

Higher GCSE Mathematics Revision Pack**DATA HANDLING – CALC**

- Q1.** The probability that a seed will grow into a flower is 0.85.
Loren plants 800 seeds.

Work out an estimate for the number of these seeds that will grow into flowers.

.....

(Total 2 marks)

- Q2.** Here is some information about the time, in minutes, it took the 21 teachers at a school to get to work on Monday.

13	18	20	35	45	34	44
23	33	12	46	21	22	17
22	31	23	8	15	22	10

- (a) Draw an ordered stem and leaf diagram to show this information.

(3)

Roadworks near the school meant that the time to travel to school by every teacher on Tuesday was increased by 5 minutes.

- (b) What was the median of the times on Tuesday?

..... minutes

(2)

- (c) State whether the interquartile range of the times on Tuesday would be less, greater or the same as the interquartile range of the times on Monday.
Give a reason for your answer.

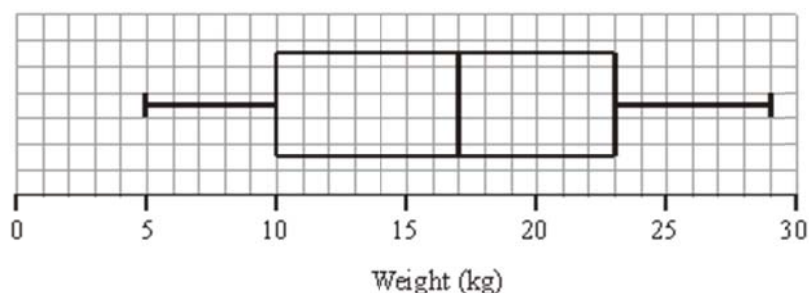
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(1)

(Total 6 marks)

- Q3.** The box plot gives information about the distribution of the weights of bags on a plane.



- (a) Jean says the heaviest bag weighs 23 kg.

She is **wrong**. Explain why.

..... (1)

- (b) Write down the median weight. kg (1)

- (c) Work out the interquartile range of the weights.

..... kg

(1)

There are 240 bags on the plane.

- (d) Work out the number of bags with a weight of 10 kg or less.

.....

(2)

(Total 5 marks)

- Q4.** A bag contains only red counters, blue counters, green counters and yellow counters. Rachel is going to take at random a counter from the bag.

The table shows each of the probabilities that Rachel will take a red counter or a blue counter or a green counter or a yellow counter.

Colour	Red	Blue	Green	Yellow
Probability	0.15	$2x$	x	0.1

- (a) Work out the probability that Rachel will take a green counter.

.....

(2)

Rachel says that there are exactly 9 blue counters in the bag.
Rachel is wrong.

- (b) Explain why there cannot be exactly 9 blue counters in the bag.

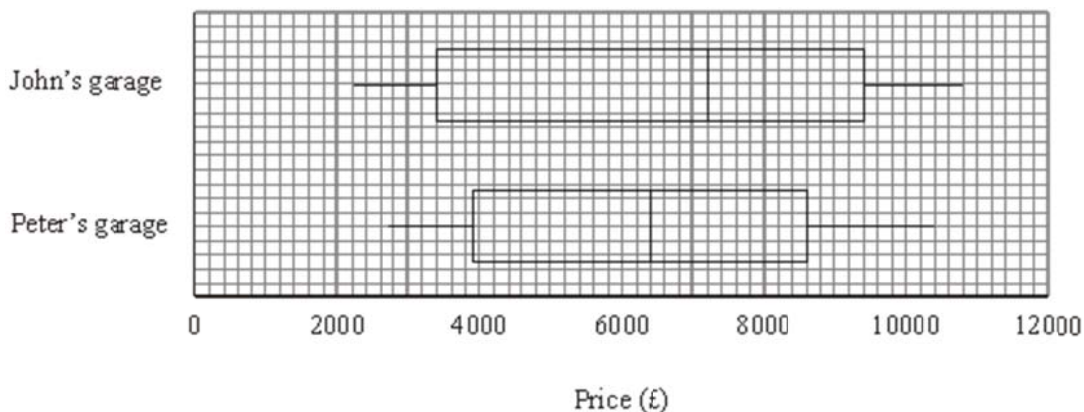
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(1)

(Total 3 marks)

- Q5.** John and Peter each own a garage.
They both sell used cars.

The box plots show some information about the prices of cars at their garages.



Compare the distribution of the prices of cars in these two garages.
Give **two** comparisons.

- 1
- 2

(Total 2 marks)

- Q6.** Some students did a test.

This back-to-back stem and leaf diagram shows information about their scores.

Boys' scores		Girls' scores
8 2	2	7 8
9 6 5 2	3	0 4 7 8
9 5 4 3 2 1 0	4	3 5 5 7 8
7 7 7 6 5 4	5	0 1 3 5 7 7 9 9
5 3 2 1	6	0 3 6

Key for boys' scores
8 | 2 means 28

Key for girls' scores
2 | 7 means 27

Compare and contrast the scores of these students.

(Total 6 marks)

Q7. Kelly recorded the length of time 48 teachers took to travel to school on Monday.

The table shows information about these travel times in minutes.

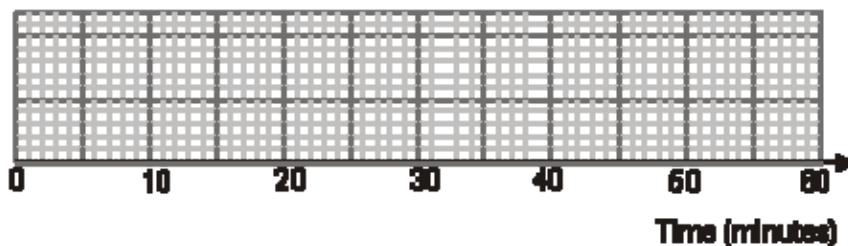
Least time	5
Greatest time	47
Median	28
Lower quartile	18
Upper quartile	35

- (a) Work out the number of teachers with a travel time of 35 minutes or more.

.....

(2)

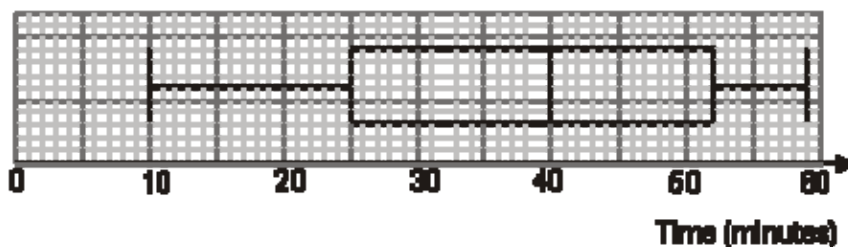
- (b) On the grid, draw a box plot to show the information in the table.



(2)

Kelly then recorded the times the same 48 teachers took to travel to school on Tuesday.

The box plot shows some information about these times.



- (c) Compare the travel times on Monday and on Tuesday.

.....

.....

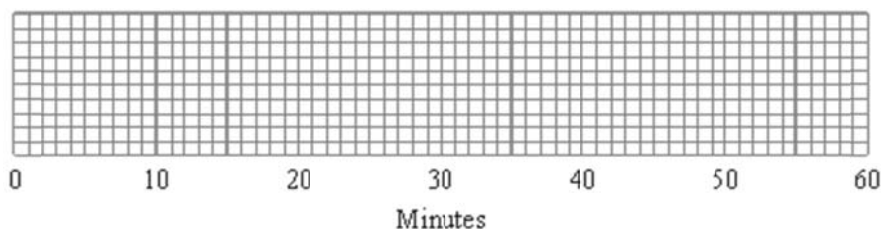
(2)

(Total 6 marks)

- Q8.** On Friday, Peter went to the airport.
He recorded the number of minutes that each plane was delayed.
He used his results to work out the information in this table.

	Minutes
Shortest delay	0
Lower quartile	2
Median	8
Upper quartile	18
Longest delay	41

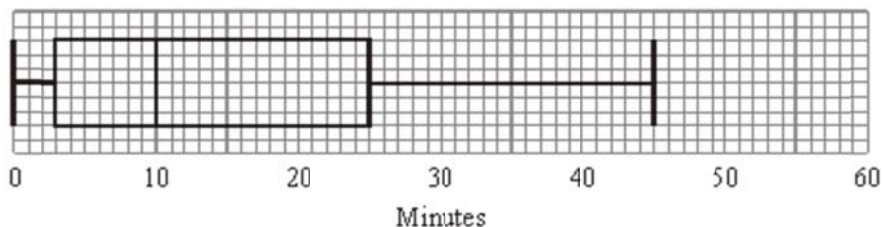
- (a) On the grid, draw a box plot to show the information in the table.



(2)

Peter also went to the airport on Saturday.
He recorded the number of minutes that each plane was delayed.

The box plot below was drawn using this information.



- (b) Make two comparisons between the distributions of plane delays on Friday and on Saturday.

.....

.....

.....

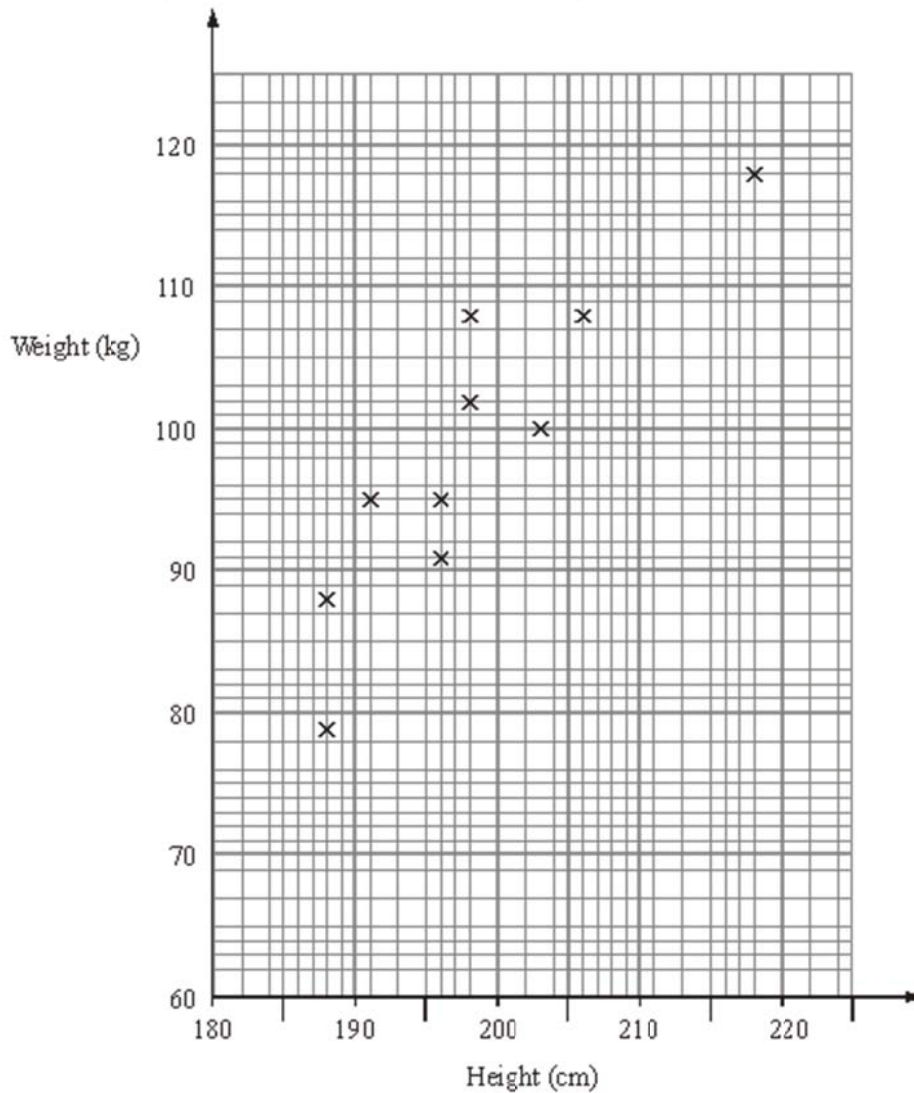
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(2)

(Total 4 marks)

Q9. The scatter graph shows some information about a random sample of ten male players at a basketball club.

For each player it shows his height and his weight.



(a) (i) On the scatter graph, draw a line of best fit.

(1)

(ii) Work out the gradient of your line of best fit.

.....

(2)

(iii) Write down a practical interpretation of this gradient.

.....

(2)

Some of the male players at the basketball club have a weight greater than 99 kg.

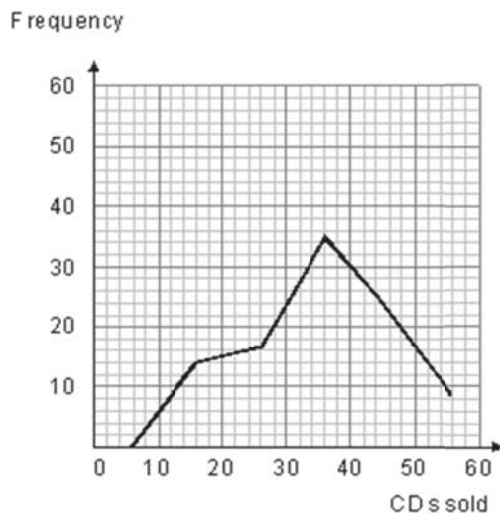
(b) Estimate the proportion of these players who have a height less than 200 cm.

.....

(2)

(Total 7 marks)

- Q10.** Kevin and Joe each manage a shop that sells CDs. Kevin's shop is in the High Street and Joe's is in the Retail Park. They want to compare the sales of CDs in each of their shops for the first 100 days of the year.



