

h

Answers to Ch. 6 HH Text (2014)

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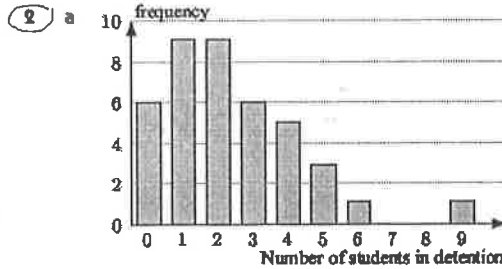
EXERCISE 6A

- ① a quantitative discrete b categorical
 c quantitative continuous d quantitative continuous
 e categorical f quantitative discrete g categorical
 h quantitative discrete i quantitative continuous
 j quantitative continuous k quantitative continuous
 l categorical m quantitative discrete
- ② a 0, 1, 2, 3, ..., 8 b red, yellow, orange, green, ...
 c 0 - 15 minutes d 0 - 25 m
 e Ford, BMW, Renault, ... f 1, 2, 3, ..., 20
 g Australia, Hawaii, Dubai, ... h 0.0 - 10.0
 i 0 - 4 L j 0 - 80 hours k $-20^{\circ}\text{C} - 35^{\circ}\text{C}$
 l cereal, toast, fruit, rice, eggs, ... m 0, 1, 2, ..., 10

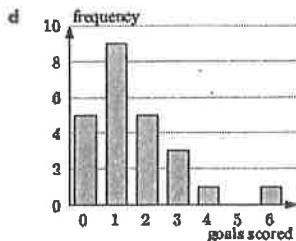
EXERCISE 6B

- ① a the number of goals scored in a game
 b variable is counted, not measured

Goals scored	Tally	Frequency	Rel. Frequency
0		5	0.208
1		9	0.375
2		5	0.208
3		3	0.125
4		1	0.042
5		0	0
6		1	0.042
Total		24	



- b 1 and 2 c positively skewed, one outlier, (9 dete
 d $12\frac{1}{2}\%$



- e 1 goal
 f positively skewed, one outlier, (6 goal
 g $\approx 20.8\%$

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- ④ a 45 b 1 time c 8 d 20%
 e positively skewed, no outliers

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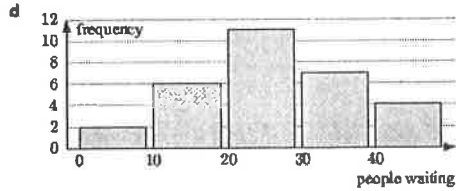
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EXERCISE 6C

1 a

People waiting	Tally	Frequency	Rel. Freq.
0 - 9		2	0.067
10 - 19		6	0.200
20 - 29		11	0.367
30 - 39		7	0.233
40 - 49		4	0.133
Total		30	

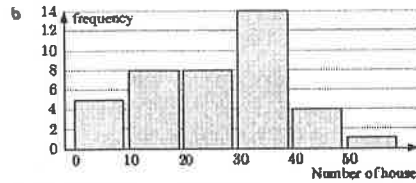
b 2 days c $\approx 36.7\%$ e 20 - 29 people



2 a 37 b 40 - 49 employees c negatively skewed
d $\approx 37.8\%$
e No, only that it was in the interval 50 - 59 employees.

3 a

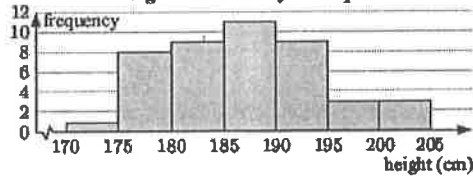
Number of houses	Tally	Frequency
0 - 9		5
10 - 19		8
20 - 29		8
30 - 39		14
40 - 49		4
50 - 59		1
Total		40



c 30 - 39 houses d 67.5%

EXERCISE 6D

1 a Height is measured on a continuous scale.
b Heights of a volleyball squad



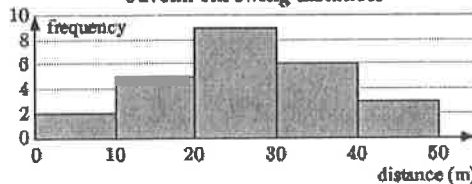
c $185 \leq H < 190$ cm. This is the class of values that most often.
d slightly positively skewed

