NEW CENTURY MATHS 11
MATHEMATICS STANDARD (PATHWAY 2)

FULLY WORKED SOLUTIONS

Chapter 1: Collecting and presenting data

SkillCheck

Question 1

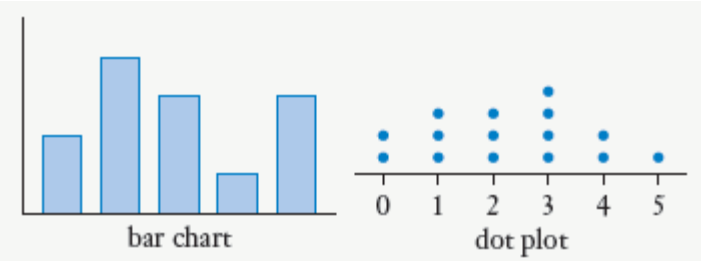
a sector graph

b stem-and-leaf plot

c line graph

d divided bar graph

Question 2



Question 3

a 20

b 5

c 500

Question 4

a $\frac{3}{8}$

b $\frac{3}{8} \times 100\% = 37\frac{1}{2}\%$

Question 5

a $\frac{126^\circ}{360^\circ} = \frac{7}{20}$

b $\frac{7}{20} \times 100\% = 35\%$

Question 6

$\frac{20 + 29}{2} = 24.5$

Exercise 1.01 Interpreting graphs

Question 1

a 16%

b $16\% - 13\% = 3\%$

c 13% of 35 750 = 4647.5 ≈ 4648

d 100% – 16% = 84%

84% of 43 320 = 36 388.8 ≈ 36 389

e It remained stable at 13%.

f 1995: 8%, 2013: 16%; which is double, so the statement is true.

g The percentage of people drinking at a risky level will be higher.

Question 2

a $\frac{1}{4}$

b labour

c $15\% \text{ of } 17.50 = \frac{15}{100} \times 17.50$

$= 2.625$

$\approx \$2.63$

d $5\% = \$325$

So, $1\% = \frac{325}{5}$

$\therefore 100\% = 65 \times 100$

$= \$6500$

e $15\% \text{ of } 360° = \frac{15}{100} \times 360°$

$= 54°$

f $20\% \text{ of } \$5300 = \frac{20}{100} \times 5300$

$= \$1060$

Question 3

a The bar measures 120 mm.

$\frac{20}{120} = \frac{1}{6}$

b $\frac{42}{120} \times 100\% = 35\%$

c $\frac{45}{120} \times 100\% = 37.5\%$ (Suspicious)

d $\frac{7}{120} \times 275 \approx 16$ fires

Question 4

a male

b 25–34

c 14%

d 14% of 1 705 000 = 238 700

e 65–74

f decreases

Question 5

a In-store, online via PC

b **i** in-store **ii** in-store **iii** online via PC

c **i** 17% **ii** 8% **iii** 11%

Question 6

a Yes

b underweight

c 18

d $\text{BMI} = \frac{78}{1.73^2} = 26.06...$

It would be suggested that Jake needs to lose weight.

e 16 to 25

f Answers will vary.

Question 7

a 1 mm

b number of rain days

c 23 mm; 4

d October; 24.5 mm

e July; 6

f April (lowest rainfall)

g 9

Question 8

$9\% = 2475$

$\therefore 1\% = \frac{2475}{9}$

$\therefore 100\% = 275 \times 100$

$= 27\ 500$

So, A.

Question 9

a share prices over 6 days

b 10 c

c $4.55

d Tuesday

e It fell, then rose.

f Thursday; lowest price.

g NCM Bank

Question 10

a 17

b East; 25 on Thursday

c Monday; first working day

d Wednesday; 23 – 17 = 6

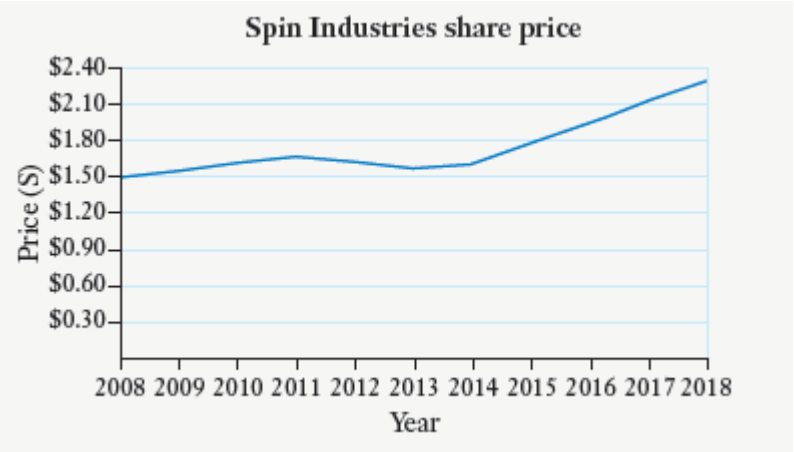
e Saturday; no industry

Exercise 1.02 Misleading graphs

Question 1

a The vertical axis starts at $1.50 so increases in share price appear steeper than they actually are.