Kevin's information about the number of CDs sold each day in the High Street shop is shown on the grid. Each class interval is 10 CDs wide.

Joe's information about the number of CDs sold each day in the Retail Park shop is shown in the table.

Number of CDs sold each day	Frequency
0 – 10	10
11 – 20	34
21 – 30	24
31 – 40	13
41 – 50	7
51 – 60	12

Compare the sales of CDs in the two shops.

(Total 4 marks)

- Q11.** A factory makes 600 laptops. Mrs Green is responsible for checking these laptops. She is going to take a random sample of 80 of the laptops.

(a) Describe a method she could use to select the sample.

.....

Mrs Green finds that 3 of the 80 laptops are faulty.

(b) Work out an estimate for how many of the 600 laptops are faulty.

.....

(2)

(Total 3 marks)

Q12. Sue wants to find out if a 6-sided dice is biased.
She rolls the dice six times.

The table shows her results.

Score	1	2	3	4	5	6
Frequency	0	1	1	1	1	2

Sue says “My experiment shows this dice is biased”.

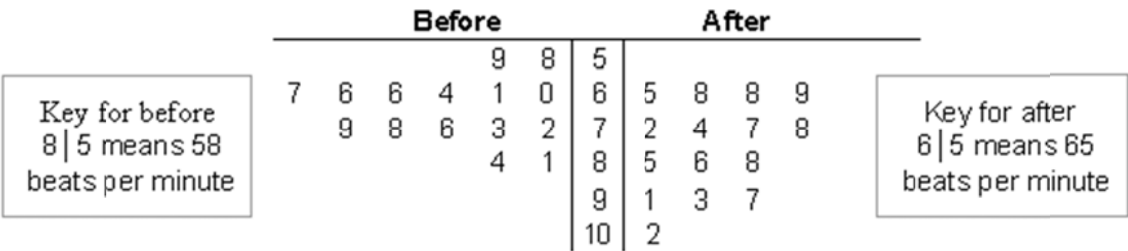
Sue is wrong.
Explain why.

.....
.....

(Total 1 mark)

Q13. Zoe recorded the heart rates, in beats per minute, of each of 15 people.
Zoe then asked the 15 people to walk up some stairs.
She recorded their heart rates again.

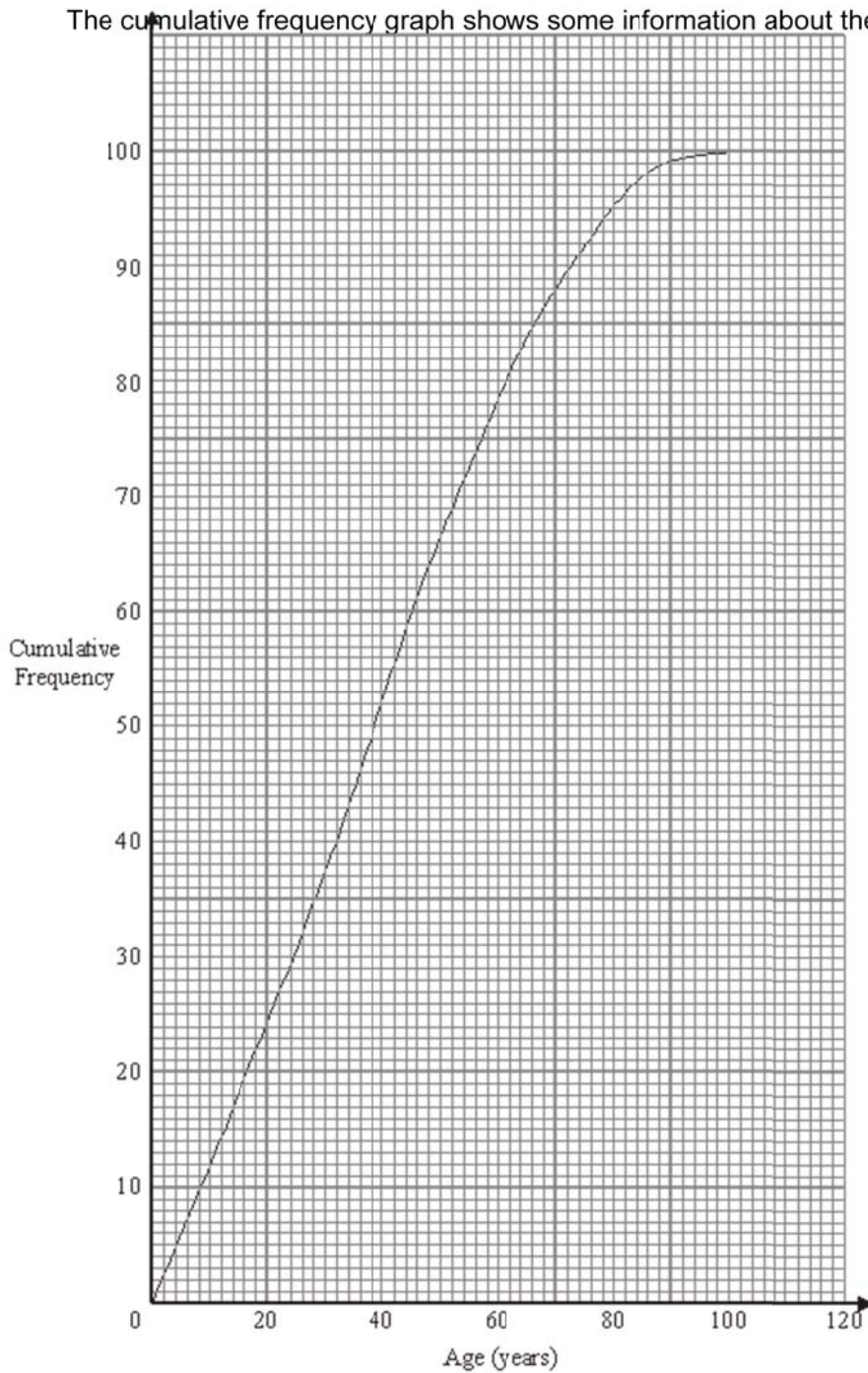
She showed her results in a back-to-back stem and leaf diagram.



Compare the heart rates of the people before they walked up the stairs with their heart rates after they walked up the stairs.

(Total 6 marks)

Q14. The cumulative frequency graph shows some information about the ages of 100 people.



(a) Use the graph to find an estimate for the number of these people less than 70 years of age.

.....

(1)

(b) Use the graph to find an estimate for the median age.

..... years

(1)

(c) Use the graph to find an estimate for the interquartile range of the ages.

..... years

(2)

(Total 4 marks)

Q15. The table gives some information about the area, in km², of 30 countries.

Area (n million km ²)	Frequency
$0.00 < n \leq 0.25$	4
$0.25 < n \leq 0.50$	9
$0.50 < n \leq 0.75$	4
$0.75 < n \leq 1.00$	5
$1.00 < n \leq 1.25$	6
$1.25 < n \leq 1.50$	1
$1.50 < n \leq 1.75$	1

(a) Write down the modal class interval.

.....

(1)

(b) Find the class interval that contains the median.

.....

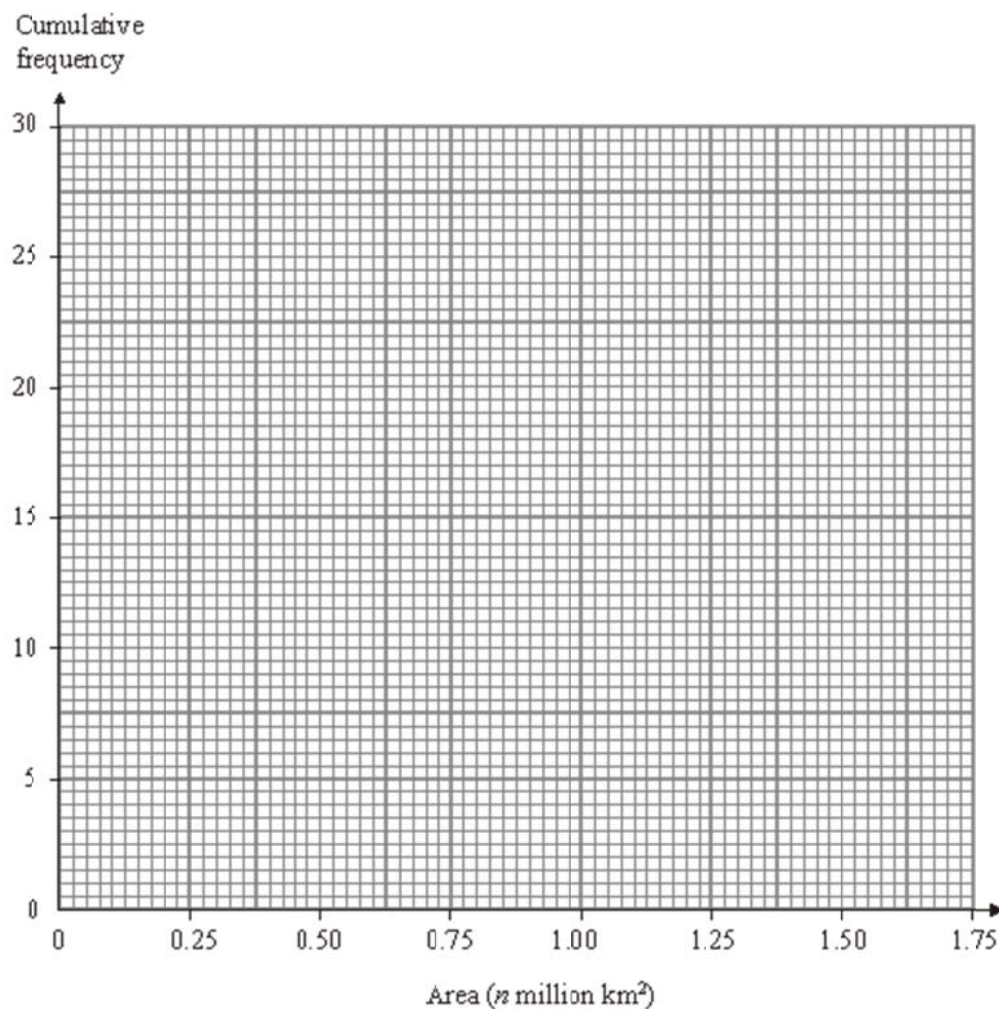
(1)

(c) Complete the cumulative frequency table.

Area (n million km ²)	Frequency
$0.00 < n \leq 0.25$	4
$0.00 < n \leq 0.50$	
$0.00 < n \leq 0.75$	
$0.00 < n \leq 1.00$	
$0.00 < n \leq 1.25$	
$0.00 < n \leq 1.50$	
$0.00 < n \leq 1.75$	

(1)

- (d) On the grid, draw a cumulative frequency graph for your table.



(2)

- (e) Use your graph to find an estimate for the number of these countries with an area greater than 0.90 million km².

.....

(2)

(Total 7 marks)

- Q16.** There are 4 bottles of orange juice,
3 bottles of apple juice,
2 bottles of tomato juice.

Viv takes a bottle at random and drinks the juice.
Then Caroline takes a bottle at random and drinks the juice.

Work out the probability that they both take a bottle of the same type of juice.

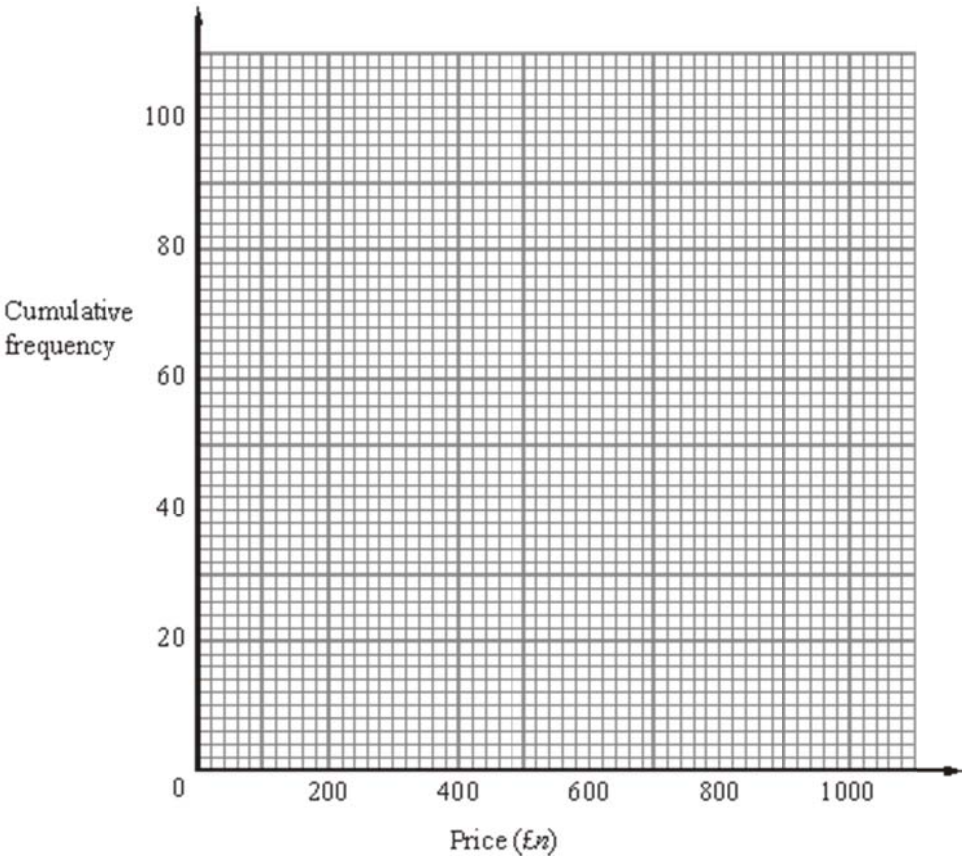
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(Total 4 marks)

Q17. The **cumulative frequency** table shows information about the prices, in £, of 100 televisions.

