

Further Practice: Interpreting Sets of Data

Remember: all questions match the numbered examples on pages 60–71.

- 1** Find the mean of 2, 7, 8, 12, 17 and 20.
- 2** Find the mean of 7, 15, 9, 23, 16, 35 and 21.
- 3** Find the median of 9, 4, 3, 6 and 11.
- 4** Find the median of 16, 32, 45 and 28.
- 5** Find the mode of the scores: 2, 7, 9, 3, 7, 4, 9, 7, 6, 3.
- 6** The mean of a set of scores is 86. A new score of 79 is added to the set. What will happen to the mean? Justify your answer.
- 7** The mean of a set of seven scores is 75. Another score of 83 is added to the set. What is the new mean?

- 8** The following frequency distribution table has been prepared after determining the number of mistakes on each page of a document.

x	f	fx
1	3	
2	8	
3	5	
4	3	
5	4	
Total		

- a Complete the table.
b Find the mean number of mistakes per page.

- 9** The following table has been drawn up to show the number of times each score was recorded when a die was tossed.

Score	1	2	3	4	5	6
Frequency	19	32	16	24	27	21

- a What is the mode?
b How many times was the die tossed?
c Draw up a frequency distribution table and find the mean, to one decimal place.
d What is the median score?

- 10** The table, below, shows the number and price of items sold at a market stall.
- a How many items were sold altogether?
b What is the mean price of the items sold?
c What is the modal price?
d What is the median?
e What percentage of items were sold for less than the mean?
f A media report after the market stated the median price but not the mean. Why might this have been?

Price	Number sold
\$2	37
\$5	49
\$10	42
\$20	23
\$100	7

- 11** Find the mean of the following scores.
63 72 81 80 75 77 69 68
74 80 62 69 56 84 79 74

- 12** The following marks, out of 20, were scored by students in a test.

Mark	13	14	15	16	17	18	19	20
Frequency	3	5	6	8	10	9	7	4

Use your calculator to determine the mean, correct to one decimal place.

- 13** Find the range of these scores:
8 6 7 6 9 4 6 5 9 8
7 10 5 9 8 6 8 7 7 5

- 14** Find the range of the scores: 26, 20, 25, 31 and 28.

- 15** The lower quartile of a set of scores is 27 and the upper quartile is 63. What is the interquartile range?

- 16** For the scores 2 2 2 2 3 3 4 5 6 6 6 7 find:
a the lower quartile
b the upper quartile
c the interquartile range.

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Cumulative frequency

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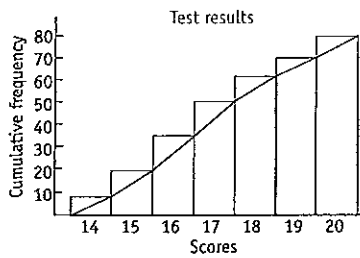
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17 A cumulative frequency histogram and polygon have been drawn for a set of scores.



- a What is the median?
- b What is the upper quartile?
- c What is the lower quartile?
- d What is the interquartile range?

18 In an exam the marks in class X had a standard deviation of 4.8 and class Y had a standard deviation of 6.3. Which class had the greater spread of marks?

19 The students in a class sat for a theory test and a practical test. Every student scored exactly 5 marks less in their practical test than they did in the theory test.

- a What can be said about the mean of the practical test compared to the mean of the theory test?
- b What can be said about the standard deviation of the practical test compared to the standard deviation of the theory test?

20 A test was given to all the students doing a particular course. The marks (out of 50) scored by the students in Mr Cope's class are: 37 48 39 41 43 38 45 47 45 41 37 40 44. What is the standard deviation (σ_{n-1}) to two decimal places?

21 The members of a class were given a test and all the marks (out of 20) are given below:

18 17 13 17 16 14 19 13
17 16 18 15 17 16 18 18

What is the standard deviation (σ_n) to one decimal place?

22 Two classes both sat for the same test. The results, out of 60, were:

Class A: 42 45 38 51 47 37 53 50 43
46 45 38 39 41 46 35 45 49

Class B: 36 39 44 44 48 57 55 32 46
43 50 49 33 41 45 47 51 42

- a Find the mean and standard deviation (σ_{n-1}) for both sets of scores. (Give the answers correct to one decimal place.)
- b In which class were the scores closer to the mean?

