



Skew

About 45 minutes Calculator allowed 36 marks

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** **Last lesson** [2 marks]
- Box plots show the times, in minutes, two classes took to finish a test. Class P: median 29, interquartile range 7. Class Q: median 25, interquartile range 9. Compare the two distributions.

Answer
- The scores of 5 golfers on one hole were 6, 2, 8, 2, 7. Work out the standard deviation. Give your answer to 2 decimal places.

Answer

- A3** **Maths skill** [2 marks] **A4** **Maths skill** [2 marks]
- Write $\frac{100}{16}$ as a mixed number in its simplest form.

Answer
- Find the gradient of the line through (4, -5) and (1, -3).

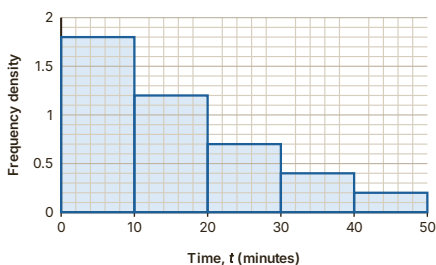
Answer

B Example, then your turn

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

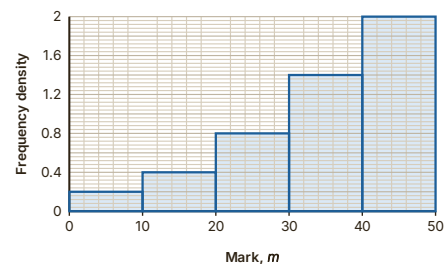
EXAMPLE 1

The histogram shows the times that 43 customers spent in a shop. Describe the skew and say what it means.



Hint Where is the peak? Which way does the long tail go?

- B1** [2 marks]
- The histogram shows the marks of 48 students in a test out of 50. Describe the skew and say what it means.



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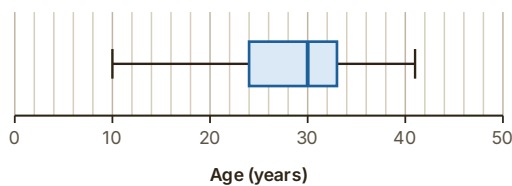
EXAMPLE 2

The prices of the houses sold in a town last year have a mean of £312 000, a median of £265 000 and a mode of £240 000. Describe the skew. Which average best represents a typical price?

Hint Put the three averages in order of size.

EXAMPLE 3

The box plot shows the ages of the members of a running club. Describe the skew.



Hint Compare the distance from the lower quartile to the median with the distance from the median to the upper quartile.

EXAMPLE 4

A set of times has a mean of 48.6 seconds, a median of 51 seconds and a standard deviation of 8 seconds. Work out $\text{skewness} = \frac{3(\text{mean} - \text{median})}{\text{standard deviation}}$ and say what it shows.

Hint Put the numbers in the formula. The sign gives the direction of the skew.

B2 The lifetimes of some batteries have a mean of 18.2 hours, a median of 20.5 hours and a mode of 21 hours. Describe the skew and say what it means for the batteries.

B3 The box plot shows the prices, in pounds, of the books in a shop. Describe the skew. Give a reason.



B4 The lengths of some fish have a mean of 27.4 cm, a median of 25.0 cm and a standard deviation of 6.2 cm. Work out the skewness. Say what type of skew this shows.

Answer Skewness skew

c Practice

C1 A data set has a mean of 54, a standard deviation of 10 and a skewness of -0.6 . Work out the median. [2 marks]

Answer

C2 The salaries in a company have strong positive skew. Which average should be used to describe a typical salary? Give a reason. [1 mark]

C3 Here are the numbers of minutes late of 10 trains. [3 marks]
3, 4, 4, 4, 5, 6, 7, 9, 12, 16
The standard deviation is 3.97 minutes. Work out the skewness of the times.

C4 The skewness of the times taken to deliver some parcels is 1.4. Say what this tells you about the delivery times. [1 mark]

Answer

D Exam-style questions

D1 The waiting times at a doctor's surgery have positive skew. [3 marks]
Ella says, "Positive skew means that most patients have a long wait."
Is Ella right? Give a reason.

D2 The weekly earnings of the staff at Shop A have a mean of £320, a median of £280, a mode of £250 and a standard deviation of £80.
(a) Work out the skewness of the earnings at Shop A. [2 marks]

Answer

(b) The earnings at Shop B have a skewness of -0.4 . Compare the skew of the earnings at the two shops. [2 marks]

(c) Which average best represents the earnings at Shop A? Give a reason. [1 mark]

Total for D2: 5 marks

E Extension

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

- E1** A data set has a mean of 30, a median of 27 and a standard deviation of 12. Every value x is replaced by $50 - 2x$. [4 marks]

Work out the skewness of the new data set.

Answer

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** Work out the new mean, the new median and the new standard deviation one at a time.
- Hint 2** The new mean is $50 - 2 \times 30 = -10$ and the new median is $50 - 2 \times 27 = -4$.
- Hint 3** Adding 50 does not change the spread, and multiplying by -2 doubles it, so the new standard deviation is 24. Put the three values in the formula.

How did it go?

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

I can describe the skew of a distribution from a diagram or from its averages. ☐ ☐ ☐

I can work out the skewness with $3(\text{mean} - \text{median}) \div \text{standard deviation}$. ☐ ☐ ☐

I can say what skew means in context, and which average to use. ☐ ☐ ☐