Price (£ <i>n</i>)	Cumulative frequency
$0 < n \leq 200$	5
$0 < n \leq 400$	20
$0 < n \leq 600$	40
$0 < n \leq 800$	75
$0 < n \leq 1000$	100

(a) On the grid below, draw a cumulative frequency graph for the table.



(2)

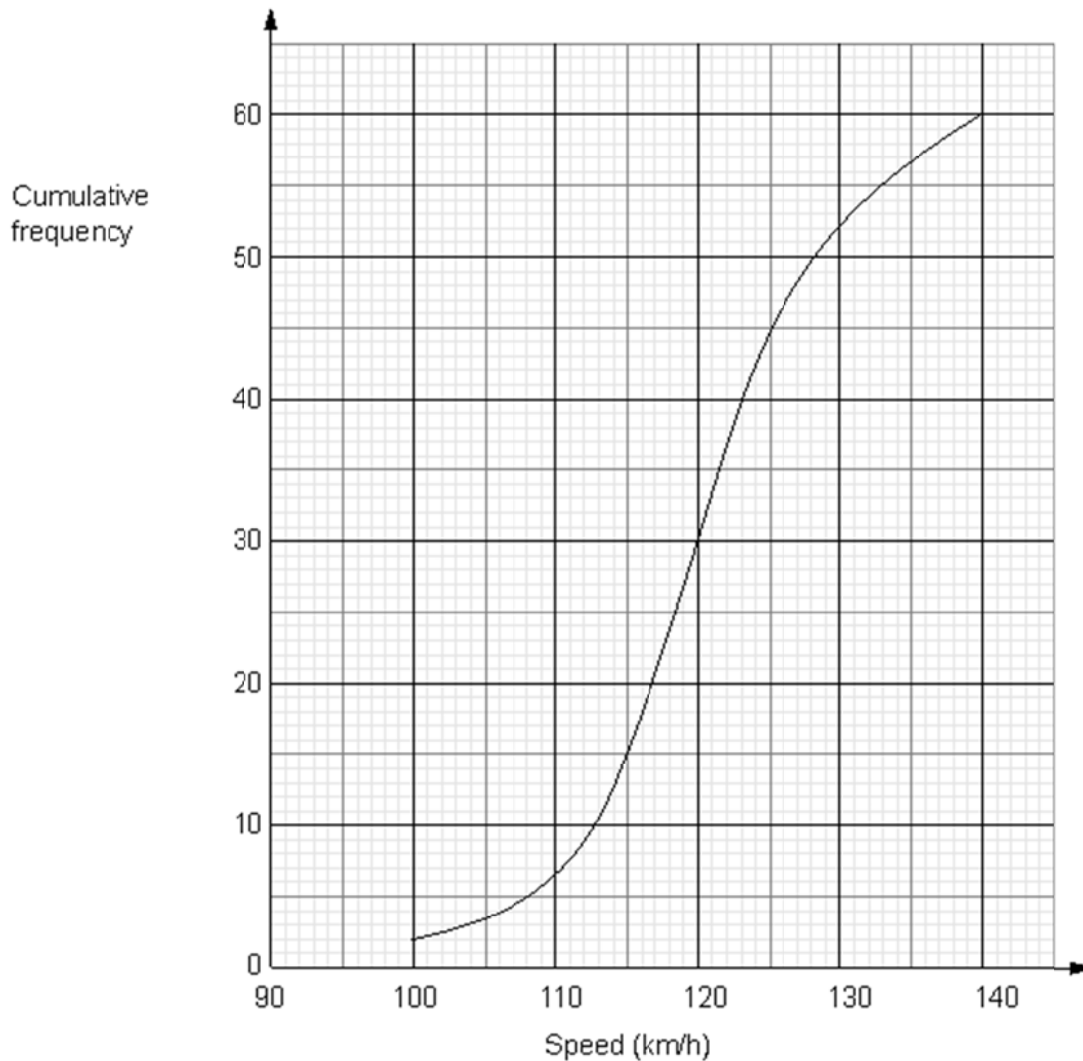
(b) Use your graph to find an estimate for the median price of these televisions.

£

(1)

(Total 3 marks)

- Q18.** The cumulative frequency graph shows information about the speeds of 60 cars on a motorway one Sunday morning.



- (a) Use the graph to find an estimate for the median speed.

..... km/h

(1)

The speed limit on this motorway is 130 km/h.

The traffic police say that more than 20% of cars travelling on the motorway break the speed limit.

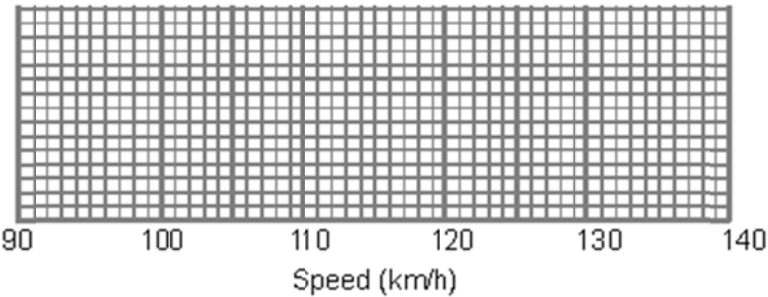
- (b) Comment on what the traffic police say.

(3)

For these 60 cars

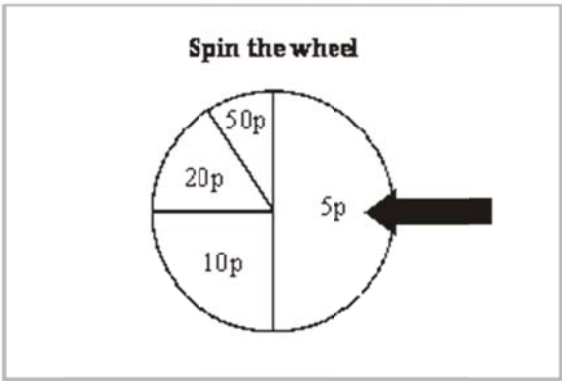
the minimum speed was 97 km/h
and the maximum speed was 138 km/h.

- (c) Use the cumulative frequency graph and the information above to draw a box plot showing information about the speeds of the cars.



(3)
(Total 7 marks)

Q19.



Bert has a game at a fair.

In the game players pay to spin a wheel.

When the wheel stops, the amount shown by the arrow is given to the player.
The table shows the probabilities that the wheel will stop on 5p, on 10p, on 20p and on 50p.

	5p	10p	20p	50p
Probability	0.5	0.25	0.15	0.1

Bert wants to make a profit from the game.

Work out the minimum he can charge players to spin the wheel.

.....
(Total 4 marks)

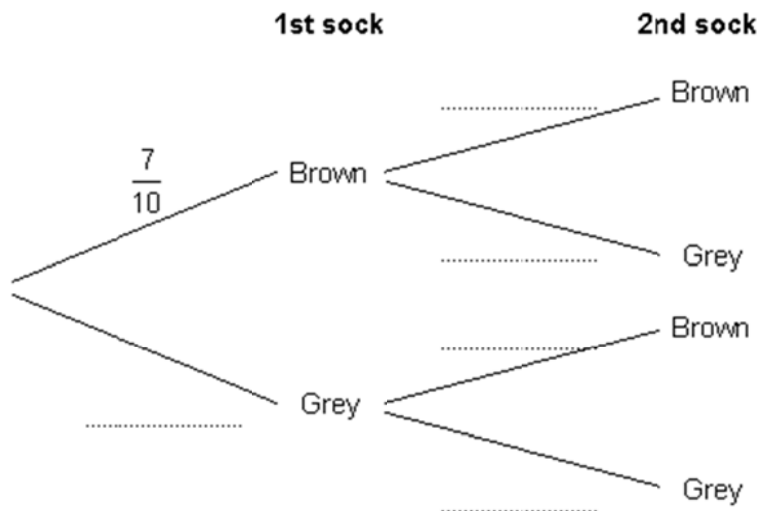
Q20. There are 10 socks in a drawer.

7 of the socks are brown.

3 of the socks are grey.

Bevan takes at random two socks from the drawer at the same time.

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that Bevan takes two socks of the same colour.

.....

(3)

(Total 5 marks)

Q21. The table shows some information about the weights, in grams, of 60 eggs.

Weight (w grams)	Frequency		
$0 < w \leq 30$	0		
$30 < w \leq 50$	14		
$50 < w \leq 60$	16		
$60 < w \leq 70$	21		
$70 < w \leq 100$	9		

(a) Calculate an estimate for the mean weight of an egg.

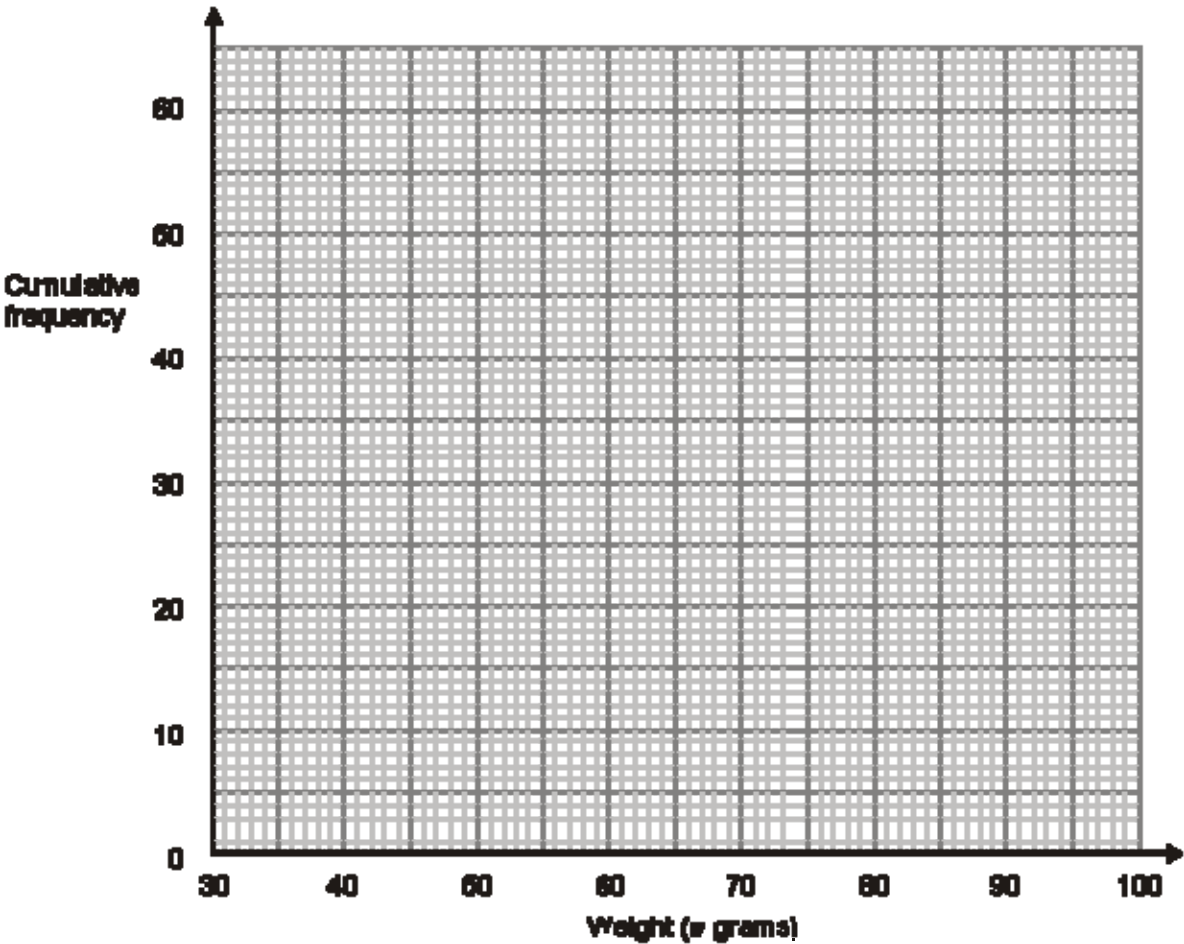
..... g

(4)

(b) Complete the cumulative frequency table.

Weight (w grams)	Cumulative frequency
$0 < w \leq 30$	0
$0 < w \leq 50$	
$0 < w \leq 60$	
$0 < w \leq 70$	
$0 < w \leq 100$	

(1)



(c) On the grid, draw a cumulative frequency graph for your table.

(2)

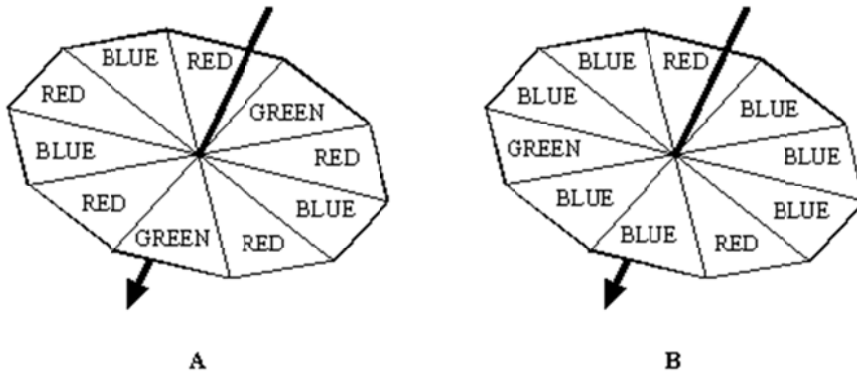
(d) Use your graph to find an estimate for the number of eggs with a weight greater than 63 grams.