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4 a, b

Distance (m)	Tally	Frequency
$0 \leq d < 10$		2
$10 \leq d < 20$		5
$20 \leq d < 30$		9
$30 \leq d < 40$		6
$40 \leq d < 50$		3
Total		25

c Javelin throwing distances



d $20 \leq d < 30$ m e 36%

EXERCISE 6E.1

- ① a 1 cup b 2 cups c 1.8 cups 2 9
- ③ a i 5.61 ii 6 iii 6 b i 16.3 ii 17 iii 18
 c i 24.8 ii 24.9 iii 23.5
- ④ a data set A: 6.46, data set B: 6.85
 b data set A: 7, data set B: 7
 c The data are the same except for the last value, which pushes the mean of set B up.
 d 7 is the middle value in both data sets. It is not affected by extreme values.
- ⑤ Ruth (164)
- ⑥ a i Pies: 67.1, Pasties: 53.6
 ii Pies: 69, Pasties: 52
 b Pies, higher mean (more sold), higher median (higher data values)
- ⑦ a Bus: mean = 39.7, median = 40.5,
 Tram: mean ≈ 49.1, median = 49
 b Tram has higher mean and median, but there are more bus trips per day and more people travel by bus in a day, so bus is more popular.
- ⑧ a 44 points b 44 points c 40.2 points
 d increase, 40.3 points
- ⑨ \$185 604 10 3144 km 11 17.25 goals 12 $x = 15$
- ⑬ a = 5 14 37 15 14.8 16 6, 12 17 7, 9

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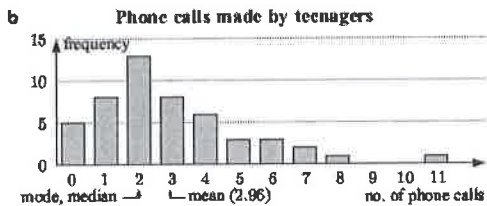
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6E.3

EXERCISE 6E.2

- ① a Mean: \$103 770, median: \$147 200
 Mean has been affected by the extreme values (the two values greater than \$200k).
 b i the mean ii the median
- ② a mean: \$29 300, median: \$23 500, mode: \$23 000
 b It is the lowest value in the data set.
 c No, it is too close to the lower end of the distribution.
- ③ a mean: 3.19 mm, median: 0 mm, mode: 0 mm
 b The median is not in the centre as the data is positively skewed.
 c The mode is the lowest value.
 d Yes, 42 and 21. e No

EXERCISE 6E.3

- ① a 1 head b 1 head c 1.43 heads
- ② a i 2.61 children ii 2 children iii 2 children
 b This school has more children per family than average.
 c positive d mean is higher than the median, mode
- ③ a i 2.96 calls ii 2 calls iii 2 calls



- c positively skewed d Because of the skewness.
 e mean

- ④ a i 49 matches ii 49 matches iii 49.0 matches
 b No c Need a larger sample.
- ⑤ a i 5.63 peas ii 6 peas iii 6 peas
 b i 6.81 peas ii 7 peas iii 7 peas
 c all of them d It has improved it.

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#2

EXERCISE 6E.4

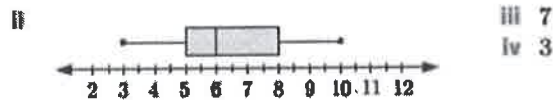
- ① 31.7 ② a 70 b $\approx 411\,000$ L c ≈ 5870 L
 ③ a 11.5 points b i 11.3 points ii 11.4 points
 c ii is closer to the actual mean than i. Smaller class intervals give better estimates.
 ④ 90.1 km h⁻¹ ⑤ 768 m²
 ⑥ a 125 people b 119 marks c $\frac{3}{25}$ d 137

