

# Displaying Data

## Difficulty: Easy

### Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Statistics
Sub-Topic	Displaying Data
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 1

**Time allowed:** 18 minutes

**Score:** /14

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

The table shows some information about the mass,  $m$  grams, of 200 bananas.

Mass ( $m$ grams)	$90 < m \leq 110$	$110 < m \leq 120$	$120 < m \leq 125$	$125 < m \leq 140$
Frequency	40	70	60	30
Height of column in histogram (cm)	1	3.5	6	1

Frequency Density:  $\frac{40}{110 - 90} = 2$   $\frac{70}{120 - 110} = 7$   $\frac{60}{125 - 120} = 12$   $\frac{30}{140 - 125} = 2$

Complete the table.

The extra row in the table above is the Frequency Density which is found by dividing the Frequency by the Class Width.

Looking at the 120 to 125 category, it is clear that the Frequency Density has been divided by 2 to get the Column Height...

[4]

## Question 2

The four sector angles in a pie chart are  $2x^\circ$ ,  $3x^\circ$ ,  $4x^\circ$  and  $90^\circ$ .

Find the value of  $x$ .

[2]

We have that sector angles in a pie chart add to 360

$$2x + 3x + 4x + 90 = 360$$

Subtract 90 from both sides

$$\rightarrow 9x = 360 - 90$$

$$\rightarrow 9x = 270$$

Divide through by 9

$$\rightarrow x = 270 \div 9$$

$$= 30$$

### Question 3

Michelle sells ice cream.

The table shows how many of the different flavours she sells in one hour.

Flavour	Vanilla	Strawberry	Chocolate	Mango
Number sold	6	8	9	7

Michelle wants to show this information in a pie chart.

Calculate the sector angle for mango.

[2]

Mango as a fraction

$$\frac{7}{6 + 8 + 9 + 7}$$

$$= \frac{7}{30}$$

Hence, the angle is

$$\frac{7}{30} \times 360$$

$$= 84$$

## Question 4

Bruce plays a game of golf.

His scores for each of the 18 holes are shown below.

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

The information is to be shown in a pie chart.

Calculate the sector angle for the score of 4.

[2]

We want to know the fraction of the **frequency** of “4s” of the whole.

There are 18 holes, of which “4” appears 8 times.

Therefore, in the resulting pie chart, the frequency of “4” will appear as:

$$\frac{8}{18} = 22.22\%$$

We know that a circle is 360 degrees,

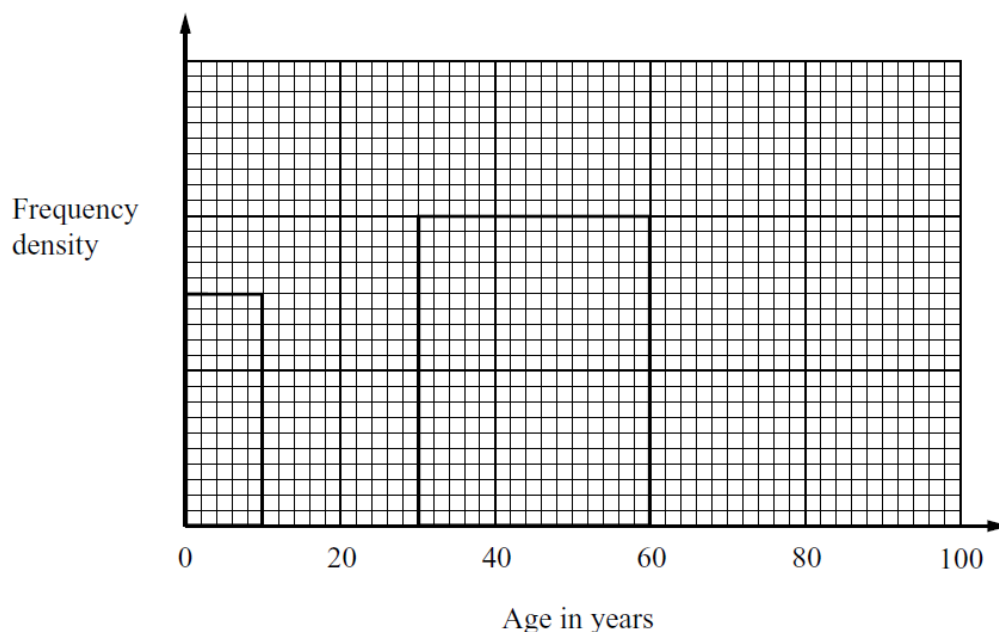
Hence, the angle of the sector is:

$$\begin{aligned}\frac{8}{18} \times 360^\circ &= \mathbf{160^\circ} \\ &= \mathbf{160^\circ}\end{aligned}$$

## Question 5

A doctor's patients are grouped by age, as shown in the table and the histogram below.

Age ( $x$ years)	$0 \leq x < 10$	$10 \leq x < 30$	$30 \leq x < 60$	$60 \leq x < 100$
Number of patients	300	600		880



(a) Complete the following:

1 cm<sup>2</sup> represents ..... patients.

[1]

For the first interval, the histogram represents 300 patients in 3 cm<sup>2</sup>.

**Therefore, 1 cm<sup>2</sup> = 100 patients.**

(b) Use the histogram to fill in the blank in the table.

[1]

The interval  $30 \leq x < 60$  is represented by 12 cm<sup>2</sup>.

We fill in the blank with the number: 100 patients/cm<sup>2</sup> x 12 cm<sup>2</sup> =

**1200 patients.**

(c) Draw the missing two rectangles to complete the histogram.

[2]

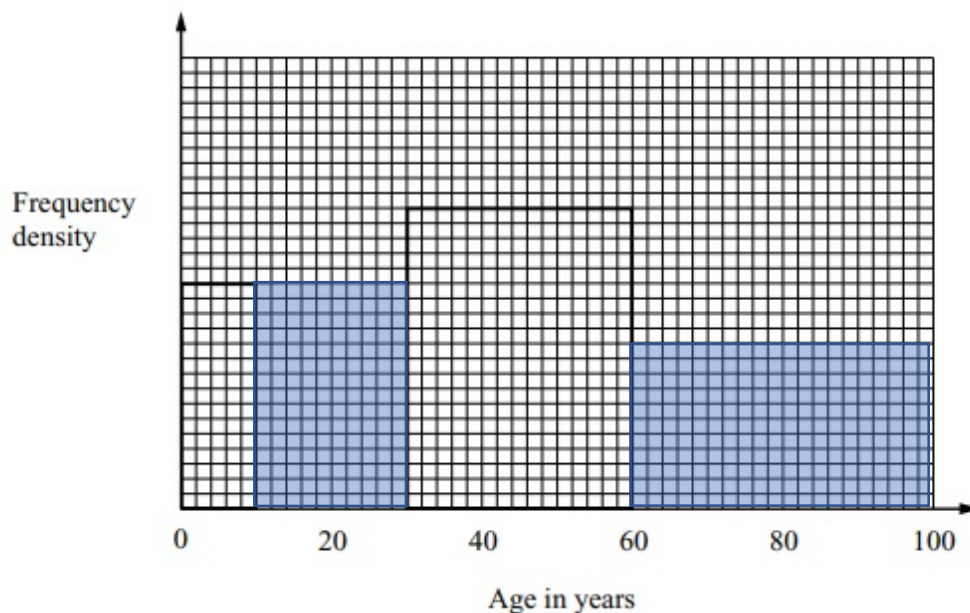
600 patients will be represented by  $6 \text{ cm}^2$  and 880 patients by  $8.8 \text{ cm}^2$ .

On the x-axis, 10 years represent  $1 \text{ cm}^2$ .

For the second interval, the height will be 3 cm and the width 2 cm.

For the last interval, the class width is 40 years. Therefore, the width will be

4 cm. The height in this case is  $8.8 \text{ cm} / 4 \text{ cm} = 2.2 \text{ cm}$



# Displaying Data

## Difficulty: Hard

### Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Statistics
Sub-Topic	Displaying Data
Paper	Paper 2
Difficulty	Hard
Booklet	Model Answers 1

**Time allowed:** 19 minutes

**Score:** /15

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%



## Question 1

Six students revise for a test.

The scatter diagram shows the time, in hours, each student spent revising and their mark in the test.

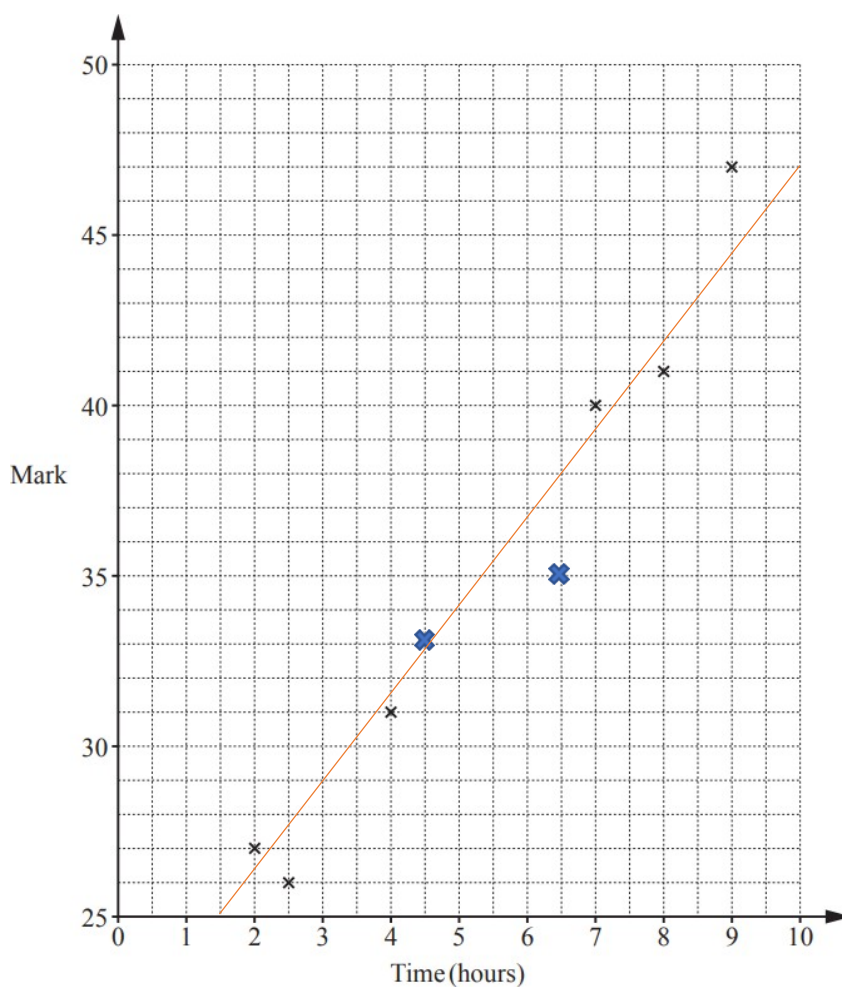
(a) The data for two more students is shown in the table.

Time (hours)	4.5	6.5
Mark	33	35

Plot these two points on the scatter diagram.

[1]

The blue crosses below



(b) What type of correlation is shown on the scatter diagram?

[1]

**Positive correlation.**

- (c) Draw a line of best fit on the scatter diagram.

[1]

The orange line above

- (d) Another student spent 5.5 hours revising.

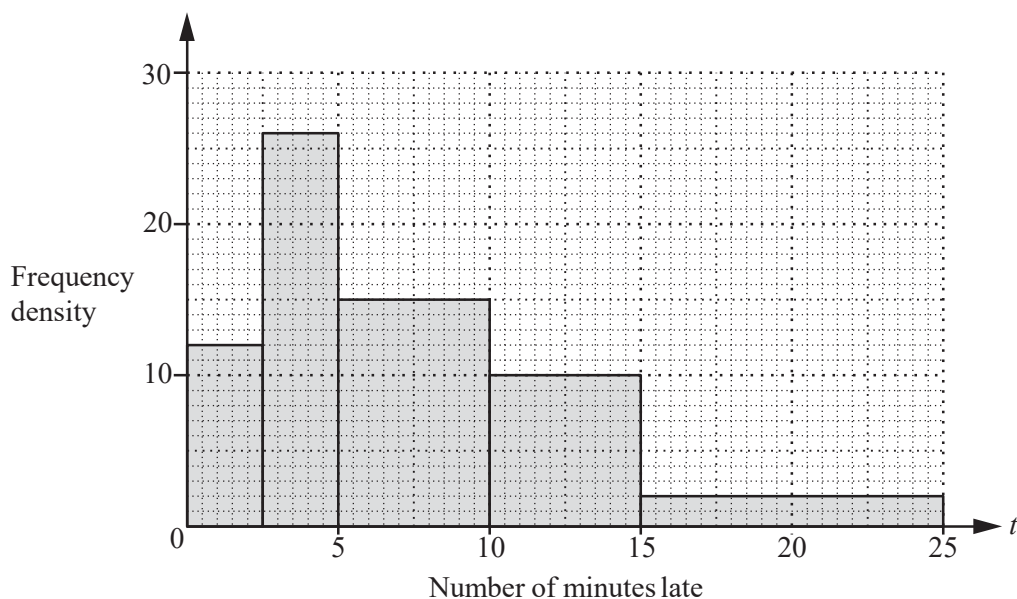
Estimate a mark for this student.

[1]

35

## Question 2

Deborah records the number of minutes late,  $t$ , for trains arriving at a station. The histogram shows this information.



- (a) Find the number of trains that Deborah recorded.

[2]

We need to add the areas of the rectangles together

$$12 \times 2.5 + 26 \times 2.5 + 15 \times 5 + 10 \times 5 + 2 \times 10 \\ = 240$$

\

- (b) Calculate the percentage of the trains recorded that arrived more than 10 minutes late.

[2]

Number of trains that arrived more than 10 minutes late is the area of the last 2 bars

$$5 \times 10 + 10 \times 2 \\ = 70$$

This, as a percentage of the total, is

$$\frac{70}{240} \times 100\% \\ = 29.2\%$$

### Question 3

Raj measures the height,  $h$  cm, of 70 plants.  
The table shows the information.

Height ( $h$ cm)	$10 < h \leq 20$	$20 < h \leq 40$	$40 < h \leq 50$	$50 < h \leq 60$	$60 < h \leq 90$
Frequency	7	15	27	13	8

Calculate an estimate of the mean height of the plants.

[4]

Find the midpoint of each height inequality and multiply by the corresponding frequency for each section. The sum of these values divided by the number of plants measured, will find the mean.

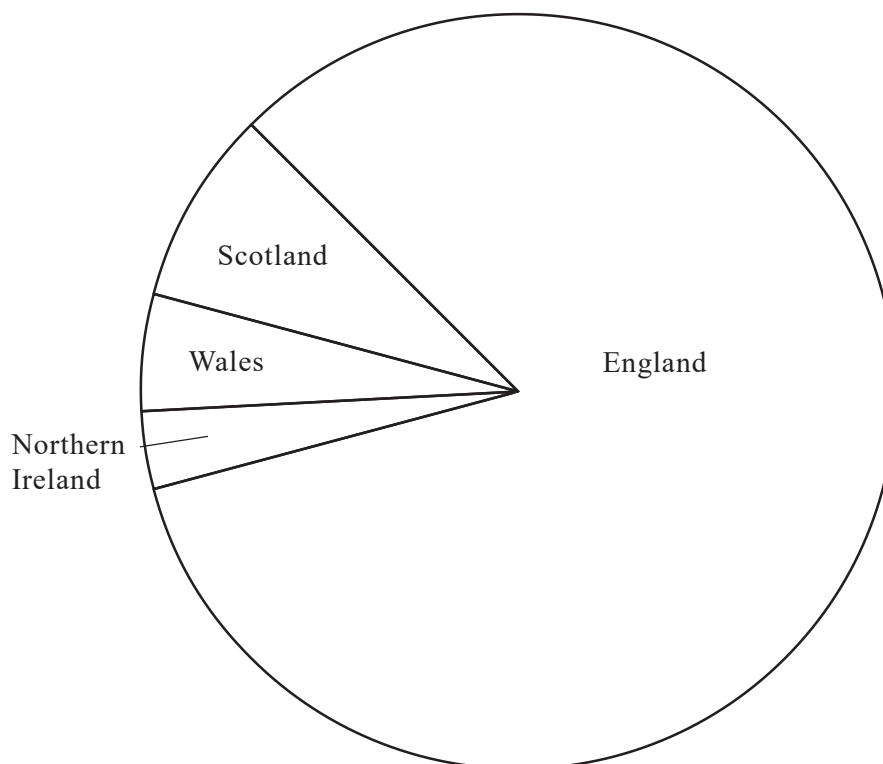
Height ( $h$ cm)	$10 < h \leq 20$	$20 < h \leq 40$	$40 < h \leq 50$	$50 < h \leq 60$	$60 < h \leq 90$
Frequency	7	15	27	13	8
Mid-point	15	30	45	55	75
Mid-point x frequency	$15 \times 7 = 105$	$30 \times 15 = 450$	$45 \times 27 = 1215$	$55 \times 13 = 715$	$75 \times 8 = 600$

Total of the 'mid-point x frequency' =  $105 + 450 + 1215 + 715 + 600 = 3085$

$$\begin{aligned} \text{Mean} &= \frac{\text{'total mid - point } \times \text{ frequency'}}{\text{total number of plants}} = \frac{3085}{7 + 15 + 27 + 13 + 8} \\ &= 44.1 \text{ (3sf)} \end{aligned}$$

## Question 4

The populations of the four countries of the United Kingdom, in the year 2000, are shown on the pie chart below.