.....

(2)

(Total 9 marks)

- Q22.** William has two 10-sided spinners.
The spinners are equally likely to land on each of their sides.



Spinner **A** has 5 red sides, 3 blue sides and 2 green sides.
Spinner **B** has 2 red sides, 7 blue sides and 1 green side.

William spins spinner **A** once.
He then spins spinner **B** once.

Work out the probability that spinner **A** and spinner **B** do **not** land on the same colour.

.....

(Total 4 marks)

- Q23.** A book has 120 pages.

The mean number of words per page for the whole book is 231.
The mean number of words per page for the first 20 pages is 236.

Calculate the mean number of words per page for the other 100 pages.

.....

(Total 3 marks)

- Q24.** In a bag there are 5 red counters and 4 blue counters.

Suki takes at random two counters from the bag.

Work out the probability that the counters will each have a different colour.

.....

(Total 4 marks)

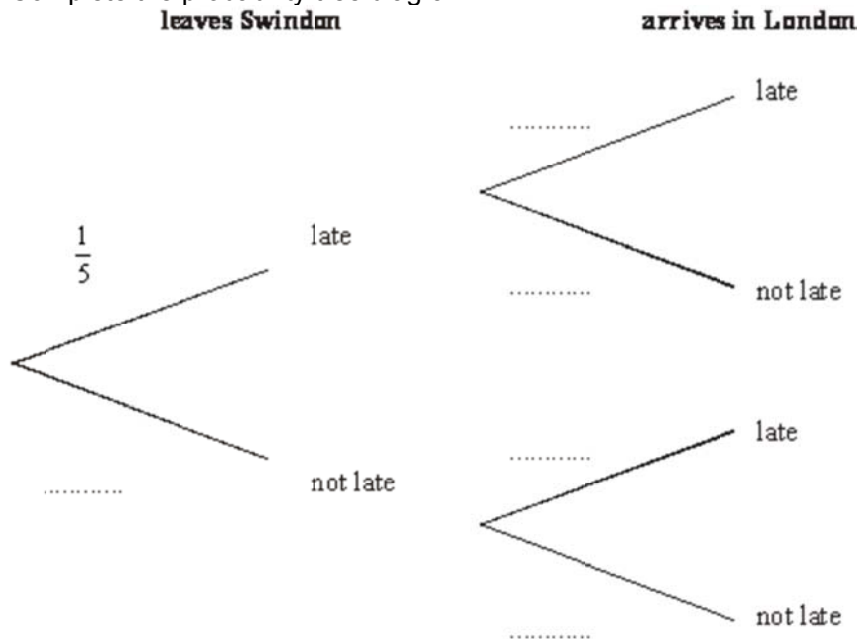
Q25. Nicola is going to travel from Swindon to London by train.

The probability that the train will be late leaving Swindon is $\frac{1}{5}$

If the train is late leaving Swindon, the probability that it will arrive late in London is $\frac{7}{10}$

If the train is **not** late leaving Swindon, the probability that it will arrive late in London is $\frac{1}{10}$

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that Nicola will arrive late in London.

.....

(3)

(Total 5 marks)

Q26. Phil has 20 sweets in a bag.

5 of the sweets are orange. 7 of the sweets are red. 8 of the sweets are yellow.

Phil takes at random **two** sweets from the bag.

Work out the probability that the sweets will **not** be the same colour.

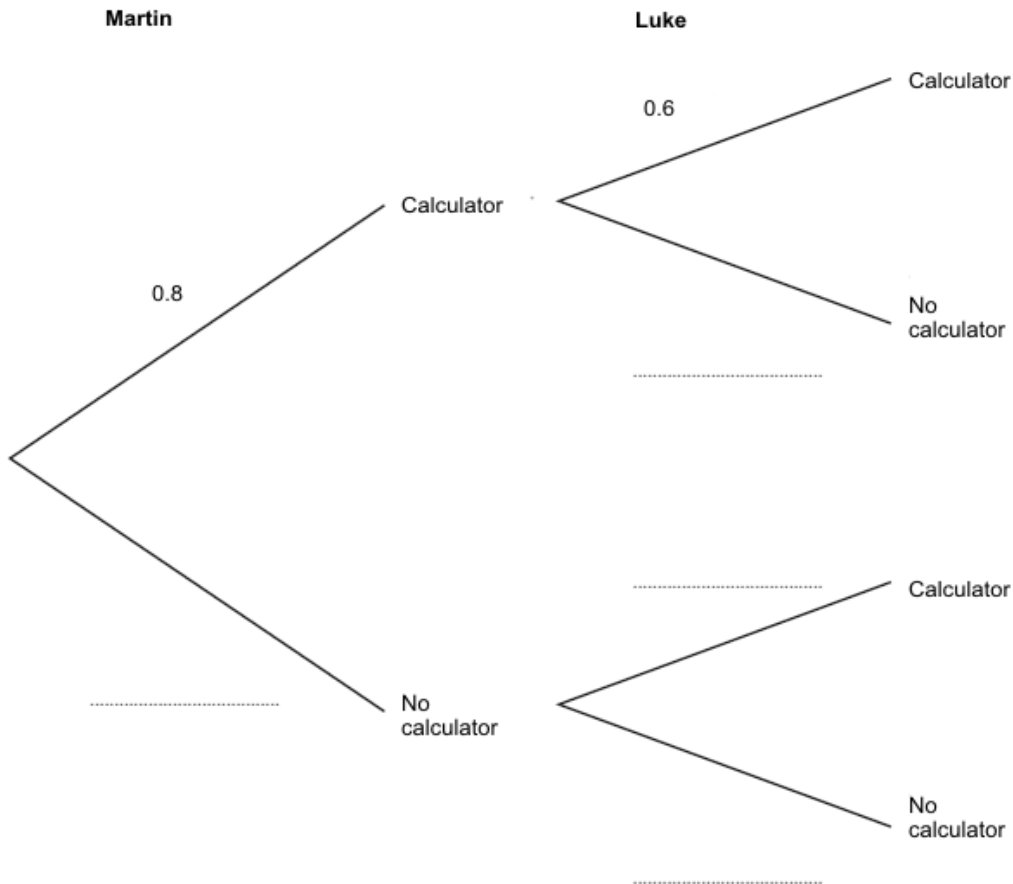
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(Total 4 marks)

Q27. Martin and Luke are students in the same maths class.

The probability that Martin will bring a calculator to a lesson is 0.8.
The probability that Luke will bring a calculator to a lesson is 0.6.

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that **both** Martin and Luke will **not** bring a calculator to a lesson.

$\dots\dots\dots$

(2)

(Total 4 marks)

Q28. Mary plays a game of throwing a ball at a target.

The table shows information about the probability of each possible score.

Score	0	1	2	3	4	5
Probability	0.09	x	$3x$	0.16	0.21	0.30

Mary is 3 times as likely to score 2 points than to score 1 point.

(a) Work out the value of x .

(3)

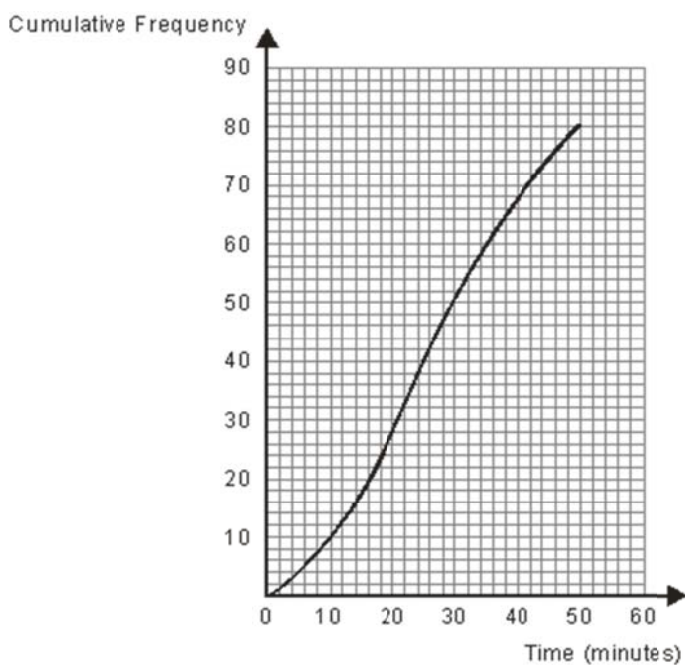
Mary plays the game twice.

- (b) Work out the probability of Mary scoring a total of 8.

(3)

(Total 6 marks)

- Q29.** The cumulative frequency diagram gives information about the time, in minutes, 80 people were kept waiting at a hospital casualty department.



- (a) Write down the number of people who waited for 20 minutes or less.

.....

(1)

- (b) Work out an estimate of the number of people who waited for between 26 minutes and 40 minutes.

.....

(2)

The hospital has a target that no more than 15% of people are kept waiting for 40 minutes or more in the casualty department each day.

- (c) Has the hospital achieved its target for the day?
You must explain your answer.

.....

.....

(2)

(Total 5 marks)

- Q30.** There are 15 bags of apples on a market stall.
The mean number of apples in each bag is 9

The table below shows the numbers of apples in **14** of the bags.

Number of apples	Frequency
7	2
8	3
9	3
10	4
11	2

Calculate the number of apples in the 15th bag.

.....

(Total 3 marks)

- Q31.**

Angling Chronicle

Anglers dismayed at falling fish numbers!

A scientist wants to estimate the number of fish in a lake.
He catches 50 fish from the lake and marks them with a dye.
The fish are then returned to the lake.
The next day the scientist catches another 50 fish.
4 of these fish are marked with the dye.

Work out an estimate for the total number of fish in the lake.
You must write down any assumptions you have made.

.....

(Total 4 marks)

Q32.

	Male	Female
First year	399	602
Second year	252	198

The table gives information about the numbers of students in the two years of a college course.

Anna wants to interview some of these students.

She takes a random sample of 70 students stratified by year and by gender.

Work out the number of students in the sample who are male and in the first year.

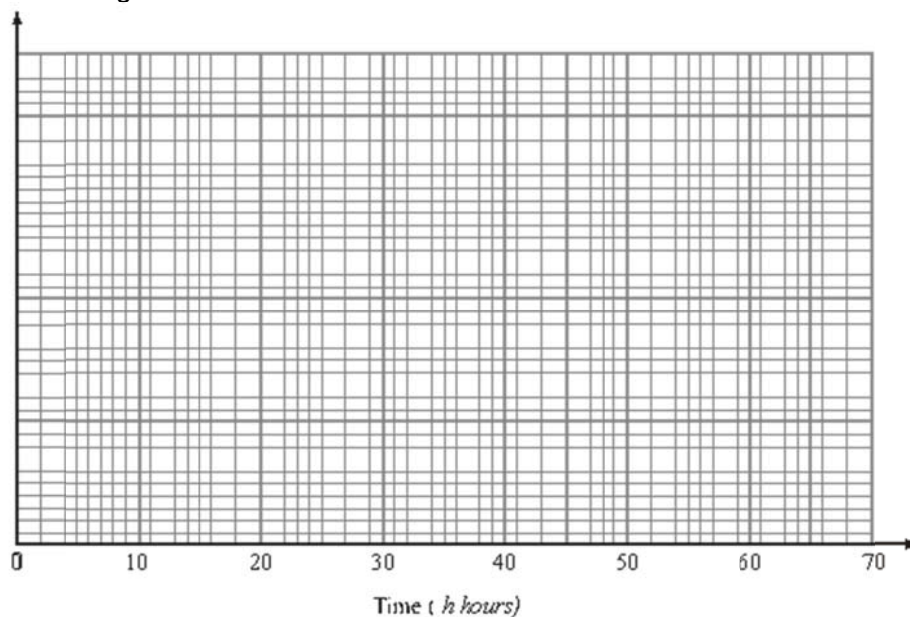
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(Total 3 marks)

Q33. The table gives some information about the lengths of time, in hours, that some batteries lasted.

Time (h hours)	Frequency
$0 \leq h < 10$	5
$10 \leq h < 20$	18
$20 \leq h < 25$	15
$25 \leq h < 40$	12
$40 \leq h < 60$	10

Draw a histogram for the information in the table.



(Total 3 marks)

Q34. The table gives some information about the weights, in kg, of 50 suitcases at an airport check-in desk.

Weight (w kg)	Frequency
$0 < w \leq 10$	16
$10 < w \leq 15$	18
$15 < w \leq 20$	10
$20 < w \leq 35$	6

(a) Work out an estimate for the mean weight.