EXERCISE 6F

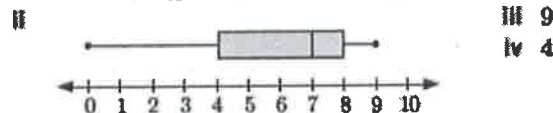
- ① a i 6 ii $Q_1 = 4, Q_3 = 7$ iii 7 iv 3
 b i 17.5 ii $Q_1 = 15, Q_3 = 19$ iii 14 iv 4
 c i 24.9 ii $Q_1 = 23.5, Q_3 = 26.1$ iii 7.7 iv 2.6
 ② a median = 2.45 min, $Q_1 = 1.45$ min, $Q_3 = 3.8$ min
 b range = 5.2 minutes, IQR = 2.35 minutes
 c i 2.45 min ii 3.8 min iii 0, 5.2, 5.2
 ③ a 6 b 28 c 15 d 12 e 21 f 22 g 9
 ④ a i 124 cm ii $Q_1 = 116$ cm, $Q_3 = 130$ cm
 b i 124 cm ii 130 cm c i 29 cm ii 14 cm
 d 14 cm
 ⑤ a i 7 peas ii 6 peas iii 5 peas iv 7 peas v 2 peas
 b i 10 peas ii 7 peas iii 6 peas iv 8 peas
 v 2 peas
 c The fertiliser does improve the yield of peas.

EXERCISE 6G.1

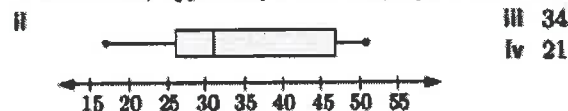
- ① a i 35 points ii 78 points iii 13 points
 iv 53 points v 26 points
 b i 65 points ii 27 points
 ② a i 98, 25 marks ii 70 marks iii 85 marks
 iv 55, 85 marks
 b 73 marks c 30 marks d 67 marks
 ③ a i min = 3; $Q_1 = 5$; med = 6; $Q_3 = 8$; max = 10



- b i min = 0, $Q_1 = 4$; med = 7; $Q_3 = 8$, max = 9

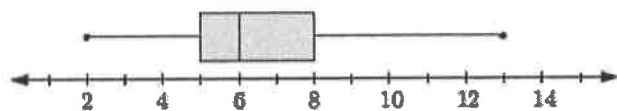


- c i min = 17, $Q_1 = 26$; med = 31; $Q_3 = 47$, max = 51

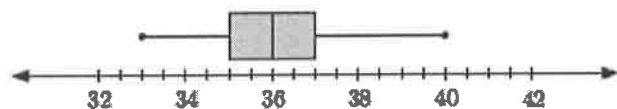


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- 4 a median = 6, $Q_1 = 5$, $Q_3 = 8$ b 3
c



- 5 a min = 33, $Q_1 = 35$, med = 36, $Q_3 = 37$, max = 40
b i 7 ii 2
c



d No

EXERCISE 6G.2

1 a

Statistic	Year 9	Year 12
minimum	1	6
Q_1	5	10
median	7.5	14
Q_3	10	16
maximum	12	17.5

b i Year 9: 11, Year 12: 11.5
ii Year 9: 5, Year 12: 6

c i cannot tell ii true since Year 9 $Q_1 <$ Year 12 min.

- 2 a Friday: min = \$20, $Q_1 =$ \$50, med = \$70,
 $Q_3 =$ \$100, max = \$180
Saturday: min = \$40, $Q_1 =$ \$80, med = \$100,
 $Q_3 =$ \$140, max = \$200

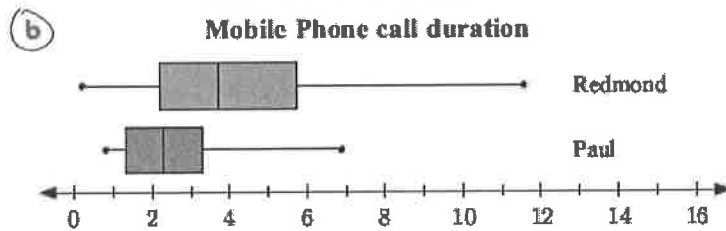
b i Friday: \$160, Saturday: \$160
ii Friday: \$50, Saturday: \$60

- 3 a i Class 1 (96%) ii Class 1 (37%) iii Class 1
b 18 c 55 d i 25% ii 50%
e i slightly positively skewed ii negatively skewed
f ... class 2, ... class 1

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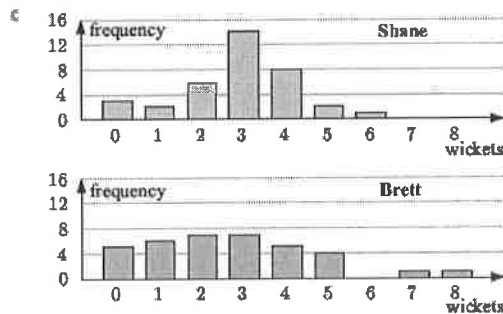
4 (a) Paul: min = 0.8; $Q_1 = 1.3$; med = 2.3; $Q_3 = 3.3$;
max = 6.9

Redmond: min = 0.2; $Q_1 = 2.2$; med = 3.7;
 $Q_3 = 5.7$; max = 11.5



(c) Both are positively skewed (Redmond's more so than Paul's).
Redmond's phone calls were more varied in duration.

