

Core

SOLUTIONS

Question 1

Table 1 shows the percentage of women ministers in the parliaments of 22 countries in 2008.

Table 1

Country	Percentage of women ministers
Norway	56
Sweden	48
France	47
Spain	44
Switzerland	43
Austria	38 Q_3
Denmark	37
Iceland	36
Germany	33
Netherlands	33
New Zealand	32
Australia	24
Italy	24
United States	24
Belgium	23
United Kingdom	23
Ireland	21 Q_1
Liechtenstein	20
Canada	16
Luxembourg	14
Japan	12
Singapore	0

median locator:
 $\frac{(22+1)}{2} = 11\frac{1}{2}$ th
 position

$$\leftarrow \text{Median} = \frac{24+32}{2} = 28$$

- a. What proportion of these 22 countries have a higher percentage of women ministers in their parliament than Australia?

$$\frac{11}{22} = \frac{1}{2} \text{ (or } 50\%)$$

1 mark

- b. Determine the median, range and interquartile range of this data.

median 28

range 56

interquartile range $38 - 21 = 17$

2 marks

The ordered stemplot below displays the distribution of the percentage of women ministers in parliament for 21 of these countries. The value for **Canada** is missing.

stem (10s)	leaf (units)
0	0
1	2 4 6
2	0 1 3 3 4 4 4
3	2 3 3 6 7 8
4	3 4 7 8
5	6

- c. Complete the stemplot above by adding the value for Canada.

1 mark

- d. Both the median and the mean are appropriate measures of centre for this distribution.

Explain why.

The data is approximately symmetrical
with no outliers or extreme values

1 mark

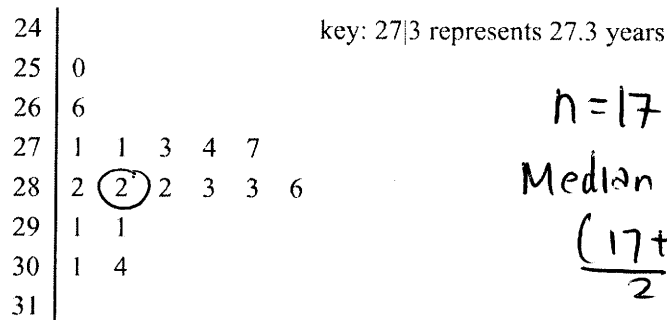
Core – continued
TURN OVER

Core

Question 1

The stemplot in Figure 1 shows the distribution of the average age, in years, at which women first marry in 17 countries.

average age, in years, of women at first marriage



$$n = 17$$

Median location

$$\frac{(17+1)}{2} \text{th} = 9 \text{th position}$$

Figure 1

- a. For these countries, determine
- i. the lowest average age of women at first marriage

25.0

- ii. the median average age of women at first marriage.

28.2

1 + 1 = 2 marks

The stemplot in Figure 2 shows the distribution of the average age, in years, at which men first marry in 17 countries.

average age, in years, of men at first marriage

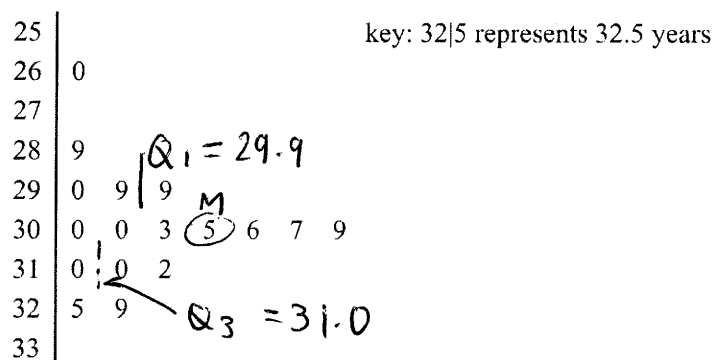


Figure 2

- b. For these countries, determine the interquartile range (IQR) for the average age of men at first marriage.

$$Q_3 - Q_1 = 31.0 - 29.9 = 1.1$$

1 mark

- c. If the data values in Fig 2 were used to construct a boxplot with outliers, the country with an average age of 26.0 would be shown as an outlier. Explain why this is so. Show an appropriate calculation to support your explanation.

