



H05-test Standardised Scores: Test Pack

EDEXCEL 1ST0 · Calculator allowed · about 20 minutes

Total Marks

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** A standardised score, or z-score, tells you how many standard deviations a value lies above or below the mean of a data set.

$$z = (x - \text{mean}) / (\text{standard deviation})$$

In a Year 11 statistics mock test, the mean mark was 60 and the standard deviation was 10.

- (a)** Ahmed scored 75 marks. Work out Ahmed's standardised (z) score. (2)

-
(b) Bella scored 51 marks. Work out Bella's standardised (z) score. (2)

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(c) State, giving a reason, which of Ahmed and Bella performed better relative to the rest of the group. (1)

(Total for Question 1 is 5 marks)

2 Four students are asked to identify the correct formula for a standardised (z) score.

(a) Which of these is the correct formula for a standardised (z) score? (1)

☐ A) $z = (x - \text{mean}) / (\text{standard deviation})$

☐ B) $z = (\text{mean} - x) / (\text{standard deviation})$

☐ C) $z = (x - \text{standard deviation}) / \text{mean}$

☐ D) $z = x / (\text{mean} \times \text{standard deviation})$

(b) Explain why formula B would give the wrong sign for a raw value that is above the mean. (1)

(Total for Question 2 is 2 marks)

3 In her end-of-year exams, Priya's raw marks and her class's statistics were as follows.

Subject	Class mean	Class standard deviation	Priya's raw mark
Maths	58	12	82
Science	60	6	78

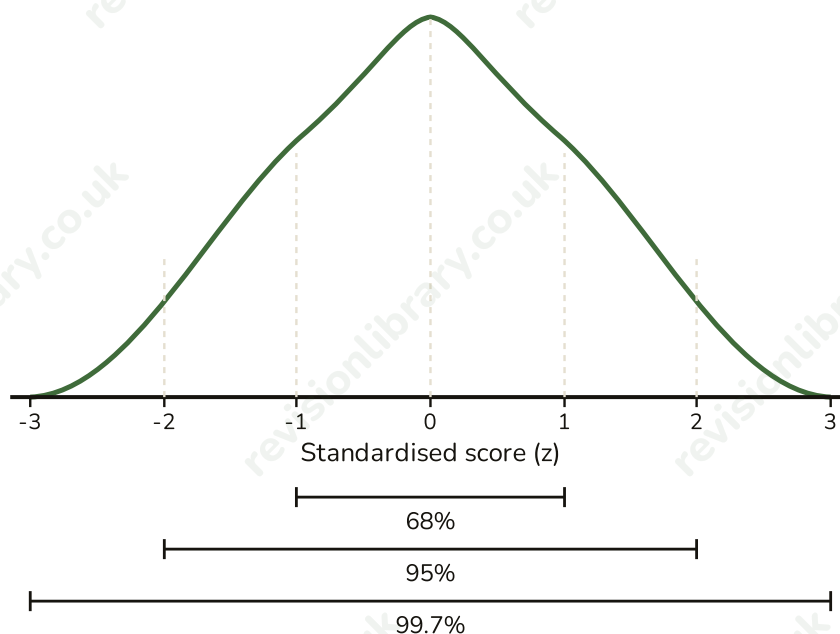
(a) Work out Priya's standardised (z) score in Maths. (2)

(b) Work out Priya's standardised (z) score in Science. (2)

(c) Priya scored a higher raw mark in Maths (82) than in Science (78). Use the z-scores from parts (a) and (b) to explain which subject actually shows Priya's stronger performance relative to her class. (2)

(Total for Question 3 is 6 marks)

- 4 For data that is roughly normally distributed, the empirical rule links standardised scores to percentages of the data, as shown on the diagram below.



- (a) Using the diagram, write down the percentage of values that lie within 1 standard deviation of the mean. (1)
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- (b) A data set has a mean of 500 and a standard deviation of 20. Work out the range of raw values that contains approximately 95% of the results. (2)
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- (c) A student in this data set has a raw score of 545. Using your answer to part (b), explain whether this score is unusual compared with the rest of the group. (2)

(Total for Question 4 is 5 marks)

Mark scheme · H05-test Standardised Scores: Test Pack

Question 1

- (a) **M1** $(75 - 60) / 10$, oe
- (a) **A1** 1.5 cao
- **(a) Answer: 1.5**
- (b) **M1** $(51 - 60) / 10$, oe
- (b) **A1** -0.9 cao
- **(b) Answer: -0.9**
- (c) **B1** Ahmed, because his z-score (1.5) is positive/above the mean, while Bella's (-0.9) is negative/below the mean oe
- **(c) Answer: Ahmed performed better relative to the group.**

Question 2

- (a) **B1** A cao
- **(a) Answer: A) $z = (x - \text{mean}) / (\text{standard deviation})$**
- (b) **B1** formula B swaps x and the mean, so for x above the mean, (mean - x) is negative, giving a negative z when it should be positive oe
- **(b) Answer: Formula B reverses the subtraction, so a value above the mean gives a negative result instead of the correct positive z-score.**

Question 3

- (a) **M1** $(82 - 58) / 12$, oe
- (a) **A1** 2.0 cao
- **(a) Answer: 2.0**
- (b) **M1** $(78 - 60) / 6$, oe
- (b) **A1** 3.0 cao
- **(b) Answer: 3.0**
- (c) **B1** identifies Science as the stronger relative performance
- (c) **B1** correct reason: Priya's Science z-score (3.0) is higher than her Maths z-score (2.0), even though her raw Science mark was lower, because Science had a smaller spread/standard deviation oe
- **(c) Answer: Science - Priya's z-score of 3.0 in Science is higher than her z-score of 2.0 in Maths, showing she did relatively better compared with her class in Science, despite the lower raw mark.**

Question 4

- (a) **B1** 68% cao
- **(a) Answer: 68%**
- (b) **M1** $500 - 2 \times 20$ and $500 + 2 \times 20$, oe
- (b) **A1** 460 to 540 cao
- **(b) Answer: 460 to 540**
- (c) **B1** 545 is above 540, the upper end of the middle 95% range found in part (b)
- (c) **B1** so this score is unusually high, lying outside the range containing most (95%) of the group oe
- **(c) Answer: Yes, it is unusual - 545 lies just above 540, outside the range (460 to 540) that contains the middle 95% of results.**