Answer ALL questions. Write your answers in the spaces provided.

1. The heights, x metres, of 40 children were recorded by a teacher. The results are summarised as follows

$$\sum x = 58 \quad \sum x^2 = 84.829$$

(a) Find the mean and the variance of the heights of these 40 children.

(3)

The teacher decided that these statistics would be more useful in centimetres.

(b) Find

(i) the mean of these heights in centimetres,

(ii) the standard deviation of these heights in centimetres.

(2)

Two more children join the group. Their heights are 130 cm and 160 cm.

(c) (i) State, giving a reason, the mean height of the 42 children.

(ii) Without recalculating the standard deviation, state, giving a reason, whether the standard deviation of the heights of the 42 children will be greater than, less than or the same as the standard deviation of the heights of the group of 40 children.

(4)

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2: Students in class A and class B sit a statistics test.

There are 24 students in class A and 30 students in class B

The marks, x, for students in each class are summarised in the table below.

	n	$\bar{x}$	$\sum x^2$
Class A	24	47	66 876
Class B	30	b	73 826

The two classes are combined into one group of 54 students.
The mean mark for all 54 students is 45

(a) Show that $b = 43.4$

(2)

(b) Find the standard deviation of the marks for all 54 students.

(2)

Following moderation, each student in class B has their mark increased by 2

(c) Without further calculations state, giving a reason in each case, the effect this will have on

(i) the variance of the marks for class B

(ii) the mean mark for all 54 students

(iii) the standard deviation of the marks for all 54 students.

(3)

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5. The weights, in grams, of a random sample of 48 broad beans are summarised in the table.

Weight in grams (x)	Frequency (f)	Class midpoint (y)
$0.9 < x \leqslant 1.1$	9	1.0
$1.1 < x \leqslant 1.3$	12	1.2
$1.3 < x \leqslant 1.5$	11	1.4
$1.5 < x \leqslant 1.7$	8	1.6
$1.7 < x \leqslant 1.9$	3	1.8
$1.9 < x \leqslant 2.1$	3	2.0
$2.1 < x \leqslant 2.7$	2	2.4

(You may assume $\sum fy^2 = 101.56$)

A histogram was drawn to represent these data. The $2.1 < x \leqslant 2.7$ class was represented by a bar of width 1.5 cm and height 1 cm.

(a) Find the width and height of the $0.9 < x \leqslant 1.1$ class.

(3)

(b) Give a reason to justify the use of a histogram to represent these data.

(1)

(c) Estimate the mean and the standard deviation of the weights of these broad beans.

(4)

(d) Use linear interpolation to estimate the median of the weights of these broad beans.

(2)

One of these broad beans is selected at random.

(e) Estimate the probability that its weight lies between 1.1 grams and 1.6 grams.

(1)