Taking measurements from the pie chart, complete the table.

Country	Population (millions)
England	50
Scotland	5
Wales	3
Northern Ireland	2

[3]

Working:

Use the given population (Northern Ireland) to find a scale for the pie chart:

Measuring the angle gives:  $12^\circ = 2 \text{ million}$

Which simplifies to:  $6^\circ = 1 \text{ million}$

Measuring the other angles and dividing by 6 to get the population in millions

$$\text{England} = 300^\circ \div 6 = 50 \text{ million}$$

$$\text{Scotland} = 30^\circ \div 6 = 5 \text{ million}$$

$$\text{Wales} = 18^\circ \div 6 = 3 \text{ million}$$

# Mean/Median/Mode/Range

## Difficulty: Easy

### Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Statistics
Sub-Topic	Mean/Median/Mode/Range
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 1

**Time allowed:** 27 minutes

**Score:** /21

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

Amber's mean mark on five tests is 80.  
Her marks on four of these tests are 68, 81, 74 and 89.

Work out her mark on the fifth test.

[2]

Let her score on the 5<sup>th</sup> test be  $x$

$$\frac{x + 68 + 81 + 74 + 89}{5} = 80$$

$$\rightarrow x = 5 \times 80 - 312$$

$$= 88$$

## Question 2

Shahruk plays four games of golf.

His four scores have a mean of 75, a mode of 78 and a median of 77.

Work out his four scores.

[3]

The mean is the sum of the four scores divided by 4

$$\frac{s_1 + s_2 + s_3 + s_4}{4} = 75$$

The mode is the number that occurs most frequently, i.e. 2 or more of his scores must be

78. Let

$$s_3 = s_4 = 78$$

Where we have an even number of items, the median is the mean of the middle 2

numbers when put in rank order. Let the middle two scores be  $s_2$  and  $s_3$ . Thus, we have

$$\frac{s_2 + 78}{2} = 77$$

$$\rightarrow s_2 = 76$$

We can now figure out  $s_1$  from the mean

$$s_1 + 76 + 78 + 78 = 4 \times 75$$

$$\rightarrow s_1 = 68$$

Final answer is

**68, 76, 78, 78**



### Question 3

Jim scores the following marks in 8 tests.

7      8      8       $y$       6      9      10      5

His mean mark is 7.5 .

Calculate the value of  $y$ .

[2]

The mean mark is calculated by summing all the individual marks and dividing the sum by the number of tests.

$$\text{mean} = \frac{7 + 8 + 8 + y + 6 + 9 + 10 + 5}{8}$$

$$7.5 = \frac{53 + y}{8}$$

Multiply both sides by 8.

$$60 = 53 + y$$

Subtract 53 from both sides.

$$y = 7$$

## Question 4

7      9      20      3      9

- (a) A number is removed from this list and the median and range do not change.

[1]

Write down this number.

The range is 3 to 20 and the median value is 9.

Therefore the removed number is

**=7.**

- (b) An extra number is included in the original list and the mode does not change.

Write down a possible value for this number.

[1]

The mode is 9 (the number 9 appears twice on the list), so any other number than the other numbers on the list (3, 7, 20) can be added.

If any numbers out of these numbers was to be added, there would be two pairs of the same numbers so the median would change.

The answer is therefore

**any number except 3, 7, 20. For example 42.**

## Question 5

Cheryl recorded the midday temperatures in Seoul for one week in January.

Day	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Temperature ( $^{\circ}\text{C}$ )	-4	-5	-3	-11	-8	-3	-1

(a) Write down the mode.

[1]

The 'mode' is the number that appears most often in a set of numbers

All we have to do is read the table, and see if any of the numbers appear more often than the rest

-3 appears twice, while all of the other values appear just once, so

the answer is -3

(b) On how many days was the temperature lower than the mode?

[1]

We know from the last question that the mode was  $-3^{\circ}\text{C}$

To find out how many days the temperature was lower than this we need to look in the table and count the numbers that are less than -3

These are Monday ( $-4^{\circ}\text{C}$ ), Tuesday ( $-5^{\circ}\text{C}$ ), Thursday ( $-11^{\circ}\text{C}$ ) and Friday ( $-8^{\circ}\text{C}$ )

So the temperature was below the mode on 4 of the days

## Question 6

Assembled by A/S

Leon scores the following marks in 5 tests.

8   4   8    $y$    9

His mean mark is 7.2.

Calculate the value of  $y$ .

[2]

We have that

$$\frac{8 + 4 + 8 + y + 9}{5} = 7.2$$

Multiply through by 5 then subtract all the other test scores

$$y = 5 \times 7.2 - 9 - 8 - 4 - 8$$

$$\rightarrow y = 7$$

## Question 7

In Vienna, the mid-day temperatures, in °C, are recorded during a week in December. This information is shown below.

-2    2    1    -3    -1    -2    0

Calculate

- (a) the difference between the highest temperature and the lowest temperature,

[1]

By looking at the values we see that the highest temperature is 2 and the lowest is -3.

$$-(-3)$$

= 5 degrees difference between them.

- (b) the mean temperature.

[2]

The mean represents the sum of all the values divided by the number of values taken into consideration.

In our case, the sum is:

$$(-2) + 2 + 1 + (-3) + (-1) + (-2) + 0 = -5$$

There are 7 values in total.

$$\text{Mean} = \frac{-5}{7}$$

## Question 8

During one week in April, in Quebec, the daily minimum temperatures were

$-5^{\circ}\text{C}$ ,  $-1^{\circ}\text{C}$ ,  $3^{\circ}\text{C}$ ,  $2^{\circ}\text{C}$ ,  $-2^{\circ}\text{C}$ ,  $0^{\circ}\text{C}$ ,  $6^{\circ}\text{C}$ .

Write down

(a) the lowest of these temperatures, [1]

**-5**

(b) the range of these temperatures. [1]

$$6 - -5$$

$$= 6 + 5$$

$$= 11$$

## Question 9

For the numbers 8, 3, 5, 8, 7, 8 find

(a) the mode,

[1]

The mode represents the number with the highest frequency.

**Mode = 8** (appears 3 times)

(b) the median,

[1]

The median represents the middle value of the list of numbers in order.

3, 5, 7, 8, 8, 8

The number of total values is even, 6, therefore, the median will be the average of the middle 2 numbers:

$$\text{Median} = \frac{7+8}{2} = 7.5$$

(c) the mean.

[1]

The mean represents the sum of all the values divided by the total number of values listed.

$$\text{Mean} = \frac{8+3+5+8+7+8}{6}$$

$$\text{Mean} = \frac{39}{6} = 6.5$$

# Grouped Data

## Difficulty: Easy

### Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Statistics
Sub-Topic	Grouped Data
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 1

**Time allowed:** 26 minutes

**Score:** /20

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%



## Question 1

James is an animal doctor.

The table shows some information about the cats he saw in one week.

Day	Monday	Tuesday	Wednesday	Thursday	Friday
Number of cats seen	2	4	1	3	2
Mean mass of a cat (kg)	1.9	0.9	2.1	1.8	2

One of the cats James saw had a mass of 4kg.

On which day did he see this cat?

[2]

The total mass of the cats seen on the required day must be  $> 4\text{kg}$

Use Total Mass = Mean  $\times$   $n$

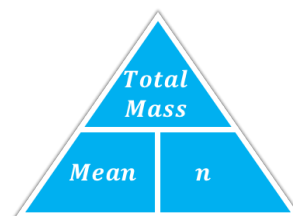
Monday: Total Mass =  $1.9 \times 2 = 3.8\text{kg}$

Tuesday: Total Mass =  $0.9 \times 4 = 3.6\text{kg}$

Wednesday: Total Mass =  $2.1 \times 1 = 2.1\text{kg}$

Thursday: Total Mass =  $1.8 \times 3 = 5.4\text{kg}$

Friday: Total Mass =  $2 \times 2 = 4\text{kg}$



**The day was Thursday**

## Question 2

The table shows information about the numbers of pets owned by 24 students.

Number of pets	0	1	2	3	4	5	6
Frequency	1	2	3	5	7	3	3

- (a) Calculate the mean number of pets.

[3]

Mean number of pets can be calculated by summing the products of the number of pets and their frequencies and then dividing the sum by the total number of students.

$$\text{mean} = \frac{0 \times 1 + 1 \times 2 + 2 \times 3 + 3 \times 5 + 4 \times 7 + 5 \times 3 + 6 \times 3}{24 \text{ students}}$$

$$\text{mean} = \frac{(0 + 2 + 6 + 15 + 28 + 15 + 18) \text{ pets}}{24 \text{ students}} = \frac{84 \text{ pets}}{24 \text{ students}}$$

$$\text{mean} = 3.5 \text{ pets per student}$$

- (b) Jennifer joins the group of 24 students.

When the information for Jennifer is added to the table, the new mean is 3.44 .

Calculate the number of pets that Jennifer has.

[3]

There are now 25 students.

In part a) there were 84 pets, therefore now there are  $84+x$ , if Jennifer has  $x$  pets.

$$\text{mean} = \frac{\text{total pets}}{\text{total students}}$$

The new mean is 3.44.

$$3.44 \text{ pets per student} = \frac{84 + x}{25 \text{ students}}$$

Multiply both sides by 25.

$$3.44 \times 25 = 84 + x$$

$$86 = 84 + x$$

Subtract 84 from both sides of the equation to work out the value of  $x$ .

$$x = 2$$

Jennifer has **2 pets**.

### Question 3

The heights, in metres, of 200 trees in a park are measured.

Height ( $h$ m)	$2 < h \leq 6$	$6 < h \leq 10$	$10 < h \leq 13$	$13 < h \leq 17$	$17 < h \leq 19$	$19 < h \leq 20$
Frequency	23	47	45	38	32	15

- (a) Find the interval which contains the median height. [1]

The median represents the middle value of the list.

In our case, the total number of heights is 200, because there are 200 trees measured.

The median value of the heights therefore is 100.

To obtain the first 100 heights we need to add up the heights from the first few intervals to work out which one has the middle value.

By adding up the heights for the first 3 intervals, we obtain:

$$23 + 47 + 45 = 115$$

$115 > 100$  and the interval  $10 < h \leq 13$  has 45 measurements.

Therefore, we deduce that the middle value will be in this interval.

$$10 < h \leq 13$$

- (b) Calculate an estimate of the mean height. [4]

The mean represents the sum of all numbers divided by how many numbers are in total.

We do not know the exact value for each measurement taken so we need to make an estimate based on the interval given for each frequency. These heights will be estimated as the middle value of the interval.

For example, for the first interval,  $2 < h \leq 6$ , the middle of the interval is:  $\frac{2+6}{2} = 4$

The estimate for each interval is shown in the table below:

Interval	$2 < h \leq 6$	$6 < h \leq 10$	$10 < h \leq 13$	$13 < h \leq 17$	$17 < h \leq 19$	$19 < h \leq 20$
Estimate	4	8	11.5	15	18	19.5

To sum up all the heights, we use this estimate for each frequency.

The sum will be:

$$23 \times 4 + 47 \times 8 + 45 \times 11.5 + 38 \times 15 + 32 \times 18 + 15 \times 19.5 = 2424$$

The total number of heights measured is 200.

$$\text{Estimated mean} = \frac{2424}{200}$$

**Estimated mean = 12.12**

(c) Complete the cumulative frequency table for the information given in the table above. [2]

Height ( $h$ m)	$2 < h \leq 6$	$h \leq 10$	$h \leq 13$	$h \leq 17$	$h \leq 19$	$h \leq 20$
Cumulative frequency	23	<b>70</b>	<b>115</b>	<b>153</b>	<b>185</b>	<b>200</b>

To calculate the cumulative frequency, we add up the frequencies for the corresponding intervals.

For example, to work out the cumulative frequency for  $h \leq 10$ , we add up the frequency for the interval  $2 < h \leq 6$  with the frequency for the interval  $6 < h \leq 10$ .

$$23 + 47 = 70$$

For  $h \leq 13$ , we add up the cumulative frequency for  $h \leq 10$  with the frequency for the interval

$$10 < h \leq 13.$$

$$70 + 45 = 115$$

We do the same for each inequality, keeping in mind that the total number of heights measured is 200, therefore the last cumulative frequency should be 200, summing up all the frequencies.

## Question 4

In a traffic survey of 125 cars the number of people in each car was recorded.

Number of people in each car	1	2	3	4	5
Frequency	50	40	10	20	5

Find

(a) the range,

[1]

Range is largest number minus the smallest

$$\text{range} = 5 - 1$$

$$= 4$$

(b) the median,

[1]

The median is the mean of the middle two numbers. The middle number is 67, which occurs in the 2<sup>nd</sup> bracket

$$= 2$$

(c) the mode.

[1]

The mode is the number that occurs the most.

$$1$$

## Question 5

Height ( $h$ cm)	$0 < h \leq 10$	$10 < h \leq 15$	$15 < h \leq 30$
Frequency	25	$u$	9
Frequency density	2.5	4.8	$v$

The table shows information about the heights of some flowers.

Calculate the values of  $u$  and  $v$ .

[2]

$$u = (15 - 10) \times 4.8$$

$$\rightarrow u = 24$$

$$(30 - 15) \times v = 9$$

$$\rightarrow v = \frac{9}{15}$$

$$\rightarrow v = \frac{3}{5}$$

# Cumulative Frequency

## Difficulty: Easy

### Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Statistics
Sub-Topic	Cumulative Frequency
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 1

**Time allowed:** 37 minutes

**Score:** /29

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

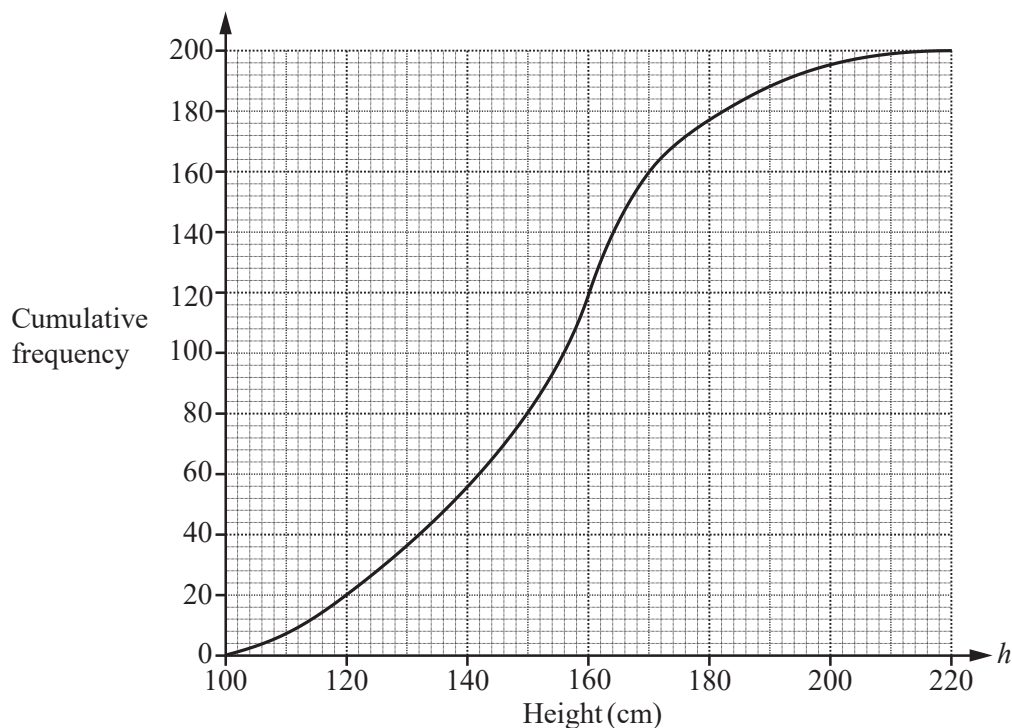
##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%



## Question 1

Simon records the heights,  $h$  cm, of 200 sunflowers in his garden.  
The cumulative frequency diagram shows this information.



