GCSE Stats Revision Paper 1

35 marks - 40 minutes (ET +10 minutes)

Higher Tier Formulae

You must not write on this page.

Anything you write on this page will gain NO credit.

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

$$\text{Standard deviation} = \sqrt{\frac{1}{n}\sum(x - \bar{x})^2}$$

An alternative formula for standard deviation is

$$\text{standard deviation} = \sqrt{\frac{\sum x^2}{n} - \left(\frac{\sum x}{n}\right)^2}$$

Spearman's rank correlation coefficient

$$r_s = 1 - \frac{6\sum d^2}{n(n^2 - 1)}$$

Rates of change (e.g. Crude birth rate = $\frac{\text{number of births} \times 1000}{\text{total population}}$)

Solutions.

1

Below are the mean and standard deviation for all the 100 m races in the 1984 and 2024 Olympcsi respectively.

	1984	**2024**
Mean (seconds)	10.18	10.00
Standard Deviation (seconds)	0.09	0.14

(a) Use this information to compare the distribution of race times for the 1984 and 2024 Olympic 100m races.
Interpret one of your comparisons in context. (3 marks)

* The mean race time for 2024 was 10, whereas the mean race time for 1984 was 10.18 (B1)
* The standard deviation for 1984 was 0.09 whereas the standard deviation for 2024 was 0.14 (B1)

INTERPRET: * The race times in 1984 were more consistent than 2024
* The race times in 2024 wee faster than 1984 (B1 for either)

(b) The times of the winners of the 1984 and 2024 Olympic gold medal are shown below. Use standarised scores to decide which one was the better runner compared to the other competitors.

1984	2024
9.99s	9.79s

Explain your conclusion. (4 marks)

1984: $\frac{9.99 - 10.18}{0.09} = -2.11$ (M1)

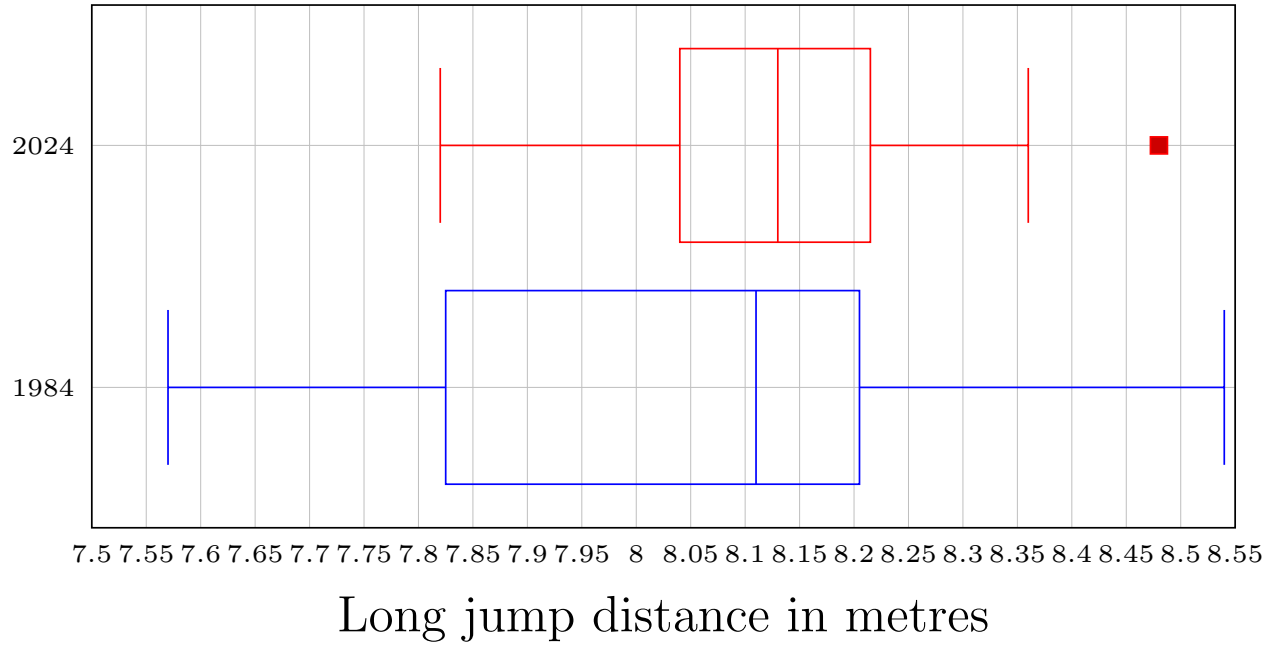
2024: $\frac{9.79 - 10.00}{0.14} = -1.5$ (M1)

(B1)

The 1984 winner was better compared to the other competitors, because his standised score shows he is more than 2 s.d from the mean, whereas 1984 winner is only 1.5 s.d from the mean. + reason (B1)

2

These two boxplots show the results for the men's long jump (qualifying and final) in the 1984 and 2024 Olympics.