5 a discrete



d Shane: approximately symmetrical Brett: positively skewed.

e Shane: mean ≈ 2.89 , median = 3, mode = 3

Brett: mean ≈ 2.67 , median = 2.5, mode = 2, 3

Shane's mean and median are slightly higher.

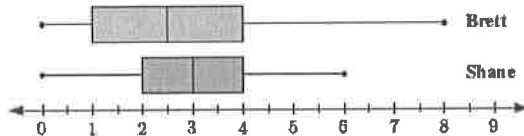
Shane has a clear mode of 3, whereas Brett has two modes (2 and 3)

f Shane: Range = 6, IQR = 2

Brett: Range = 8, IQR = 3

Shane's data set demonstrates less variability than Brett's.

g



h Shane is more consistent with his bowling (in terms of wickets taken) than Brett.

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⑥ a continuous (the data is measured)

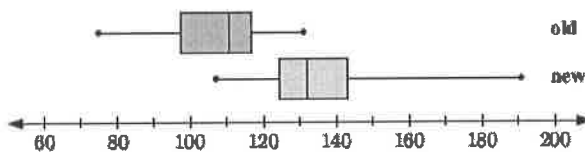
c Old: mean = 107, median = 110.5, range = 56,
IQR = 19, min = 75, max = 131

New: mean = 134, median = 132, range = 84,
IQR = 18.5, min = 107, max = 191

The 'new' type of light globe has a higher mean and median than the 'old' type.

The IQR is relatively unchanged going from 'old' to 'new', however, the range of the 'new' type is greater, suggesting greater variability.

d



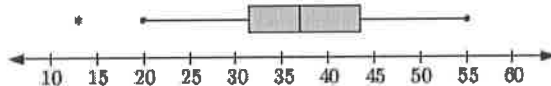
e Old type: negatively skewed, New type: positively skewed

f The 'new' type of light globes do last longer than the old type. Each number in the 5-number summary is at least 20% greater in the 'new' type. The manufacturer's claim appears to be valid.

EXERCISE 6G.3

① a 12 b lower: 13.5, upper: 61.5 c 13

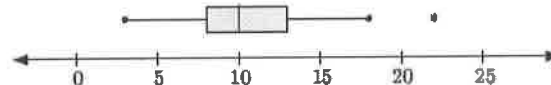
d



② a median = 10, $Q_1 = 8$, $Q_3 = 13$ b 5

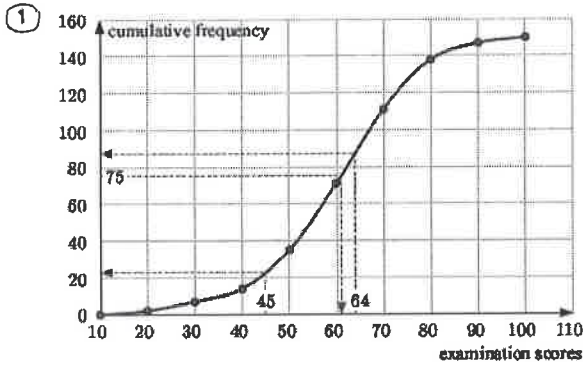
c lower = 0.5, upper = 20.5 d Yes, 22

e



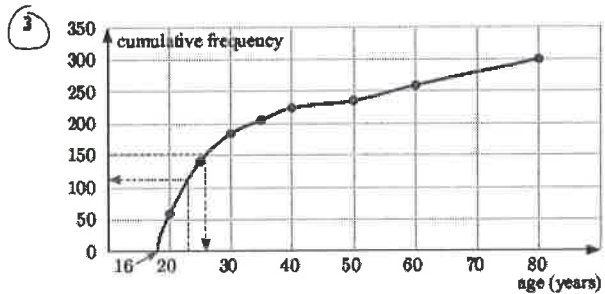
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6H