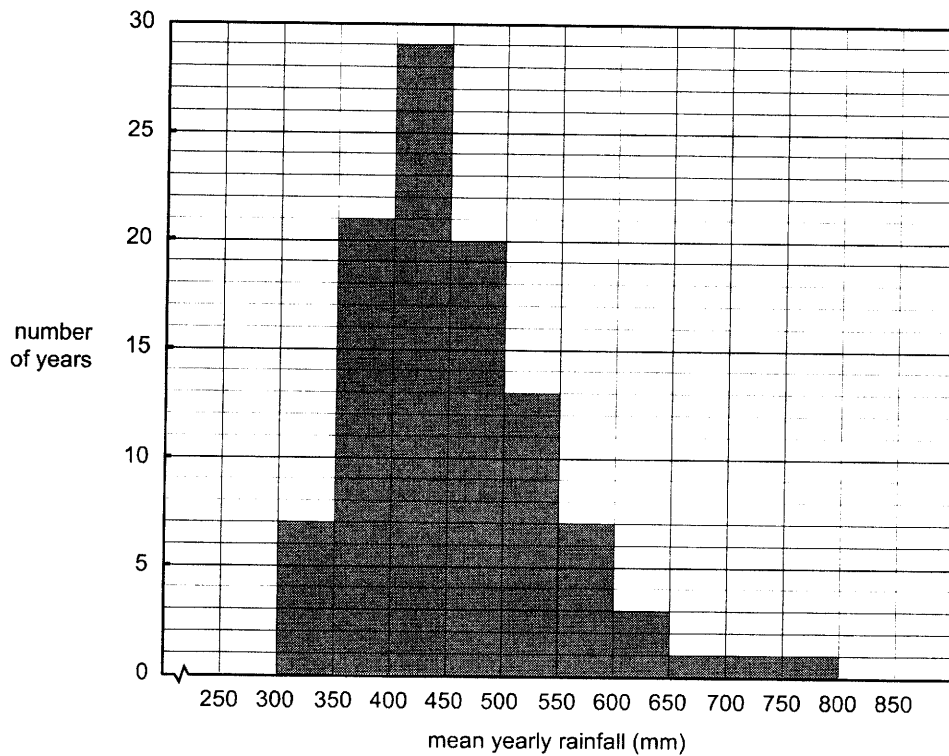
Lower limit for outliers = $Q_1 - 1.5 \times IQR = 29.9 - 1.5 \times 1.1 = 28.25$ 2 marks

Since $26.0 < 28.25$, it will be shown as an outlier.

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Question 1

The histogram below shows the distribution of mean yearly rainfall (in mm) for Australia over 103 years.



Data source: ABS 2007

- a. Describe the shape of the histogram.

positively skewed

1 mark

- b. Use the histogram to determine

- i. the number of years in which the mean yearly rainfall was 500 mm or more

$$13 + 7 + 3 + 1 + 1 + 1 = 26$$

- ii. the percentage of years in which the mean yearly rainfall was between 500 mm and 600 mm.

Write your answer correct to one decimal place.

$$\frac{20}{103} \times \frac{100}{1} = \frac{2000}{103} = 19.4\%$$

1 + 1 = 2 marks

Core – continued

Core

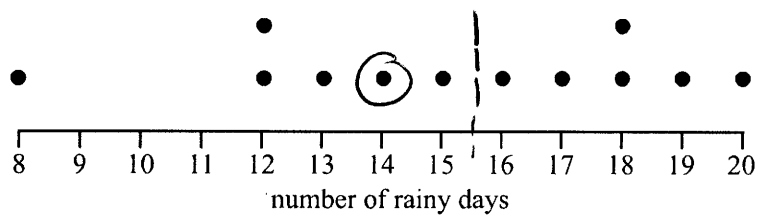
Question 1

Table 1 shows the number of rainy days recorded in a high rainfall area for each month during 2008.

Table 1

Month	Number of rainy days
January	12
February	8
March	12
April	14
May	18
June	18
July	20
August	19
September	17
October	16
November	15
December	13

The dot plot below displays the distribution of the number of rainy days for the 12 months of 2008.



- a. Circle the dot on the dot plot that represents the number of rainy days in April 2008.

1 mark

- b. For the year 2008, determine

- i. the median number of rainy days per month

$$\text{Median} = 15.5$$

- ii. the percentage of months that have more than 10 rainy days. Write your answer correct to the nearest per cent.

$$\frac{11}{12} \times 100 = 92\%$$

1 + 1 = 2 marks

Core – continued

Core

Table 1 shows the heights (in cm) of three groups of randomly chosen boys aged 18 months, 27 months and 36 months respectively.