- (a) Find the number of these sunflowers that have a height of more than 160 cm.

[2]

The number of sunflowers with height 160 or less is 116 (read from the graph), hence

$$200 - 116$$

$$= 84$$

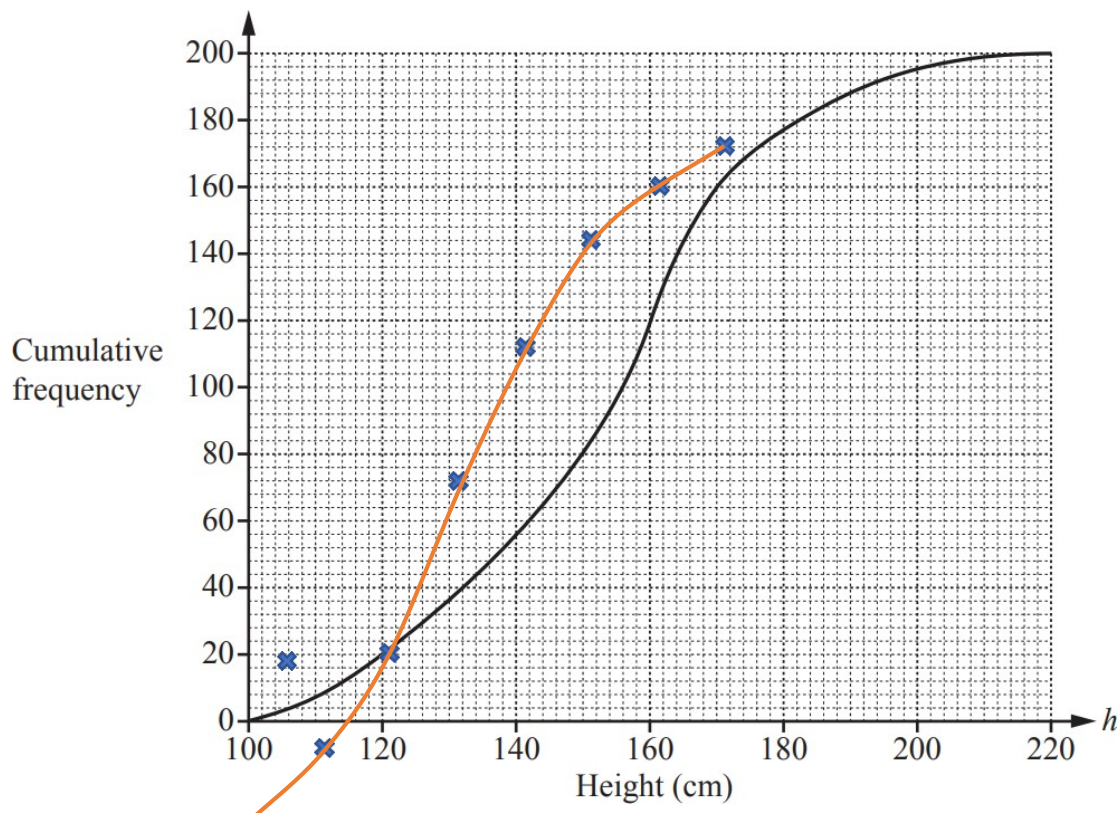
- (b) Sue records the heights,  $h$  cm, of 200 sunflowers in her garden.  
The cumulative frequency table shows this information.

[3]

Height ( $h$ cm)	Cumulative frequency
$h \leq 100$	0
$h \leq 110$	20
$h \leq 120$	48
$h \leq 130$	100
$h \leq 140$	140
$h \leq 150$	172
$h \leq 160$	188
$h \leq 170$	200

On the grid above, draw another cumulative frequency diagram to show this information.

On the grid above, draw another cumulative frequency diagram to show this information.



- (c) Work out the difference between the median heights of Simon's sunflowers and Sue's sunflowers.

[2]

Median height of Simon's sunflowers is 130.

Median height of Sue's is 156.

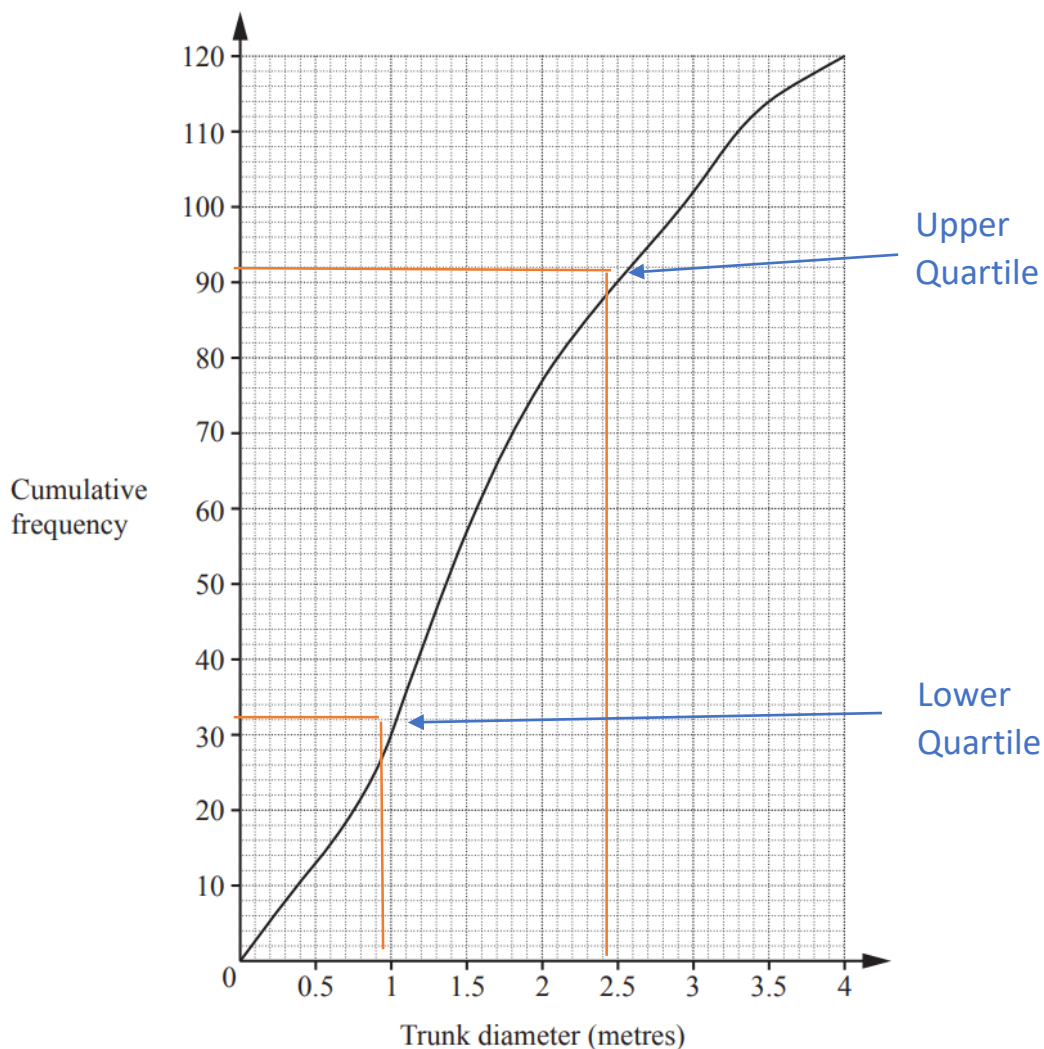
Hence

$$156 - 130$$

$$= 26$$

## Question 2

The cumulative frequency diagram shows information about the trunk diameter, in metres, of 120 trees.



Find

(a) the inter-quartile range,

[2]

Subtract the lower quartile from the upper quartile (as seen on graph below)

$$2.5 - 1$$

$$= 1.5$$

(b) the 95th percentile,

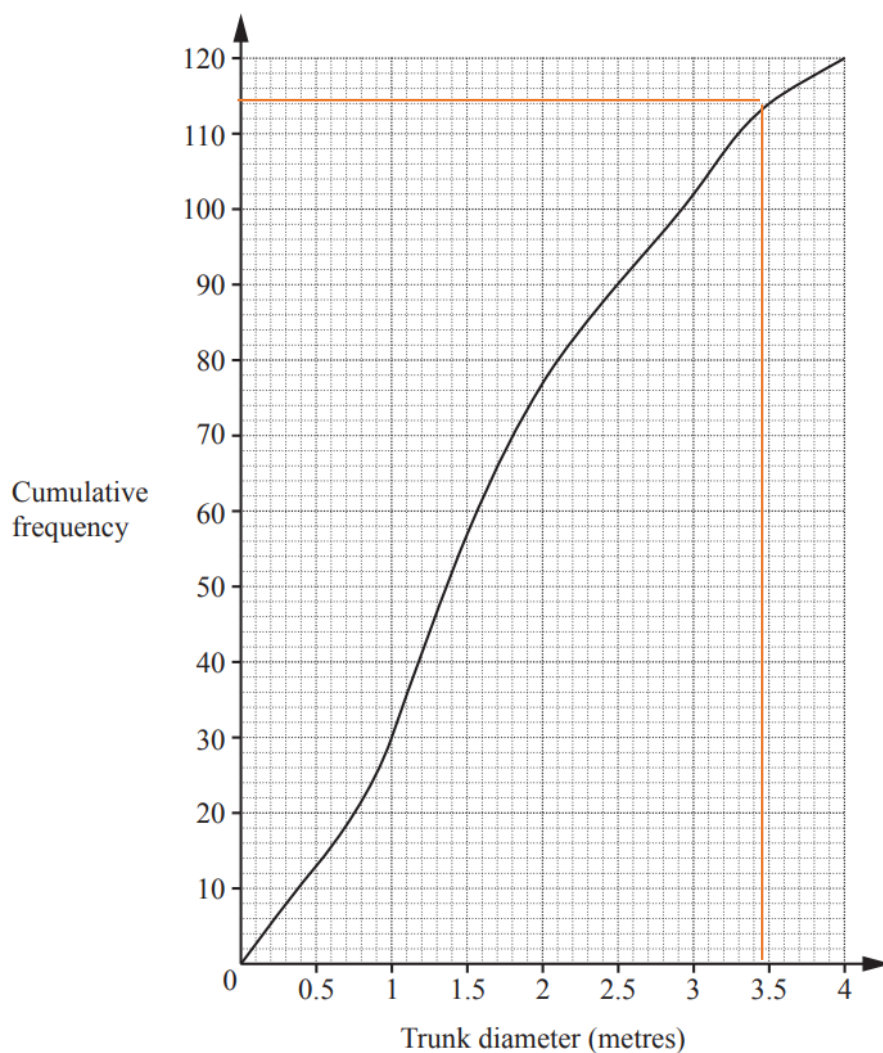
[2]

95% of 120 is

$$0.95 \times 120$$

$$= 114$$

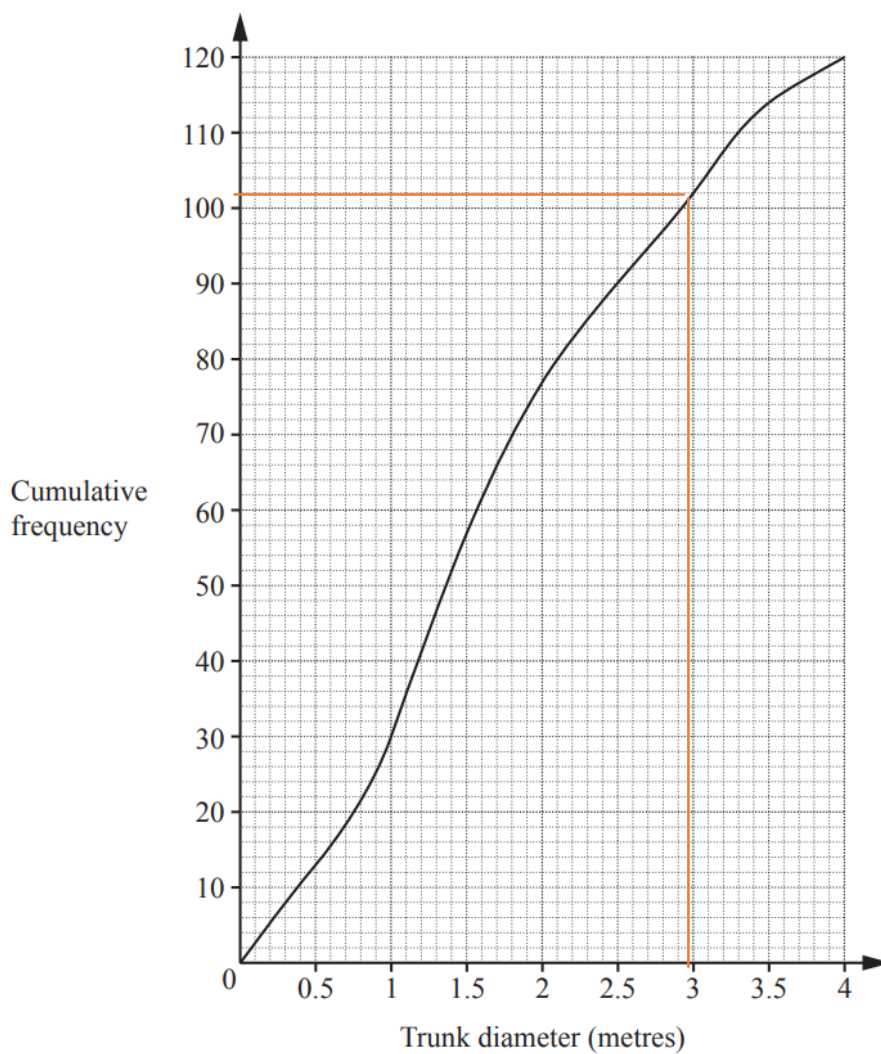
Read this across and read off corresponding x value = 3.5



- (c) the number of trees with a trunk diameter greater than 3 metres.

[2]

Read off y-value for 3 metres and subtract this from total number of trees (120).

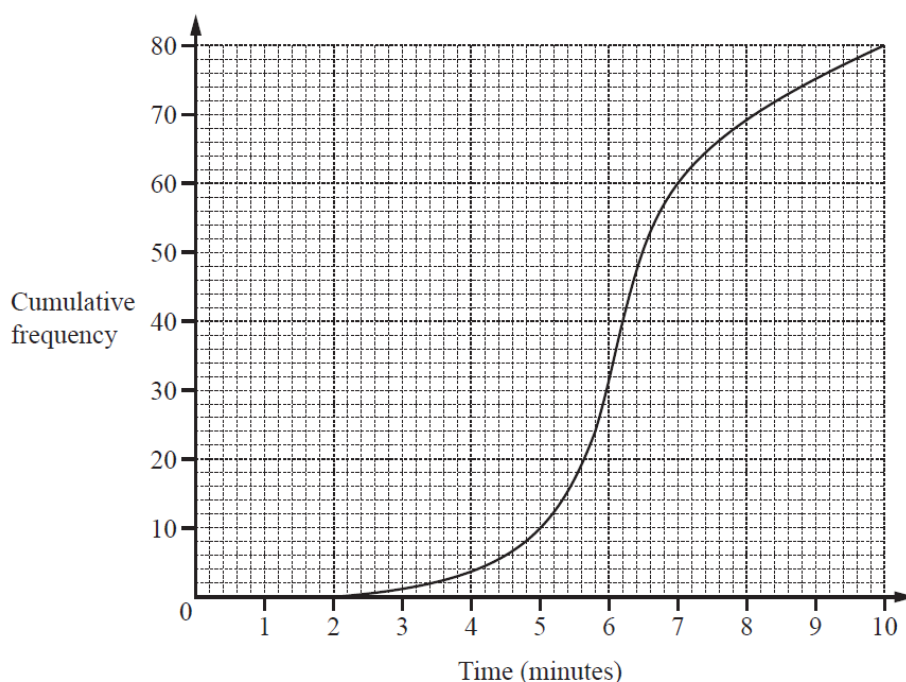


$$120 - 102$$

$$= 18$$



### Question 3



The cumulative frequency diagram shows information about the times, in minutes, taken by 80 students to complete a short test.

Find

- (a) the median, [1]

The median is the 50<sup>th</sup> percentile. As there are 80 students, it is the value of 40<sup>th</sup> student (red).

From the graph, this is **6.2 minutes**.