a ≈ 61 marks b ≈ 87 students c ≈ 76 students
 d ≈ 23 students e 79 marks

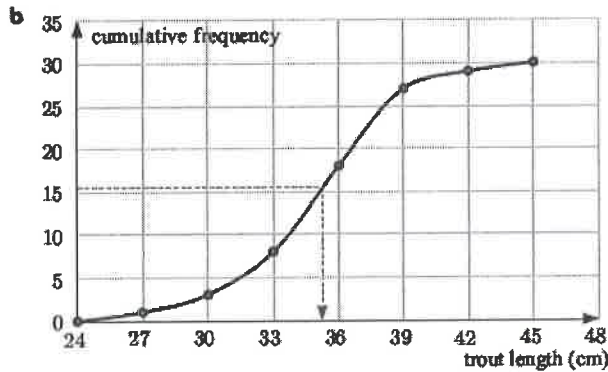
② a 9 b $\approx 28.3\%$ c 7.1 cm d ≈ 2.4 cm
 e 90% of the seedlings are shorter than 10 cm.



a 26 years b 36% c i 0.527 ii 0.0267

④ a

Length (cm)	Frequency	Cumulative frequency
$24 \leq x < 27$	1	1
$27 \leq x < 30$	2	3
$30 \leq x < 33$	5	8
$33 \leq x < 36$	10	18
$36 \leq x < 39$	9	27
$39 \leq x < 42$	2	29
$42 \leq x < 45$	1	30

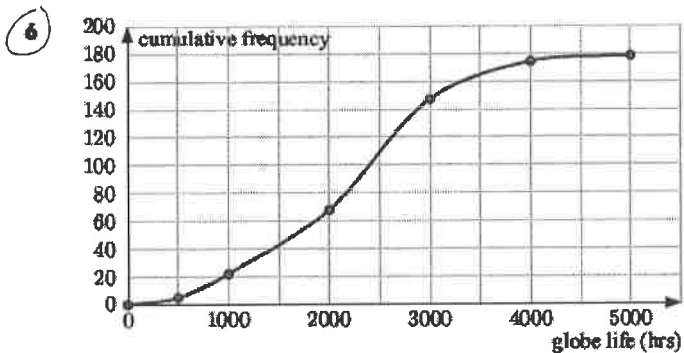


c median ≈ 35 cm
 d median = 34.5. Median from graph is a good approximation.

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6H

- 5 a 27 min b 29 min c 31.3 min
 d 4.3 min e ≈ 28 min

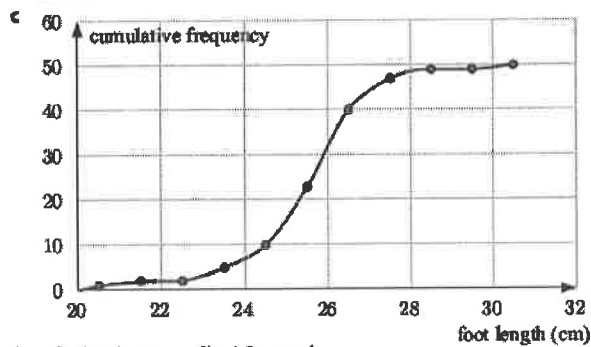


- a ≈ 2270 hours b $\approx 69\%$ c ≈ 63

- 7 a $19.5 \leq l < 20.5$

b

Foot length (cm)	Frequency	Cumulative frequency
$19.5 \leq l < 20.5$	1	1
$20.5 \leq l < 21.5$	1	2
$21.5 \leq l < 22.5$	0	2
$22.5 \leq l < 23.5$	3	5
$23.5 \leq l < 24.5$	5	10
$24.5 \leq l < 25.5$	13	23
$25.5 \leq l < 26.5$	17	40
$26.5 \leq l < 27.5$	7	47
$27.5 \leq l < 28.5$	2	49
$28.5 \leq l < 29.5$	0	49
$29.5 \leq l < 30.5$	1	50