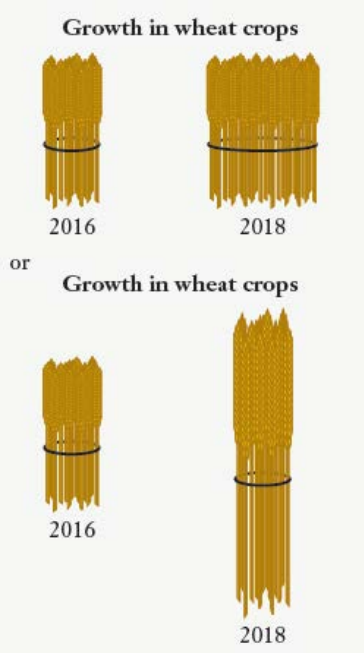
b



Question 2

a Because the 2018 picture is double the length and double the width, it is actually four times the size of the 2016 picture instead of two times the size.

b



Question 3

a a company's sales

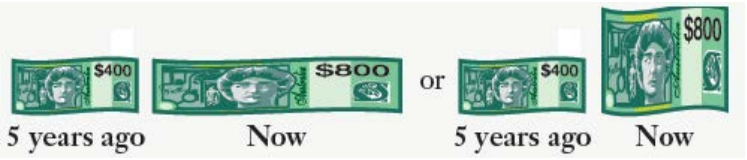
b The new director has made sales go down.

c sales figures and months

Question 4

a The $800 note is double the length and double the width of the $400 note and this makes it four times the size of the $400 note instead of two times the size.

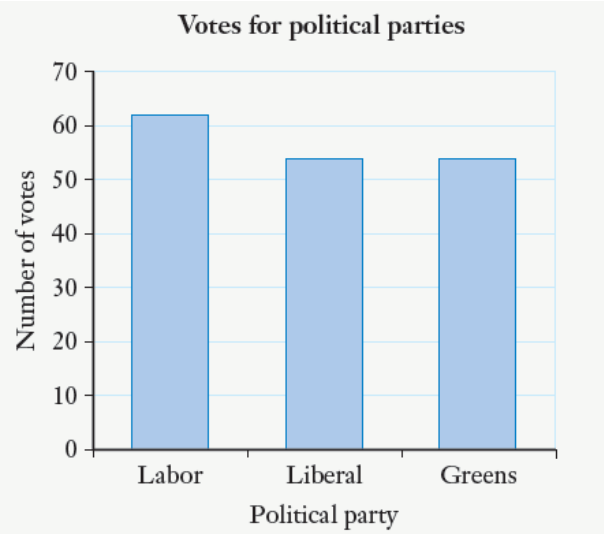
b



Question 5

a By starting the scale on the vertical axis at 53.

b

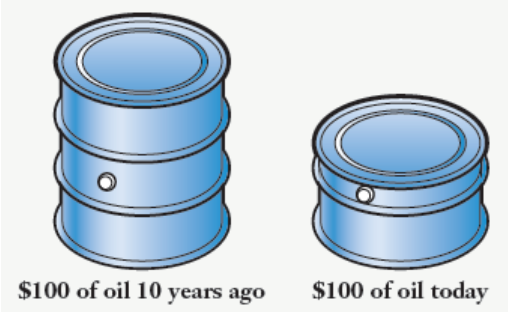


c The Labor votes are not overwhelmingly higher. They are just 8 more.

Question 6

a The picture for '$100 of oil today' is actually about $\frac{1}{4}$ the size of the picture for '10 years ago'.

b



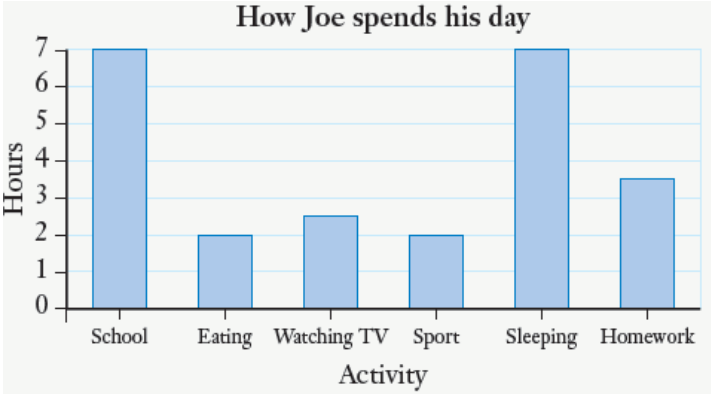
Question 7

a 7 hours

b The hours scale does not begin at 0.

c Big difference between school or sleeping and the other activities..

d



Exercise 1.03 Types of data

Question 1

a	C	**e**	N	**i**	N
b	N	**f**	C	**j**	N
c	C	**g**	C	**k**	N
d	N	**h**	C	**l**	C

Question 2

Categorical data uses words/symbols, for example, type of pet.