(a) Given that for 2024, the lower quartile is 8.04m. median is 8.13m, upper quartile is 8.215m. Show that the winning jump of 8.48m is an outlier. (3 marks)

IQR = 8.215 − 8.04 = 0.175 M1

Upper fence: 8.215 + 1.5(0.175) = 8.4775 M1

8.48 > 8.4775 ← A sentence or inequality A1

(b) Comment on the differences between the two distributions (4 marks)

* 2024 has a median of 8.13, whereas 1984 has a median of 8.11. B1
* 1984 has an IQR of (8.205 − 7.85) 0.355 whereas 2024 has an IQR of 0.175. B1
* 2024 is symmetrical, whereas 1984 has negative skew. B1
* 2024 has one outlier, 1984 has no outliers. B1

3

Below are the scores for the Women's Street Skateboarding in the 2024 Olympics.

Skater	**Run Score**	**Best Trick**	Rank	Rank	d	d^2
Coco Yoshizawa (Japan)	96.49	90	1	2	1	1
Liz Akama (Japan)	89.26	92.62	3	1	2	4
Rayssa Leal (Brazil)	92.88	85	2	3	1	1
Chenxi Cui (China)	88.83	80	4	4	0	0
Poe Pinson (USA)	85.12	75	5	5	0	0
Paige Heyn (USA)	81.23	70	6	6	0	0

M1 M1

(a) Calculate Spearman's rank correlation coeeficient for the competitors score in the run and their best trick. (3 marks)

$$r_s = 1 - \frac{6\Sigma d^2}{n(n^2-1)}$$

$$= 1 - \frac{6(6)}{6(36-1)}$$

$$= 1 - \frac{6}{35}$$

$$= \frac{29}{35} = 0.829$$ A1

4

In a supermarket, apples are sold in bags of 6 apples.

The probability that any given apple will be bruised is 5%.

$X \sim Bin(6, 0.05)$

(a) If you buy 1 bag of apples, what is the probability that no apples will be bruised. (2 marks)

$P(X=0) = 0.95^6$ M1

$= 0.735$ A1

(b) If you buy 1 bag of apples, what is the probability that less than half of the apples with be bruised? (3 marks)

$P(X<3) = P(X=0) + P(X=1) + P(X=2)$ M1

$= 0.735 + {}^6C_1(0.05)(0.95)^5 + {}^6C_2(0.05)^2(0.95)^4$

$= 0.735 + 0.232 + 0.0305$ M1 for either.

$= 0.998$ A1

5

Below are the chainbase index numbers for the average price of petrol each month for the first 6 months of 2024.

Month	Jan	Feb	Mar	Apr	May	Jun
Chain Base Index	100	104.56	109.09	115.23	109.77	109.57

(a) Which month is the base month? (1 mark)

January

B1

(b) Which month did petrol prices increase the most? Explain your reasoning. (2 marks)

B1

April, since the chain base index number is the highest

B1 reason

(c) Calculate the average percentage increase per month for the petrol prices for the Feb - June of 2024.
Give your answer to 3 significant figures. (3 marks)