- d i 25.2 cm ii 18 people

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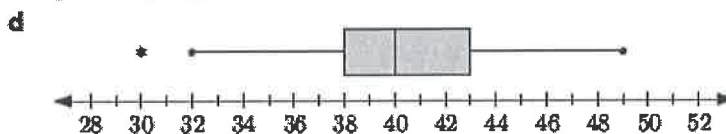
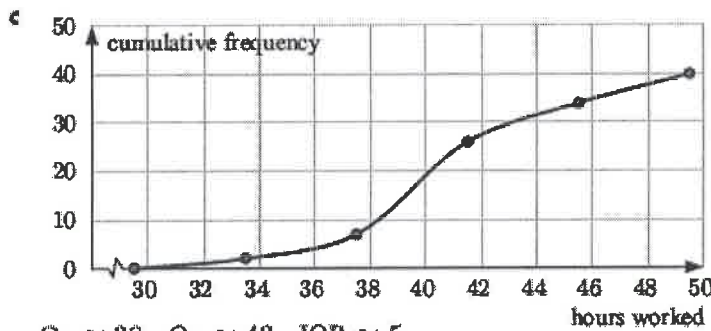
EXERCISE 61.1

- ① a 1.49 b 4.73
- ② mean = 55 L, standard deviation \approx 10.9 L
- ③ mean \approx 1.69 kg, standard deviation \approx 0.182 kg
- ④ a $\bar{x} = 169$, $s \approx 6.05$ b $\bar{x} = 174$, $s \approx 6.05$
 c The distribution has simply shifted by 5 cm. The mean increases by 5 cm and the standard deviation remains the same.
- ⑤ a $\bar{x} = 1.01$ kg; $s = 0.17$ b $\bar{x} = 2.02$ kg; $s = 0.34$
 c Doubling the values doubles the mean and standard deviation.
- ⑥ a 0.809 b 2.8, from volunteer F c 0.150
 d the extreme value greatly increases the standard deviation

EXERCISE 61.2

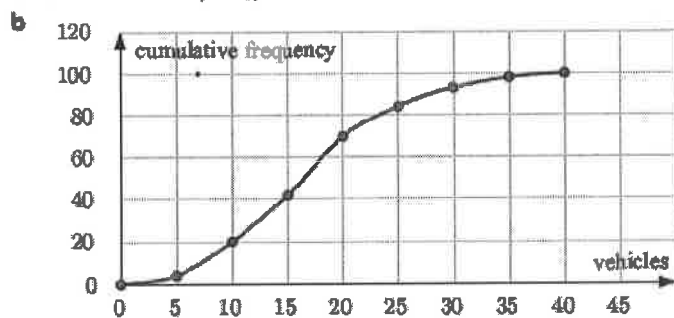
- ① $\bar{x} \approx 1.72$ children, $s_n \approx 1.67$ children
- ② $\bar{x} \approx 14.5$ years, $s_n \approx 1.75$ years
- ③ $\bar{x} = 45$ clients, $s_n \approx 3.28$ clients
- ④ $\bar{x} \approx 48.3$ cm, $s_n \approx 2.66$ cm ⑤ $\bar{x} \approx \$390.30$, $s_n \approx \$15.87$

- ⑥ a $\bar{x} \approx 40.4$ hours $s_n \approx 4.23$ hours
 b $\bar{x} = 40.6$ hours $s_n \approx 4.10$ hours
 The mean increases slightly, the standard deviation decreases slightly. These are good approximations.



h

7 a $\bar{x} \approx 17.5$ cars, $s_n \approx 7.87$ cars



$Q_1 \approx 11$, $Q_3 \approx 22$, $IQR \approx 11$

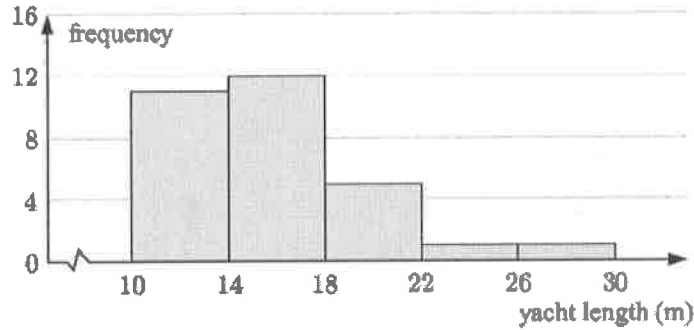
EXERCISE 61.3

- 1 a Sample A
b Sample A: mean = 8, Sample B: mean = 8
c Sample A: $s_n = 2$, Sample B: $s_n \approx 1.06$
Sample B's standard deviation is smaller than Sample A's.
The graph shows the data to be less 'spread out' in Sample B.
- 2 a Andrew: $\bar{x} = 25$, $s_n \approx 4.97$ b Andrew
Brad: $\bar{x} = 30.5$, $s_n \approx 12.6$
- 3 a Rockets: mean = 5.7, range = 11
Bullets: mean = 5.7, range = 11
b We suspect the Rockets, they have two zeros.
c Rockets: $s_n = 3.9$ ← greater variability
Bullets: $s_n \approx 3.29$
d Standard deviation, as it takes into account all data values.
- 4 a No, because of random variation
b i the sample mean \bar{x}
ii the sample standard deviation s_n
c Less variability in the volume of soft drink per can.