..... kg

(4)

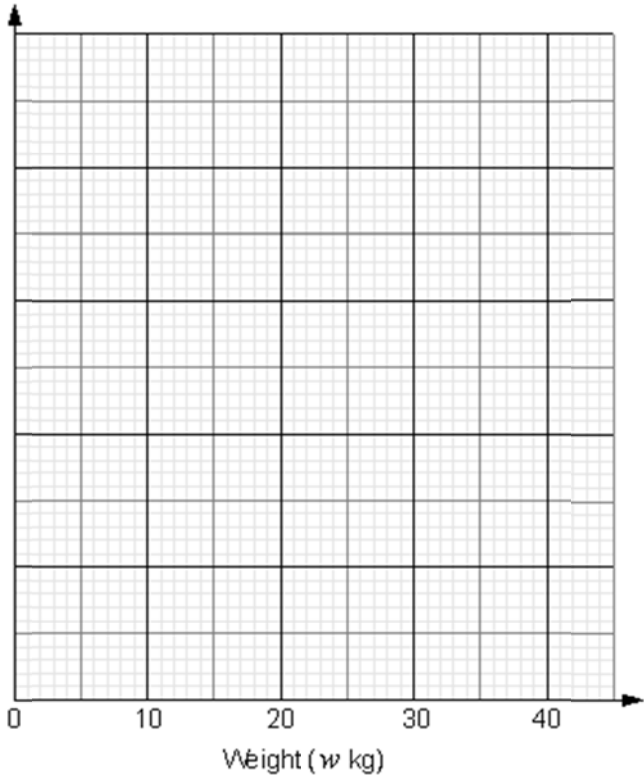
Passengers have to pay extra money for any suitcase that weighs more than 20 kg. Two of the 50 suitcases are chosen at random.

(b) Work out the probability that both suitcases weigh more than 20 kg.

.....

(2)

(c) On the grid, draw a histogram for the information in the table.



(3)

(Total 9 marks)

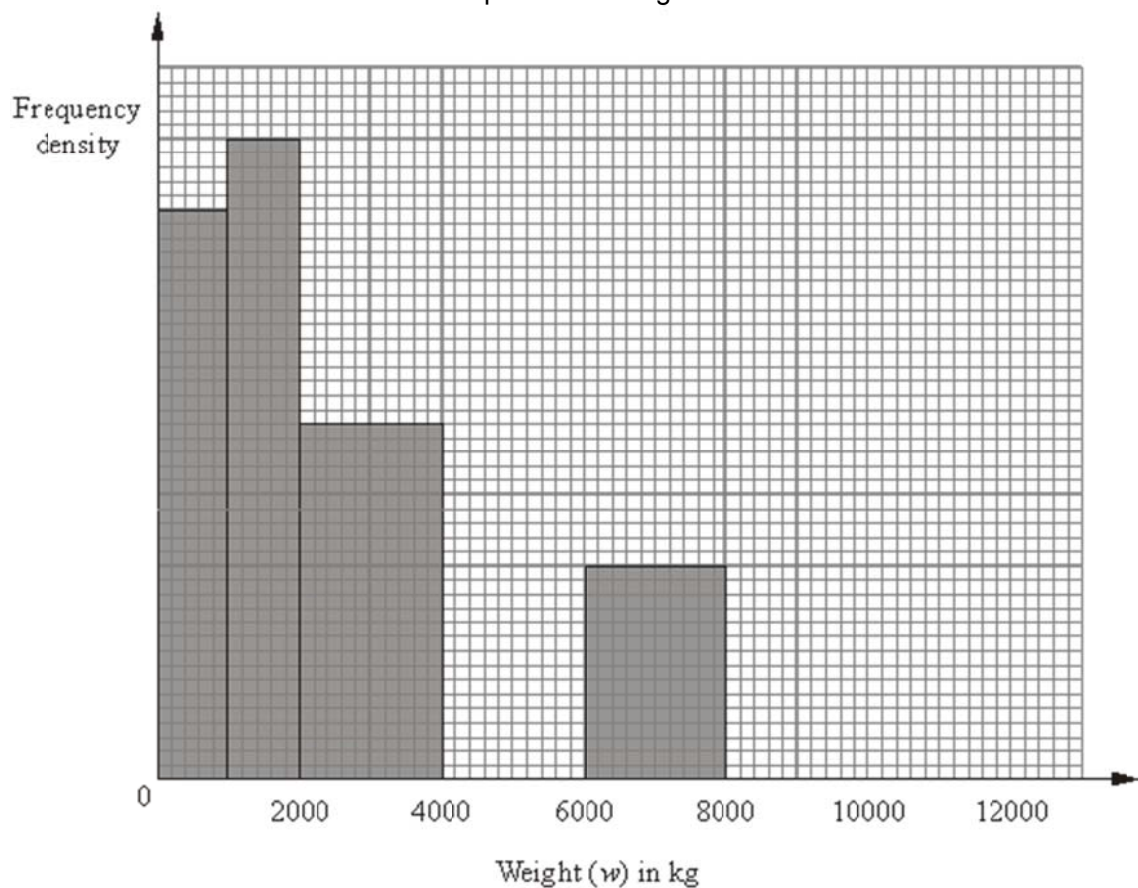
- Q35.** The incomplete histogram and table show information about the weights of some containers.

Weight (w) in kg	Frequency
$0 < w \leq 1000$	16
$1000 < w \leq 2000$	
$2000 < w \leq 4000$	
$4000 < w \leq 6000$	16
$6000 < w \leq 8000$	
$8000 < w \leq 12000$	8

- (a) Use the information in the histogram to complete the table.

(2)

- (b) Use the information in the table to complete the histogram.



(2)

(Total 4 marks)

Q36. (a) Explain what is meant by

(i) a random sample,

.....

(1)

(ii) a stratified sample.

.....

(1)

A Sixth Form College has 850 students.
The table shows some information about these students.

	Number of female students	Number of male students
Year 12	184	241
Year 13	222	203

Linda is going to do a survey of the students in the college.
She uses a sample of 50 students stratified by year group and by gender.

(b) Work out the number of Year 12 female students in her sample.

.....

(2)

(Total 4 marks)

Q37. 182 students go to an outdoor activity centre for a day.
Each student chooses one activity, climbing or sailing.

The table shows information about the activities the students chose.

	Activity chosen	
	Climbing	Sailing
Male	34	57
Female	26	65

The manager of the centre gives a questionnaire to some of the students.
He takes a sample of 50 students stratified by gender and the activity chosen.

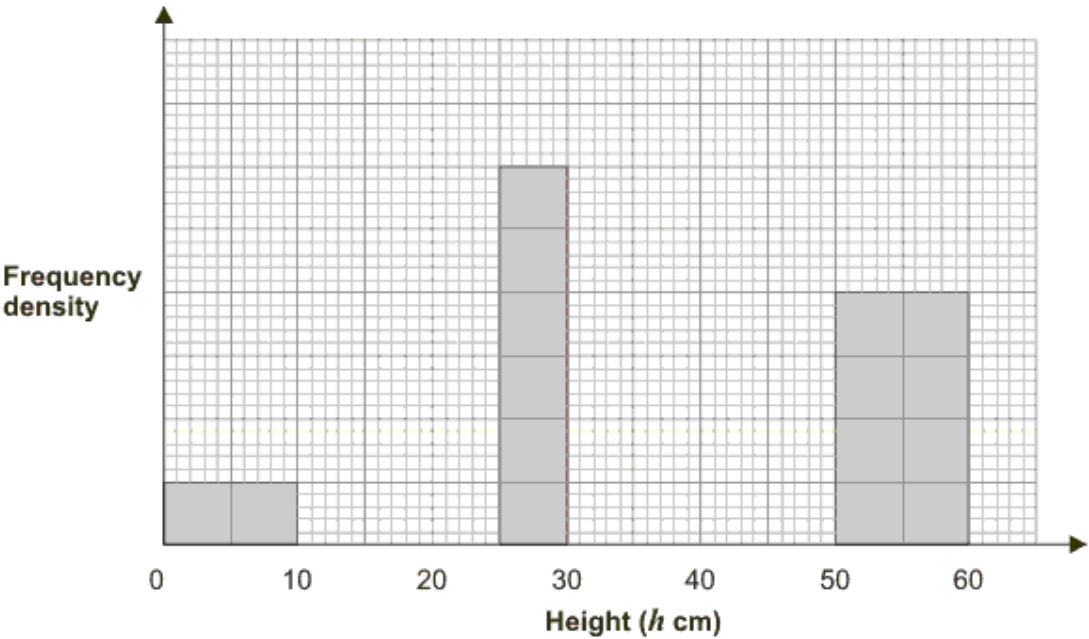
Work out the number of male students who chose climbing he should have in his sample.

.....

(Total 2 marks)

Q38. The incomplete frequency table and histogram give some information about the heights, in centimetres, of some tomato plants.

Height (h cm)	Frequency
$0 < h \leq 10$	
$10 < h \leq 25$	30
$25 < h \leq 30$	
$30 < h \leq 50$	50
$50 < h \leq 60$	20



(a) Use the information in the histogram to complete the table.

(2)

(b) Use the information in the table to complete the histogram.

(2)

(Total 4 marks)

Q39. The table below shows the population of each of three villages.

Village	Population
Ashley	243
Brigby	370
Irton	127

Mr Akhtar carries out a survey of the people living in these three villages.
He uses a sample stratified by village population.

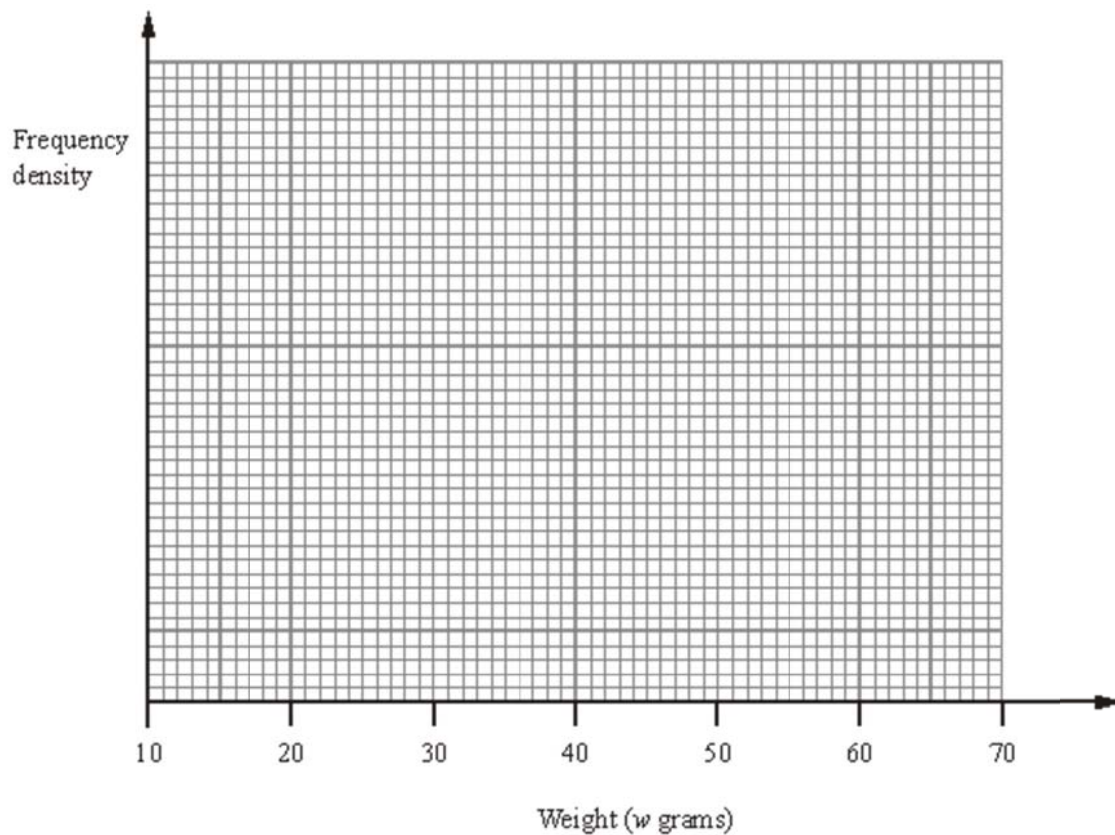
There are 50 people from Brigby in his sample.

Work out the number of people from Irton in his sample.

.....
(Total 2 marks)

Q40. The table shows some information about the weights of some packets of crisps.

Weight (w grams)	Frequency
$20 < w \leq 25$	4
$25 < w \leq 35$	12
$35 < w \leq 45$	14
$45 < w \leq 50$	8
$50 < w \leq 70$	6



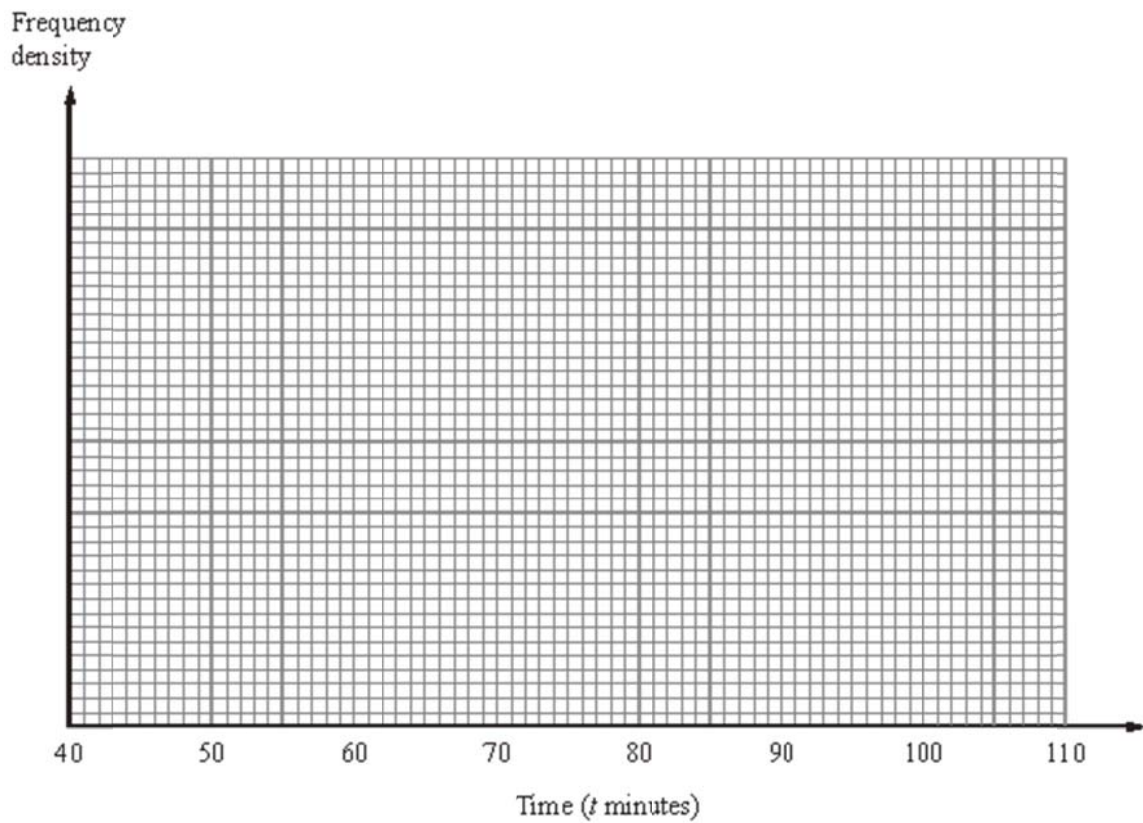
Use the information in the table to draw a histogram.