Numerical data uses quantities/numbers, for example, person's height

Question 3

a	N	**e**	N
b	O	**f**	O
c	O	**g**	O
d	N	**h**	N

Question 4

a	C	**e**	D
b	C	**f**	C
c	C	**g**	D
d	C	**h**	C

Question 5

a	HSC subjects	**c**	number of children in a family
b	size of hot chips at a fast food store	**d**	heights of boys in Year 11

Question 6

a	numerical	**c**	continuous
b	categorical	**d**	nominal

Question 7

B

Exercise 1.04 Sampling techniques

Question 1

a C

b S

c S

d C

e S

f S

g C

h S

Question 2

2021, 2026

Question 3

Teacher to check reasons.

a systematic

b random

c self-selected

d stratified

e random

f random

g random

h random

i random

j self-selected

Question 4

Total = 3347 + 1504

= 4851

$$\text{Female shoppers} = \frac{3347}{4851} \times 200$$

$$= 137.99...$$

$$\approx 138$$

Question 5

Total = 830 960

$$\text{West} = \frac{260\ 450}{830\ 960} \times 600$$

$$= 188.05...$$

$$\approx 188$$

Question 6

Total = 38

$$\text{Teachers} = \frac{5}{38} \times 8$$

$$= 1.05...$$

$$\approx 1$$

So, B.

Question 7

a Not all teens read magazines.

b Only those diners interested/volunteering to complete the survey are sampled.

c Need to select more students and not only those who arrive early.

d Need to sample workers as well, not only management who may have a biased view.

e People at a premiere are not the usual moviegoers.

f It is restricted to one radio station.

Question 8

b, f and **g**

Question 9

a systematic sample

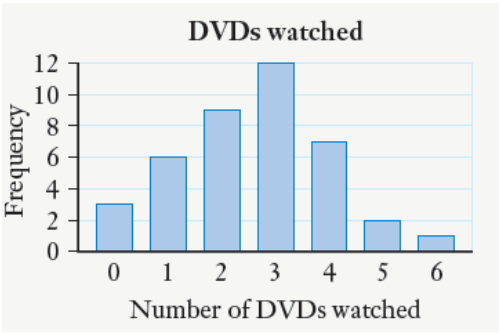
b shoppers in 1 store only; only females or males

Exercise 1.05 Constructing graphs

Question 1

a

Score	Frequency
0	3
1	6
2	9
3	12
4	7
5	2
6	1
	40



b data is discrete (not continuous)

c 3

d 6; 1 student

e Total = 2 + 1 = 3

$$\therefore \frac{3}{4} \times 100\% = 7.5\%$$

Question 2

a shows parts of the whole amount

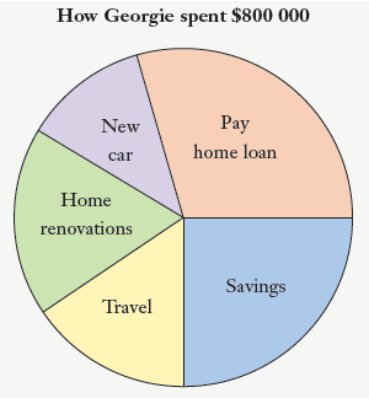
b $$\text{home loan} = \frac{235\ 000}{800\ 000} \times 360° \approx 106°$$

$$\text{new car} = \frac{96\,000}{800\ 000} \times 360° \approx 43°$$

$$\text{home reno} = \frac{144\,000}{800\,000} \times 360° \approx 65°$$

$$\text{travel} = \frac{125\ 000}{800\ 000} \times 360° \approx 56°$$

$$\text{savings} = \frac{200\,000}{800\ 000} \times 360° = 90°$$



c saved it

d $$\frac{144\,000}{800\ 000} = \frac{9}{50}$$

e $$\frac{96\ 000}{800\ 000} \times 100\% = 12\%$$

Question 3

a $3460 + 855 + 4140 + 4215 + 2300 = 14\,970$

b sector; divided bar; bar chart

c Draw a bar 6 cm long (could choose any length)