23 The scores (out of 20) gained by the members of a class in a test are given below:

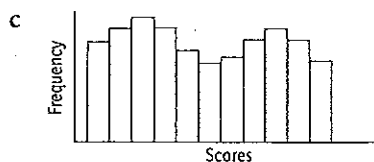
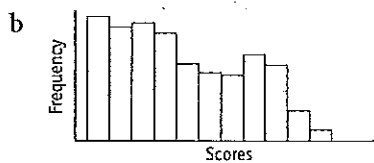
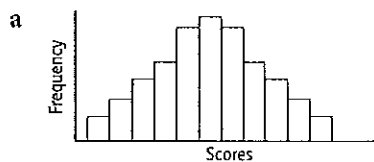
3 12 13 13 14 14 14 14 14 15 15 15
16 16 16 16 17 17 18 18 19

- a What is the mean to one decimal place?
- b What is the standard deviation (σ_{n-1}) to one decimal place?
- c What is the mode?
- d What is the median?
- e What is the range?
- f Jill only scored three marks. Recalculate the mean, standard deviation, mode, median and range if Jill's score is ignored.

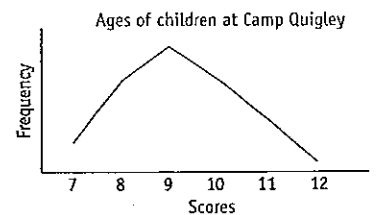
24 The costs, in dollars, of a person's monthly phone bills over the last 16 months are shown below. Ignoring any outliers, find the mean monthly phone cost.

44 36 53 48 37 50 762 51
39 45 48 56 38 50 54 55

25 Briefly describe the shape of each of the histograms in terms of smoothness, symmetry and number of modes.



26 A line graph has been drawn to show the ages of children attending a camp. What information can be gained from the shape of the display?



27 Bridget tossed a die a number of times and the results are given below.

1 5 3 1 4 3 2 5 6 1 4 2 4 6
3 5 5 1 6 2 3 5 4 6 3 5 1 6

- a Draw a dot-plot of the results.
- b What information can be gained about the data from the dot-plot?

- 28** A stem-and-leaf plot has been drawn to show the results of a class test.

Test results

4	9
5	1 5 8
6	4 5 6 8 8 8 9
7	1 2 2 6 7 9
8	0 4 9
9	2 6

- What is the range?
- What is the mode?
- What is the median?
- Briefly comment on the features of the display.

- 29** Two classes sat for the same test (out of 60) and the results are shown in the back-to-back stem-and-leaf plot below.

Test results
Class X Class Y

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

- Which class had the greater range of scores?
- What is the median score for each class?
- Caitlin is in class X. She said, 'My class did better than class Y.' Do you agree? Justify your answer.

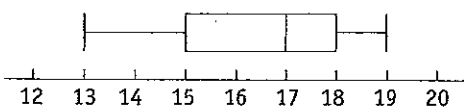
- 30** Forty students sat for an exam and the results (out of 100) for boys and for girls are listed below.

Boys: 65 73 79 64 82 93 81 77 69 71
80 76 76 68 87 72 79 66 88 80
Girls: 74 82 76 62 77 85 91 73 75 71
90 84 69 73 78 86 77 70 77 76

- Draw a back-to-back stem-and-leaf plot of the results.
- The teacher believed there was not a significant difference between the results for the boys and for the girls. Do you agree?

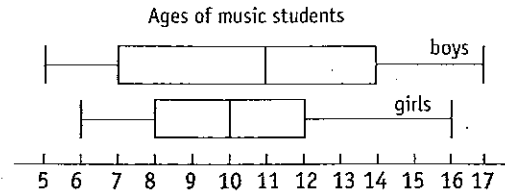
- 31** A box-and-whisker plot has been drawn to illustrate the scores out of twenty by students in a test.

Test results



- What was the median mark?
- What was the range of marks?
- What is the interquartile range?
- Approximately what percentage of the students scored 15 or more in the test?

- 32** The ages that students at a particular college started studying music are depicted in the box-and-whisker plots below.



What similarities and differences are there between the two data sets?

- 33** Two sisters both won ribbons at pony club meets over the last year. The number of ribbons per month each won was studied and a five number summary produced.

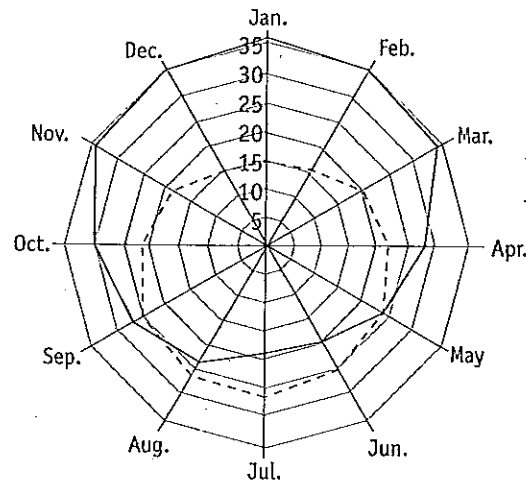
Roxanne: [0, 2, 4, 6, 9]

Sarah-Jane: [0, 3, 3, 5, 7]

- Draw two box-and-whisker plots on the same scale for the data.
- Briefly comment on any similarities and differences between the two data sets.