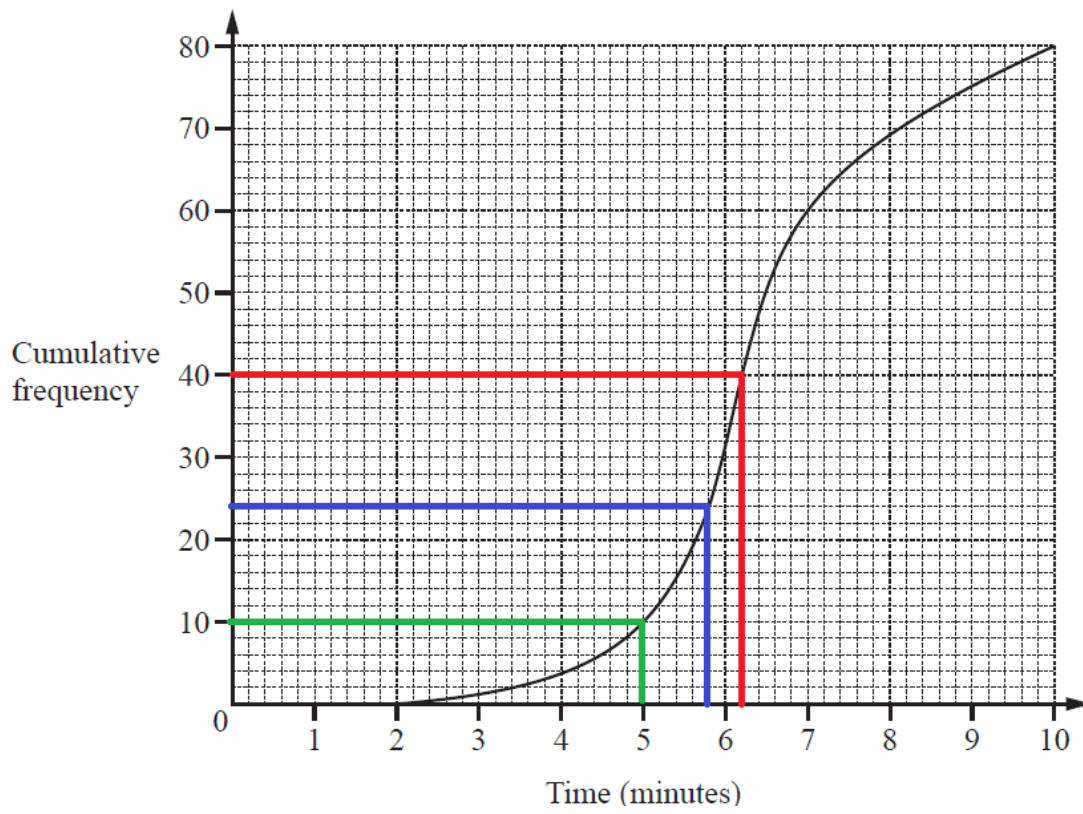
- (b) the 30th percentile, [2]

The 30<sup>th</sup> percentile is the value of student who is 30% of 80, which is 24.

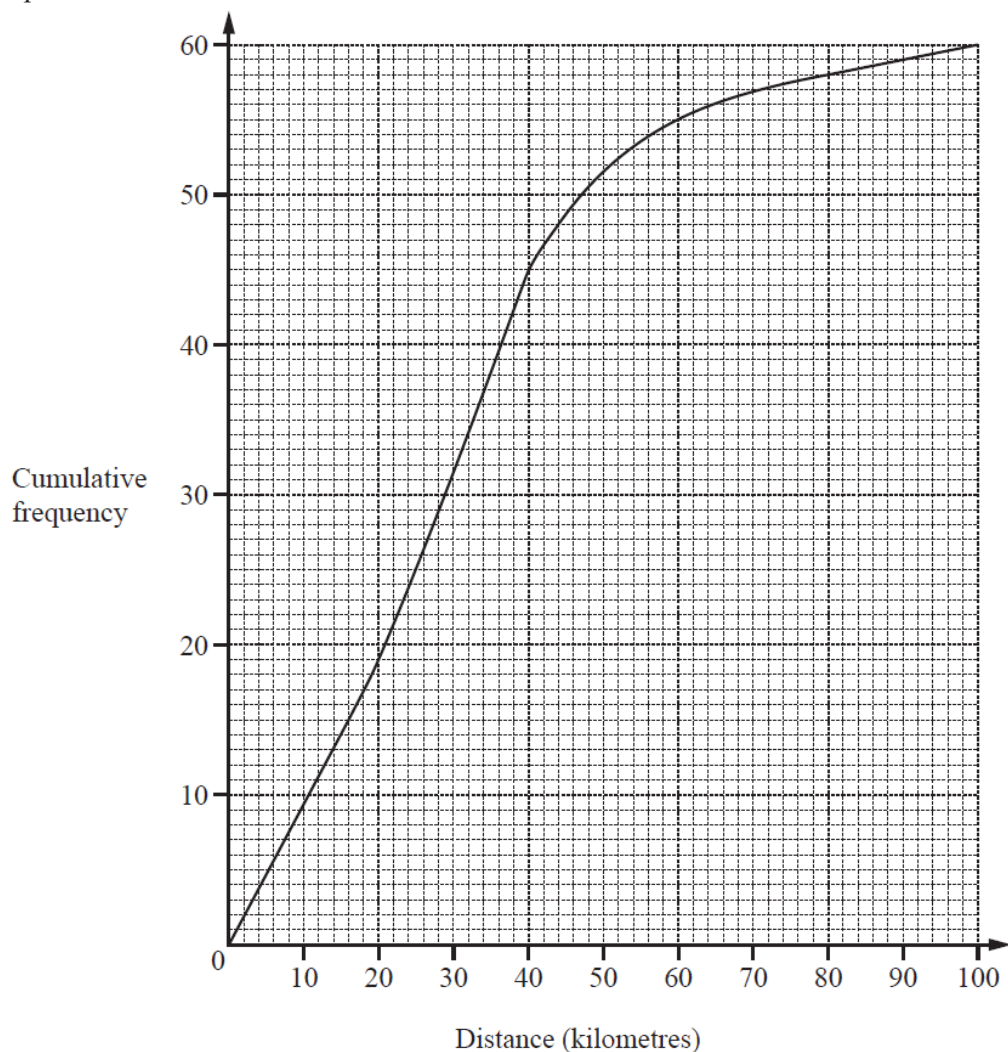
This is **5.8 minutes**. (blue line)

- (c) the number of students taking more than 5 minutes. [2]

From the graph, there are 10 students who took 5 minutes or less (green line) to complete a short test, therefore there must be **70 students** taking more than 5 minutes.



The cumulative frequency diagram shows information about the distances travelled, in kilometres, by 60 people.



Find

(a) the 80th percentile,

[2]

We calculate 80% of 60 (total number of people), which is 48. To get the 80<sup>th</sup> percentile, we look at the 48<sup>th</sup> reading (at the distance travelled by the 48<sup>th</sup> person), which is **44 kilometres**.  
(red line)



(b) the inter-quartile range,

[2]

The inter-quartile range is the difference between the upper and the lower quartile.

The lower quartile is the distance of a person who is 25% of 60, which is 15. The distance travelled of 15<sup>th</sup> person is 16 kilometres. (green line)

For upper quartile we take the value of student who is 75% of 60, which is 45. The distance travelled of 45<sup>th</sup> person is 40 kilometres. (orange line)

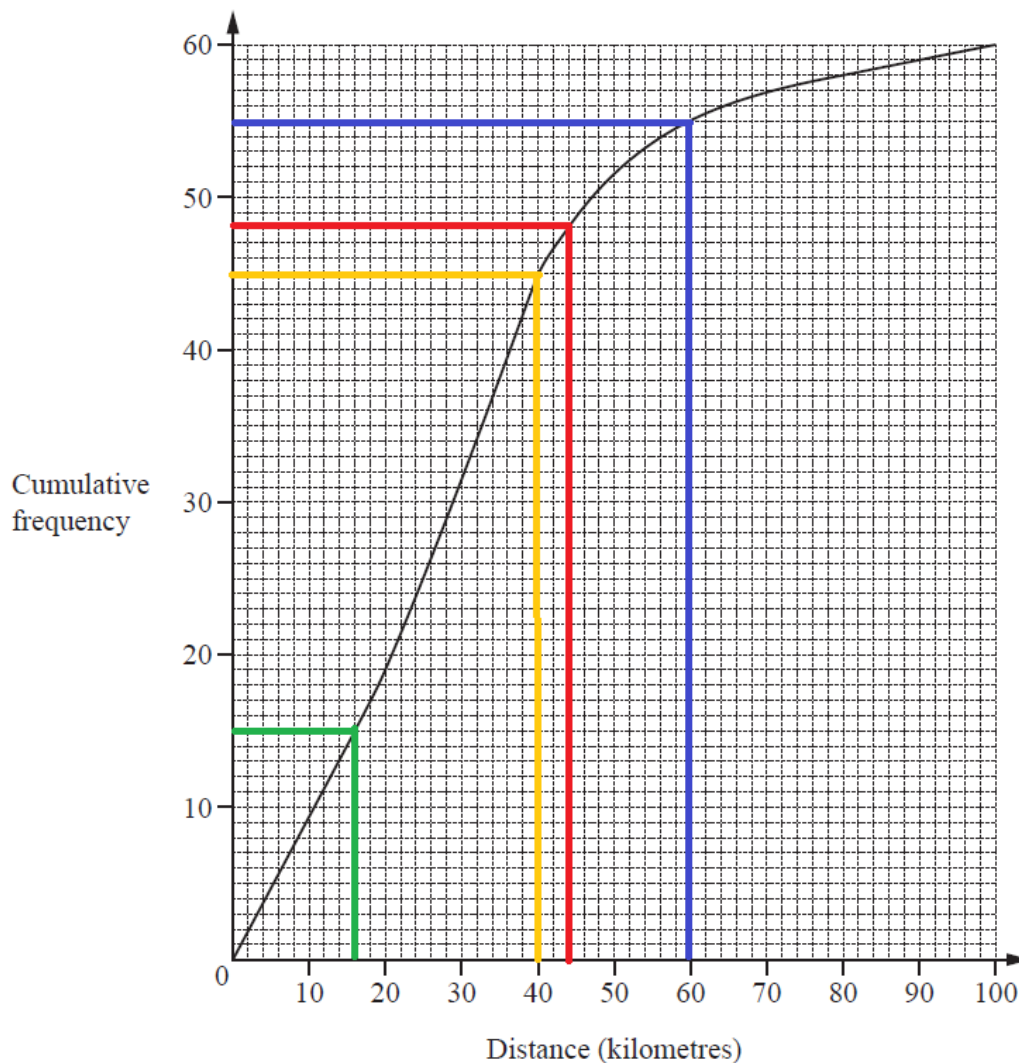
The inter-quartile range is therefore **24 kilometres**  $= (40 - 16 \text{ kilometres})$ .

(c) the number of people who travelled more than 60 km.

[2]

From the graph, there are 55 people who travelled 60 kilometres or less. (blue line)

Therefore there must be **5 people** who travelled more than 60 kilometres.

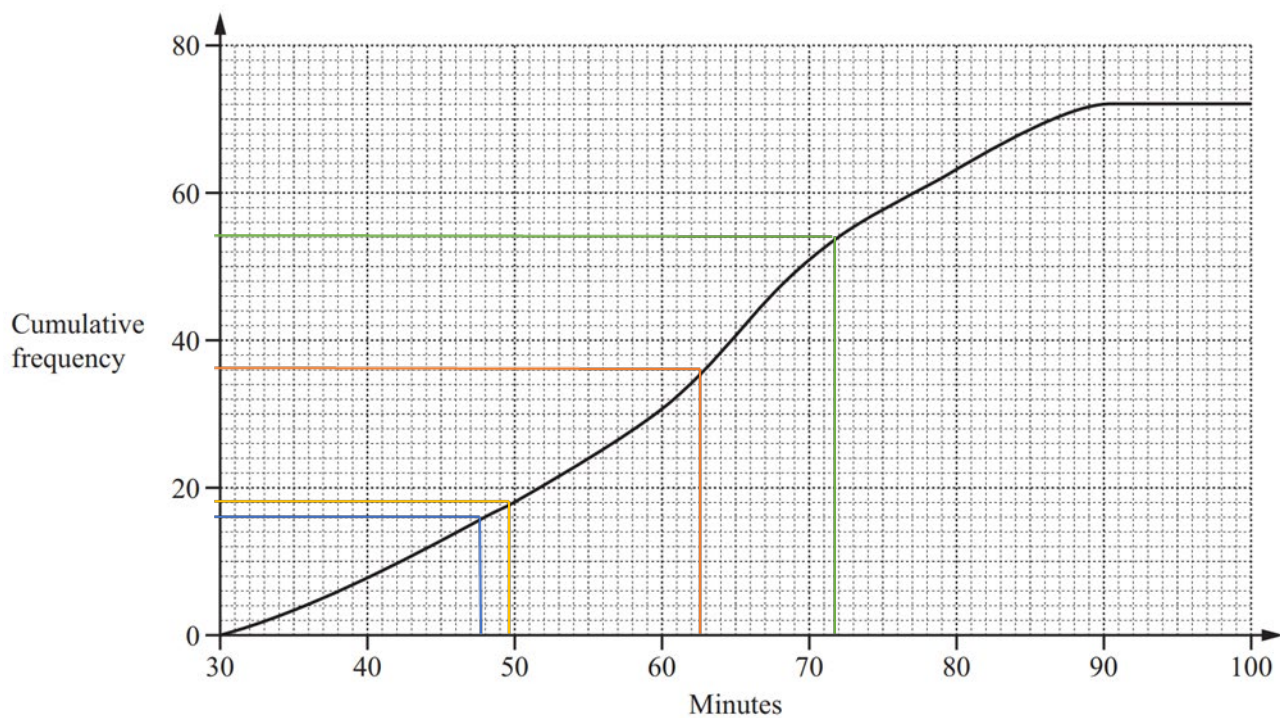
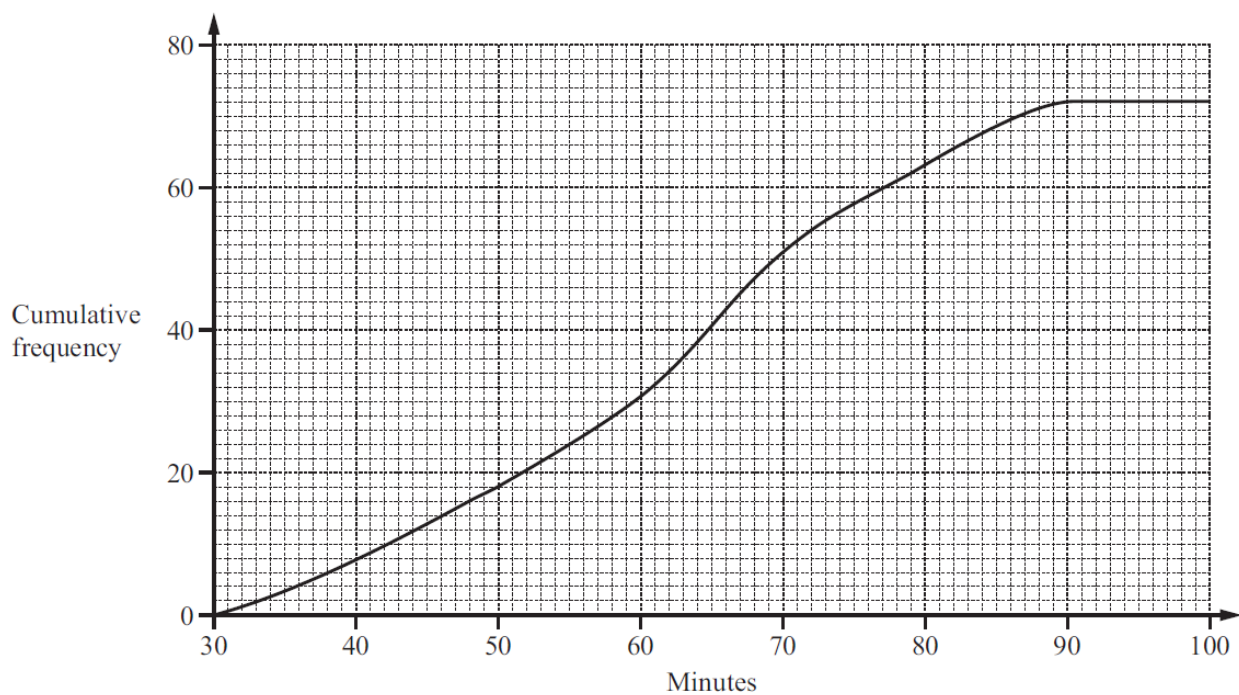


## Question 5

72 students are given homework one evening.

They are told to spend no more than 100 minutes completing their homework.