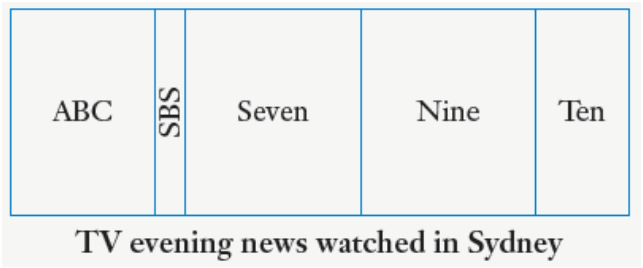
$$\text{ABC} = \frac{3460}{14\,970} \times 6 \approx 1.4 \text{ cm}$$

$$\text{SBS} = \frac{855}{14\,970} \times 6 \approx 0.3 \text{cm}$$

$$\text{Seven} = \frac{4140}{14\,970} \times 6 \approx 1.7 \text{ cm}$$

$$\text{Nine} = \frac{4215}{14\,970} \times 6 \approx 1.7 \text{ cm}$$

$$\text{Ten} = \frac{2300}{14\,970} \times 6 \approx 0.9 \text{cm}$$



TV evening news watched in Sydney

d $\frac{3460}{14970} \times 100\% \approx 23\%$

e Seven and Nine $= 4140 + 4215$

$= 8355$

Yes, this is more than half of 14 970.

f No, since the survey only included Sydney households.

Question 4

a $7 + 5 + 11 + 21 + 15 + 9 + 4 = 72$

b bar chart; discrete data

c $\frac{7}{12} \times 100\% \approx 9.7\%$

d Total 'no more than 3' $= 7 + 5 + 11 + 21 = 44$

$\therefore \frac{44}{72} = \frac{11}{18}$

Question 5

D

Question 6

a Delivery delayed, pizza not hot

b 1100

c 90%

d incorrectly billed ≈ 65
not baked properly ≈ 20
$\therefore$ True

e On-time delivery, pizza hotter. Discuss with drivers/employees ways to coordinate cooking pizza with prompt delivery to improve efficiency. If delayed delivery is traffic related, then perhaps other means of transport is needed in certain areas – scooter, bicycle, walking.

Question 7

a Insects

b Insufficient storage, loud music after 11 p.m.

c 100

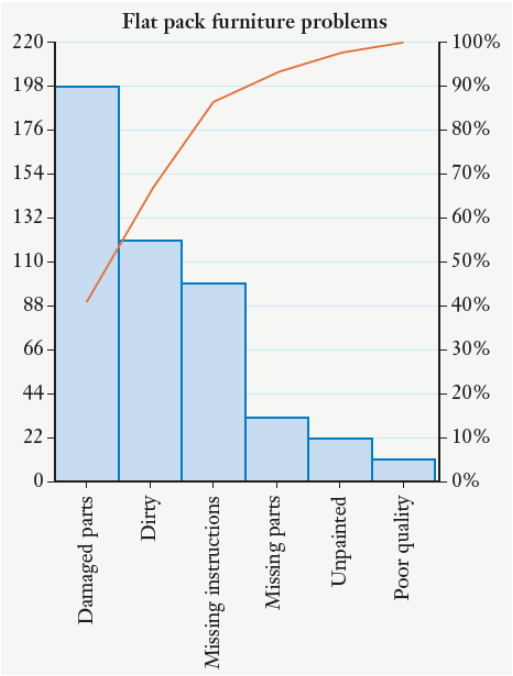
d 25%

e **i** True **ii** False **iii** True

f Install fly screens in rooms and reverse cycle air conditioning.

Question 8

a



b Damaged parts, dirty

c Checking products are unbroken and clean before packing, providing safer packing and transportation.

Question 9

a Total $= 20 + 35 + 7 + 10 + 3 + 12 + 6 = 93$

Draw a bar 7.2 cm long (could choose any length)

UK $= \frac{20}{93} \times 7.2 \approx 1.5$ cm

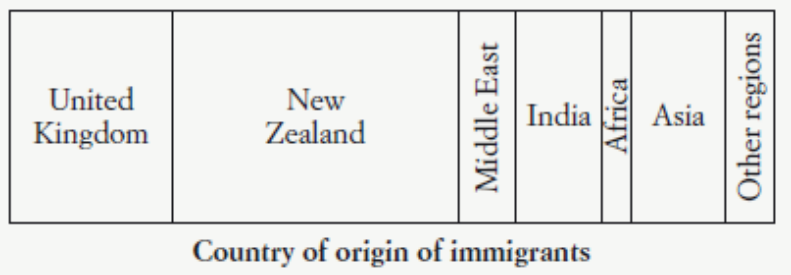
NZ $= \frac{35}{93} \times 7.2 \approx 2.7$ cm