REVIEW SET 6A

- 1 a quantitative discrete b quantitative continuous
 c categorical d categorical e categorical
 f quantitative continuous g quantitative continuous
 h quantitative discrete i quantitative discrete

2 a

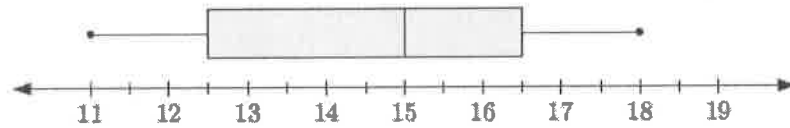


- b i median = 14.5 m ii range = 17.3 m
 c The data is positively skewed.

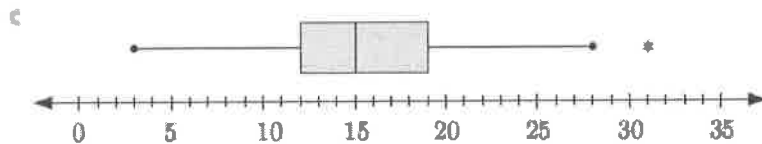
3 a = 2

- 4 a negatively skewed b 47.5% c 7.5%
 d We do not know all the data values exactly, only the class intervals they fall into.

5



- 6 a 77 days b 12 days
 7 a $\bar{x} \approx 122$, $s_n \approx 7.94$ b $\bar{x} \approx 7.01$, $s_n \approx 0.984$
 8 a min = 3; $Q_1 = 12$; med = 15; $Q_3 = 19$; max = 31
 b range = 28; IQR = 7

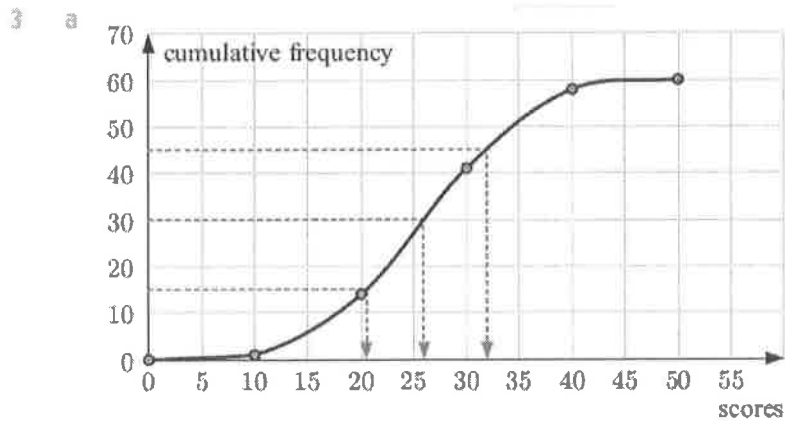
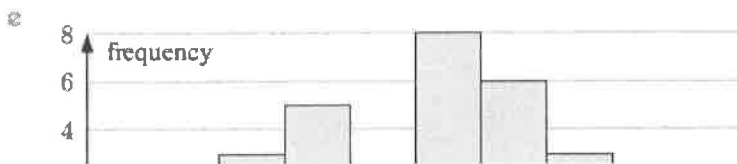


REVIEW SET 6B

- 1 a quantitative continuous b categorical c categorical
 d quantitative continuous e quantitative continuous
 f quantitative discrete g categorical
- 2 a minimum = 64.6 m, maximum = 97.5 m
 b i mean \approx 81.1 m ii median \approx 83.1 m