The cumulative frequency diagram shows the number of minutes they spend.



- (a) How many students spent more than 48 minutes completing their homework?

[2]

Using the blue lines on the diagram above we can see  
that 16 students spent 48 minutes or less, therefore:

$$72 - 16$$

$$= 56$$

spent more than 48 minutes.

- (b) Find

- (i) the median,

[1]

The orange line on the diagram above.

Median time is:

$$63$$

- (ii) the inter-quartilerange.

[2]

Upper quartile is the green line; lower quartile is the  
yellow line.

The difference between them is the interquartile range:

$$72 - 50$$

$$= 22$$

# Cumulative Frequency

## Difficulty: Easy

### Model Answers 2

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Statistics
Sub-Topic	Cumulative Frequency
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 2

**Time allowed:** 28 minutes

**Score:** /22

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

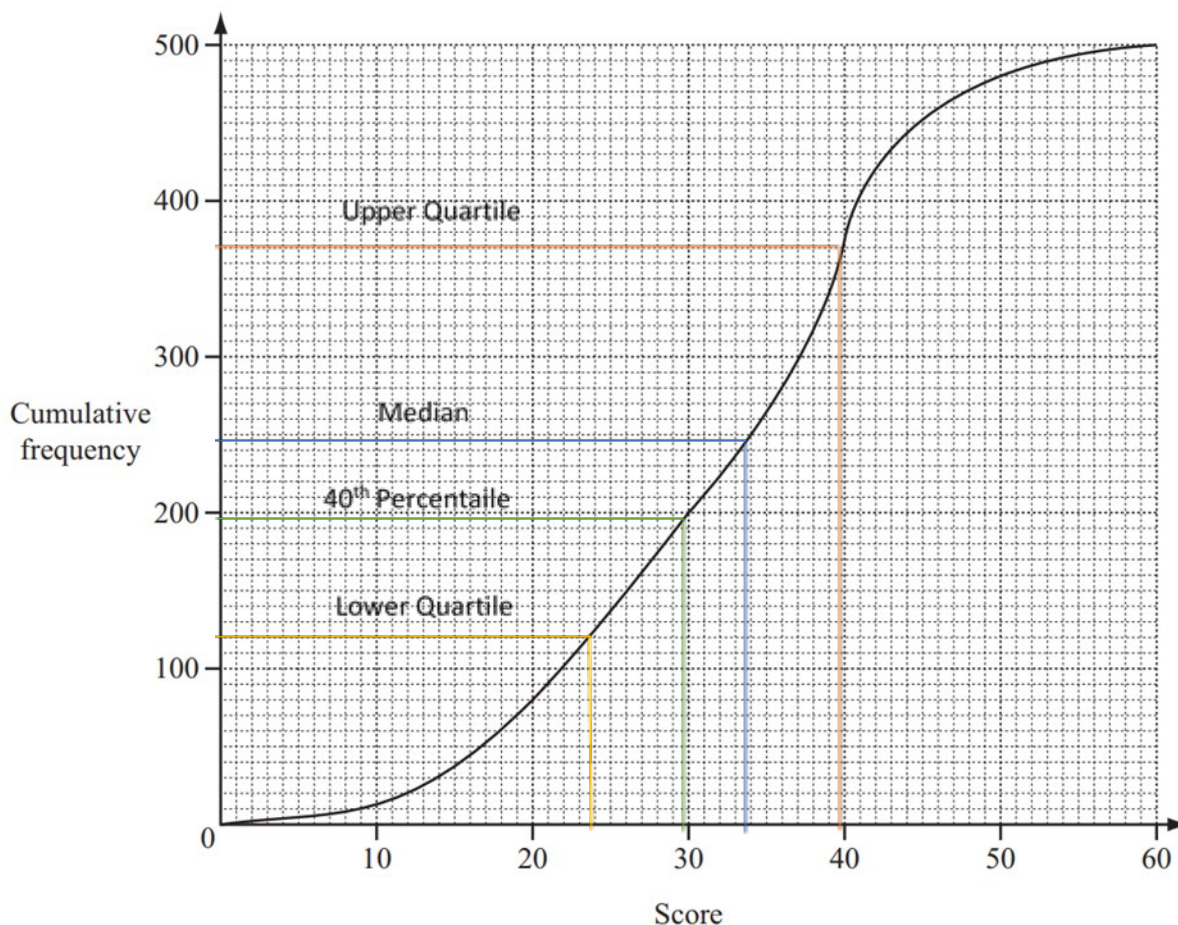
A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

Jenna draws a cumulative frequency diagram to show information about the scores of 500 people in a quiz.



Use the diagram to find

(a) the median score,

[1]

Median (blue line) is

**34**

(b) the inter-quartile range,

[2]

Interquartile range is upper quartile (orange line) minus lower quartile  
(yellow line)

$$40 - 24$$

$$= 16$$

(c) the 40th percentile,

[1]

$$40\% \text{ of } 500 = 0.4 \times 500$$

$$= 200$$

**40<sup>th</sup> percentile (green line) is 30**

(d) the number of people who scored 30 or less but more than 20.

[1]

We can see that 200 people scored 30 or less, and 80 people scored 20 or less,

hence

$$200 - 80$$

$$= 120$$

## Question 2

Lauris records the mass and grade of 300 eggs. The table shows the results.

Mass ( $x$ grams)	$30 < x \leq 40$	$40 < x \leq 50$	$50 < x \leq 60$	$60 < x \leq 70$	$70 < x \leq 80$	$80 < x \leq 90$
Frequency	15	48	72	81	54	30
Grade	small		medium	large	very large	

(a) Find the probability that an egg chosen at random is graded very large.

[1]

The number of very large eggs is

$$54 + 30$$

$$= 84$$

The total number of eggs is 300. The probability of a very large egg is then

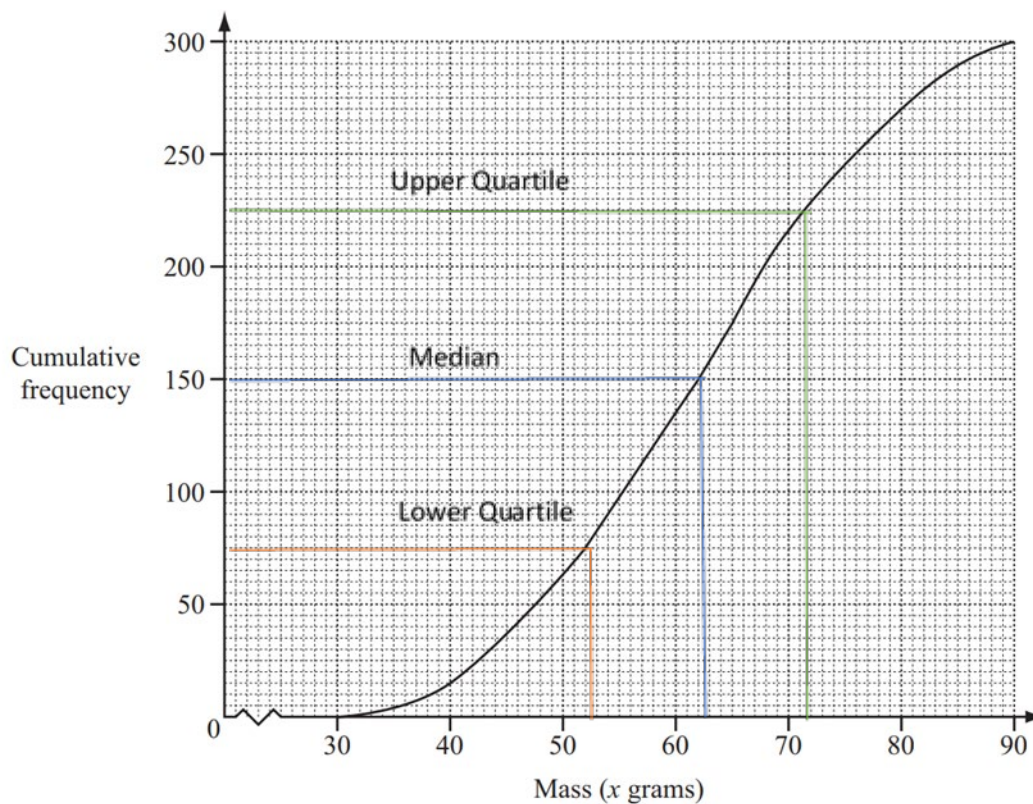
$$84 \div 300$$

$$= \frac{84}{300}$$

$$= \frac{7}{25}$$



(b) The cumulative frequency diagram shows the results from the table.



Use the cumulative frequency diagram to find

(i) the median, [1]

The median is the blue line

=62

(ii) the lower quartile, [1]

The lower quartile is the orange line

=52



- (i) the inter-quartile range,

[1]

The interquartile range is the upper quartile (the green line) minus the lower quartile (from part bii)

$$71 - 52$$

$$= 19$$

- (iv) the number of eggs with a mass greater than 65 grams.

[2]

The number of eggs with a mass of 65g and below is 175 (as seen by the orange line on the graph below).

This means that the number of eggs with a mass greater than 65 is

$$300 - 175$$

$$= 125$$

### Question 3

Mass of parcel ( $m$ kilograms)	$0 < m \leq 0.5$	$0.5 < m \leq 1.5$	$1.5 < m \leq 3$
Frequency	20	18	9

The table above shows information about parcels in a delivery van.

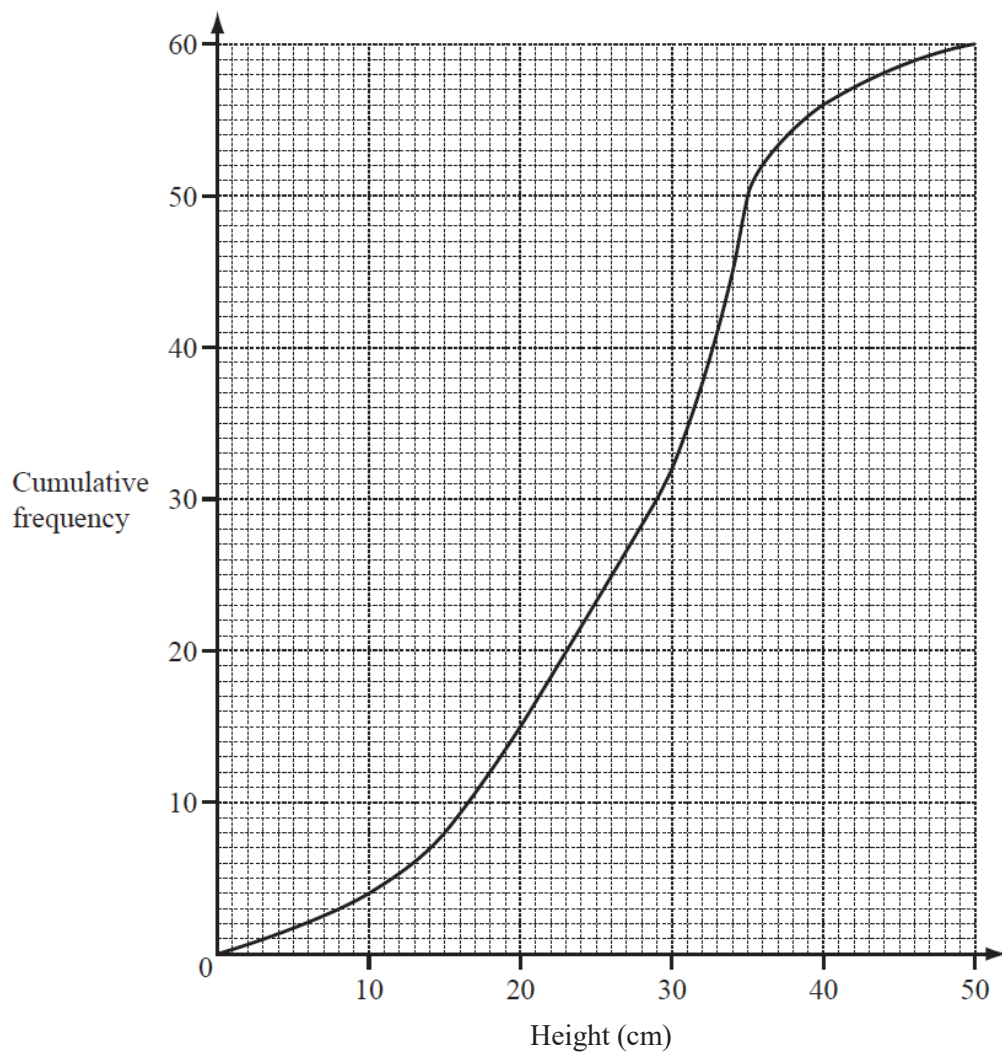
John wants to draw a histogram using this information.

Complete the table below.

[2]

Mass of parcel ( $m$ kilograms)	$0 < m \leq 0.5$	$0.5 < m \leq 1.5$	$1.5 < m \leq 3$
Frequency density	40	18	6

## Question 4



The cumulative frequency diagram shows information about the heights of 60 tomato plants. Use the diagram to find

- (a) the median,

[1]

Read off the graph at 30

=29

- (b) the lower quartile,

[1]

Read off the graph at 15

=20

- (c) the interquartile range,

[1]

Read off the graph at 45 for the upper quartile

$$34$$

Hence the interquartile range is

$$34 - 20$$

$$= 14$$

- (d) the probability that the height of a tomato plant, chosen at random, will be more than 15 cm.

[2]

Read off the graph at *Height* = 15

$$8$$

Hence, 8 plants have height 15 or lower and

$$60 - 8$$

$$= 52$$

52 plants have height greater than 15.

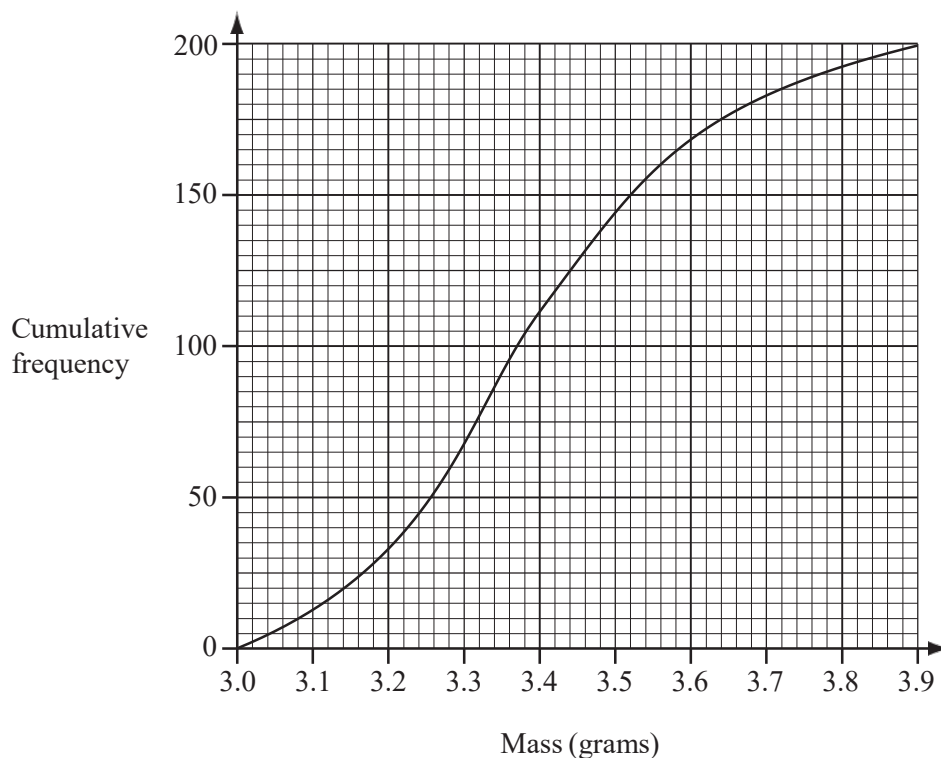
This is a probability of

$$\frac{52}{60}$$

$$= \frac{13}{15}$$

## Question 5

The mass of each of 200 tea bags was checked by an inspector in a factory.  
The results are shown by the cumulative frequency curve.



For the purposes of these answers let  $y$  be the Cumulative frequency

Use the cumulative frequency curve to find

(a) the median mass,

[1]

Read off the graph at  $y = 100$

**Median = 3.365**

(b) the interquartilerange,

[2]

Read off the graph at  $y = 150$  for the upper quartile

**$UQ = 3.52$**

Read off the graph at  $y = 50$  for the lower quartile

**$LQ = 3.26$**

Hence, the inter quartile range is

$$3.52 - 3.26$$

$$= 0.26$$

- (c) the number of tea bags with a mass greater than 3.5 grams.