Table 1.

18 months	height (cm)	
	27 months	36 months
76.0	82.0	88.0
78.5	83.1	88.8
78.6	84.0	90.0
80.0	86.8	92.3
80.5	87.2	93.0
81.2	87.6	94.1
82.8	88.3	94.2
83.2	90.7	95.8
83.4	91.0	96.9
83.7	92.3	97.1
85.8	92.5	97.8
86.6	93.1	99.2
87.3	94.8	100.6
89.8	97.2	103.8

Question 1

- a. Complete Table 2 by calculating the standard deviation of the heights of the 18-month-old boys. Write your answer correct to one decimal place.

Table 2.

$s_x = 3.8$ from CAS

age	18 months	27 months	36 months
mean	82.7	89.3	95.1
standard deviation	3.8	4.5	4.5

1 mark

A 27-month-old boy has a height of 83.1 cm.

- b. Calculate his standardised height (z score) relative to this sample of 27-month-old boys.

Write your answer correct to one decimal place.

$$z = \frac{(83.1 - 89.3)}{4.5} = -1.4$$

1 mark

- c. i. The heights of the 36 month old boys are normally distributed. A 36 month old boy has a standardized height of 2. Approximately what percentage of 36 month old boys will be shorter than this child?

1 mark

- ii. What is the approximate height of this 36 month old boy? Give your answer correct to one decimal place.

$$95.1 + 2 \times 4.5 = 104.1 \text{ cm}$$

1 mark

The following information relates to Questions 1, 2 and 3.

The back-to-back **ordered** stemplot below shows the distribution of maximum temperatures (in °Celsius) of two towns, Beachside and Flattown, over 21 days in January.

Beachside	Flattown
9 8 7 5	1 8 9
4 3 2 2 1 1 0 0	2
9 9 8 7 6 5	2 8 9
3 2	3 3 3 4
8	3 5 5 6 7 7 7 8 8
	4 0 0 1 2
	4 5 6

Question 1

The variables temperature (° Celsius) and town (Beachside or Flattown)

are

- A. both categorical variables.
- B. both numerical variables.
- C. categorical and numerical variables respectively.
- D. numerical and categorical variables respectively.
- E. neither categorical nor numerical variables.

Question 2

For **Beachside**, the range of maximum temperatures is

- A. 3°C
- B. 23°C
- C. 32°C
- D. 33°C
- E. 38°C

Question 3

The distributon for maximum temperatures in Flattown is best described as:

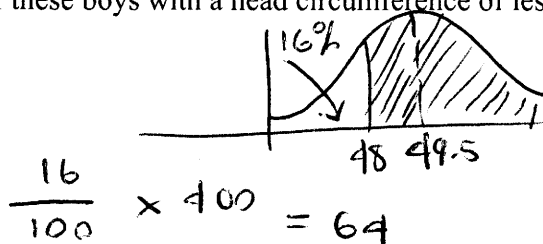
- A. positively skewed
- B. positively skewed with outliers
- C. negatively skewed
- D. approximately symmetric
- E. approximately symmetric with outliers

Question 4

The head circumference (in cm) of a population of infant boys is normally distributed with a standard deviation of 1.5 cm and a mean of 49.5 cm.

Four hundred of these boys are selected at random and each boy's head circumference is measured. The number of these boys with a head circumference of less than 48.0 cm is closest to:

- A. 3
- B. 10
- C. 64
- D. 272
- E. 336



The following information relates to Questions 5 and 6.

The lengths of the left feet of a large sample of Year 12 students were measured and recorded. These foot lengths are approximately normally distributed with a mean of 24.2 cm and a standard deviation of 4.2 cm.

Question 5

A Year 12 student has a foot length of 23 cm.

The student's standardised foot length (standard z score) is closest to

- A. -1.2
- B. -0.9
- C. -0.3
- D. 0.3
- E. 1.2

$$z = \frac{(23 - 24.2)}{4.2}$$
$$\approx -0.3$$

Question 6

The percentage of students with foot lengths between 20.0 and 24.2 cm is closest to

- A. 16%
- B. 32%
- C. 34%
- D. 52%
- E. 68%