(Total 3 marks)

Q41. The table gives some information about the lengths of time some boys took to run a race.

Time (t minutes)	Frequency
$40 \leq t < 50$	16
$50 \leq t < 55$	18
$55 \leq t < 65$	32
$65 \leq t < 80$	30
$80 \leq t < 100$	24

Draw a histogram for the information in the table.



(Total 3 marks)

- Q42.** 258 students each study one of three languages.
The table shows information about these students.

	Language studied		
	German	French	Spanish
Male	45	52	26
Female	25	48	62

A sample, stratified by the language studied and by gender, of 50 of the 258 students is taken.

- (a) Work out the number of male students studying Spanish in the sample.

.....

(2)

- (b) Work out the number of female students in the sample.

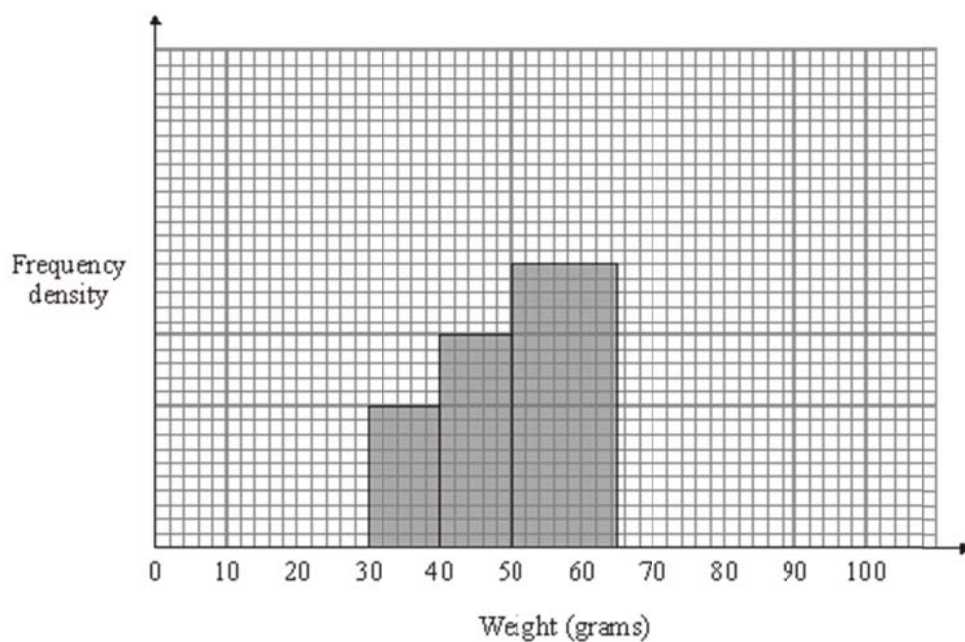
.....

(2)

(Total 4 marks)

Q43. The table and histogram show some information about the weights, in grams, of some tomatoes.

Weight (w grams)	Frequency
$30 < w \leq 40$	4
$40 < w \leq 50$	6
$50 < w \leq 65$	15
$65 < w \leq 80$	9
$80 < w \leq 100$	4



Use the table to complete the histogram.

(Total 2 marks)

HIGHER CALCULATOR – DATA HANDLING

SOLUTIONS

M1.

Working	Answer	Mark	Additional Guidance
0.85×800	680	2	M1 for 0.85×800 A1 cao
Total for Question: 2 marks			

M2.

	Working	Answer	Mark	Additional Guidance
(a)	0: 8 1: 023578 2: 0122233 3: 1345 4: 456 Key 4 6 means 46 minutes	Correct stem and leaf	3	B3 Fully correct (B2 All entries correct, no key) (B1 correct entries unordered, key or no key) OR (B2 Three rows correct, key or no key) (B1 Two rows correct, key or no key)
(b)	Old median = 22 New median = $22 + 5$	27 minutes	2	M1 finds median correctly for original data and adds 5 A1 cao OR M1 Redoes table (ft) with each value increased by 5 and attempts to find median A1 cao
(c)		The same + reason	1	C1 All the values have increased by 5 minutes so when you subtract the 5 minutes will cancel out.
Total for Question: 6 marks				

M3.

	Working	Answer	Mark	Additional Guidance
(a)		Heaviest bag is 29kg	1	B1 for 23kg is the upper quartile oe, or the heaviest bag is 29kg oe, or 25% of bags are heavier than 23kg or range is 5 – 29 oe
(b)		17	1	B1 for 17 cao
(c)	$23 - 10$	13	1	B1 for 13 cao
(d)	$\frac{25}{100} \times 240$	60	2	$\frac{25}{100} \times 240$ oe or $\frac{25}{100} \times 241$ oe M1 for $\frac{25}{100} \times 240$ oe or $\frac{25}{100} \times 241$ oe A1 for 60 cao (SC: B1 for 25% or 0.25 or quarter seen)
Total for Question: 5 marks				

M4.

	Working	Answer	Mark	Additional Guidance
(a)	$1 - (0.15 + 0.1) = 0.75$	0.25	2	M1 for $1 - (0.15 + 0.1)$ or 0.75 seen A1 cao
(b)		appropriate correct explanation	1	C1 for an appropriate correct explanation, e.g. you can't have 4.5 green counters or $9 \div 5$ is not a whole number, or that would mean there are 1.8 yellow counters
Total for Question: 3 marks				

M5.

Answer	Mark	Additional Guidance
2 comparisons	2	B1 for a comparison of a specific value, e.g. John's median is greater than Peter's median B1 for a comparison of spread, e.g. John's range is wider than Peter's range (watch out for two comparisons given together)
Total for Question: 2 marks		

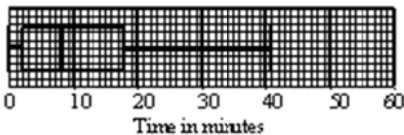
M6.

	Working	Answer	Mark	Additional Guidance
QWC (i, iii)	Median (boys) = 45 Median (girls) = 50 Range (boys) = $65 - 22 = 43$ Range (girls) = $66 - 27 = 39$ IQR (boys) = $57 - 39 = 18$ IQR (girls) = $57 - 38 = 19$	Compares 1. medians 2. range/IQR	6	B2 for median (boys) = 45 and median (girls) = 50 (B1 for one correct median) B2 for range (boys) = 43 and range (girls) = 39 OR IQR (boys) = 18 and IQR (girls) = 19 (B1 for one correct range/IQR) OR B2 for fully correct diagram/chart to compare, e.g. box plots, cumulative frequency diagrams, etc (B1 for diagram/chart with one error in presentation) C1 for median (girls) > median (boys) oe or ft their medians or for range (boys) > range (girls) oe or ft their ranges or IQR (girls) > IQR (boys) oe or ft their IQRs C1 for comments relating to all working (ie range/median/charts dep on B4) QWC: Decisions should be justified, and calculations attributable SC If no marks scored B1 for a correct comparison
Total for Question: 6 marks				

M7.

	Working	Answer	Mark	Additional Guidance
(a)	$48 \div 4$	12	2	M1 $48 \div 4$ or $49 \div 4$ or $48 - 36$ A1 for 12
(b)		Box plot drawn	2	B2 fully correct box plot (B1 for the box plot drawn with one plotting error)
(c)		On Tuesday: Median higher (IQ) Range higher.	2	B1 for median higher on Tuesday or journeys took longer on Tuesday B1 for (IQ) range higher on Tuesday or more variation in journey length on Tuesday. (NB: For B2 at least one comparison must be in context)
Total for Question: 6 marks				

M8.

	Working	Answer	Mark	Additional Guidance
(a)		Box plot	2	B1 for ends of whiskers at 0 and 41 (with an appropriate box) B1 for ends of box at 2 and 18 with median at 8
(b)		2 comparisons	2	B2 for two comparisons with at least one on spread (B1 for one comparison of spread or one comparison of values)
Total for Question: 4 marks				

M9.

	Answer	Mark	Additional Guidance
(a)(i)	Line of best fit	5	B1 for line drawn between (190, 80), (190, 95) and (210, 105), (210, 120) M1 for diff. y / diff. x A1 for 0.5 — 2 or ft their line of best fit
(ii)	1.25		B2 for increase in kg per cm increase in height oe (B1 for a correct interpretation with only one or no units)
(iii)	practical interpretation		
(b)	40%	2	M1 for a horizontal line at 99 and a vertical line at 200 or 2 seen A1 for 40% or 2/5 or 0.4 oe

M10.

	Working	Answer	Mark	Additional Guidance
QWC i, iii FE	Makes a comparison of the shape of the distribution by drawing Makes a comparison of the modal classes(31—40, 11—20) Makes a comparison of the	Correct comparisons	4	B1, B1, B1 for any 4 of the following done correctly Plots frequency polygon or produces table compares modes compares medians compares total sales

class intervals that contain the medians.(31—40, 21—30)			C1 for comments on shape of the distributions QWC: Decisions should be stated, and all comments should be clear and follow through from any working or diagrams
Works out an estimate of the total sales of each shop(2635, 3530)			
Total for Question: 4 marks			

M11.

	Working	Answer	Mark	Additional Guidance
(a)		Correct method to choose a random sample	1	B1 for equal chance of selection, e.g. number each laptop and then use the random number function on a calculator or pick the numbers out of a bag
(b)	$\frac{3}{80} \times 600 = 22.5$	22.5	2	$\frac{3}{80} \times 600$ M1 for $\frac{3}{80} \times 600$ A1 for 22.5 or 22 or 23 SC B1 for $\frac{22.5}{600}$ or $\frac{22}{600}$ or $\frac{23}{600}$
Total for Question: 3 marks				

M12.

Answer	Mark	Additional Guidance
Reason	1	B1 for indication of not enough trials
Total for Question: 1 mark		

M13.

Working	Answer	Mark	Additional Guidance
Median (before) = 67 Median (after) = 78 Mean (before) = 69.6 Mean (after) = 80.8(6...) Range (before) = 84 – 58 = 26 Range (after) = 102 – 65 = 37 IQR (before) = 78 – 61 = 17 IQR (after) = 91 – 69 = 22	Comparison of 1. medians / means 2. range / IQR	6	B2 for median (before) = 67 and median (after) = 78 (B1 for one correct median) OR B2 for mean (before) = 69.6 and mean (after) = 80.9 /80.8(6...) (B1 for one correct mean) B2 for range (before) = 26 and range (after) = 37 OR B2 for IQR (before) = 17 and IQR (after) = 22 (B1 for one correct range/IQR) OR B2 for fully correct diagram/chart to compare, e.g. box plots, cumulative frequency diagrams, etc (B1 for diagram/chart with one error in presentation) C1 for median (after) > median (before) oe or ft their medians OR for mean (after) > mean (before) oe or ft their means OR C1 for range (after) > range (before) oe or ft their ranges OR for IQR (after) > IQR (before) oe or ft their IQRs C1 for comments, in context, relating to an average and to the spread of the data (dep on B3). QWC: Decisions should be

		justified and calculations attributable SC If no marks scored, B1 for a correct comparison (eg Heart rates are faster after walking up the stairs)
Total for Question: 6 marks		

M14.

	Working	Answer	Mark	Additional Guidance
(a)		88	1	B1 for value in range 87 – 89
(b)		38	1	B1 for value in range 38 –39
(c)	57 – 20	37	2	B2 for 32 – 40 (B1 for using graph at 25 and 75; may be indicated by marks at 25 and 75)
Total for Question: 4 marks				

M15.

	Answer	Mark	Additional Guidance
(a)	$0.25 < p \leq 0.50$	1	B1 for $0.25 < p \leq 0.50$ (accept 0.25 to 0.5(0) or clearly identified on the diagram as the mode)
(b)	$0.5 < n \leq 0.75$	1	B1 for $0.5 < n \leq 0.75$ (accept 0.5(0) to 0.75 or clearly identified on the diagram as the median)
(c)	4, 13, 17, 22, 28, 29, 30	1	B1 cao
(d)	cf graph	2	B2 for a fully correct cf graph (accept ogive) [B1 for 5 or 6 consistent, correctly plotted points from a sensible cf table (increasing values) OR for a cf graph drawn through points other than the end points of each interval]
(e)	9 or 10 or 11	2	M1 for clear method to read off from a cf graph at area = 0.90, on the cf scale, can be awarded from their reading ± 1 sq A1 ft for an answer of 9 or 10 or 11 [B1 for an answer in the range 9 to 11 if M0 scored]
Total for Question: 7 marks			

M16.

