40 < a \leq 50$	13
$50 < a \leq 60$	8

Answer

- B3** The table shows the lengths, t minutes, of 80 phone calls. Estimate the median length. [3 marks]

Length, t (minutes)	Frequency
$0 < t \leq 5$	8
$5 < t \leq 10$	20
$10 < t \leq 15$	30
$15 < t \leq 20$	16
$20 < t \leq 25$	6

Answer

EXAMPLE 4

The table shows the heights, h cm, of 20 seedlings. Their actual heights add up to 171 cm. Compare the estimate of the mean with the true mean. Explain why they are different.

Height, h (cm)	Frequency
$0 < h \leq 4$	3
$4 < h \leq 8$	7
$8 < h \leq 12$	6
$12 < h \leq 16$	4

Hint Work out both means first.

B4 The table shows the times, t minutes, of 40 commutes. [4 marks]

Work out an estimate of the mean. The actual mean of the 40 times is 26.4 minutes. Give a reason why your estimate is different.

Time, t (minutes)	Frequency
$0 < t \leq 15$	6
$15 < t \leq 30$	18
$30 < t \leq 45$	12
$45 < t \leq 60$	4

c Practice

- C1** The table shows the ages, a years, of 50 people at a café. [3 marks]
The classes are not all the same width. Work out an estimate of the mean age.

Age, a (years)	Frequency
$0 < a \leq 15$	6
$15 < a \leq 25$	14
$25 < a \leq 40$	18
$40 < a \leq 60$	8
$60 < a \leq 80$	4

Answer

- C2** Ana says, "There are five classes, so the median is in the middle one, $20 < x \leq 30$." [2 marks]

The table shows the number of minutes, x , that 50 students spent on homework. Is Ana right? Give a reason.

Time, x (minutes)	Frequency
$0 < x \leq 10$	14
$10 < x \leq 20$	18
$20 < x \leq 30$	8
$30 < x \leq 40$	6
$40 < x \leq 50$	4

C3 The table shows the number of hours, h , that some pupils spent reading last week. An estimate of the mean is 7.6 hours. Work out x . [3 marks]

Hours, h	Frequency
$0 < h \leq 4$	6
$4 < h \leq 8$	x
$8 < h \leq 12$	10
$12 < h \leq 16$	4

C4 A table of 30 bus journey times has a last class $60 < t \leq 120$ minutes. Only two journeys are in it, and they took 61 and 65 minutes. Will the estimate of the mean from the table be too high or too low? Explain why. [2 marks]

Answer

D Exam-style questions

D1 Sam says, "The estimate of the mean is $(5 + 15 + 25 + 35 + 45) \div 5 = 25$ seconds." [3 marks]

The table shows the times, t seconds, that 50 web pages took to load. Is Sam correct? You must show your working.

Time, t (s)	$0 < t \leq 10$	$10 < t \leq 20$	$20 < t \leq 30$	$30 < t \leq 40$	$40 < t \leq 50$
Frequency	2	6	10	14	18

D2 The table shows the waiting times, t minutes, of 40 customers at Shop A.

Time, t (min)	$0 < t \leq 2$	$2 < t \leq 4$	$4 < t \leq 6$	$6 < t \leq 8$	$8 < t \leq 10$
Frequency	8	14	10	5	3

(a) Work out an estimate of the mean waiting time. [3 marks]

Answer

(b) Estimate the median waiting time. Give your answer to 2 decimal places. [3 marks]

Answer

(c) At Shop B, the median waiting time was 4.9 minutes. Compare the waiting times at the two shops. [2 marks]

Total for D2: 8 marks

E Extension

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

E1 The table shows the lengths, l cm, of some leaves. One frequency is x . An estimate of the median, found by interpolation, is 23 cm. Work out x . [3 marks]

Length, l (cm)	$0 < l \leq 10$	$10 < l \leq 20$	$20 < l \leq 30$	$30 < l \leq 40$
Frequency	8	x	20	12

Answer

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** There are $40 + x$ leaves, so the median is the $\frac{40+x}{2}$ th value. It is in $20 < l \leq 30$.
- Hint 2** 23 is 3 cm into a class of width 10, so the median is $\frac{3}{10} \times 20 = 6$ values into the class.
- Hint 3** $\frac{40+x}{2} = 8 + x + 6$.

How did it go?

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

- I can estimate the mean from a grouped table and say why it is an estimate. ☐ ☐ ☐
- I can find the modal class, the median class and the median by interpolation. ☐ ☐ ☐
- I can say why an estimate differs from the true value. ☐ ☐ ☐