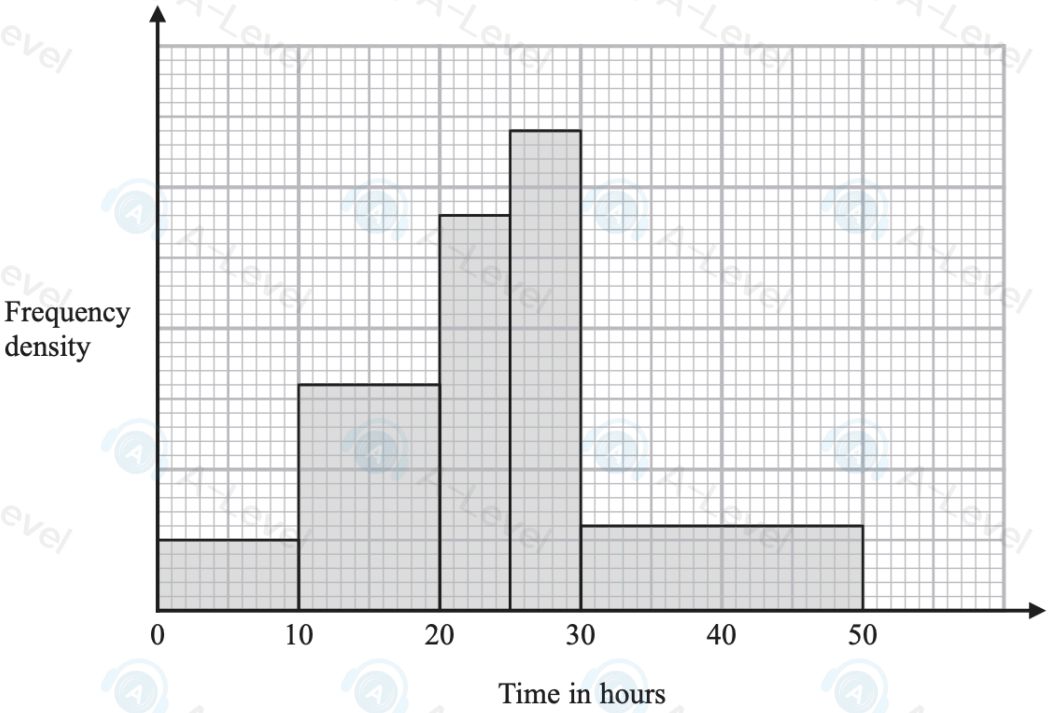
One of these broad beans having a recorded weight of 0.95 grams was incorrectly weighed. The correct weight is 1.4 grams.

(f) State, giving a reason, the effect this would have on your answers to part (c). Do not carry out any further calculations.

(2)

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5.



The histogram shows the number of hours worked in a given week by a group of 64 freelance photographers.

(a) Give a reason to justify the use of a histogram to represent these data.

(1)

Given that 16 of these freelance photographers spent between 10 and 20 hours working in this week,

(b) estimate the number that spent between 12 and 24 hours working in this week.

(3)

(c) Find an estimate for the median time spent working in this week by these 64 freelance photographers.

(2)

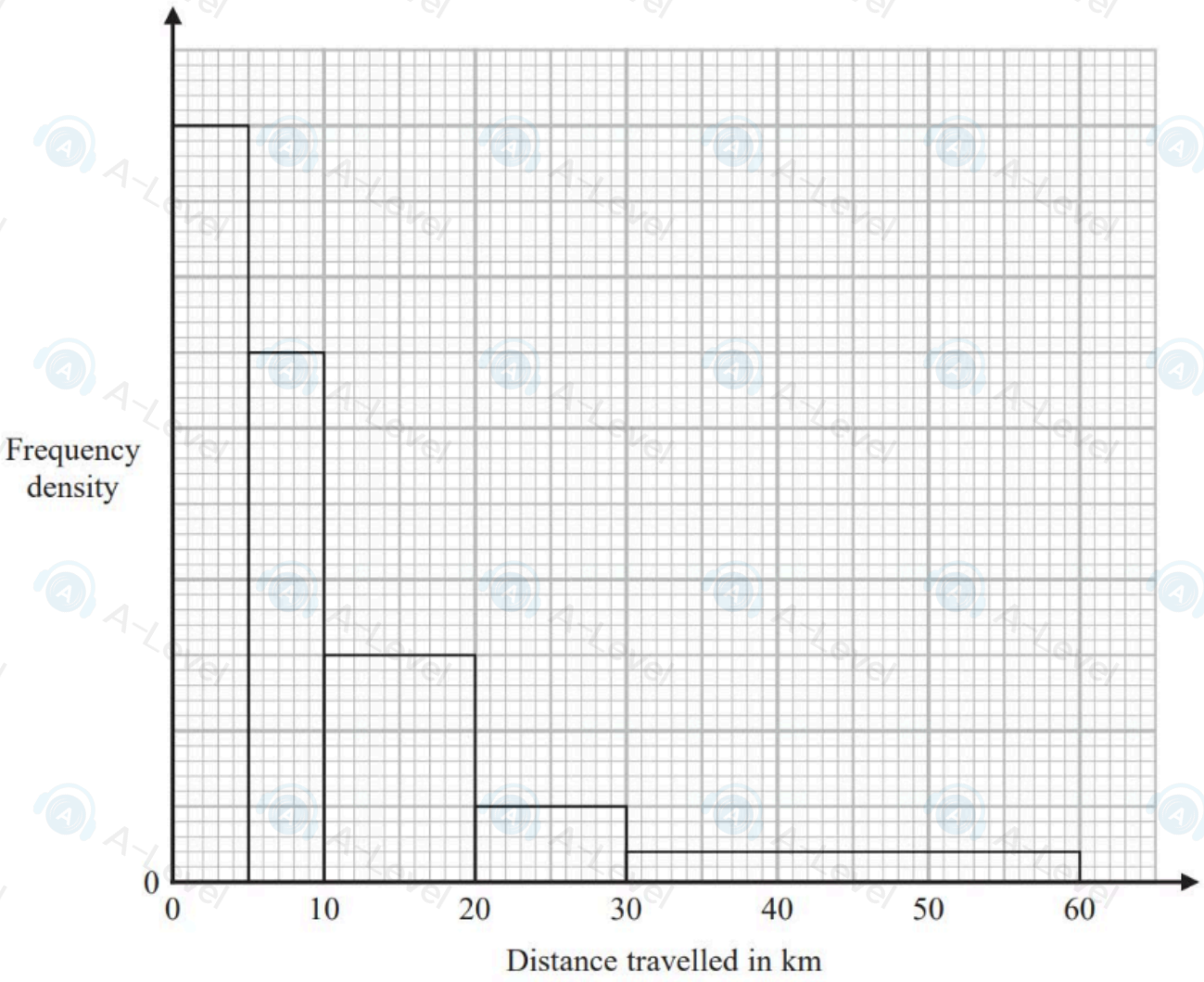
Charlie decides to model these data using a normal distribution.
Charlie calculates an estimate of the mean to be 23.9 hours to one decimal place.