Working	Answer	Mark	Additional Guidance
$\left(\frac{4}{9} \times \frac{3}{8}\right) + \left(\frac{3}{9} \times \frac{2}{8}\right) + \left(\frac{2}{9} \times \frac{1}{8}\right)$ $= \frac{12+6+2}{72}$	$\frac{20}{72}$ oe	4	B1 for $\frac{3}{8}$ or $\frac{2}{8}$ or $\frac{1}{8}$ seen as 2 nd probability M1 for $\left(\frac{4}{9} \times \frac{3}{8}\right)$ or $\left(\frac{3}{9} \times \frac{2}{8}\right)$ or $\left(\frac{2}{9} \times \frac{1}{8}\right)$ M1 for $\left(\frac{4}{9} \times \frac{3}{8}\right) + \left(\frac{3}{9} \times \frac{2}{8}\right) + \left(\frac{2}{9} \times \frac{1}{8}\right)$ A1 for $\frac{20}{72}$ oe


			<p>Alternative scheme for replacement</p> <p>B0 for $\frac{4}{9}$ or $\frac{3}{9}$ or $\frac{2}{9}$ seen as 2nd probability</p> <p>M1 for $\left(\frac{4}{9} \times \frac{4}{9}\right)$ or $\left(\frac{3}{9} \times \frac{3}{9}\right)$ or $\left(\frac{2}{9} \times \frac{2}{9}\right)$</p> <p>M1 for $\left(\frac{4}{9} \times \frac{4}{9}\right) + \left(\frac{3}{9} \times \frac{3}{9}\right) + \left(\frac{2}{9} \times \frac{2}{9}\right)$</p> <p>A0 for $\frac{29}{81}$</p> <p>Special cases S.C. if M0 scored, award B2 for $\frac{29}{81}$ or $\frac{20}{81}$ or $\frac{29}{72}$</p> <p>S.C. if M0 scored award B1 for $\frac{3}{9}$ or $\frac{2}{9}$ or $\frac{1}{9}$ or $\frac{3}{8}$ and $\frac{2}{8}$ and $\frac{4}{8}$ as second probability if</p> <p>B2 not scored</p>
Total for Question: 4 marks			

M17.

	Working	Answer	Mark	Additional Guidance
(a)	Heights = 5, 20, 40, 75, 100	Correct cumulative frequency graph	2	B2 for fully correct cumulative frequency graph (Ignore any part of graph outside range of points) (B1 for 4 or 5 points plotted correctly ± 1 full (2mm) square at the end of interval or for 4 or 5 points plotted not at end but consistent within each interval and joined)
(b)		640 – 680	1	B1 for 640 – 680 or ft (dep on graph being cf) for reading from graph at 50+ 1 full (2mm) square
Total for Question: 3 marks				

M18.

	Working	Answer	Mark	Additional Guidance
(a)		120	1	B1 for 119.5 – 120.5
(b)	60 – 52 = 8 20% of 60 = 12	Claim not true since 8 < 20% of 60	3	M1 for using graph at 130, may be implied by a value in the range 52 to 53 seen A1 for 8 (cars breaking speed limit) or 13.(3..)% (accept 7 or 11.(6..)%) A1 for correct conclusion with fully correct working OR M1 for using cf = 48 A1 for (20% of cars exceed) value in the range 126.5 to 127.5 km/h A1 for correct conclusion with fully correct working

(c)		3	B3 for complete box plot with all three aspects Aspect 1: ends of whiskers at 97 and 138 Aspect 2: ends of box at 115 and 125 Aspect 3: median marked at 120 or ft (a) (B2 for two aspects, B1 for one aspect) $\frac{1}{2}$ (Allow tolerance of $\frac{1}{2}$ square)
Total for Question: 7 marks			

M19.

Working	Answer	Mark	Additional Guidance
$0.5 \times 5 + 0.25 \times 10 + 0.15 \times 20 + 0.1 \times 50 = 13$	14p	4	M2 for $0.5 \times 5 + 0.25 \times 10 + 0.15 \times 20 + 0.1 \times 50$ oe or for a consistent calculation for n spins, e.g. $50 \times 5 + 25 \times 10 + 15 \times 20 + 10 \times 50$ where $n = 100$ (condone one error) (M1 for 0.5×5 or 0.25×10 or 0.15×20 or 0.1×50 oe) A1 for 13 or 14 A1 for 14p
Total for Question: 4 marks			

M20.

	Working	Answer	Mark	Additional Guidance
(a)		$\frac{3}{10}$ $\frac{6}{9}, \frac{3}{9}, \frac{7}{9}, \frac{2}{9}$	2	B1 for $\frac{3}{10}$ correct for 1 st sock B1 for $\frac{6}{9}, \frac{3}{9}, \frac{7}{9}, \frac{2}{9}$ correct for 2 nd sock
(b)	$\frac{7}{10} \times \frac{6}{9} + \frac{3}{10} \times \frac{2}{9}$	$\frac{48}{90}$	3	M1 ft for $\frac{7}{10} \times \frac{6}{9}$ or $\frac{3}{10} \times \frac{2}{9}$ M1 for $\frac{7}{10} \times \frac{6}{9} + \frac{3}{10} \times \frac{2}{9}$ A1 for $\frac{48}{90}$ oe SC B2 for $\frac{58}{100}$ oe seen
Total for Question: 5 marks				

M21.

	Working	Answer	Mark	Additional Guidance
(a)	$15 \times 0 = 0$ $40 \times 14 = 560$ $55 \times 16 = 880$ $65 \times 21 = 1365$ $85 \times 9 = 765$ $3570 \div 60$	59.5	4	M1 for finding at least 4 products fx consistently within interval (including end points) M1 (dep) for use of at least 4 correct midpoints M1 (dep on first M) for " Σfx " $\div 60$ A1 for 59.5

(b)		14, 30, 51, 60	1	B1 all 4 correct
(c)			2	M1 for at least 4 of "5 points" plotted consistently within each interval, ± 0.5 full square, and joined by curve or line segments providing no gradient is negative. A1 for a fully correct cf graph.
(d)			2	B2 for answer in the range 21 – 25 (B1 for answer in the range 35 – 39) OR M1 (dep on graph being cf) for using $w = 63$ A1 ft (± 0.5 square)
Total for Question: 9 marks				

M22.

Working	Answer	Mark	Additional Guidance
$\left(\frac{5}{10} \times \frac{7}{10}\right) + \left(\frac{5}{10} \times \frac{1}{10}\right)$ $+ \left(\frac{3}{10} \times \frac{2}{10}\right) + \left(\frac{3}{10} \times \frac{1}{10}\right)$ $+ \left(\frac{2}{10} \times \frac{2}{10}\right) + \left(\frac{2}{10} \times \frac{7}{10}\right)$ $= \frac{35 + 5 + 6 + 3 + 4 + 14}{100}$ <p>OR</p> $1 - \left[\left(\frac{5}{10} \times \frac{2}{10}\right) + \left(\frac{3}{10} \times \frac{7}{10}\right) \right]$ $+ \left(\frac{2}{10} \times \frac{1}{10}\right)$ $= 1 - \frac{10 + 21 + 2}{100} = 1 - \frac{33}{100}$	$\frac{67}{100}$	4	<p>M1 for a tree diagram with at most 2 errors or one of $\left(\frac{5}{10} \times \frac{7}{10}\right)$ or $\left(\frac{5}{10} \times \frac{1}{10}\right)$ etc</p> <p>M1 for 5 out of 6 correct pairings of different colours or 2 out of 3 correct pairings of same colours or 8 out of 9 correct pairings of all colours</p> <p>M1 (dep on M2) for adding 5 or 6 correct pairings of different colours or 1 – (2 or 3 correct pairings of same colours)</p> <p>A1 for $\frac{67}{100}$ oe</p> <p>SC All correctly done but 2nd spinner all $\frac{x}{9}$</p> <p>Award M1 for a “correct tree”</p> <p>M1 for adding 5 or 6 “correct pairings” of different colours or 1 – (2 or 3 “correct pairings” of same colours)</p> <p>M0 A0 (answer = 67/90)</p>
Total for Question: 4 marks			

M23.

Working	Answer	Mark	Additional Guidance
$(120 \times 231 - 20 \times 236) \div 100$	230	3	<p>M1 for 120×231 or 20×236 or 27720 or 4720 seen</p> <p>M1 for $(120 \times 231 - 20 \times 236) \div 100$ oe</p> <p>A1 cao</p>
Total for Question: 3 marks			

M24.

Working	Answer	Mark	Additional Guidance
$\frac{5}{9} \times \frac{4}{8} + \frac{4}{9} \times \frac{5}{8} = \frac{20}{72} + \frac{20}{72}$ OR $1 - \left[\frac{5}{9} \times \frac{4}{8} + \frac{4}{9} \times \frac{3}{8} \right] = 1 - \frac{32}{72}$	$\frac{40}{72}$	4	M1 for tree diagram with at most 2 errors or one of $\frac{5}{9} \times \frac{4}{8}$ or $\frac{4}{9} \times \frac{5}{8}$ or $\frac{4}{9} \times \frac{3}{8}$ or $\frac{20}{72}$ or $\frac{12}{72}$ or $\frac{5}{18}$ or $\frac{3}{18}$ oe M1 for any two of $\frac{5}{9} \times \frac{4}{8}, \frac{4}{9} \times \frac{5}{8}, \frac{4}{9} \times \frac{3}{8}$ or $\frac{20}{72}, \frac{20}{72}, \frac{12}{72}$ or $\frac{5}{18}, \frac{5}{18}, \frac{3}{18}$ oe M1 for $\frac{5}{9} \times \frac{4}{8} + \frac{4}{9} \times \frac{5}{8}$ oe or $1 - \left[\frac{5}{9} \times \frac{4}{8} + \frac{4}{9} \times \frac{3}{8} \right]$ oe A1 for $\frac{40}{72}$ oe SC B2 for $\frac{40}{81}$
Total for Question: 4 marks			

M25.

	Working	Answer	Mark	Additional Guidance
(a)		$\frac{4}{5}$ $(\frac{7}{10}, \frac{3}{10})$ $(\frac{1}{10}, \frac{9}{10})$	2 3	B2 cao (B1 for 2 correct from $\frac{4}{5}, (\frac{7}{10}, \frac{3}{10}), (\frac{1}{10}, \frac{9}{10})$) M1 for $\frac{1}{5} \times \frac{7}{10}$ or $\frac{4}{5} \times \frac{1}{10}$ oe selected M1 for $(\frac{1}{5} \times \frac{7}{10}) + (\frac{4}{5} \times \frac{1}{10})$ oe A1 for $\frac{11}{50}$ oe
(b)	$(\frac{1}{5} \times \frac{7}{10}) + (\frac{4}{5} \times \frac{1}{10})$	$\frac{11}{50}$		
Total for Question: 5 marks				

M26.

Working	Answer	Mark
$\frac{5}{20} \times \frac{7}{19} + \frac{5}{20} \times \frac{8}{19} + \frac{7}{20} \times \frac{5}{19} + \frac{7}{20} \times \frac{8}{20} + \frac{8}{20} \times \frac{5}{19} + \frac{8}{20} \times \frac{7}{19}$ or $\left(\frac{5}{20} \times \frac{15}{19} + \frac{7}{20} \times \frac{13}{19} + \frac{8}{20} \times \frac{12}{19} \right)$ or $1 - \left(\frac{5}{20} \times \frac{4}{19} + \frac{7}{20} \times \frac{6}{19} + \frac{8}{20} \times \frac{7}{19} \right)$	$\frac{131}{190}$	4
Total for Question: 4 marks		

Additional Guidance

M1 for at least one product of the form $\frac{a}{20} \times \frac{b}{19}$
M1 for identifying all products
 (condone 2 errors in 6 products, 1 error in 3 products)
Either

$$\left(\frac{5}{20} \times \frac{7}{19}, \frac{5}{20} \times \frac{8}{19}, \frac{7}{20} \times \frac{5}{19}, \frac{7}{20} \times \frac{8}{19}, \frac{8}{20} \times \frac{5}{19}, \frac{8}{20} \times \frac{7}{19} \right) \text{ or } \left(\frac{5}{20} \times \frac{15}{19}, \frac{7}{20} \times \frac{13}{19}, \frac{8}{20} \times \frac{12}{19} \right) \text{ or } \left(\frac{5}{20} \times \frac{4}{19}, \frac{7}{20} \times \frac{6}{19}, \frac{8}{20} \times \frac{7}{19} \right)$$

M1 (dep) for

$$\left(\frac{5}{20} \times \frac{7}{19} + \frac{5}{20} \times \frac{8}{19} + \frac{7}{20} \times \frac{5}{19} + \frac{7}{20} \times \frac{8}{19} + \frac{8}{20} \times \frac{5}{19} + \frac{8}{20} \times \frac{7}{19} \right) \text{ oe}$$

$$\text{or } \left(\frac{5}{20} \times \frac{15}{19} + \frac{7}{20} \times \frac{13}{19} + \frac{8}{20} \times \frac{12}{19} \right) \text{ oe or } 1 - \left(\frac{5}{20} \times \frac{4}{19} + \frac{7}{20} \times \frac{6}{19} + \frac{8}{20} \times \frac{7}{19} \right) \text{ oe}$$

A1 for $\frac{131}{190}$ oe or 0.68947... correct to at least 2 decimal places or answer that rounds to 0.69

NB : If decimals used for products then must be correct to at least 2 decimal places

With replacement

M0

M1 for identifying all products

(condone 2 errors in 6 products, 1 error in 3 products)

either

$$\left(\frac{5}{20} \times \frac{7}{20}, \frac{5}{20} \times \frac{8}{20}, \frac{7}{20} \times \frac{5}{20}, \frac{7}{20} \times \frac{8}{20}, \frac{8}{20} \times \frac{5}{20}, \frac{8}{20} \times \frac{7}{20} \right) \text{ or } \left(\frac{5}{20} \times \frac{5}{20}, \frac{7}{20} \times \frac{7}{20}, \frac{8}{20} \times \frac{8}{20} \right) \text{ or } \left(\frac{5}{20} \times \frac{15}{20}, \frac{7}{20} \times \frac{13}{20}, \frac{8}{20} \times \frac{12}{20} \right)$$

M1 (dep) for

$$\left(\frac{5}{20} \times \frac{7}{20} + \frac{5}{20} \times \frac{8}{20} + \frac{7}{20} \times \frac{5}{20} + \frac{7}{20} \times \frac{8}{20} + \frac{8}{20} \times \frac{5}{20} + \frac{8}{20} \times \frac{7}{20} \right)$$

$$\text{or } \left(\frac{5}{20} \times \frac{15}{20} + \frac{7}{20} \times \frac{13}{20} + \frac{8}{20} \times \frac{12}{20} \right) \text{ or } 1 - \left(\frac{5}{20} \times \frac{5}{20} + \frac{7}{20} \times \frac{7}{20} + \frac{8}{20} \times \frac{8}{20} \right)$$

A0 for $\frac{262}{400}$ oe or 0.655 (NB: $\frac{262}{400}$ oe or 0.655 implies M2)

Partial replacement

SC: **B2** for $\frac{141}{200}$ oe or 0.705 **or** $\frac{121}{190}$ oe or 0.6368... correct to at least 2 decimal places

M27.