Mid East $= \frac{7}{93} \times 7.2 \approx 0.5$ cm

India $= \frac{10}{93} \times 7.2 \approx 0.8$ cm

Africa $= \frac{3}{93} \times 7.2 \approx 0.2$ cm

Other $= \frac{6}{93} \times 7.2 \approx 0.5$ cm



Country of origin of immigrants

b UK and NZ = 20 + 35 = 55, which is more than half of the 93

$\therefore$ True

c $\frac{12}{93} = \frac{4}{31}$

d $\frac{7}{93} \times 100\% \approx 8\%$

e 10.75% of 93 $= \frac{10.75}{100} \times 93$

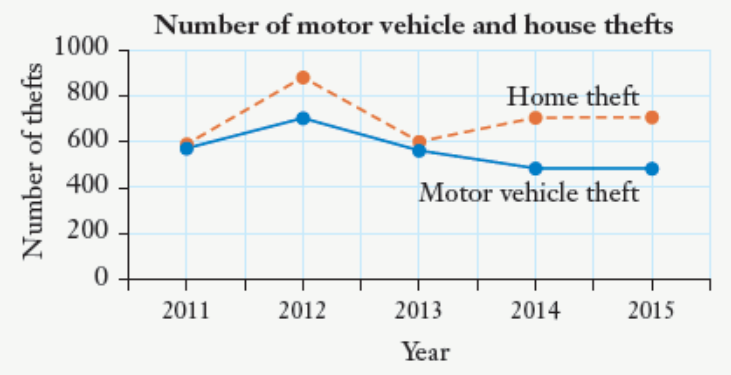
$= 9.975$

≈ 10

$\therefore$ India

Question 10

a



b 2012

c 2015

d home theft

e Home thefts rose sharply from 2011 to 2012, then reduced significantly in 2013 to then increase again only slightly until 2015.

f decreased, only slightly

Exercise 1.06 Frequency histograms and polygons

Question 1

a

Photo posts/day	Frequency
0	2
1	10
2	5
3	8
4	7
5	8
	40

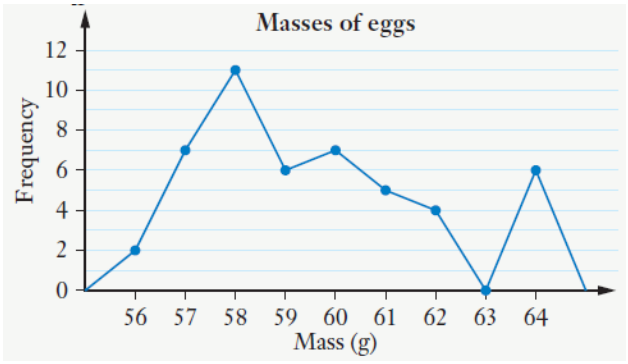
b

Question 2

a

Mass (g)	Number of eggs
56	2
57	7
58	11
59	6
60	7
61	5
62	4
63	0
64	6
	48

b

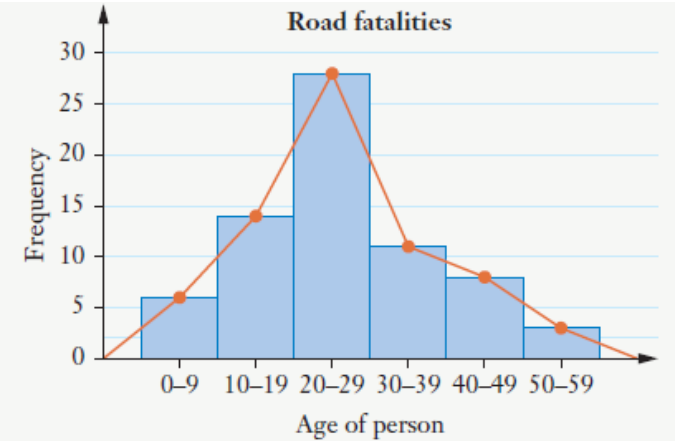


c Yes, since 26 out of 48 (about 54%) eggs are less than 60 g.

Question 3

a 6 + 14 + 28 + 11 + 8 + 3 = 70 people

b



c Most road deaths occur in the (10–39) age group.

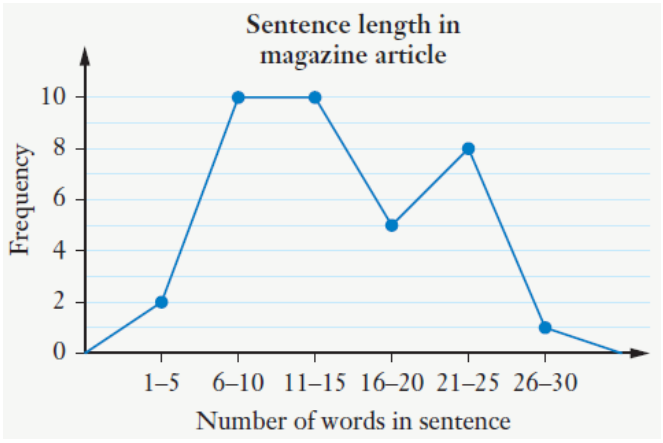
Question 4

a discrete

b

Number of words in sentence	Class centre	Tally	Number of sentences
1–5	3	II	2
6–10	8	𝍸 𝍸	10
11–15	13	𝍸 𝍸	10
16–20	18	𝍸	5
21–25	23	𝍸 III	8
26–30	28	I	1
			36

c



d (6–10) and (11–15) are he two modal classes.

