Calculating skew

Grade 8 | Worked solutions

GCSE Statistics topic practice

1 The marks scored by a class in a science test have mean 52, median 55 and standard deviation 6.

a. Calculate the skew of the marks. (2)

b. Describe the skew of the distribution. (1)

(3 marks)

a)

$$\text{skew} = \frac{3(\text{mean} - \text{median})}{\text{standard deviation}}$$

$$\text{skew} = \frac{3 \times (52 - 55)}{6}$$

$$\text{skew} = \frac{-9}{6}$$

$$\text{skew} = -1.5$$

b) The skew is less than 0

Negative skew

a) -1.5 b) negative skew

2 The annual salaries of the staff at a company have mean £31 400, median £28 600 and standard deviation £6000.

a. Calculate the skew of the salaries. (2)

b. Interpret your answer to part (a) in context. (1)

c. Which average, the mean or the median, better represents a typical salary at this company? Give a reason for your answer. (1)

(4 marks)

a)

$$\text{skew} = \frac{3(\text{mean} - \text{median})}{\text{standard deviation}}$$

$$\text{skew} = \frac{3 \times (31400 - 28600)}{6000}$$

$$\text{skew} = \frac{3 \times 2800}{6000}$$

$$\text{skew} = \frac{8400}{6000}$$

$$\text{skew} = 1.4$$

b) The skew is positive

Most staff have lower salaries

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A few staff have much higher salaries

c)

The median

It is not affected by the few very high salaries

a) 1.4 b) positive skew c) median

3 The table shows information about the journey times, in minutes, on two bus routes.

	Mean	Median	Standard deviation
Route A	34	31	6
Route B	30	31.5	9

a. Calculate the skew for each route. (3)

b. Compare the skew of the two distributions. (1)

(4 marks)

a) skew = 3(mean - median) ÷ standard deviation

$$\text{skew A} = \frac{3 \times (34 - 31)}{6}$$

$$\text{skew A} = \frac{9}{6}$$

$$\text{skew A} = 1.5$$

$$\text{skew B} = \frac{3 \times (30 - 31.5)}{9}$$

$$\text{skew B} = \frac{-4.5}{9}$$

$$\text{skew B} = -0.5$$

b) 1.5 is positive and -0.5 is negative

Route A has positive skew and Route B has negative skew

The skew is stronger for Route A

a) A 1.5, B -0.5 b) A positive, B negative

4 The ages, x years, of the 20 members of a chess club are summarised below.

$\Sigma x = 480$ $\Sigma x^2 = 12\,020$

The median age is 22 years.

a. Calculate the mean and the standard deviation of the ages. (3)

b. Calculate the skew of the ages. (2)

(5 marks)

a)

$$\text{mean} = \frac{\text{sum of } x}{n}$$

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$$\text{mean} = \frac{480}{20}$$

$$\text{mean} = 24 \text{ years}$$

$$\text{sd} = \sqrt{\left(\frac{\text{sum of } x^2}{n} - \text{mean}^2\right)}$$

$$\text{sd} = \sqrt{\left(\frac{12020}{20} - 24^2\right)}$$

$$\text{sd} = \sqrt{(601 - 576)}$$

$$\text{sd} = \sqrt{25}$$

$$\text{sd} = 5 \text{ years}$$

Mean 24 years, sd 5 years

b)

$$\text{skew} = \frac{3(\text{mean} - \text{median})}{\text{standard deviation}}$$

$$\text{skew} = \frac{3 \times (24 - 22)}{5}$$

$$\text{skew} = \frac{6}{5}$$

$$\text{skew} = 1.2$$

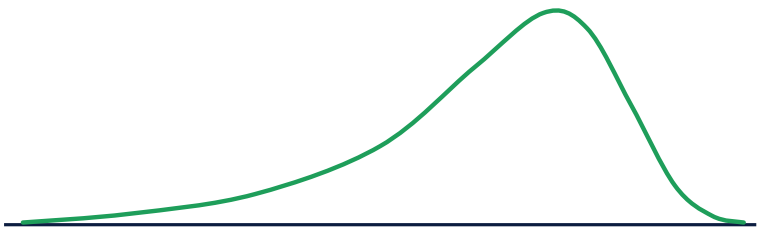
a) mean 24 years, sd 5 years b) 1.2

5 The masses of the dogs at a rescue centre have mean 17.4 kg and standard deviation 8 kg. The skew of the masses is −0.6

a. Work out the median mass. (3)

b. On the axes, sketch a possible shape for the distribution of the masses. (1)

c. Is a normal distribution a suitable model for these masses? Give a reason for your answer. (1)



Mass (kg)

(5 marks)

a)

$$\text{skew} = \frac{3(\text{mean} - \text{median})}{\text{standard deviation}}$$

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$$-0.6 = \frac{3(17.4 - \text{median})}{8}$$

$$-4.8 = 3(17.4 - \text{median})$$

$$-1.6 = 17.4 - \text{median}$$

$$\text{median} = 17.4 + 1.6$$

$$\text{median} = 19 \text{ kg}$$

b) The skew is negative

The longer tail is on the left

The peak is on the right

c)

No, a normal distribution is symmetrical (skew 0)

This distribution has negative skew

a) 19 kg b) tail on the left c) no, not symmetrical

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