[1]

Read off the graph at  $Mass = 3.5$

$$y = 145$$

Hence 145 bags had mass 3.5 or below.

Hence the number with mass great than 3.5 is

$$200 - 145$$

$$= 55$$

# Cumulative Frequency

## Difficulty: Hard

### Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Statistics
Sub-Topic	Cumulative Frequency
Paper	Paper 2
Difficulty	Hard
Booklet	Model Answers 1

**Time allowed:** 39 minutes

**Score:** /30

**Percentage:** /100

#### Grade Boundaries:

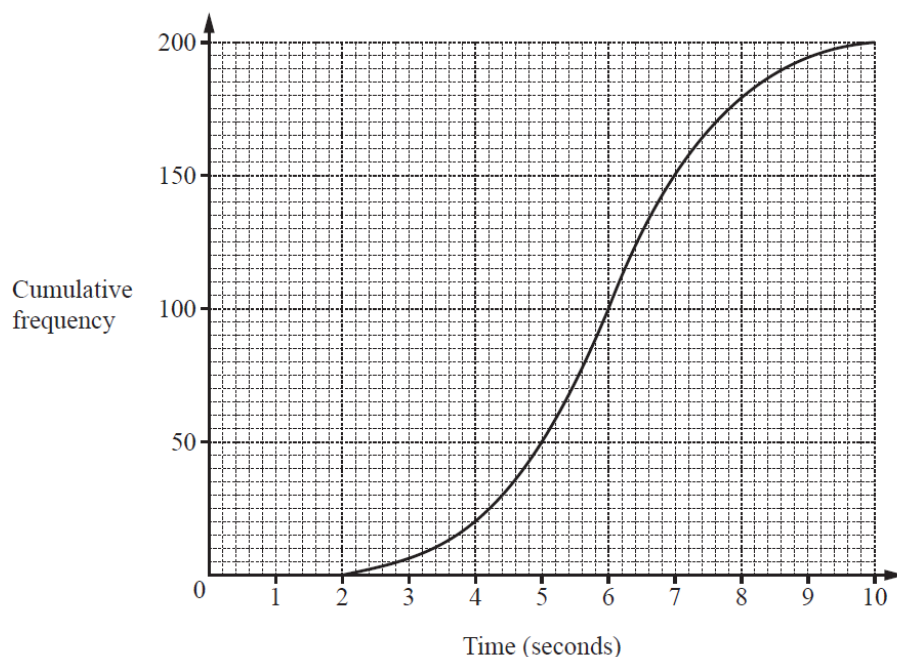
##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1



200 students take a reaction time test.  
The cumulative frequency diagram shows the results.

Find

- (a) the median,

[1]

The median is the 50<sup>th</sup> percentile. As there are 200 students, it is the value of 100<sup>th</sup> student (red).

From the graph, this is **6 seconds**.

- (b) the inter-quartile range,

[2]

The inter-quartile range is the difference between the upper and the lower quartile.

The lower quartile is the value of student who is 25% of 200, which is 50. This is 5 seconds. (blue line)

The upper quartile is the value of student who is 75% of 200, which is 150. This is 7 seconds. (orange)

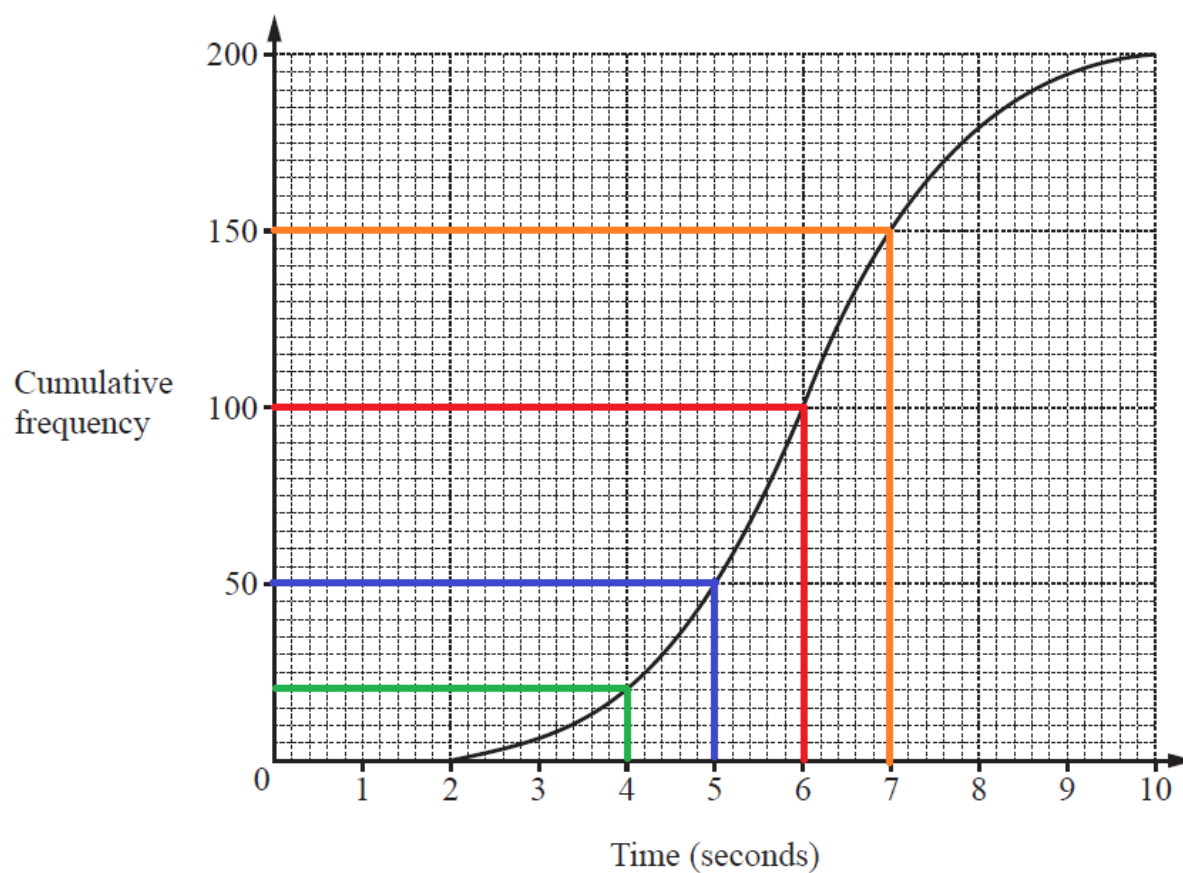
The inter-quartile range is therefore **2 seconds**.



(c) the number of students with a reaction time of more than 4 seconds.

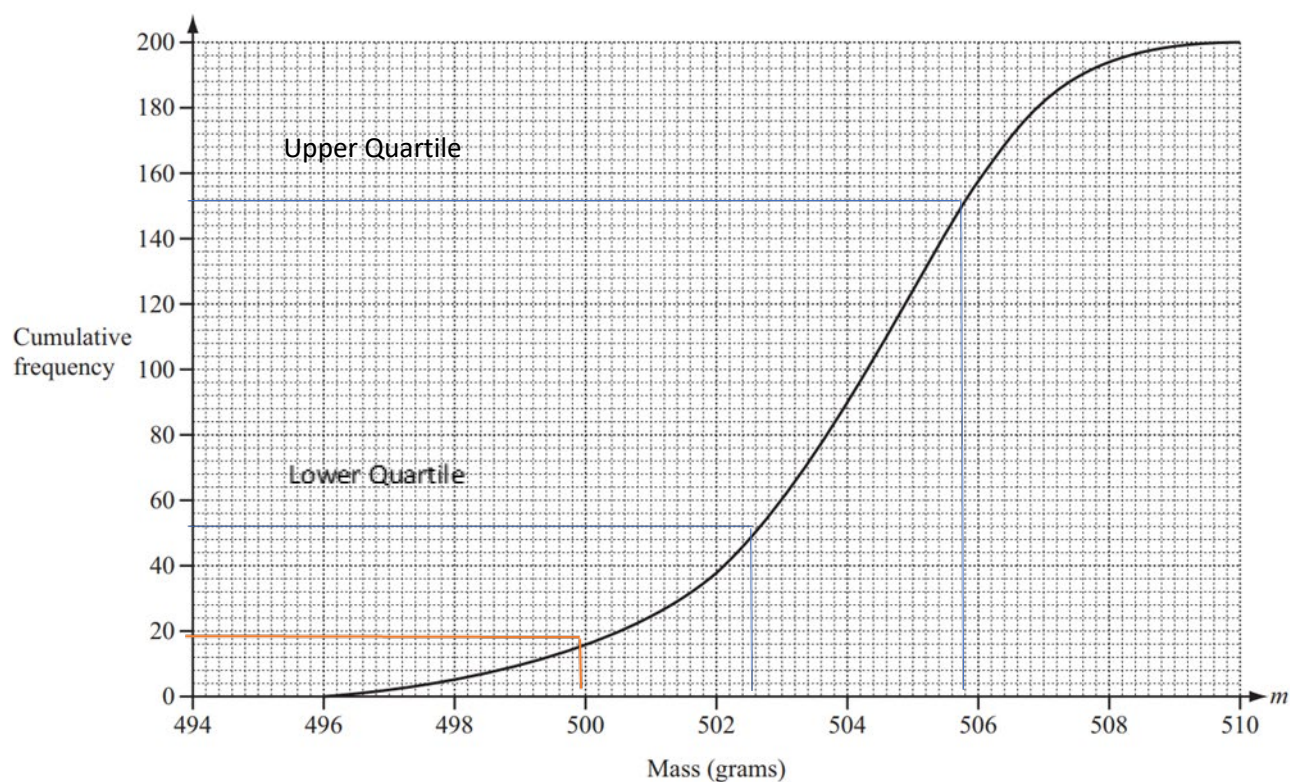
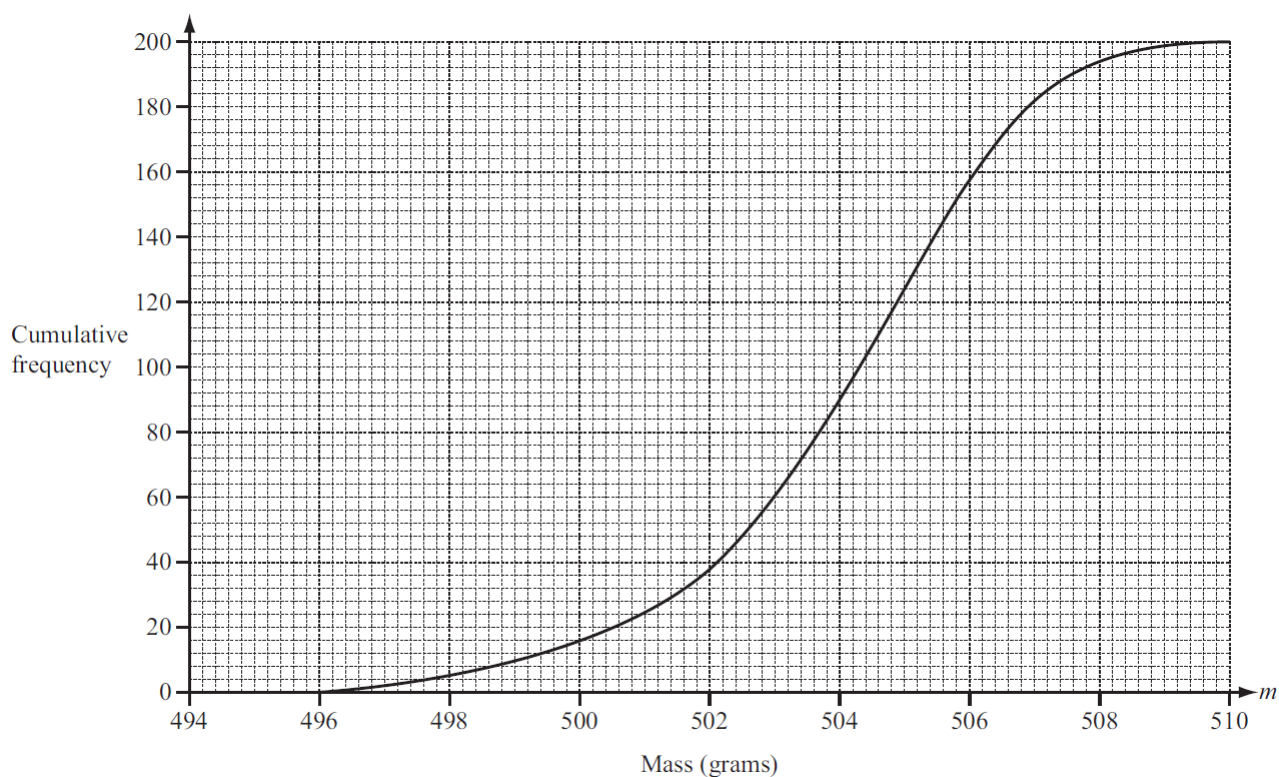
[2]

From the graph, there are 20 students who have reaction time of 4 seconds or less (green line), therefore there must be **180 students** with a reaction time of more than 4 seconds.



## Question 2

The mass,  $m$  grams, of cornflakes in each of 200 boxes is recorded.  
The cumulative frequency diagram shows the results.



- (a) Use the diagram to estimate the inter-quartile range.

[2]

Upper and lower quartile drawn in blue on graph above.

Interquartile range is the difference

$$505.8 - 502.6$$

$$= 3.2$$

- (b) Find the probability that a box chosen at random has a mass of 500 grams or less.

[2]

We can see from the orange line on the graph above that 16 boxes have a mass 500g or below.

Hence the probability is

$$\frac{16}{200}$$

(c)

Mass ( $m$ grams)	$496 < m \leq 500$	$500 < m \leq 504$	$504 < m \leq 508$	$508 < m \leq 510$
Frequency	16	74	104	6

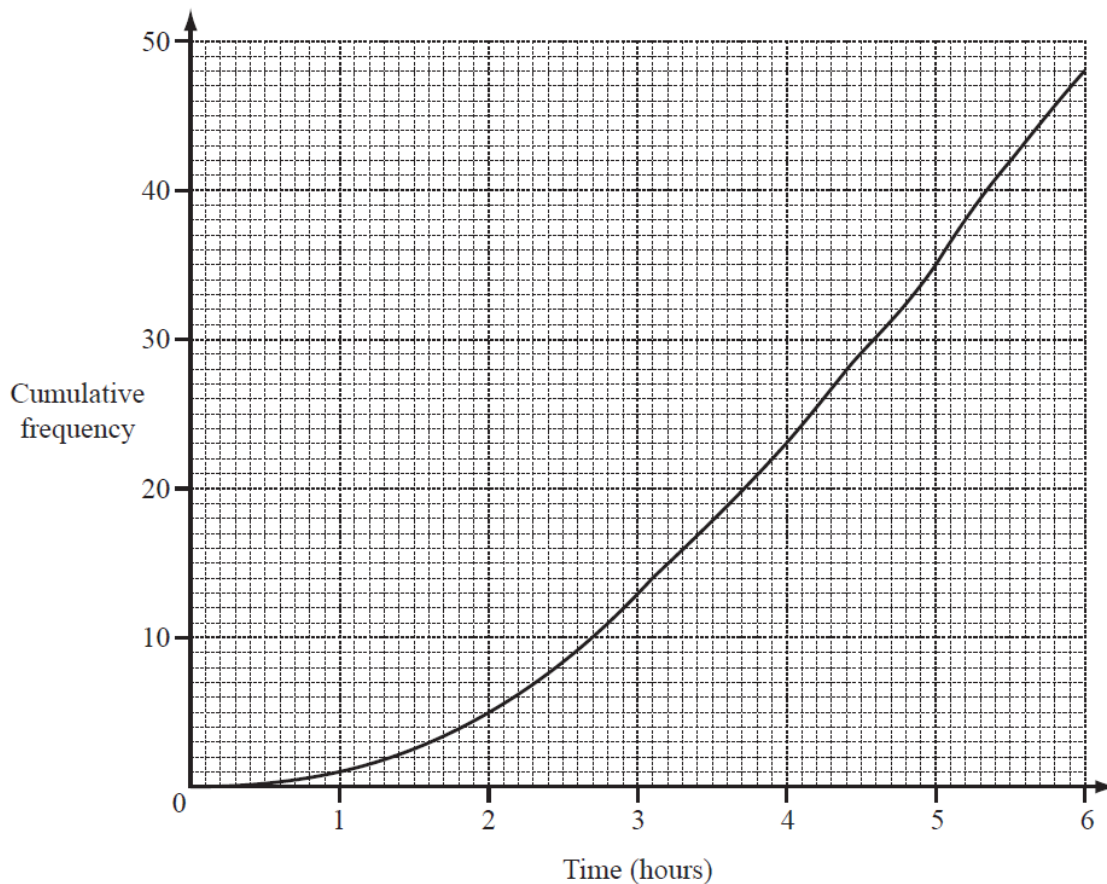
[2]

The data in this frequency table is to be shown in a histogram.