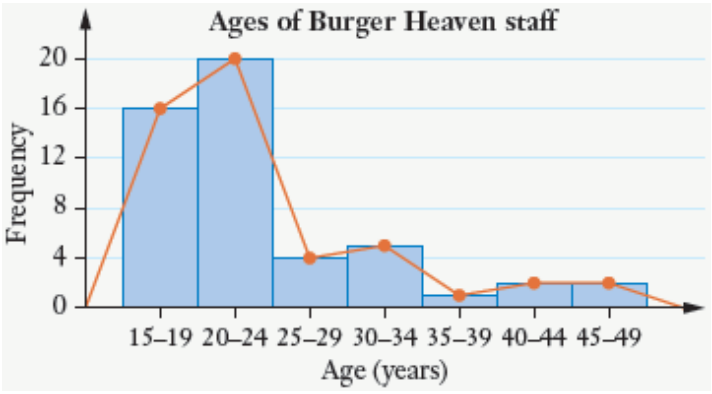
Question 5

a

Class	Class centre	Tally	Frequency
15–19	17	𝍸 𝍸 𝍸 I	16
20–24	22	𝍸 𝍸 𝍸 𝍸	20
25–29	27	IIII	4
30–34	32	𝍸	5
35–39	37	I	1
40–44	42	II	2
45–49	47	II	2
			50

b 50

c



d The data is skewed towards younger workers; most of the worked are aged less than 25 years.

Question 6

a none

b $7+3+4+1+2+5+6+3+2+4+6=43$

c $\frac{7}{43}\times 100\% \approx 16.3\%$

d No, since the last column only tells those who made more than 30 calls.

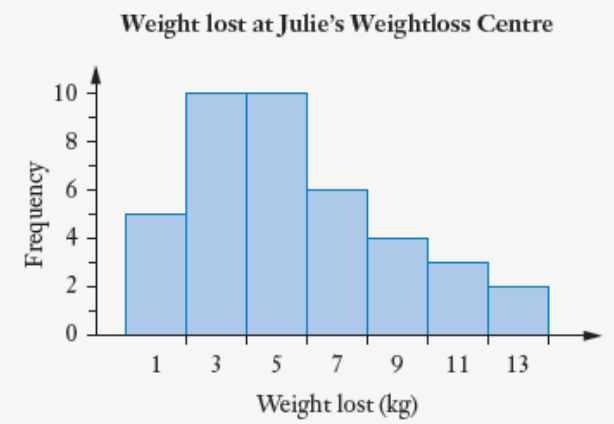
Question 7

a continuous

b

Class	Class centre	Frequency
0 – < 2	1	5
2 – < 4	3	10
4 – < 6	5	10
6 – < 8	7	6
8 – < 10	9	4
10 – < 12	11	3
12 – < 14	13	2
		40

c



d Modal classes are (2 – < 4) and (4 – < 6).

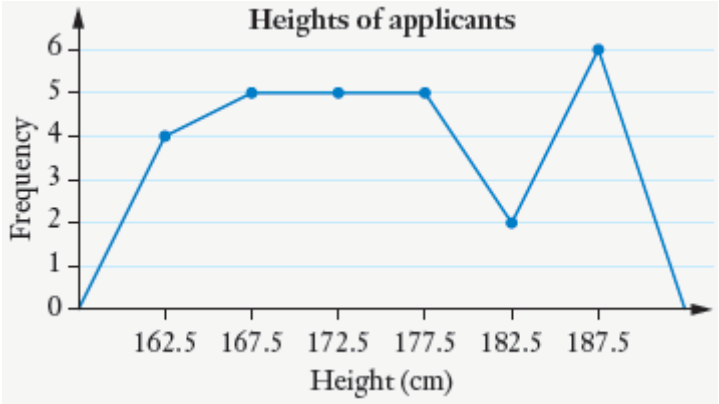
e The program seems effective, because most people lost weight.

