Question 1

(a) Give an example of a data set where this statement is false:

"minimum $<$ **mean** $<$ maximum".

The set containing one number, for example $\{1\}$. Here, the minimum is the same as the maximum and also the mean, so we have

"minimum $=$ **mean** $=$ maximum".

Thus, the statement is false.

(b) Describe for what kind of data sets this statement is false:

"minimum $<$ **mean** $<$ maximum".

For this kind of set, we need the mean to be equal to the maximum and the minimum. So either the set contains a single element, or if more than one element, all elements of the set have the same numerical value. This also means that the standard deviation for the data will be zero.

Question 2

(i) Draw a back-to-back stem-and-leaf plot below to display the students' scores.

IQ Test 1						*IQ Test 2*				
				9	7					
			9	6	8	3				
	7	6	6	4	9	4	7	7	9	
8	5	4	4	3	10	2	5	6	8	8
		9	5	1	11	1	1	4	7	
					12	0				

Key: $9\,|\,7 =$ a score of 97

(ii) Find the range of scores for each IQ test.

Range of *IQ Test 1* $= 119 - 79 = 40.$	Range of *IQ Test 2* $= 120 - 83 = 37.$

(iii) Find the median score for each IQ test.

15 data points in each set, so median is the $\frac{15+1}{2} = 8th$ *data point.*	
Median of *IQ Test 1* $= 103.$	Median of *IQ Test 2* $= 106.$

(iv) Find the mean score for each IQ test.

Mean of *IQ Test 1* $= \frac{1506}{15} = 100 \cdot 4.$	Mean of *IQ Test 2* $= \frac{1572}{15} = 104 \cdot 8.$

(v) Compare the scores on the two IQ tests. Refer to **at least one** measure of central tendency and **at least one** measure of variability (spread) in your answer.

In general, the scores in *IQ Test 2* are slightly higher than in *IQ Test 1*, as both the mean and median are higher for *IQ Test 2*.

The scores are slightly more spread out in *IQ Test 1* than in *IQ Test 2*, as the range is bigger for *IQ Test 1*; *or* The spread of scores is very similar, as the two ranges are almost the same.

(vi) Marshall says that every student in the class must have done better on *IQ Test 2* than on *IQ Test 1*. Is Marshall correct? Explain your answer.

Answer: No.

Explanation: The person who got 119 on *IQ Test 1* could have got less, e.g. 94, on *IQ Test 2*.

Or:

Explanation: The maximum score on *IQ Test 1* is greater than the minimum score on *IQ Test 2*.

Question 3

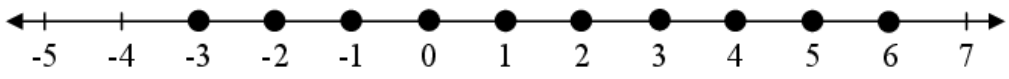
One method:

$$\begin{aligned} & -17 \le 1-3x < 13 \\ -1: \quad & -18 \le -3x < 12 \\ \div(-3): \quad & 6 \ge x > -4 \\ \text{i.e.} \quad & -4 < x \le 6. \end{aligned}$$

Or:

$$\begin{aligned} -17 \le 1-3x \quad & \text{and} \quad 1-3x < 13 \\ 3x \le 18 \quad & \text{and} \quad -3x < 12 \\ x \le 6 \quad & \text{and} \quad x > -4 \end{aligned}$$

i.e. $-4 < x \le 6$.



Question 4

(a) Represent this data on a back-to-back stem-and-leaf diagram.

Aerobics class								Swimming class						
						9	0	7	8					
			8	7	5	3	1	2	3	4	5	6	8	
		7	4	4	2	0	2	2	2	3	4	4	4	9
	9	7	7	7	3	2	3	1	3	5	6	6	8	
9	8	8	5	2	2	1	4	1	2	5	7	8		
		8	6	4	3	1	5	1	2	3				
					3	1	6	2						
								Key: 1 | 5 means 15						

(b) Use your diagram to identify the median in each case.

Aerobic median: $\frac{37+39}{2} = 38$

Swimming median: $\frac{29+31}{2} = 30$

(c) What other measure of central tendency could have been used when examining this data?

Mean or Mode

(d) Based on the data make one observation about the ages of the two groups.

An older age group take Aerobics class
or
A younger age group take Swimming class
or
Similar

Question 5

(a) Given that this question was answered by 4171 girls and 2979 boys, calculate how many female students kept their mobile phones under their pillows.

Girls – phone under pillow	=	35% of 4171	
	=	$4171 \times 0{\cdot}35$	
	=	1459·85	
	=	1460	(or 1459·85 or 1459)

(b) Calculate the overall percentage of students who kept their mobile phones under their pillows.

Total number of students	=	7150			
Boys – phone under pillow	=	23% of 2979			
	=	685·17			
	=	685	(or 685·17 or 686)		
Total	=	1460 + 685	=	2145	(or 2145·02)
Percentage	=	$\frac{2145}{7150} \times 100$	(or $\frac{2145 \cdot 02}{7150} \times 100$)		
	=	30%	(or 30·0002%).		

(c) A new pie chart is to be drawn showing the mobile phone location for all students.
Calculate the measure of the angle that would represent the students who kept their mobile phones under their pillows.

Angle	=	30% of 360°	
	=	$360 \times 0{\cdot}3$	
	=	108°	(or 108·00072)°

The mid - interval values are 5000, 15000, 25000, 35000, 45000, 55000, 65000

Mean =

$$\frac{(5000\times1)+(15\,000\times6)+(25\,000\times12)+(35\,000\times9)+(45\,000\times2)+(55\,000\times1)+(65\,000\times1)}{32}$$

$$=\frac{5000+90000+300000+315000+90000+55000+65000}{32}$$

$$=\frac{920000}{32}$$

$$=€28{,}750$$

(c) **(i)** Outline another method which could have been used to calculate the mean salary.

Add up all the individual salaries and divide by 32.

(ii) Which method is more accurate? Explain your answer.

Answer	Adding up individual salaries and dividing by 32

Reason	This gives the actual mean as estimates (mid-intervals) are not used.

Question 7

(a) Represent the data on a back-to-back stem-and-leaf diagram.

Male actors		Female actors
	9 | 2	5 6 8 9 9 9
8 8 7 7 6 2	3	0 2 3 3 3 5 5 6 9
8 7 6 5 5 3 0	4	2 5 5 9
4 2 0 0	5	
0 0	6	1

Key: 2|5 is 25 years old

(b) State one similarity and one difference that can be observed between the ages of the male and female winners.

Same shape of distribution
No one over 61
No one under 24
The range is similar in both

Outlier in female winners
No female in her 50s
The female are younger

(c) Mary says "The female winners were younger than the male winners."
Investigate this statement in relation to:

(i) The mean age of the male winners and mean age of the female winners.

Male
Sum = 887
Mean = 44·35

Female
Sum =714
Mean = 35·7

Mean age of women is lower so statement is true for mean age

(ii) The median age of the male winners and the median age of the female winners.

Male
(45+45)/2
Median = 45

Female
(33+33)/2
Median = 33

Median age of women is lower so statement is true for median age

(d) Find the interquartile ranges of the ages of the male winners and of the female winners.

Male

50 – 37·5
12·5

Female

40·5 – 29
11·5