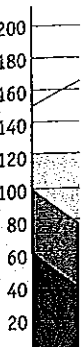
- 34** This radar chart shows the average monthly maximum temperatures for two cities X and Y.

Average monthly maximum temperatures ($^{\circ}\text{C}$)



- What is the average monthly maximum temperature for city X in February?
- In what month are the average monthly maximum temperatures of the two cities the same?
- One city is in the southern hemisphere and one is in the northern hemisphere. Which city is in the southern hemisphere? Justify your answer.
- What other information can readily be seen from the graph?

- 35** Jessica is of the se the resu



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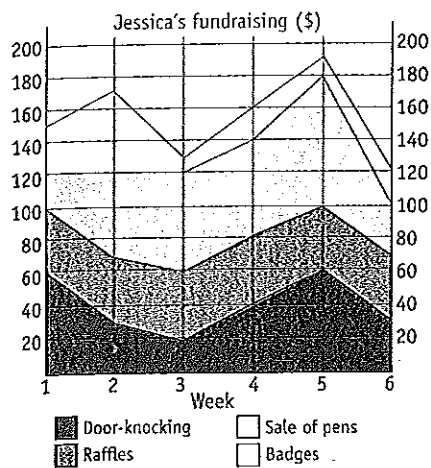
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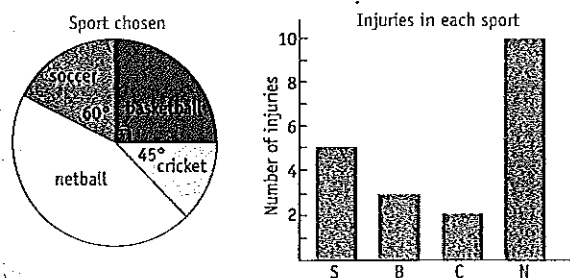
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35 Jessica is raising money for a charity and kept a record of the sources of the funds over six weeks. She showed the results in an area chart (below).



- In which week did Jessica raise the least amount of money?
- If Jessica aims to raise \$200 every week, by how much did she fall short in week 5?
- One source of funds raised the same amount each week. What is that source and how can we see that it is the same?
- Which is the most profitable source of funds?

36 240 students at a school had a choice of four sports. The numbers choosing each sport are shown in the sector graph. The column graph shows the number of injuries in each sport last week.



- How many students were injured playing soccer?
- How many students played netball?
- What percentage of basketball players were injured?
- Based on these figures, which sport is the most dangerous? Justify your answer.

37 Some students at a college were surveyed to see whether or not they lived on campus. The table shows the results.

	Residents	Non-residents
Male	47	65
Female	52	56

- How many students were residents?
- How many students were female?

- What percentage of males were residents?
- What percentages of residents were male?
- What fraction of all those surveyed were female non-residents?

38 A survey of pets was conducted to see whether or not they were micro-chipped.

	Micro-chipped	Not micro-chipped
Dogs	62	18
Cats	48	32

- How many pets in total were surveyed?
- What percentage of pets were not micro-chipped?
- What fraction of dogs were not micro-chipped?
- What percentage of those not micro-chipped were dogs?

39 Denise collected information from the last twenty years about the maximum daily temperatures for February and for August for her town. She worked out the five-number summary for each month:

Feb. 21, 24, 28, 30, 39
 Aug. 12, 17, 19, 22, 27

- Which month had the greater range?
- Which month had the greater interquartile range?
- Denise noted that in more than 50% of cases, February had higher maximum temperatures than August ever did. Was she correct?

40 Two groups, both of 25 people, sat for the same trivia quiz. The results for group A are shown in the table.

False answers	Frequency
0	2
1	5
2	4
3	6
4	3
5	2
6	2
7	1

The mean number of false answers made by group B was 2.96 and the (sample) standard deviation was 2.1.

- How many false answers did group A give altogether?
- Calculate the mean and sample standard deviation for group A.
- Which group gave more false answers?
- Which group had the more consistent results? Justify your answer.

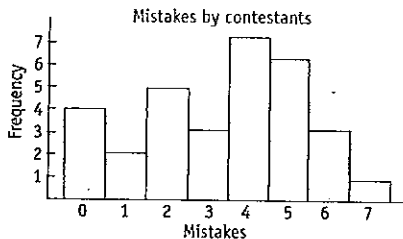
Go to pp 285–6 for **Quick Answers**
 or to pp 311–14 for **Worked Solutions**

Challenge: Interpreting Sets of Data

1 Every week, the students in Flora's class write an essay with marks out of ten. In the last six weeks Flora has scored 6, 5, 7, 8, 6 and 7.