$$\sqrt[5]{104.56 \times 109.09 \times 115.23 \times 109.77 \times 109.57}$$

M1

$= 109.59$ M1

9.59% A1

6

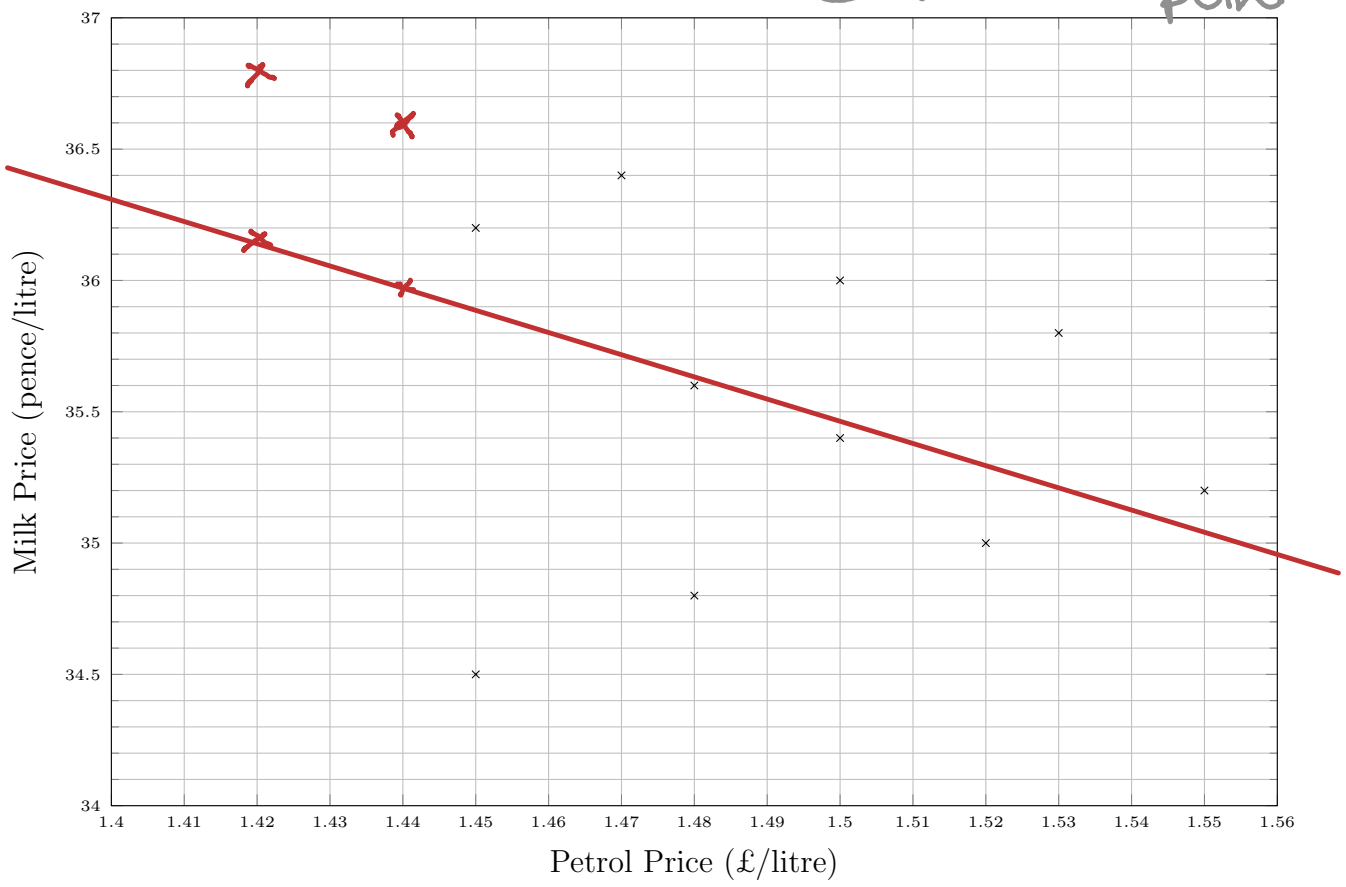
Below are the petrol and milk prices for 2024 by month:

Month	Petrol Price (£/litre)	Milk Price (pence/litre)
January	1.45	34.5
February	1.48	34.8
March	1.52	35.0
April	1.55	35.2
May	1.50	35.4
June	1.48	35.6
July	1.53	35.8
August	1.50	36.0
September	1.45	36.2
October	1.47	36.4
November	1.44	36.6
December	1.42	36.8

Below is a partially completed scatter diagram.

(a) Plot the data for November and December on the graph. (2 marks)

M1 for each point



(b) The equation of the line of best fit for this data is $y = -8.7x + 48.5$
Draw this line on your scatter diagram. (3 marks)

M1 for calculating one point
M1 for using gradient to calculating second point
A1 for correct line.

(1·42, 36·146) (1·44, 35·972)

(c) Explain whether it is valid to use this equation to predict the price of milk, when you know the price of petrol, you should make reference to the scatter diagram. (2 marks)

B1

Not valid, the data points do not look to have any linear correlation. B1 for reason.

(or equivalent statement)