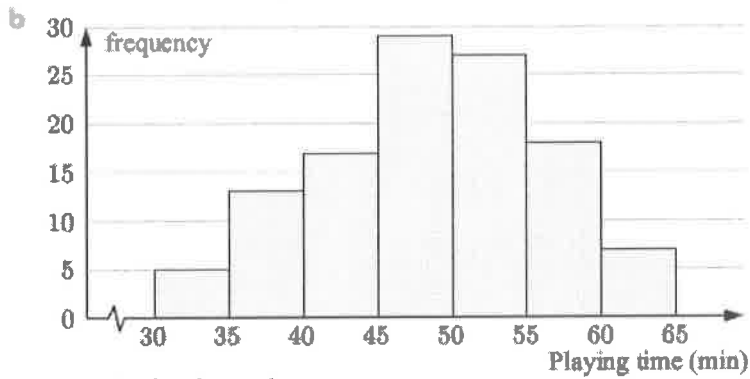
c, d

Distance (m)	Tally	Frequency
$60 \leq d < 65$		1
$65 \leq d < 70$		3
$70 \leq d < 75$		5
$75 \leq d < 80$		2
$80 \leq d < 85$		8
$85 \leq d < 90$		6
$90 \leq d < 95$		3
$95 \leq d < 100$		2
	<i>Total</i>	30



- b i median \approx 26.0 ii IQR \approx 12
 iii $\bar{x} \approx$ 26.0 iv $s_n \approx$ 8.31
- 4 a i £352.50 ii £336 iii £365.50
 b £29.50 c $\bar{x} \approx$ £350, $s_n \approx$ £17.80
- 5 a 88 students b $m = 24$

6 a $\bar{x} \approx 48.6$ min, $s_n \approx 7.63$ min



c negatively skewed

7 range = 19; $Q_1 = 119$; $Q_3 = 130$; $s_n \approx 6.38$

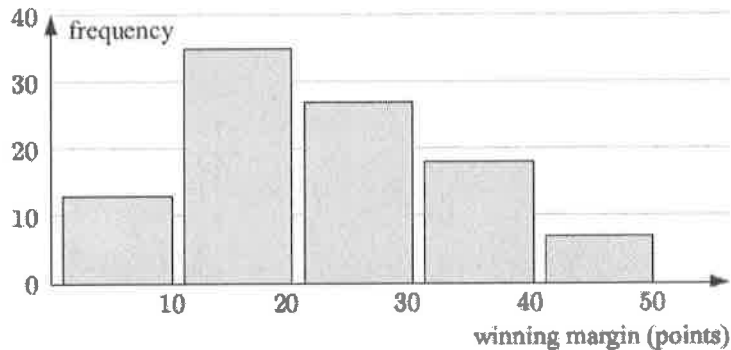
8 a $\bar{x} \approx 29.6$ allsorts, $s_n \approx 1.61$ allsorts

b More investigation is needed.

REVIEW SET 6C

1 $p = 7$, $q = 9$ (or $p = 9$, $q = 7$)

2



3 $\bar{x} \approx 414$ patrons

4 a A: min = 11 s; $Q_1 = 11.6$ s; med = 12 s;

$Q_3 = 12.6$ s; max = 13 s

B: min = 11.2 s; $Q_1 = 12$ s; med = 12.6 s;

$Q_3 = 13.2$ s; max = 13.8 s

b i A: range = 2.0 s ii A: IQR = 1.0 s

B: range = 2.6 s B: IQR = 1.2 s

c i A, the median time is lower.

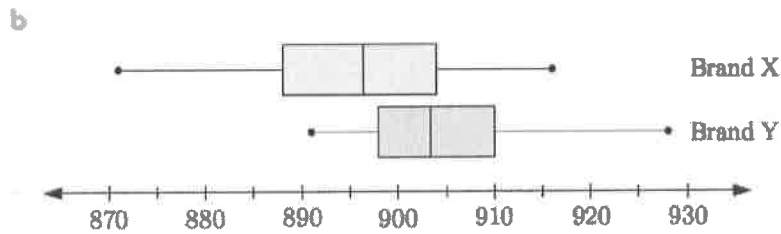
ii B, the range and IQR are higher.

5 $\bar{x} \approx \text{€}104$, $s_n \approx \text{€}19.40$

- 6 a 120 students b 65 marks c 54 and 75
d 21 marks e $\approx 73\%$ f 82 marks

7 a

	<i>Brand X</i>	<i>Brand Y</i>
min	871	891
Q_1	888	898
median	896.5	903.5
Q_3	904	910
max	916	928
IQR	16	12



- c i Brand Y, as the median is higher.
ii Brand X, as the IQR is lower, so less variations.