Complete the frequency density table below.

Mass ( $m$ grams)	$496 < m \leq 500$	$500 < m \leq 504$	$504 < m \leq 508$	$508 < m \leq 510$
Frequency Density	4	18.5	26	3

During one day 48 people visited a museum.  
The length of time each person spent in the museum was recorded.  
The results are shown on the cumulative frequency diagram.



Work out

(a) the median,

[1]

Note here that the cumulative frequency graph is plotted to a maximum of 48.

This makes 48 the 100%.

For the median, we want to find the frequency at 50%, hence at where frequency is 24.

Reading off the graph at 24, this gives us a time of 4.05 to 4.2 hours.

- (b) the 20th percentile, [2]

At the 20<sup>th</sup> percentile, we take 20% of 48 which is:

$$0.2 \times 48 = 9.6$$

Reading off the graph:

$$\text{Time spent} = 2.6 \text{ to } 2.75$$

- (c) the inter-quartile range, [2]

The inter-quartile range is given by the difference between the 75<sup>th</sup> and 25<sup>th</sup> percentiles.

75<sup>th</sup> percentile, read at where frequency = 36

25<sup>th</sup> percentile, read at where frequency = 12

This gives us an upper quartile value of 5.0 to 5.1 and a lower quartile of 2.85 to 2.95

Taking the difference gives us an answer in the range of 2.05 to 2.25.

- (d) the probability that a person chosen at random spends 2 hours or less in the museum. [2]

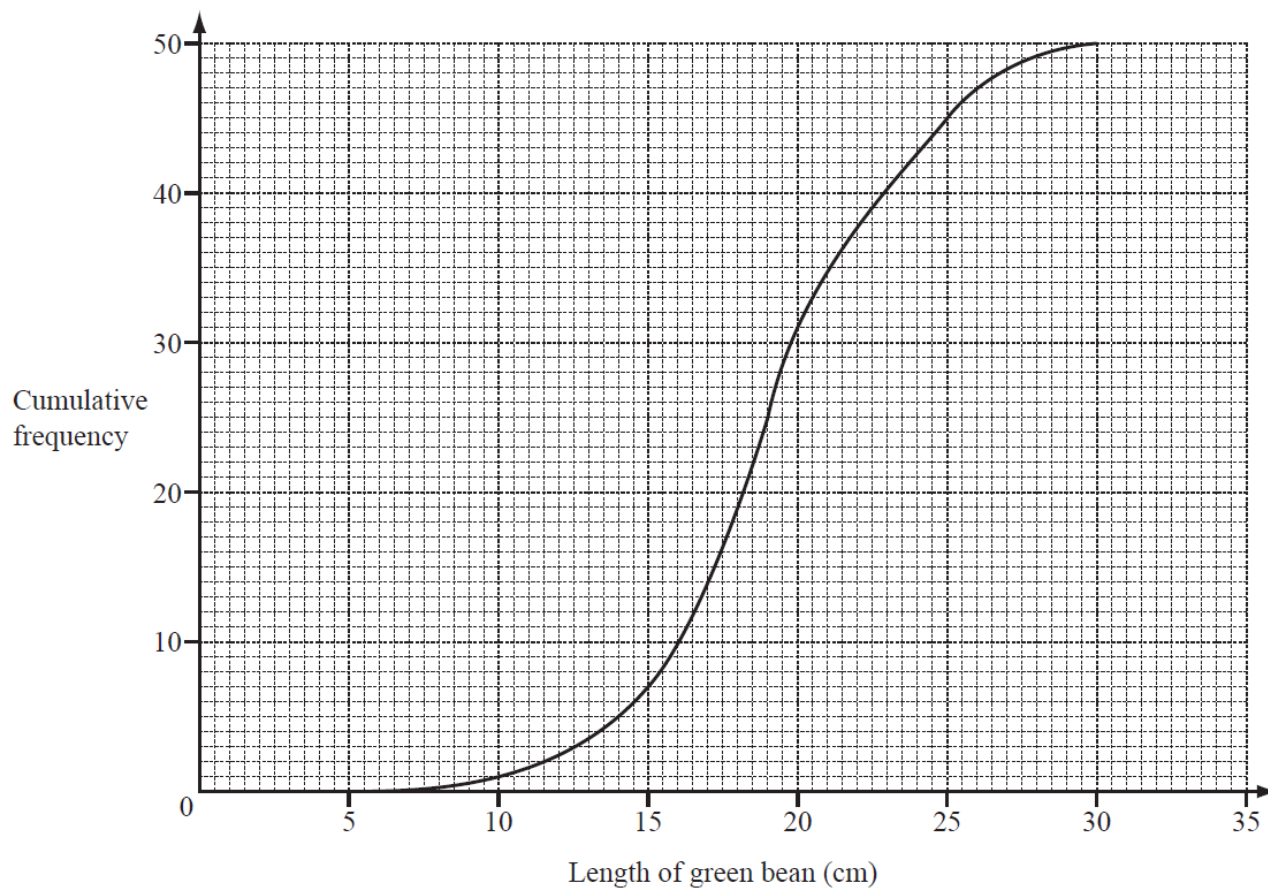
Read off at where time spent = 2, and we get a cumulative frequency of 5.

This means that out of 48 people, 5 visited the museum for less than 2 hours.

Thus, the probability is  $\frac{5}{48}$

## Question 4

A gardener measured the lengths of 50 green beans from his garden.  
The results have been used to draw this cumulative frequency diagram.



Work out

- (a) the median,

[1]

The median is read at where cumulative frequency is at 25:

**Answer: 19 to 19.1**

- (b) the number of green beans that are longer than 26 cm,

[2]

Read at where length = 26cm, frequency = 47

Therefore,

$$50 - 47 = 3$$

**There are 3 beans longer than 26cm.**



(c) the inter-quartile range,

[2]

The inter-quartile range is the length at the 75<sup>th</sup> percentile minus the length at the 25<sup>th</sup> percentile.

75<sup>th</sup> percentile is at  $0.75 * 50 = 37.5$

25<sup>th</sup> percentile is at  $0.25 * 50 = 12.5$

At 75<sup>th</sup> percentile: Length = about 22cm

At 25<sup>th</sup> percentile: Length = about 16.7cm

**Therefore inter-quartile range =  $22 - 16.17 = 5.3$  cm**

Any answer from 4.9 to 5.7 is acceptable.

(d) the probability that a green bean chosen at random is more than 14 cm long.

[2]

When length = 14, frequency = 5

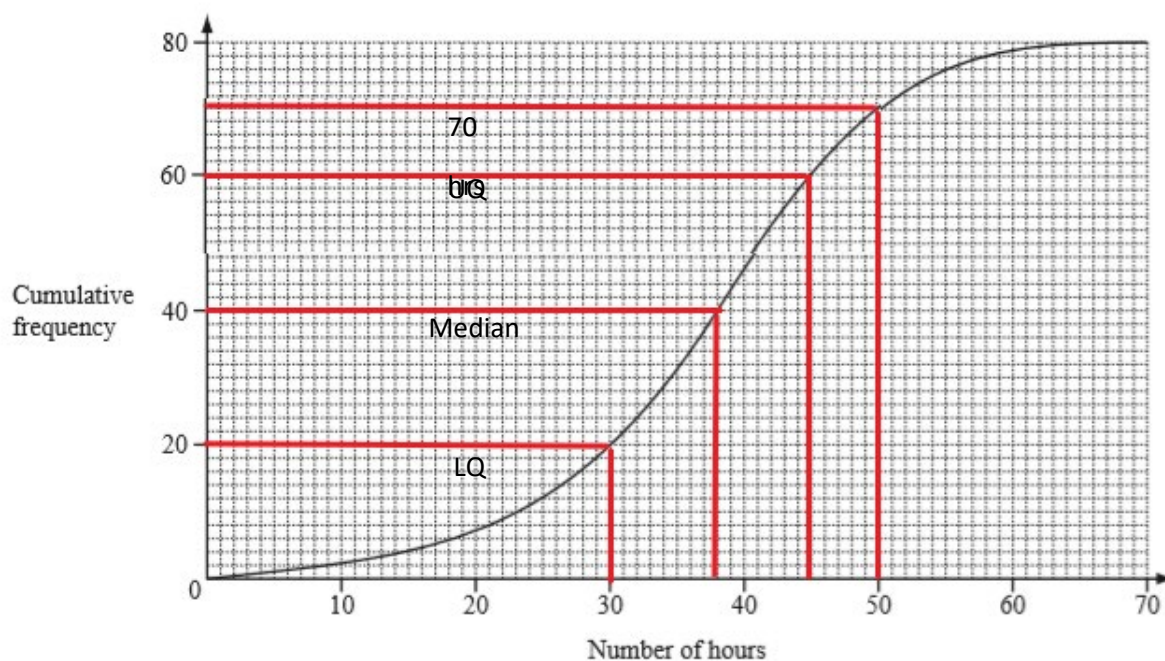
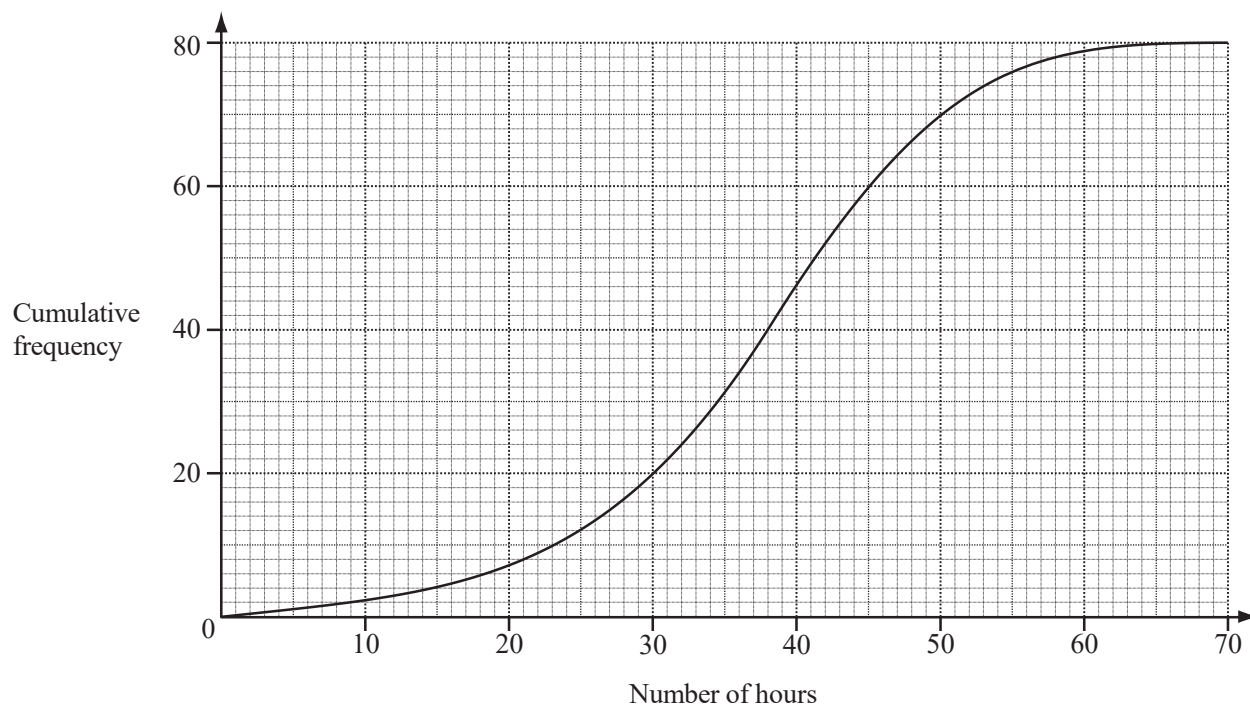
For more than 40, the frequency =  $50 - 5 = 45$

Therefore probability:

$$= \frac{45}{50}$$

## Question 5

The number of hours that a group of 80 students spent using a computer in a week was recorded. The results are shown by the cumulative frequency curve.





Use the cumulative frequency curve to find

(a) the median, [1]

From the graph:

**38hrs**

(b) the upper quartile, [1]

From the graph:

**45hrs**

(c) the interquartile range, [1]

From the graph the  $UQ = 45$ ,  $LQ = 30$ . Using  $IQR = UQ - LQ$

$$IQR = 45 - 30 = 15$$

**$IQR = 15\text{hrs}$**

(d) the number of students who spent more than 50 hours using a computer in a week. [2]

From the graph we can read off the number of students who spend less than 50hrs. So then using the total number of students and the number of students who spend less than 50hrs we can work out the number who spend more:

$$\text{Total number} = \text{Number who spend less} + \text{Number who spend more}$$

$$80 = 70 + \text{Number who spend more}$$

**Number who spend more than 50hrs a week = 10**

# Correlation

## Difficulty: Easy

### Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Statistics
Sub-Topic	Correlation
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 1

**Time allowed:** 15 minutes

**Score:** /12

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

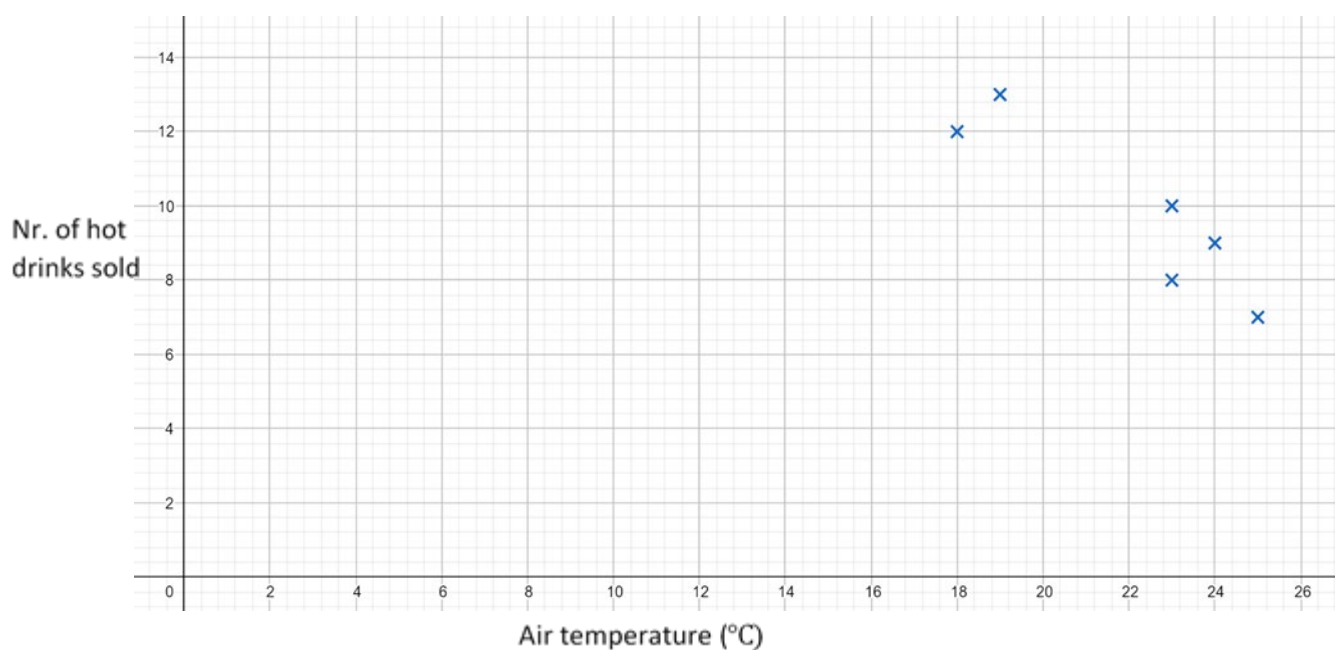
## Question 1

The owner of a small café records the average air temperature and the number of hot drinks he sells each day for a week.

Air temperature ( $^{\circ}\text{C}$ )	18	23	19	23	24	25	20
Number of hot drinks sold	12	8	13	10	9	7	12

(a) On the grid, draw a scatter diagram to show this information.

[2]



We obtain a scatter graph by plotting all the points on the grid.

(b) What type of correlation does your scatter diagram show?

