HIGHER

H05-30min Standardised Scores: 30-minute Pack

EDEXCEL 1ST0 · Calculator allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A baby clinic records that, for babies of a certain age, the mean weight is 8.2 kg with a standard deviation of 0.6 kg. A baby is weighed at the clinic and found to weigh 9.4 kg.

(a) Work out the baby's standardised (z) score for weight. **(2)**

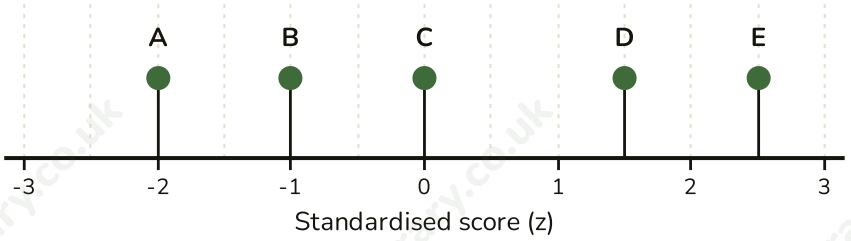
.....

(b) Interpret what this z-score tells the clinic about this baby's weight compared with other babies of the same age. **(2)**

(c) Give one reason why the clinic uses a standardised score rather than just comparing babies' raw weights. **(1)**

(Total for Question 1 is 5 marks)

2 Five contestants' standardised (z) quiz scores are shown as points A to E on the number line below. All five results come from the same general-knowledge quiz, which has a mean score of 50 and a standard deviation of 8.



(a) Write down the z-score shown at point D. **(1)**

.....

(b) Work out the raw quiz score corresponding to point E. **(2)**

.....

(c) Write down the letter of the point that represents a raw quiz score exactly equal to the mean. **(1)**

.....

(d) Point E has the largest z-score of the five. Explain what this tells you about contestant E's quiz result compared with the other four contestants. **(1)**

(Total for Question 2 is 5 marks)

3 Three runners each complete a different long-distance race, so their times are standardised against their own race's mean and standard deviation. A lower time is a better result.

Runner	Race mean time (min)	Race standard deviation (min)	Runner's time (min)
A	50	5	44
B	60	4	51
C	45	3	40.5

(a) Work out the standardised (z) score for Runner A. **(2)**

.....

(b) Work out the standardised (z) score for Runner B. **(2)**

.....

(c) Work out the standardised (z) score for Runner C. **(2)**

.....

(d) Rank the three runners from best to worst relative performance, explaining how you used the sign and size of each z-score. **(2)**

(Total for Question 3 is 8 marks)

4 Meera's raw marks and her class's statistics in three end-of-year exams were as follows.

Subject	Class mean	Class standard deviation	Meera's raw mark
Geography	54	8	70
Chemistry	60	5	71
French	50	10	73

(a) Work out Meera's standardised (z) score in Geography. **(1)**

.....

(b) Work out Meera's standardised (z) score in Chemistry. **(1)**

.....

(c) Work out Meera's standardised (z) score in French. **(1)**

.....

(d) Rank the three subjects from Meera's strongest to weakest relative performance, and state which subject shows her strongest relative performance. **(2)**

(Total for Question 4 is 5 marks)

5 A student claims: 'If Priya has a higher raw score than Tom, then Priya must have a higher z-score.' Test this claim using the following data. Priya scored 66 in a test with mean 50 and standard deviation 20. Tom scored 60 in a different test with mean 40 and standard deviation 5.

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

.....

(b) Work out Tom's standardised (z) score. **(2)**

.....

(c) Write down whether this data supports or contradicts the student's claim, giving a reason. **(1)**

.....

(Total for Question 5 is 5 marks)

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6 In a national reading assessment, raw scores are standardised so that the mean is 100 and the standard deviation is 15. A pass certificate is awarded to anyone with a standardised score of at least $z = 1.2$.

(a) Work out the minimum raw score needed to be awarded a pass certificate. **(2)**

.....

(b) A candidate scored 79 marks. Work out this candidate's z-score, and state whether they were awarded a pass certificate. **(2)**

.....

