Standardised scores

Grade 7 | Worked solutions

GCSE Statistics topic practice

1 The typing speeds of the staff in an office have a mean of 42 words per minute and a standard deviation of 8 words per minute.

a. Priya's typing speed is 56 words per minute. Calculate Priya's standardised score. (2)

b. Tom's standardised score is −0.5. What does this tell you about Tom's typing speed? (1)

(3 marks)

a) standardised score = $\frac{\text{value - mean}}{\text{standard deviation}}$

$\text{score} = \frac{56 - 42}{8}$

$\text{score} = \frac{14}{8}$

score = 1.75

b)

A negative score is below the mean

Tom types more slowly than the mean speed

(half a standard deviation below it)

a) 1.75 b) below the mean speed

2 Leo takes part in two races on his school sports day. The table shows the mean and the standard deviation of the times of all the students in each race, and Leo's times. All times are in seconds.

Race	Mean	Standard deviation	Leo's time
100 m swim	72	4	66
400 m run	80	6	68

a. Calculate Leo's standardised score for each race. (2)

b. In which race did Leo do better, compared with the other students? Give a reason for your answer. (2)

(4 marks)

a) standardised score = $\frac{\text{time - mean}}{\text{standard deviation}}$

$\text{Swim} = \frac{66 - 72}{4}$

$\text{Swim} = \frac{-6}{4}$

$\text{Swim} = -1.5$

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$$\text{Run} = \frac{68 - 80}{6}$$

$$\text{Run} = \frac{-12}{6}$$

Run = -2

b)

In a race, a lower time is better

so a lower standardised score is better

-2 is lower than -1.5

Leo did better in the 400 m run

a) swim -1.5, run -2 b) the 400 m run

3 Amara and Ben are in the same year group. The table shows the mean and standard deviation of the year group's marks in two tests, and Amara's marks.

Test	Mean	Standard deviation	Amara's mark
Maths	56	8	68
Physics	52	5	61

a. Calculate Amara's standardised score for each test. (2)

b. In which test did Amara do better, compared with the rest of the year group? Give a reason for your answer. (1)

c. Ben's standardised score in the Maths test was −0.75. Work out Ben's mark in the Maths test. (2)

(5 marks)

a) standardised score = $\frac{\text{mark} - \text{mean}}{\text{standard deviation}}$

$$\text{Maths} = \frac{68 - 56}{8}$$

$$\text{Maths} = \frac{12}{8}$$

Maths = 1.5

$$\text{Physics} = \frac{61 - 52}{5}$$

$$\text{Physics} = \frac{9}{5}$$

Physics = 1.8

b)

1.8 is greater than 1.5

Amara did better in Physics

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Her Physics mark is further above the mean, measured in standard deviations

c) mark = mean + (standardised score × sd)

$$\text{mark} = 56 + (-0.75 \times 8)$$

$$\text{mark} = 56 - 6$$

$$\text{mark} = 50$$

a) Maths 1.5, Physics 1.8 b) Physics c) 50

4 A company gives every job applicant the same aptitude test. The mean mark is 62

a. Zara's mark of 74 has a standardised score of 1.6. Work out the standard deviation. (2)

b. Omar's standardised score is −0.8. Work out Omar's mark. (2)

(4 marks)

a) $\text{standardised score} = \frac{\text{mark} - \text{mean}}{\text{sd}}$

$$1.6 = \frac{74 - 62}{\text{sd}}$$

$$1.6 = \frac{12}{\text{sd}}$$

$$\text{sd} = \frac{12}{1.6}$$

$$\text{sd} = 7.5$$

b) mark = mean + (standardised score × sd)

$$\text{mark} = 62 + (-0.8 \times 7.5)$$

$$\text{mark} = 62 - 6$$

$$\text{mark} = 56$$

a) 7.5 b) 56

5 In a music theory exam, Aleks scores 70 marks (standardised score 1.25) and Bethan scores 46 marks (standardised score −1.75)

a. Work out the mean and the standard deviation of the marks in the exam. (4)

b. Chen has a mark of 64 in the same exam. Work out his standardised score. (1)

(5 marks)

a) Difference between the two marks

$$70 - 46 = 24$$

Difference between the two standardised scores

$$1.25 - (-1.75) = 3$$

24 marks is 3 standard deviations

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$sd = 24 \div 3$

$sd = 8$

Aleks is 1.25 standard deviations above the mean

$mean = 70 - 1.25 \times 8$

$mean = 70 - 10$

$mean = 60$

Check with Bethan

$\frac{46 - 60}{8} = -1.75$

b)

$score = \frac{64 - 60}{8}$

$score = \frac{4}{8}$

$score = 0.5$

a) mean 60, sd 8 b) 0.5

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