[1]

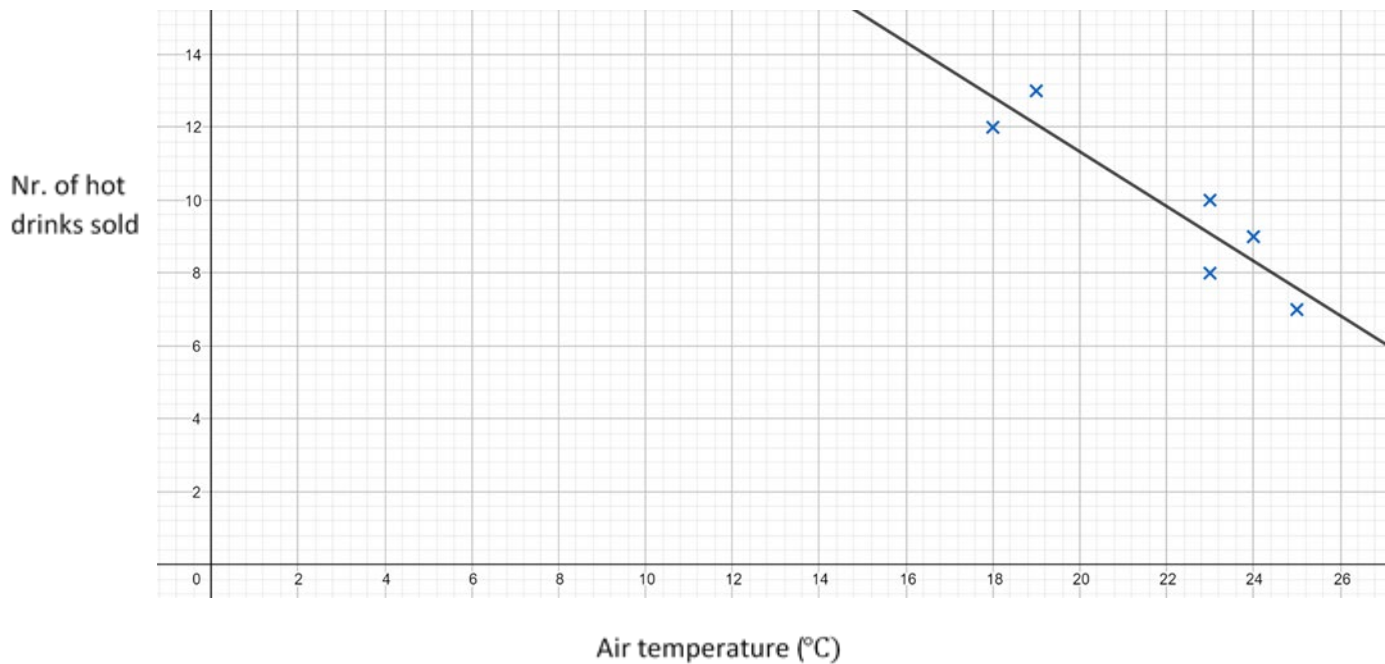
This graph shows that one of the variables, the number of hot drinks sold, increases as the other variable, air temperature, decreases.

Therefore, this scatter graph shows a negative correlation.

(c) Draw a line of best fit on the grid

. [1]

The line of best fit is drawn on the grid below:

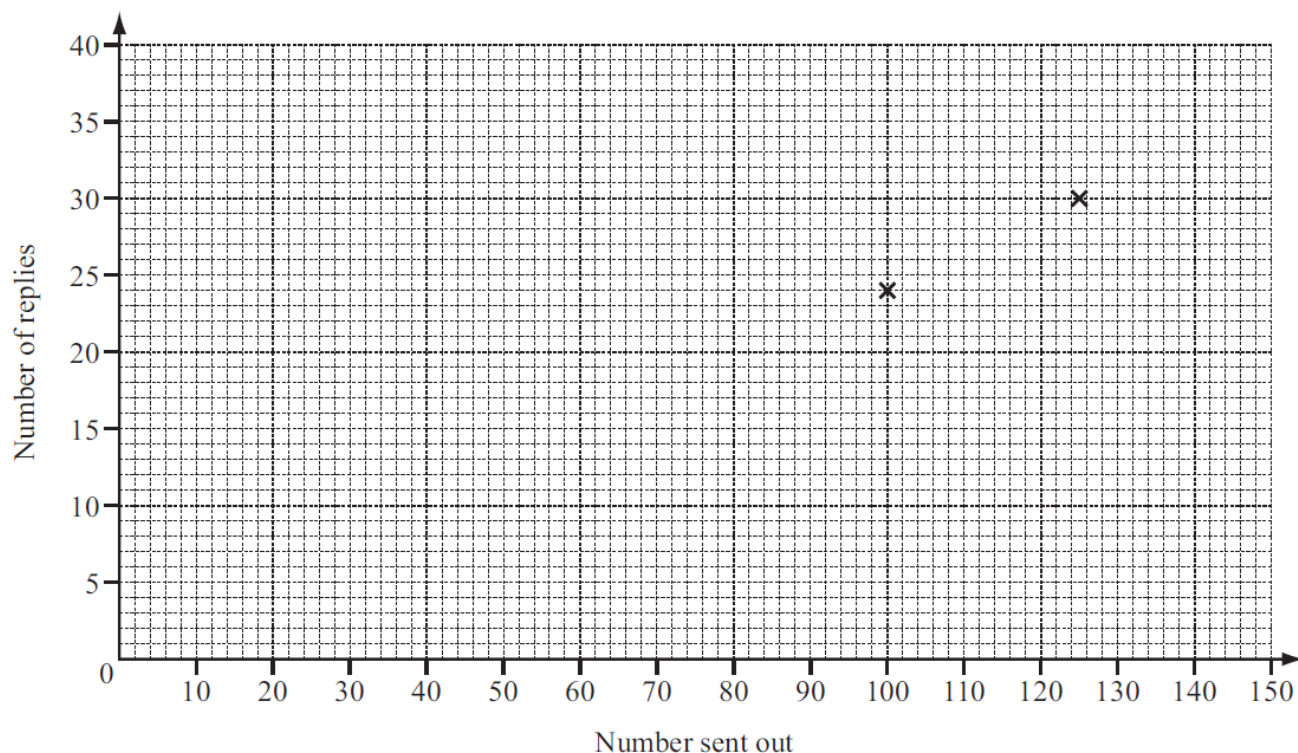


The line of best fit should go as centrally as possible through all the points plotted on the scatter graph and should follow the same steepness as the points.

## Question 2

A company sends out ten different questionnaires to its customers.  
The table shows the number sent and replies received for each questionnaire.

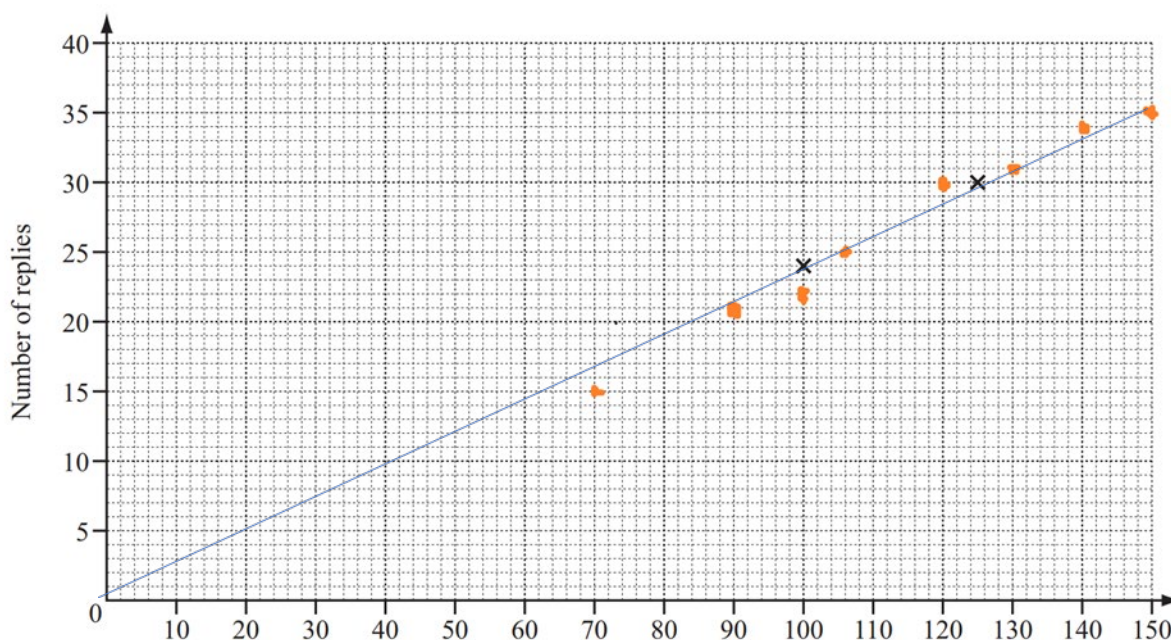
Questionnaire	A	B	C	D	E	F	G	H	I	J
Number sent out	100	125	150	140	70	105	100	90	120	130
Number of replies	24	30	35	34	15	25	22	21	30	31



- (a) Complete the scatter diagram for these results.  
The first two points have been plotted for you.

[2]

Diagram below



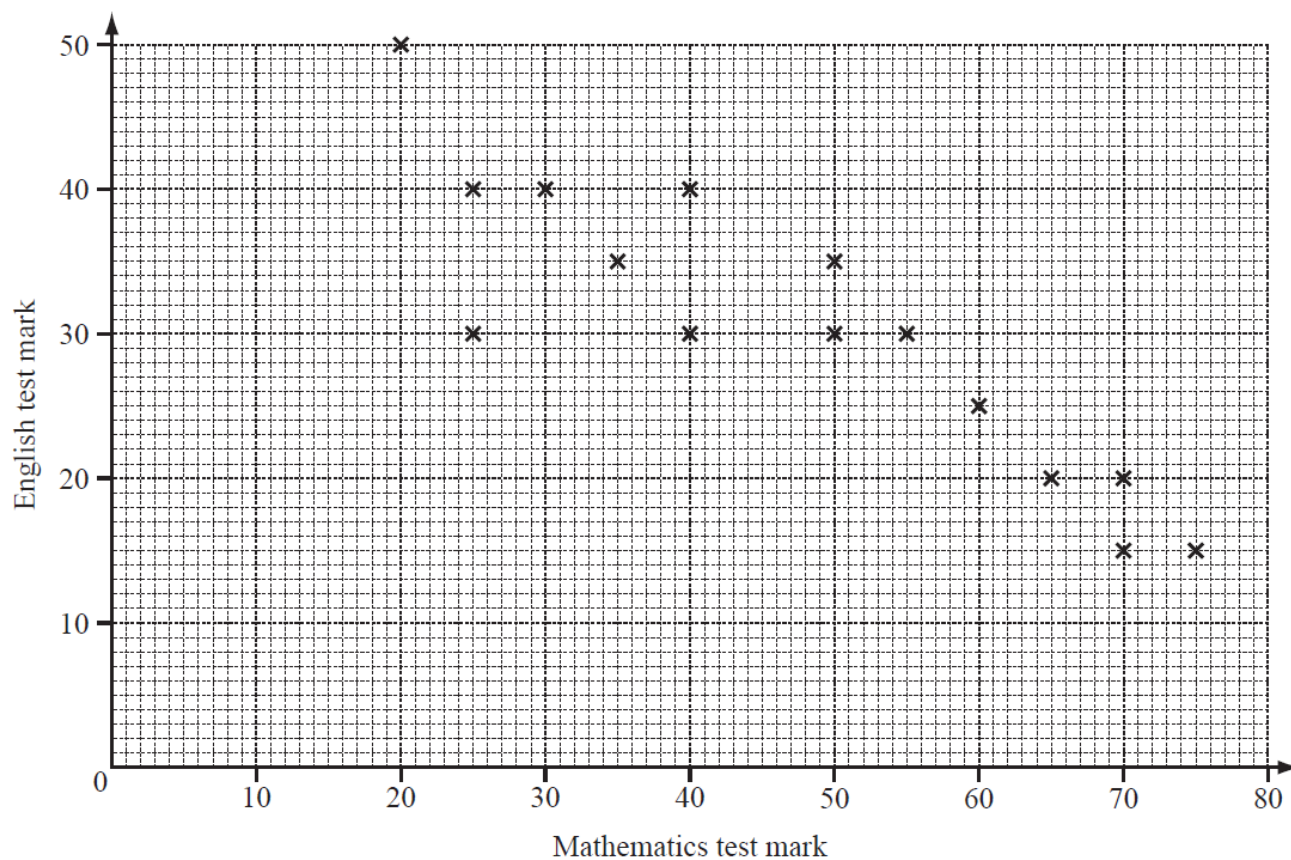
(b) Describe the correlation between the two sets of data. [1]

It is **positive** correlation.

(c) Draw the line of best fit. [1]

Line of best fit drawn in blue above

### Question 3



The scatter diagram shows the marks obtained in a Mathematics test and the marks obtained in an English test by 15 students.

(a) Describe the correlation.

[1]

We can see that as one variable increases, the English test mark, the other decreases, the Maths mark.

This means the scatter graph presents a **negative correlation**.

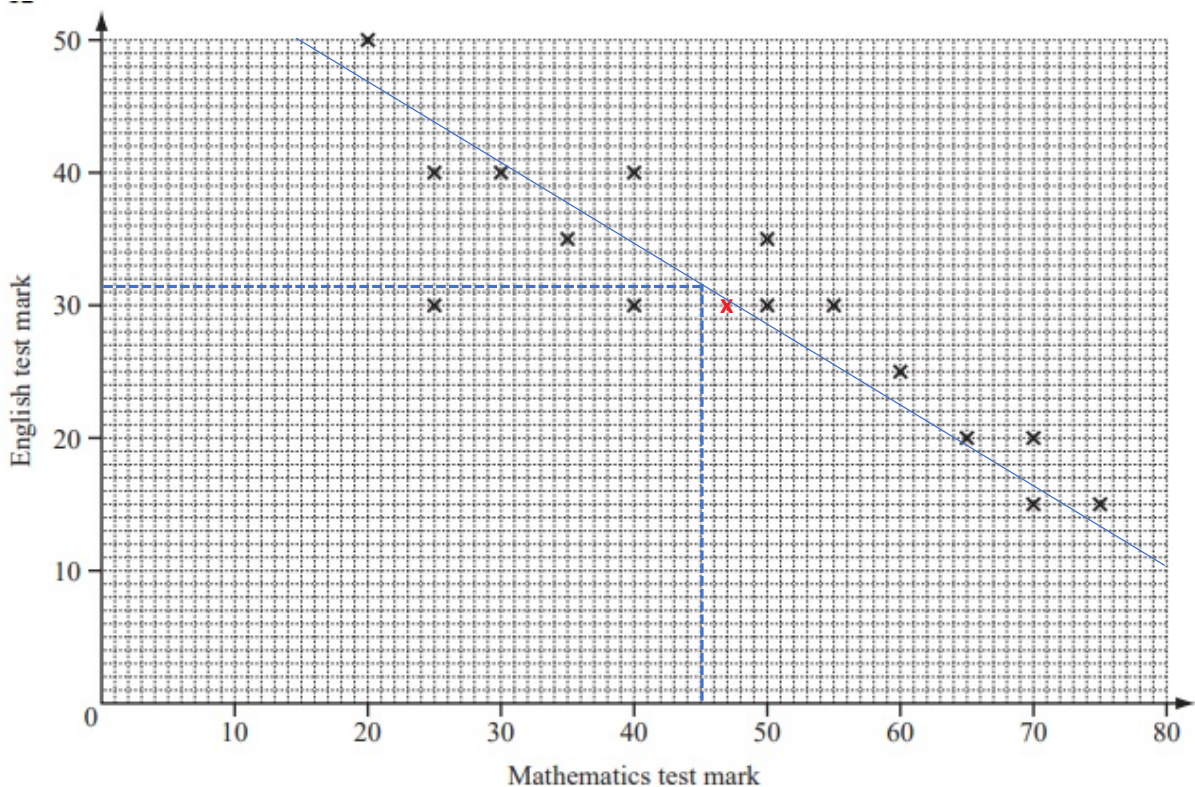
(b) The mean for the Mathematics test is 47.3 .  
The mean for the English test is 30.3 .

Plot the mean point (47.3, 30.3) on the scatter diagram above.

[1]

The point is plotted on the scatter graph shown below  
with the y coordinate = 30.3 and the x coordinate = 47.3





- (c) (i) Draw the line of best fit on the diagram above.

[1]

The line of best fit is a straight line which best represents the data on the scatter plot. This line is supposed to fit the points as well as possible.

- (ii) One student missed the English test.  
She received 45 marks in the Mathematics test.

Use your line to estimate the mark she might have gained in the English test.

[1]

By using the line of best fit drawn on the diagram above, we need to find the  $y$ -value corresponding to  $x = 45$ .

$y$  would be approximately 31.5.