- What is Flora's mean mark?
- Over the next four weeks Flora wants to increase her mean mark to 8. Is this possible? Justify your answer. *Hint 1*

2 The frequency histogram has been drawn to show the number of mistakes made by contestants in a quiz.



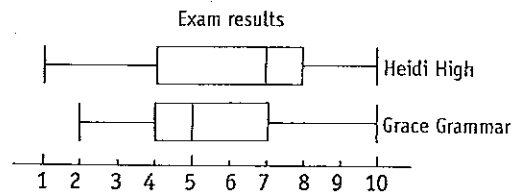
- How many contestants took part in the quiz?
- How many mistakes were made? *Hint 2*
- What was the mean number of mistakes?
- What was the modal number of mistakes?

3 The back-to-back stem-and-leaf plot shows the results in an exam by two classes, M and P.

M	P
9 7 7	5 6 8
6 4 2 0	6 3 5 7 9
9 6 4 7	7 1 2 3 5 5 8 8
8 7 7 5 2	8 0 1 4 4 6 7 9
4 3 3 1 1	9 3 7 8

- Which class had the greater range?
- Which class had the greater median and by how much?
- The mean for the two classes was the same (77.25). Which class had the greater standard deviation? *Hint 3*
- Gavin is in class M. He commented, 'My class did better than class P.' Do you agree? Justify your answer.

4 The box-and-whisker plots show the performances by two schools in an external exam. The results were given as grades from 1 to 10, with 10 being the better result.



- Compare and contrast the performances of the two schools.
- If Grace Grammar School had 212 candidates while Heidi High School had 108 candidates, which school had more students scoring a grade 7 or better? *Hint 4*

5 The following scores were achieved by two sets of students.

Group A: 87 63 73 81 77 90 68 74 86
78 69 82 77 85 82 79 74 70

Group B: 76 73 90 82 88 84 21 89 72
84 83 92 78 83 80 96 85 87

- Find the mean and standard deviation (σ_{n-1}) for each set of scores.
- Which group performed better? Briefly comment. *Hint 5*

6 The two-way table shows the results of a survey of people to see whether they were parents. The number of men who were parents is missing. Which is greater: the percentage of men who are parents or the percentage of parents who are men? *Hint 6*

	Men	Women
Parents		80
Not parents	120	100

Go to p 286 for Quick Answers or to p 314 for Worked Solutions

Hint 1: How many marks in total will Flora need to have in order to average 8 after another four essays?

Hint 2: Not all the scores are actually mistakes.

Hint 3: There is no need to actually calculate the standard deviation.

Hint 4: What percentage of scores are higher than the median? What percentage are higher than the upper quartile?

Hint 5: What is the effect of the outlier in group B?

Hint 6: Which will be greater: the number of men or the number of parents? What effect will a greater number have on the percentage? Suppose the missing number was 80, for example.

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UNIT 2: Data Analysis

Ch 4: Interpreting Sets of Data

Further Practicep72

1 mean = $\frac{2+7+8+12+17+20}{6}$
= 11

2 $\Sigma x = 7 + 15 + 9 + 23 + 16 + 35 + 21$
= 126
 $\bar{x} = \frac{\Sigma x}{n}$
= $\frac{126}{7}$
= 18

3 3, 4, 6, 9, 11
Median is 6.

4 16, 28, 32, 45
median = $\frac{28+32}{2}$
= 30

5 2, 7, 9, 3, 7, 4, 9, 7, 6, 3
Mode = 7

6 The mean will decrease. The score being added is lower than the original mean.

7 $\bar{x} = 75, n = 7$
 $\bar{x} = \frac{\Sigma x}{n}$
 $75 = \frac{\Sigma x}{7}$
 $\Sigma x = 75 \times 7$
= 525
New $\Sigma x = 525 + 83$
= 608
New $n = 7 + 1$
= 8
New mean: $\bar{x} = \frac{\Sigma x}{n}$
= $\frac{608}{8}$
= 76

8 a

x	f	fx
1	3	3
2	8	16
3	5	15
4	3	12
5	4	20
Total	23	66

b $\bar{x} = \frac{\Sigma fx}{\Sigma f}$
= $\frac{66}{23}$
= 2.869 565 217 ...
= 2.9 (1 d.p.)

The mean number of mistakes per page is 2.9, correct to one decimal place.

9

Score	1	2	3	4	5	6
Frequency	19	32	16	24	27	21

a mode = 2

b $\Sigma x = 19 + 32 + 16 + 24 + 27 + 21$
= 139

The die was tossed 139 times.

c

x	f	fx
1	19	19
2	32	64
3	16	48
4	24	96
5	27	135
6	21	126
Total	139	488

$\bar{x} = \frac{\Sigma fx}{\Sigma f}$
= $\frac{488}{139}$
= 3.510 791 367 ...
= 3.5 (1 d.p.)

d median = 4

[There are 139 scores altogether so the median is the 70th score.]

