Activity 15.6 (page 281)

Prove to yourself that the median for 'This year' data is 8. Explain why this is the median. **[4]**

An approximation of the median value is:

$$\frac{\text{number of values}}{2}$$

Thus the median = 20 ÷ 2 = 10th result.

This year 0, 2, 3, 3, 4, 5, 6, 7, 8, 8, 10, 11, 12, 12, 12, 14, 15, 18, 20, 22

The tenth result is 8.

10th result

1 a *What was the mean number of visits made by the respondents to the survey?* **[3]**

The mean is the arithmetic average.

mean = total visits/respondents
    = 110/20
    = 5.5

Answer: 5.5 visits per month

b *What was the modal number of visits?* **[3]**

The modal value is the most common value.
Both these numbers occur three times.
The modal number of visits is 4 and 7.

c *Calculate the median of these data.* **[4]**

First sort data from smallest to largest.

1 1 2 2 3 3 4 4 4 5 6 7 7 7 8 8 9 9 10 10

[1 mark]

Median value is: $\dfrac{(n+1)}{2}$

$= 21/2 = 10.5$th value

median value

1 1 2 2 3 3 4 4 4 5↓6 7 7 7 8 8 9 9 10 10

Thus the median value is 5.5 visits per month.

e *Calculate the range and the inter-quartile range.* **[6]**

The range measures the dispersion of the data.

Range   = 10 − 1
             = 9 visits

The inter-quartile range measures the middle 50% of the data.

IQR = upper quartile − lower quartile

UQ = ¾ $(n + 1)$
     = 15.75th value
     = 8 visits

LQ = ¼ $(n + 1)$
     = 5.25th value
     = 3 visits

This means that 50% of respondents visit between three and eight times a month.

Therefore, the IQR = 8 − 3
                  = 5 visits

1　1　2　2　3　3　4　4　4　5　6　7　7　7　8　8　9　9　10　10

↑ 5.25th value ↑ 15.75th value

IQR = upper quartile − lower quartile

$UQ = \frac{3}{4}(n+1)$
= 15.75th value
= 8 visits

$UQ = 20+1x.75$

$LQ = \frac{1}{4}(n+1)$
= 5.25th value
= 3 visits

$UQ = 20+1x.25$

This means that 50% of respondents visit between three and eight times a month.

Therefore, the IQR = 8 − 3
= 5 visits

2 a *Calculate the mean number of litres purchased on each visit.* **[4]**

Litres	Midpoint (x) [1 mark for identifying midpoints]	Number of customers (f)	Frequency x midpoint $f \times x$
$1 \leq 10$	5.5	2	11
$10 \leq 20$	15	5	75
$20 \leq 30$	25	10	250
$30 \leq 40$	35	2	70
	Totals	$\Sigma f = 19$	$\Sigma fx = 406$

An estimate of the mean number of litres purchased on each visit is:

$$\frac{\Sigma fx}{\Sigma f}$$
$$= \frac{406}{19}$$
$$= 21.4 \text{ litres}$$

b *What is the modal group?* **[2]**

Most common.

20 to less than 30 litres.

c *Estimate the median result.* **[4]**

$$\text{Median} = \frac{(n + 1)}{2}$$

$$= \frac{20}{2}$$

$$= \text{10th result}$$

This will be in the 20 to less than 30 litres class.

Approximately 23 litres.