(d) Comment on Charlie's decision to use a normal distribution.
Give a justification for your answer.

(2)

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1. The histogram shows the distances, in km, that 274 people travel to work.



Given that 60 of these people travel between 10 km and 20 km to work, estimate

(a) the number of people who travel between 22 km and 45 km to work,

(3)

(b) the median distance travelled to work by these 274 people,

(2)

(c) the mean distance travelled to work by these 274 people.

(3)

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3. A random sample of 100 carrots is taken from a farm and their lengths, Lcm, recorded. The data are summarised in the following table.

Length, Lcm	Frequency, f	Class mid point, $x$cm
$5 \leqslant L < 8$	5	6.5
$8 \leqslant L < 10$	13	9
$10 \leqslant L < 12$	16	11
$12 \leqslant L < 15$	25	13.5
$15 \leqslant L < 20$	30	17.5
$20 \leqslant L < 28$	11	24

A histogram is drawn to represent these data.
The bar representing the class $5 \leqslant L < 8$ is 1.5 cm wide and 1 cm high.

(a) Find the width and height of the bar representing the class $15 \leqslant L < 20$

(3)

(b) Use linear interpolation to estimate the median length of these carrots.

(2)

(c) Estimate

(i) the mean length of these carrots,

(2)

(ii) the standard deviation of the lengths of these carrots.

(3)

A supermarket will only buy carrots with length between 9 cm and 22 cm.

(d) Estimate the proportion of carrots from the farm that the supermarket will buy.

(2)

Any carrots that the supermarket does not buy are sold as animal feed.

The farm makes a profit of 2.2 pence on each carrot sold to the supermarket, a profit of 0.8 pence on each carrot longer than 22 cm and a loss of 1.2 pence on each carrot shorter than 9 cm.

(e) Find an estimate of the mean profit per carrot made by the farm.

(2)

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2. Two youth clubs, *Eastyou* and *Westyou*, decided to raise money for charity by running a 5 km race. All the members of the youth clubs took part and the time, in minutes, taken for each member to run the 5 km was recorded.

The times for the *Westyou* members are summarised in Figure 1.