10

Price	Number sold
\$2	37
\$5	49
\$10	42
\$20	23
\$100	7

a Number sold = $37 + 49 + 42 + 23 + 7$
= 158

b $\Sigma x = 37 \times \$2 + 49 \times \$5 + 42 \times \$10$
 $+ 23 \times \$20 + 7 \times \100
= \$1899

$\bar{x} = \$1899 \div 158$
= \$12.018 987 34 ...
= \$12.02 (nearest cent)

c Mode = \$5

d Median = \$5

e Number of items sold for less than the mean = $37 + 49 + 42$
= 128

Percentage = $\frac{128}{158} \times 100\%$
= 81.012 658 23 ... %
= 81% (nearest percent)

\therefore 81% of items were sold for less than the mean.

f The mean is higher because of the small number of higher priced items. The median is more representative of the price paid for most items.

11 63 72 81 80 75 77 69 68
74 80 62 69 56 84 79 74
 $\bar{x} = 72.6875$

12 $\bar{x} = 16.769 230 77 \dots$
= 16.8 (1 d.p.)

Mark	13	14	15	16	17	18	19	20
Frequency	3	5	6	8	10	9	7	4

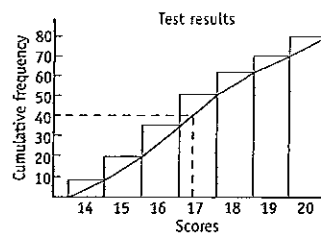
13 upper extreme = 10
lower extreme = 4
range = $10 - 4$
= 6

14 20, 25, 26, 28, 31
range = $31 - 20$
= 11

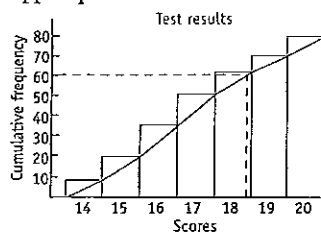
15 Interquartile range
= upper quartile - lower quartile
= $63 - 27$
= 36

16 2 2 2 2 3 3 4 5 6 6 6 7
a lower quartile = 2
b upper quartile = 6
c interquartile range = $6 - 2$
= 4

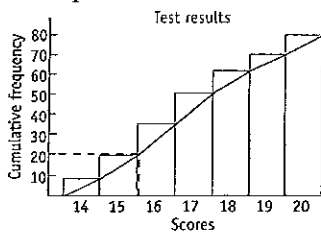
17 a median = 17



b upper quartile = 18



c lower quartile = 16



d interquartile range = $18 - 16$
= 2

18 Class Y had the greater spread because it has the greater standard deviation.

19 a The mean of the practical test will be 5 marks lower than the theory test mean.

b The standard deviation will be the same for both tests.

20 37 48 39 41 43 38 45
47 45 41 37 40 44

$$\sigma_{n-1} = 3.707\ 234\ 785 \dots \text{ [by calculator]}$$

$$= 3.71 \text{ (2 d.p.)}$$

21 18 17 13 17 16 14 19 13
17 16 18 15 17 16 18 18

$$\sigma_n = 1.763\ 341\ 997 \dots \text{ [by calculator]}$$

$$= 1.8 \text{ (1 d.p.)}$$

22 Class A:

42 45 38 51 47 37 53 50 43
46 45 38 39 41 46 35 45 49

Class B:

36 39 44 44 48 57 55 32 46
43 50 49 33 41 45 47 51 42

a Class A: $\bar{x} = 43.888\ 8888 \dots$

$$= 43.9 \text{ (1 d.p.)}$$

$$\sigma_{n-1} = 5.155\ 110\ 416 \dots$$

$$= 5.2 \text{ (1 d.p.)}$$

Class B: $\bar{x} = 44.555\ 555\ 55 \dots$

$$= 44.6 \text{ (1 d.p.)}$$

$$\sigma_{n-1} = 6.827\ 472\ 379 \dots$$

$$= 6.8 \text{ (1 d.p.)}$$

b Class A has scores closer to the mean because the standard deviation is lower for class A than for class B.