Question 8

a

Height (cm)	Class centre	Tally	Number of applicants
160 – <165	162.2	IIII	4
165 – <170	167.5	𝍸	5
170 – <175	172.5	𝍸	5
175 – <180	177.5	𝍸	5
180 – <185	182.5	II	2
185 – <190	187.5	𝍸 I	6
			27

b



c Modal class interval in 185–< 190

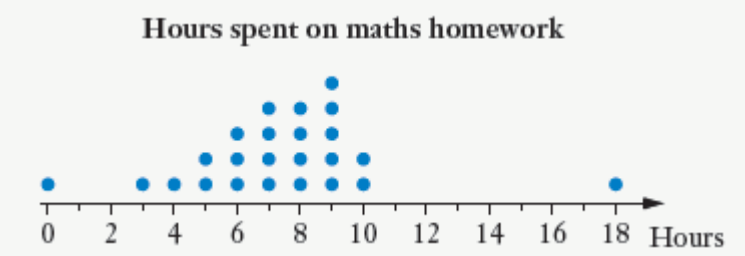
d 160–< 165

e 180–< 185

Exercise 1.07 Dot plots and stem-and-leaf plots

Question 1

a



b 24

c 0 and 18

d cluster 6–9; gaps at 1–2, 11–17 hours

Question 2

a 10

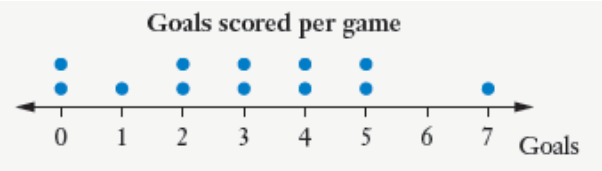
b mode = most frequent = 7

c 12; a student with big feet

d $\frac{4}{10} = \frac{2}{5}$

Question 3

a

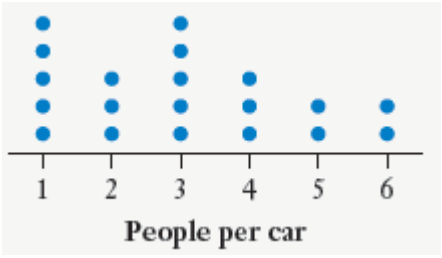


b 0

c Goals per game ranged from 0 to 7, so the team is not consistent.

Question 4

a



b 20

c 6

d no real clusters or outliers

Question 5

a 30

b $\frac{15}{30} \times 100\% = 50\%$

c around 6–10

d Mostly good results but three quite low scores

Question 6

a

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

b Count the ‘leaves’. 20

c 89

d 5 games below 56

So, $\frac{5}{20} \times 100\% = 25\%$

Question 7

a

Stem	Leaf
2	8
3	
4	2 3 7
5	1 3 7 9
6	1 3 4 6 8 8
7	2 8 9 9
8	1 2 3 4
9	3 4
10	0 3 4
11	0 2 7

b $\frac{26}{30} \times 100\% \approx 87\%$

c 28; rainy day and few customers

Question 8

a 36

b 91 seconds

c $\frac{10}{36} \times 100\% \approx 28\%$

Question 9

a

Stem	Leaf
5	2 5 6 8
6	0 0 3 3 4 4 4 5 8 8 9 9
7	1 2 2 4 4 6 6 8 9
8	0 1 1 3 3 4 4 5 9
9	0 0 3 4 7
10	
11	0

b 10

c 110, heart is beating quickly

d 4 people had a heart rate less than 60 beats per minute

Question 10

a $975 000

b 50

c $385 000

Question 11

a

Stem	Leaf
11	6 8
12	0 1 4
13	6 9
14	3 5 6 6 6
15	4 6 6 7
16	3 5 8
17	2 4 7
18	1 7

b 24

c **i** 11.6 s **ii** 18.7 s

d $\frac{12}{24} \times 100\% = 50.0\%$

e $\frac{5}{24}$

Sample HSC problem

a A

b Select some fans from each team's home ground.

c 23% of 360

$$= \frac{23}{100} \times 360$$
$$= 82.8$$
$$\approx 83°$$

d $\frac{4500}{3000} \times 100\% = 15\%$

$\therefore$ players' salaries

e Doesn't show exact values; it is difficult to compare similar values.

Question 1

a 4150

b pancreatic

c 6

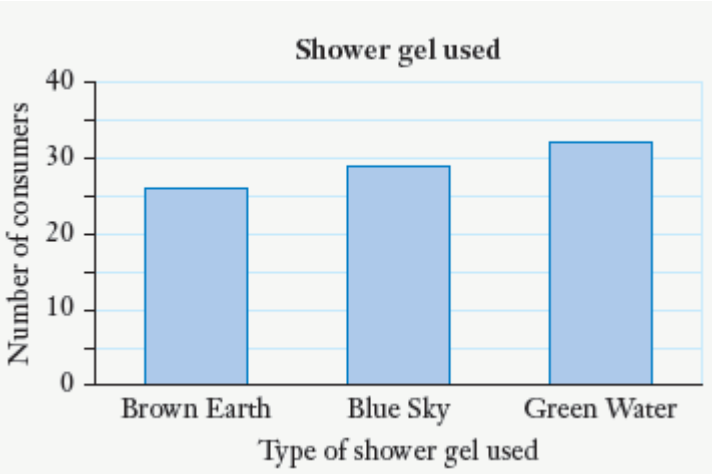
d lung = 5000

bowel and prostate $= 4150 + 3100 = 7250$
$\therefore$ False

e These cancers do not represent parts of a whole.

