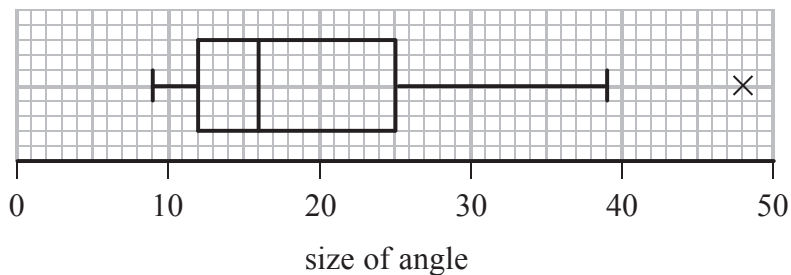




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1. Each of 60 students was asked to draw a  $20^\circ$  angle without using a protractor. The size of each angle drawn was measured. The results are summarised in the box plot below.



- (a) Find the range for these data. (1)
- (b) Find the interquartile range for these data. (1)

The students were then asked to draw a  $70^\circ$  angle. The results are summarised in the table below.

Angle, $a$ , (degrees)	Number of students
$55 \leq a < 60$	6
$60 \leq a < 65$	15
$65 \leq a < 70$	13
$70 \leq a < 75$	11
$75 \leq a < 80$	8
$80 \leq a < 85$	7

- (c) Use linear interpolation to estimate the size of the median angle drawn. Give your answer to 1 decimal place. (2)
- (d) Show that the lower quartile is  $63^\circ$  (2)

For these data, the upper quartile is  $75^\circ$ , the minimum is  $55^\circ$  and the maximum is  $84^\circ$

An outlier is an observation that falls either more than  $1.5 \times$  (interquartile range) above the upper quartile or more than  $1.5 \times$  (interquartile range) below the lower quartile.

- (e) (i) Show that there are no outliers for these data.
- (ii) Draw a box plot for these data on the grid on page 3. (5)
- (f) State which angle the students were more accurate at drawing. Give reasons for your answer. (3)













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4. Statistical models can provide a cheap and quick way to describe a real world situation.
- (a) Give two other reasons why statistical models are used. (2)

A scientist wants to develop a model to describe the relationship between the average daily temperature,  $x$  °C, and her household’s daily energy consumption,  $y$  kWh, in winter.

A random sample of the average daily temperature and her household’s daily energy consumption are taken from 10 winter days and shown in the table.

$x$	-0.4	-0.2	0.3	0.8	1.1	1.4	1.8	2.1	2.5	2.6
$y$	28	30	26	25	26	27	26	24	22	21

[You may use  $\sum x^2 = 24.76$   $\sum y = 255$   $\sum xy = 283.8$   $S_{xx} = 10.36$ ]

- (b) Find  $S_{xy}$  for these data. (3)
- (c) Find the equation of the regression line of  $y$  on  $x$  in the form  $y = a + bx$   
 Give the value of  $a$  and the value of  $b$  to 3 significant figures. (4)
- (d) Give an interpretation of the value of  $a$  (1)
- (e) Estimate her household’s daily energy consumption when the average daily temperature is 2°C (2)

The scientist wants to use the linear regression model to predict her household’s energy consumption in the summer.

- (f) Discuss the reliability of using this model to predict her household’s energy consumption in the summer. (2)

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