23 3 12 13 13 14 14 14 14
14 15 15 15 16 16 16 16
17 17 18 18 19

a mean = 14.714 285 71 ...

$$= 14.7 \text{ (1 d.p.)}$$

b $\sigma_{n-1} = 3.242\ 573\ 934 \dots$

$$= 3.2 \text{ (1 d.p.)}$$

c mode = 14

d median = 15

e range = 19 - 3

$$= 16$$

f new mean = 15.3

$$\text{new } \sigma_{n-1} = 1.866\ 604\ 009 \dots$$

$$= 1.9 \text{ (1 d.p.)}$$

mode = 14

median = 15

new range = 19 - 12

$$= 7$$

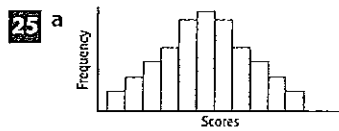
24 44 36 53 48 37 50 762 51
39 45 48 56 38 50 54 55

Outlier = 762

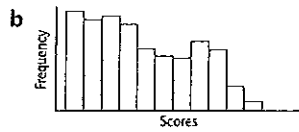
Mean of others = 46.933 33 ...

$$= 46.93 \text{ (2 d.p.)}$$

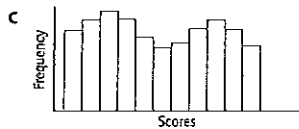
The mean monthly phone bill is \$46.93, to the nearest cent.



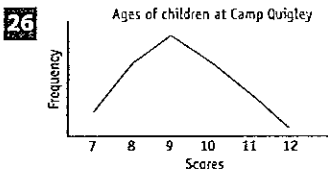
The graph is smooth and symmetrical. There is one mode.



The graph is not symmetrical or particularly smooth. It is skewed with more scores of a higher frequency at the left (positively skewed). There is just one mode.

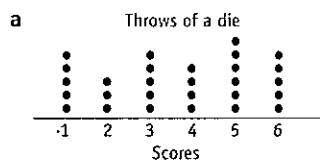


This graph is reasonably smooth and symmetrical. It has two modes.



The mode is 9. The graph is smooth but not symmetrical. It is positively skewed. There are more younger ages than older ones.

27 1 5 3 1 4 3 2 5 6 1 4 2 4 6 3
5 5 1 6 2 3 5 4 6 3 5 1 6



b The mode is 5. The scores are fairly symmetrical and evenly distributed. There are fewer even scores than odd ones.

28 Test results

4	9
5	1 5 8
6	4 5 6 8 8 8 9
7	1 2 2 6 7 9
8	0 4 9
9	2 6

a range = 96 - 49
= 47

b mode = 68

c median = $\frac{69+71}{2}$
= 70

d The display is fairly smooth and symmetrical.

29

Test results	
Class X	Class Y
6	0 5
9	1 7 8
8 7 4	2 5
9 8 7 6 5 2	3 4 6 6 6 8 9
9 9 8 8 6 4 3 0	4 0 1 2 2 4 5 7
9 7 7 5 4 2	5 0 1 1 3 6 8

a Class X: range = 59 - 6
= 53

Class Y: range = 58 - 5
= 53

The range is the same for both classes.

b Class X: median = 43
Class Y: median = 41

c Caitlin could be correct but there is not a great deal of difference between the two classes. The range is the same and the medians are only slightly different. The scores in both classes are skewed with more higher scores than lower ones.

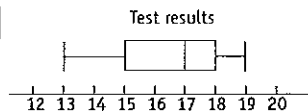
30 Boys: 65 73 79 64 82 93 81 77 69 71
80 76 76 68 87 72 79 66 88 80
Girls: 74 82 76 62 77 85 91 73 75 71
90 84 69 73 78 86 77 70 77 76

a

Exam results	
Boys	Girls
9 8 6 5 4	6 2 9
9 9 7 6 6 3 2 1	7 0 1 3 3 4 5 6 6 7 7 7 8
8 7 2 1 0 0	8 2 4 5 6
	3 9 0 1

b Yes. The range of scores is the same for both groups (29) and the median mark is the same (76.5). Both sets of marks are skewed.

31



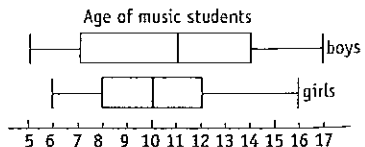
a median = 17

b range = 19 - 13
= 6

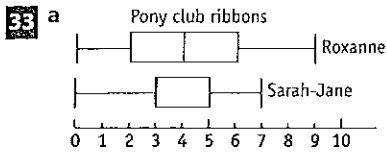
c interquartile range = 18 - 15
= 3

d The lower quartile is 15 so 25% of marks are less than 15. Approximately 75% of pupils scored 15 or more.