	Answer	Mark	Additional Guidance
(a)	0.2 0.4, 0.6, 0.4	2	B1 for Martin correct B1 for Luke correct
(b)	0.08	2	M1 for "0.2" × "0.4" ft values from tree diagram if both < 1 A1 cao
Total for Question: 4 marks			

M28.

	Working	Answer	Mark	Additional Guidance
(a)	$1 - (0.3 + 0.21 + 0.16 + 0.09)$ $0.24 \div 4$	0.06	3	M1 for $1 - (0.3 + 0.21 + 0.16 + 0.09)$ or $1 - 0.76$ or 0.24 M1 dep for " 0.24 " $\div 4$ A1 cao
(b)	$0.3 \times 0.16 + 0.16 \times 0.3 + 0.21 \times 0.21$	0.1401	3	M1 for one correct product or 3 correct pairs identified by scores or probabilities. Ignore $4 + 4$ repeated with no other errors. M1 for all correct products with intention to add A1 for 0.1401
Total for Question: 6 marks				

M29.

		Working	Answer	Mark	Additional Guidance
	(a)		28	1	B1 27 — 29
	(b)	$68 - 42$	26	2	M1 68 — 42 A1 26 — 30 (need $\frac{1}{2}$ sq tolerance on each)
FE	(c)	15% of 80 = 12	Yes, with correct conclusion	2	M1 looks up 68 or 40 min on cumulative frequency A1 correct conclusion
Total for Question: 5 marks					

M30.

	Working	Answer	Mark	Additional Guidance
	$15 \times 9 = 135$ $(7 \times 2) + (8 \times 3) + (9 \times 3) + (10 \times 4) + (11 \times 2) = 127$ $135 - 127$	8	3	M1 for 15×9 or 135 seen M1 $(7 \times 2) + (8 \times 3) + (9 \times 3) + (10 \times 4) + (11 \times 2)$ or 127 seen A1 8 cao
Total for Question: 3 marks				

M31.

	Working	Answer	Mark	Additional Guidance
QWC (ii, iii)	$\frac{4}{50} = \frac{50}{N}$ $(4 \times 12.5)/(50 \times 12.5) = 50/625$	625 Assumption	4	M1 for $\frac{4}{50}$ oe or $\frac{50}{N}$ or 12.5 seen M1 for $(4 \times 12.5)/(50 \times 12.5)$ or an attempt to scale, i.e. $4 \times k / 50 \times k$ A1 for 625 C1 for a correct assumption, e.g. the population has not changed overnight or the dye has not washed off or the returned sample has thoroughly mixed with the population or the sample is random, etc QWC: Assumption must be stated clearly, in line with supporting calculations
Total for Question: 4 marks				

M32.

Working	Answer	Mark	Additional Guidance
$\frac{399}{399 + 602 + 252 + 198} \times 70 = 19.24$	19	3	<p>M1 for $\frac{399}{399 + 602 + 252 + 198}$ or</p> <p>$\frac{399}{1451}$ or $\frac{70}{1451}$ or $\frac{1451}{70}$ or $\frac{1451}{399}$</p> <p>M1 $\frac{399}{1451} \times 70$ or $\frac{70}{1451} \times 399$ or</p> <p>$\frac{1451}{70}$ or $\frac{70}{1451}$</p> <p>A1 for 19</p> <p>399 \div 70 (= 19.2487...)</p>
Total for Question: 3 marks			

M33.

Working	Answer	Mark	Additional Guidance
$0 \leq d < 10$ fd 0.5 $10 \leq d < 20$ fd 1.8 $20 \leq d < 25$ fd 3.0 $25 \leq d < 40$ fd 0.8 $40 \leq d < 60$ fd 0.5	Correct histogram	3	<p>B2 for 5 correct histogram bars \oplus $\frac{1}{2}$ square (B1 for 3 histogram bars correct)</p> <p>B1 for frequency density label or key and consistent scaling</p>
Total for Question: 3 marks			

M34.

	Working	Answer	Mark	Additional Guidance
(a)	$5 \times 16 = 80$ $12.5 \times 18 = 225$ $17.5 \times 10 = 175$ $27.5 \times 6 = 165$ $645 \div 50 = 12.9$ or $5.5 \times 16 = 88$ $13 \times 18 = 234$ $18 \times 10 = 180$ $28 \times 6 = 168$ $670 \div 50 = 13.4$	12.9	4	<p>M1 for fx consistently within interval including ends (allow 1 error)</p> <p>M1 consistently using appropriate midpoints</p> <p>M1 (dep on first M1) for $\sum fx \div \sum f$</p> <p>A1 for 12.9 or 13.4</p>
(b)	$\frac{6}{50} \times \frac{5}{49} = \frac{30}{2450}$	$\frac{3}{245}$	2	<p>M1 for $\frac{6}{50} \times \frac{5}{49}$</p> <p>A1 for $\frac{3}{245}$ oe If M0A0, SC B1 for $\frac{9}{625}$ oe</p>
(c)	$0 \leq d < 10$ fd 1.6 $10 \leq d < 15$ fd 3.6 $15 \leq d < 20$ fd 2 $20 \leq d < 35$ fd 0.4	Correct histogram	3	<p>B2 for 4 correct histogram bars ($\pm \frac{1}{2}$ square) (B1 for 2 or 3 histogram bars of different widths correct)</p> <p>B1 for frequency density label or key and consistent scaling</p> <p>SC if B0 then M1 for clear attempt to use frequency density or area</p>
Total for Question: 9 marks				

M35.

	Working	Answer	Mark	Additional Guidance
(a)	<p>Freq = FD \times int width $= 0.018 \times 1000 = 18$ Or $= 18 \times 1 = 18$ $= 0.010 \times 2000 = 20$ or $10 \times 2 = 20$ $= 0.006 \times 2000 = 12$ or $6 \times 2 = 12$ OR No of small squares = 200 Total freq = 16 So 1 small square = $16 \div 200 = 0.08$ $9 \times 25 \times 0.08 = 18$ $10 \times 25 \times 0.08 = 20$ $6 \times 25 \times 0.08 = 12$ OR $8 \text{ cm}^2 = 16$ so $1 \text{ cm}^2 = 2$ etc</p>	18,20,12	2	<p>M1 use of Freq = FD \times int width or attempt to find freq of 1 standard square (or one answer correct) A1 cao: all three</p>
(b)	<p>FD = Freq \div int width = $16 \div 2000 = 0.008$ so 4 sqs up $= 8 \div 4000 = 0.002$ so 1 sq up OR $16 \div 0.08 = 200$ $200 \div 25 = 8$ so 4 sqs up $8 \div 0.08 = 100$ $100 \div 25 = 4$ so 1 square up OR $16 \div 2 = 8$ so 4 sqs up etc</p>	4000-6000 4 cm high 8000-12000 1 cm high	2	<p>B1 4000-6000; 4 cm high B1 8000-12000; 1 cm high or if B0, M1 use of Freq = FD \times int width or attempt to find freq of 1 standard square</p>
Total for Question: 4 marks				

M36.

	Working	Answer	Mark	Additional Guidance
(a)(i)		Correct explanation	1	<p>C1 for all have equal chance of being selected C1 for groups in the sample are in the same proportion as they are in the population</p>
(ii)			1	
(b)	$\frac{184}{850} \times 50$	11	2	<p>M1 for $\frac{184}{850} \times 50$ or $\frac{184}{17}$ A1 cao</p>
Total for Question: 4 marks				

M37.

Working	Answer	Mark	Additional Guidance
$\frac{34}{182} \times 50 = 9.34$	9	2	<p>M1 for $\frac{34}{182} \times 50$ (= 9.3..) A1 cao</p>
Total for Question: 2 marks			

M38.

	Answer	Mark	Additional Guidance
(a)	5 15	2	B1 cao B1 cao
(b)	fd = 2 (ht 4 cm) fd = 2.5 (ht 5 cm)	2	B2 for 2 correct bars B1 for 1 correct bar If B0 is scored then you can award M1 at least one correct frequency density calculated for the missing bars Or 1 sq = 2.5 plants oe
Total for Question: 4 marks			

M39.

Working	Answer	Mark	Additional Guidance
$\frac{127}{370} \times 50 = 17.16... = 17.1$ OR $243 + 370 + 127 = 740$ $\frac{370}{740} = 0.5$ so sample size = 100 $\frac{127}{740} \times 100 = 17.1....$	17	2	$\frac{127}{370} \times 50$ oe M1 for $\frac{127}{370} \times 50$ oe A1 for 17 (accept 18) SC B1 for $\frac{17}{127}$ or $\frac{18}{127}$ (Note: $50 \div 3 = 16.6(...) = 17$ scores no marks)
Total for Question: 2 marks			

M40.

Answer	Mark	Additional Guidance
Bars at 4cm, 6cm, 7cm, 8 cm and 1.5 cm in height oe with fd axis labeled correctly	3	M1 for dividing frequency by group size or sight of 0.8, 1.2, 1.4, 1.6, 0.3 (minimum 2 seen) A1 for bars of consistent areas for all given frequencies B1 for fd axis labeled correctly and consistently Alternative scheme B3 for bars at 4cm, 6cm, 7cm, 8 cm and 1.5 cm in height oe with fd axis labeled correctly and consistently (e.g. 1 cm fd 0.2) [B2 for bars at 4cm, 6cm, 7cm, 8cm and 1.5cm in height oe with no labeling or incorrect labeling on the fd axis OR fully and correctly labeled fd axis with one bar error] [B1 for 4 th bar twice as high as 1 st bar] [B0 for bar chart with unequal bars] NB apply the same mark-scheme if a different frequency density is used e.g. bars at 1.6 cm, 2.4 cm, 2.8 cm, 3.2 cm, 0.6 cm
Total for Question: 3 marks		

M41.

Working	Answer	Mark	Additional Guidance
$40 \leq t < 50$ fd 1.6 $50 \leq t < 55$ fd 3.6 $55 \leq t < 65$ fd 3.2 $65 \leq t < 80$ fd 2 $80 \leq t < 100$ fd 1.2		3	B3 for 5 correct histogram bars $\pm \frac{1}{2}$ square AND frequency density numbered appropriately or key and consistent scaling (B2 for 5 correct histogram bars $\pm \frac{1}{2}$ square or all heights correct with frequency density numbered appropriately with one error in numbering or 3 or 4 histogram bars correct AND frequency density numbered appropriately or key and consistent scaling) (B1 for 4 histogram bars in correct proportion, no numbering or 2 or more frequency densities correctly or 2 or more histogram bars in correct proportion with appropriate numbering on the f.d. axis)
Total for Question: 3 marks			

M42.

	Working	Answer	Mark	Additional Guidance
(a)	$\frac{26}{258} \times 50$	5	2	M1 for $\frac{a}{258} \times 50$ or $50 \div \frac{258}{a}$ oe, $a < 258$ or 5.03(8...) or $26 \div 5.16$ A1 for 5 cao
(b)	$\frac{(25 + 48 + 62)}{258} \times 50$	26	2	M1 for $\frac{135}{258} \times 50$ or $\frac{(25 + 48 + 62)}{258} \times 50$ or $\left(\frac{25}{258} \times 50 + \frac{48}{258} \times 50 + \frac{62}{258} \times 50 \right)$ oe or 26.1(6...) or $5 + 9 + 12$ or $135 \div 5.16$ A1 for 26 or 27
Total for Question: 4 marks				

M43.

Working	Answer	Mark	Additional Guidance
frequency densities 0.4, 0.6, 1.0, 0.6, 0.2	bars 3cm, 1cm high respectively	2	M1 for consistent correct use of fd or $1\text{cm}^2 = 2$ (may be implied by one correct bar) A1 for 2 correct bars
Total for Question: 2 marks			