(c) Give one reason why using a standardised score, rather than a fixed raw mark, to decide who passes might be considered fairer across different years of the assessment. **(1)**

.....

(Total for Question 6 is 5 marks)

Mark scheme · H05-30min Standardised Scores: 30-minute Pack

Question 1

- (a) **M1** (9.4 - 8.2) / 0.6, oe
- (a) **A1** 2.0 cao
- **(a) Answer: 2.0**
- (b) **B1** the baby's weight is 2 standard deviations above the mean/well above average for its age
- (b) **B1** this is unusually high compared with most babies of that age, so the clinic may want to monitor the baby's growth oe
- **(b) Answer: The baby is 2 standard deviations above the average weight for its age, which is unusually heavy compared with most babies of the same age - the clinic may want to keep monitoring the baby's growth.**
- (c) **B1** babies' typical weight and spread of weights change with age, so standardising allows a fair comparison against the reference group for that specific age oe
- **(c) Answer: Standardising accounts for the fact that typical weight (and its spread) changes as babies get older, so it allows a fair comparison for a baby's own age group.**

Question 2

- (a) **B1** 1.5 cao
- **(a) Answer: 1.5**
- (b) **M1** 50 + 2.5 x 8, oe
- (b) **A1** 70 cao
- **(b) Answer: 70**
- (c) **B1** C cao
- **(c) Answer: C**
- (d) **B1** since all five results share the same mean and standard deviation, the largest z-score also means the largest raw score oe
- **(d) Answer: Contestant E has the highest raw quiz score of the five, since all results are standardised using the same mean and standard deviation.**

Question 3

- (a) **M1** (44 - 50) / 5, oe
- (a) **A1** -1.2 cao
- **(a) Answer: -1.2**
- (b) **M1** (51 - 60) / 4, oe
- (b) **A1** -2.25 cao
- **(b) Answer: -2.25**
- (c) **M1** (40.5 - 45) / 3, oe
- (c) **A1** -1.5 cao
- **(c) Answer: -1.5**
- (d) **M1** recognises that because a lower time is better, the most negative z-score represents the best relative performance
- (d) **A1** correct order: B, then C, then A cao
- **(d) Answer: Best to worst: Runner B, Runner C, Runner A.**

Question 4

- (a) **B1** 2.0 cao
- **(a) Answer: 2.0**
- (b) **B1** 2.2 cao
- **(b) Answer: 2.2**
- (c) **B1** 2.3 cao
- **(c) Answer: 2.3**
- (d) **M1** compares the three z-scores (2.0, 2.2, 2.3)
- (d) **A1** order French, Chemistry, Geography, with French identified as strongest cao
- **(d) Answer: Strongest to weakest: French, Chemistry, Geography. French is Meera's strongest relative performance.**

Question 5

- (a) **M1** (66 - 50) / 20, oe
- (a) **A1** 0.8 cao
- **(a) Answer: 0.8**
- (b) **M1** (60 - 40) / 5, oe
- (b) **A1** 4.0 cao
- **(b) Answer: 4.0**
- (c) **B1** contradicts the claim: Tom has the lower raw score (60 < 66) but the higher z-score (4.0 > 0.8) cao
- **(c) Answer: Contradicts the claim - Tom's raw score (60) is lower than Priya's (66), but Tom's z-score (4.0) is higher than Priya's (0.8).**

Question 6

- (a) **M1** 100 + 1.2 x 15, oe
- (a) **A1** 118 cao
- **(a) Answer: 118**
- (b) **M1** (79 - 100) / 15, oe
- (b) **A1** z = -1.4 and No (not awarded a pass), both required cao
- **(b) Answer: z = -1.4; No, this candidate did not achieve a pass certificate.**
- (c) **B1** the difficulty of the raw test may vary from year to year, but standardising against that year's own mean and spread keeps the pass standard consistent oe
- **(c) Answer: Standardising adjusts for the fact that the test may be harder or easier in different years, keeping the pass standard fair and consistent over time.**