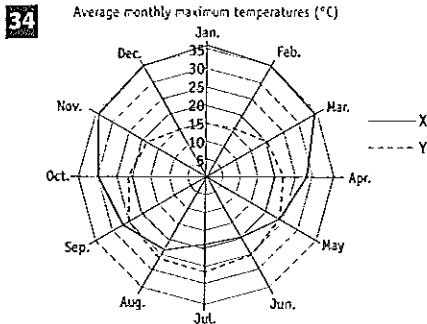
32



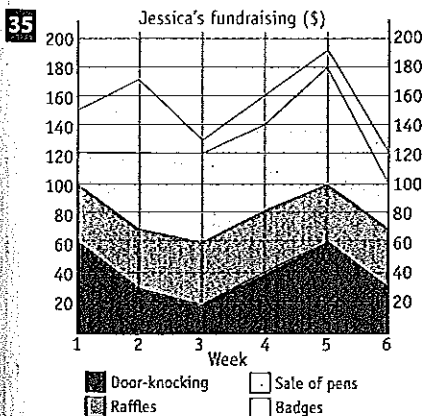
The range of ages of the boys is greater than for the girls. Both groups are fairly symmetrical although the girls are slightly skewed with the median closer to the lower extreme than the higher extreme.



b Roxanne's graph has a greater range and a greater interquartile range. It is fairly symmetrical. Sarah-Jane's graph is skewed, the median and lower quartile are the same.



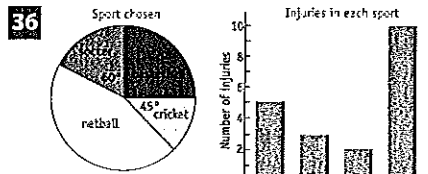
- a** 35°C
b May
c City X is in the southern hemisphere. It has its hottest average monthly maximum temperatures in December, January and February, whereas city Y has its coldest average monthly maximum temperatures then.
d City Y has a much milder climate than city X. It has fairly constant temperatures all year round. City X has average monthly maximum temperatures above 30°C for almost half of the year. City Y has much lower average monthly maximum summer temperatures but only slightly lower average monthly maximum winter temperatures than City X.



- a** Week 6
b Total raised in week 5 = \$190
 Difference = \$200 - \$190 = \$10
 Jessica fell short by \$10 in week 5.

c Raffles is the source that is the same each week. This can be seen on the graph because the width (height) of the area is constant.

d The sale of pens is the most profitable source of funds.



a Five students were injured playing soccer.

b Angle for netball
 $= 360^{\circ} - (90 + 45 + 60)^{\circ}$
 $= 165^{\circ}$

Netball players = $\frac{165}{360} \times 240$
 $= 110$
 110 students played netball.

c 3 basketball players were injured

Basketball players = $\frac{90}{360} \times 240$
 $= 60$

Percentage injured = $\frac{3}{60} \times 100\%$
 $= 5\%$

d Netball players = 110

Percentage injured = $\frac{10}{110} \times 100\%$
 $= 9.090909 \dots \%$

Soccer players = $\frac{60}{360} \times 240$
 $= 40$

Percentage injured = $\frac{5}{40} \times 100\%$
 $= 12.5\%$

Cricket players = $\frac{45}{360} \times 240$
 $= 30$

Percentage injured = $\frac{2}{30} \times 100\%$
 $= 6.66666 \dots \%$

Based on these figures, soccer is the most dangerous sport.

37

	Residents	Non-residents
Male	47	65
Female	52	56

a Total residents = $47 + 52$
 $= 99$

b Total females = $52 + 56$
 $= 108$

c Total males = $47 + 65 = 112$
 Percentage of males that are residents
 $= \frac{47}{112} \times 100\%$
 $= 41.9642857 \dots \%$
 $= 42\%$ (nearest per cent)

d Percentage of residents that are male

$$= \frac{47}{99} \times 100\%$$

$$= 47.474747 \dots \%$$

$$= 47.5\% \quad (1 \text{ d.p.})$$

e Total present = $108 + 112$
 $= 220$

$$\text{Female non-residents} = \frac{56}{220}$$

$$= \frac{14}{55}$$

38

	Micro-chipped	Not micro-chipped
Dogs	62	18
Cats	48	32

a Total surveyed = $62 + 18 + 48 + 32$
 $= 160$

b Total not micro-chipped = $18 + 32$
 $= 50$

Percentage = $\frac{50}{160} \times 100\%$
 $= 31.25\%$

c Total dogs = $62 + 18$
 $= 80$

Dogs not micro-chipped = $\frac{18}{80}$
 $= \frac{9}{40}$

d Total not micro-chipped = 50

Percentage of dogs = $\frac{18}{50} \times 100\%$
 $= 36\%$

39 Feb. 21, 24, 28, 30, 39
 Aug. 12, 17, 19, 22, 27

a Feb.: range = $39 - 21$
 $= 18$

Aug.: range = $27 - 12$
 $= 15$

February had the greater range.

b Feb.: Interquartile range = $30 - 24$
 $= 6$

Aug.: Interquartile range = $22 - 17$
 $= 5$

February had the greater interquartile range.

c Yes, Denise was correct. The median maximum daily temperature in February was 28°C , so 50% of days were hotter than 28°C . The upper extreme for August was 27°C , so the highest ever temperature in August was 27°C .