Question 2

a The vertical scale should start at zero.



b sector graph, divided bar graph

Question 3

a N

b C

c C

d N

e N

f C

Question 4

b N

c O

f N

Question 5

a D

d C

e D

Question 6

Systematic, for example, take every 10th bottle and test.

Question 7

a The sample may not necessarily take students from each Year into account.

b Total = 114 + 120 + 114 + 128 + 105 + 96 = 677

$$\begin{aligned}\text{Number of Year 10 students} &= \frac{128}{677} \times 50 \\ &= 9.453... \\ &\approx 9\end{aligned}$$

Question 8

Teacher to check.

Question 9

a $3+8+32+28+17+5=93$

b $0: \quad \frac{3}{93}\times 360° \approx 12°$

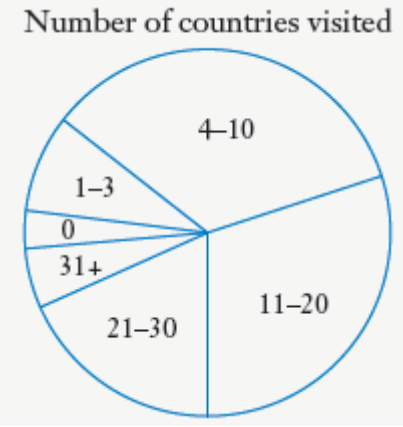
$1-3: \quad \frac{8}{93}\times 360° \approx 31°$

$4-10: \quad \frac{32}{93}\times 360° \approx 124°$

$11-20: \quad \frac{28}{93}\times 360° \approx 108°$

$21-30: \quad \frac{17}{93}\times 360° \approx 66°$

$31+: \quad \frac{5}{93}\times 360° \approx 19°$



c $12°$

d $\frac{32}{93}\times 100\% = 34.4\%$

e 11 or more countries = $28+17+5=50$, which is more than half of 93.

$\therefore$ True

f The data is not continuous; the class intervals are not equal in size.

Question 10

a traffic, child care

b emergency

c 20

d $\approx 35\%$

e Provide child care at work place, change location of company to be near public transport so traffic not an issue or give more flexible working hours to beat peak hours.

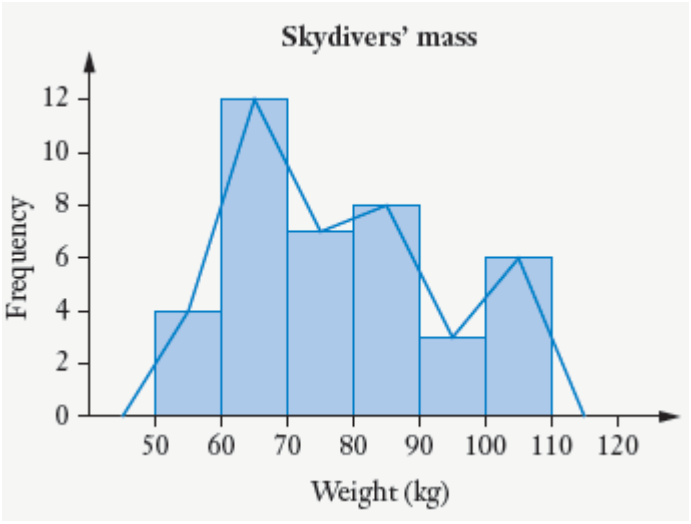
Question 11

a continuous

b

Mass (kg)	Frequency
50–< 60	4
60–< 70	12
70–< 80	7
80–< 90	8
90–< 100	3
100–< 110	6
	40

c

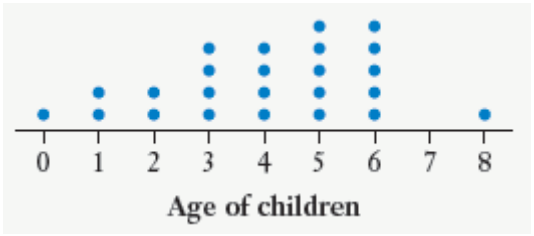


d 60–<70

e $\frac{8}{40} = \frac{1}{5}$

Question 12

a



b 24

c $\frac{6}{24} = \frac{1}{4}$

d Data are clustered around 3–6 years.

Question 13

a 3 years

b 29

c 12

d $\frac{12}{29} \times 100\% \approx 41\%$