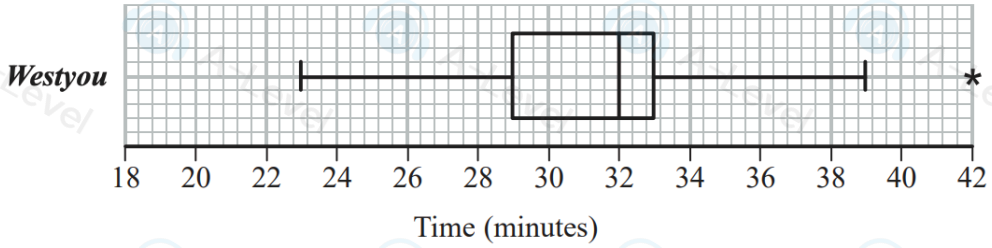


Figure 1

(a) Write down the time that is exceeded by 75% of *Westyou* members.

(1)

The times for the *Eastyou* members are summarised by the stem and leaf diagram below.

Stem	Leaf	
2	0 2 3 4	(4)
2	5 6 8 8 8 9 9	(7)
3	0 0 0 0 0 1 1 1 2 2 2 2 3 4	(14)
3	5 5 5 7 9	(5)

Key: 2|0 means 20 minutes

(b) Find the value of the median and interquartile range for the *Eastyou* members.

(3)

An outlier is a value that falls either

more than $1.5 \times (Q_3 - Q_1)$ above Q_3

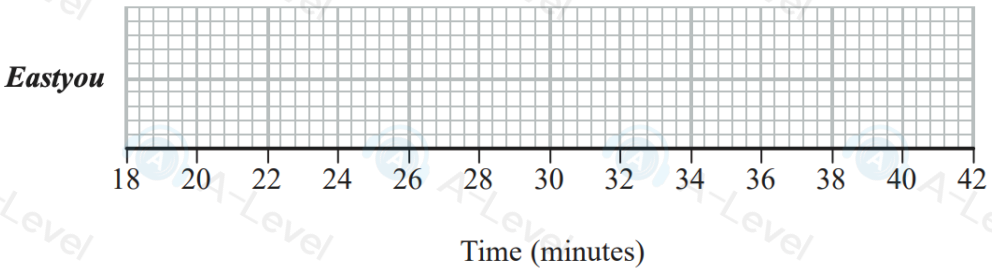
or more than $1.5 \times (Q_3 - Q_1)$ below Q_1

(c) On the grid on page 7, draw a box plot to represent the times of the *Eastyou* members.

(4)

(d) State the skewness of each distribution. Give reasons for your answers.

(3)



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4. A group of 100 adults recorded the amount of time, t minutes, they spent exercising each day. Their results are summarised in the table below.

Time (t minutes)	Frequency (f)	Time midpoint (x)
$0 \leqslant t < 15$	25	7.5
$15 \leqslant t < 30$	17	22.5
$30 \leqslant t < 60$	28	45
$60 \leqslant t < 120$	24	90
$120 \leqslant t \leqslant 240$	6	180

[You may use $\sum fx^2 = 455\,512.5$]

A histogram is drawn to represent these data.

The bar representing the time $0 \leqslant t < 15$ has width 0.5 cm and height 6 cm.

(a) Calculate the width and height of the bar representing a time of $60 \leqslant t < 120$

(3)

(b) Use linear interpolation to estimate the median time spent exercising by these adults each day.

(2)

(c) Find an estimate of the mean time spent exercising by these adults each day.

(2)

(d) Calculate an estimate for the standard deviation of these times.

(2)

(e) Describe, giving a reason, the skewness of these data.

(1)

Further analysis of the above data revealed that 18 of the 25 adults in the $0 \leqslant t < 15$ group took no exercise each day.

(f) State, giving a reason, what effect, if any, this new information would have on your answers to

(i) the estimate of the median in part (b),

(ii) the estimate of the mean in part (c),

(iii) the estimate of the standard deviation in part (d).

(3)

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