False answers	Frequency
0	2
1	5
2	4
3	6
4	3
5	2
6	2
7	1

- a Total number of false answers
 $= 5 \times 1 + 4 \times 2 + 6 \times 3 + 3 \times 4$
 $+ 2 \times 5 + 2 \times 6 + 1 \times 7$
 $= 72$
 Group A gave 72 false answers.
- b mean = 2.88
 standard deviation = 1.9
 [by calculator]
- c Group B gave more false answers since the mean number of false answers is higher but the number of people is the same.
- d Group A was more consistent because its standard deviation is lower than that of group B.

Challenge p76

1 a 6, 5, 7, 8, 6 and 7

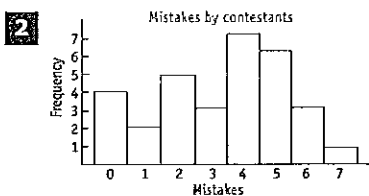
$$\text{Mean} = \frac{6+5+7+8+6+7}{6}$$

$$= \frac{39}{6}$$

$$= 6.5$$

- b After another 4 weeks there will be 10 tests. To have a mean of 8, Flora's marks must total $8 \times 10 = 80$
 Extra marks needed = $80 - 39$
 $= 41$

But each test is only worth 10 marks so the maximum marks Flora can achieve is 40. It is not possible for Flora to increase her mean mark to 8.

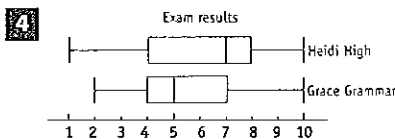


- a Number of contestants
 $= 4 + 2 + 5 + 3 + 7 + 6 + 3 + 1$
 $= 31$
- b Number of mistakes
 $= 2 \times 1 + 5 \times 2 + 3 \times 3 + 7 \times 4$
 $+ 6 \times 5 + 3 \times 6 + 1 \times 7$
 $= 104$
- c Mean number of mistakes
 $= 104 \div 31$
 $= 3.35483871 \dots$
 $= 3.35$ (2 d.p.)
- d Modal number of mistakes = 4

3

Exam results	
M	P
9 7 7	5 6 8
6 4 2 0	6 3 5 7 9
9 6 4	7 1 2 3 5 5 5 8 8
8 7 7 5 2	8 0 1 4 4 6 7 9
4 3 3 1 1	9 3 7 8

- a M: range = $94 - 57$
 $= 37$
 P: range = $98 - 56$
 $= 42$
 P had the greater range.
- b M: median = $\frac{79+82}{2}$
 $= 80.5$
 P: median = $\frac{75+78}{2}$
 $= 76.5$
 Difference = $80.5 - 76.5$
 $= 4$
 M has the greater median by 4.
- c M has the greater standard deviation. The scores in M are spread further from the mean.
- d Although the mean is the same for both classes, M has the greater median. M has more scores in the 90s although the two highest scores are both in class P. On the whole the students in M did just a little better than the students in P.



- a Heidi High had the larger range and the larger interquartile range. The upper extremes and lower quartiles are the same for both schools but the median for Heidi High is 7, whereas the median for Grace Grammar is only 5. Of Heidi High students 50% scored 7 or better but only 25% of Grace Grammar students scored 7 or better.
- b Approximately 50% of Heidi High students scored 7 or better.
 $50\% \text{ of } 108 = 54$
 Approximately 25% of Grace Grammar students scored 7 or better.
 $25\% \text{ of } 212 = 53$
 Roughly the same number of students at each school scored 7 or better.

5

Group A:	87	63	73	81	77	90	68
	74	86	78	69	82	77	85
	82	79	74	70			
Group B:	76	73	90	82	88	84	21
	89	72	84	83	92	78	83
	80	96	85	87			

- a Group A: mean = 77.5
 $\sigma_{n-1} = 7.294236242 \dots$
 $= 7.3$ (1 d.p.)
 Group B: mean = 80.1666...
 $= 80.2$ (1 d.p.)
 $\sigma_{n-1} = 16.06329393 \dots$
 $= 16.1$ (1 d.p.)
- b Group B has a higher mean but much larger standard deviation. If the outlier is ignored, then B has both a higher mean and smaller deviation than group A. Group B's results are therefore more consistent and so they clearly performed better when the score of 21 is ignored.

- 6 There are more men than there are parents. The percentage of parents who are men must therefore be higher than the percentage of men who are parents.

	Men	Women
Parents		80
Not parents	120	100