

2.3 Working with Data

Question Paper

Course	OCR A Level Maths: Statistics
Section	2. Data Presentation & Interpretation
Topic	2.3 Working with Data
Difficulty	Medium

Time allowed: 60

Score: /47

Percentage: /100

Question 1

The lengths of unicorn horns are measured in cm. For a group of adult unicorns, the lower quartile was 87 cm and the upper quartile was 123 cm. For a group of adolescent unicorns, the lower quartile was 33 cm and the upper quartile was 55 cm.

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

(a) Which of the following adult unicorn horn lengths would be considered outliers?

32 cm 96 cm 123 cm 188 cm

[2 marks]

Question 1

(b) Which of the following adolescent unicorn horn lengths would be considered outliers?

12 cm 52 cm 86 cm 108 cm

[2 marks]

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Question 1

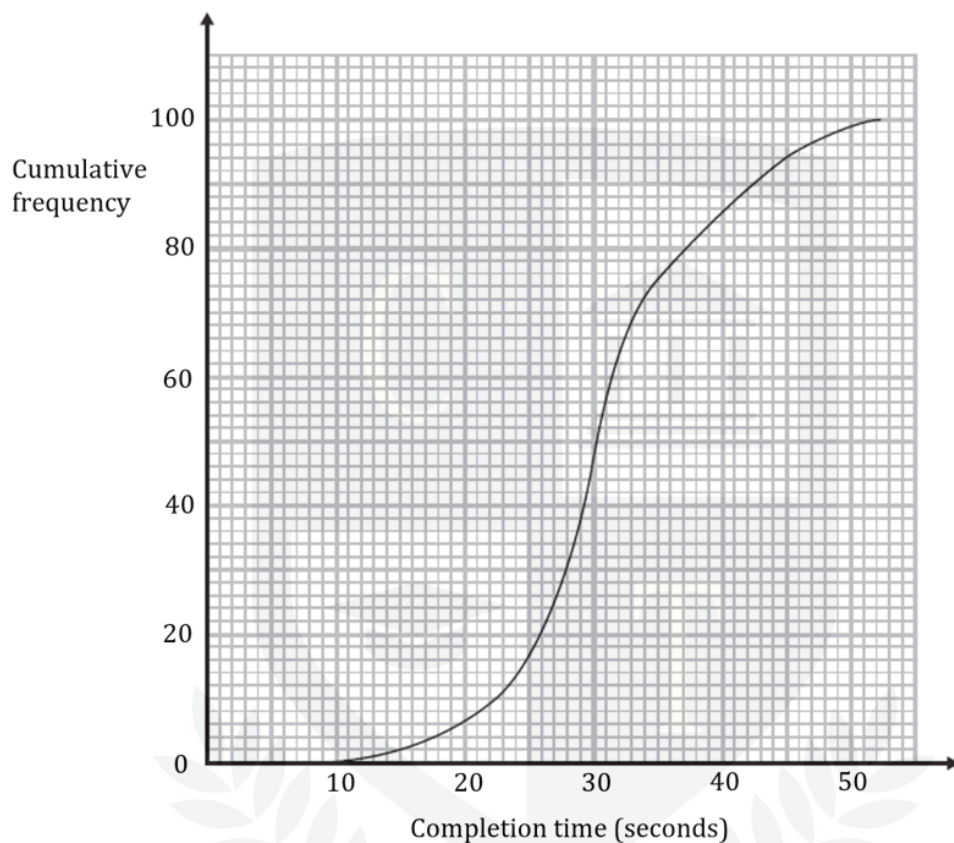
- (c) (i) State the smallest length an adult unicorn horn can be without being considered an outlier.
- (ii) State the smallest length an adolescent unicorn horn can be without being considered an outlier.

[2 marks]

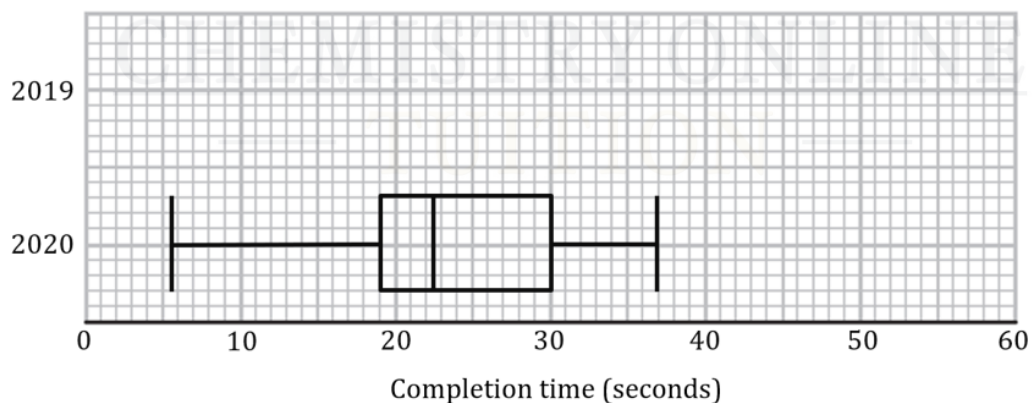


Question 2

The cumulative frequency diagram below shows completion times for 100 competitors at the 2019 Rubik's cube championships. The quickest completion time was 9.8 seconds and the slowest time was 52.4 seconds.



- (a) The grid below shows a box plot of the 2020 championship data. Draw a box plot on the grid to represent the 2019 championship data.



[4 marks]

Question 2

- (b) (i) Compare the distribution of completion times for the 2019 and 2020 championships.
- (ii) Given that the 2020 championships happened after the global pandemic, during which many competitors spent months at home, interpret your findings from part (b)(i).

[3 marks]

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Question 3

Students at two Karate Schools, Miyagi Dojo and Cobra Kicks, measured the force of a particular style of hit. Summary statistics for the force, in newtons, with which the students could hit are shown in the table below:

	n	$\sum x$	$\sum x^2$
Miyagi Dojo	12	21873	41532545
Cobra Kicks	17	29520	52330890

- (i) Calculate the mean and standard deviation for the forces with which the students could hit.
- (ii) Compare the distributions for the two Karate Schools.

[7 marks]

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Question 4

The heights, in metres, of a flock of 20 flamingos are recorded and shown below:

0.4	0.9	1.0	1.0	1.2	1.2	1.2	1.2	1.2	1.2
1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.5	1.5	1.6

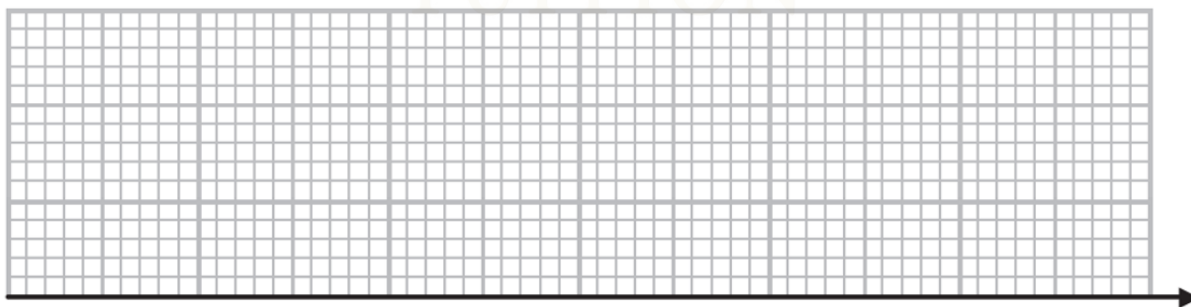
An outlier is an observation that falls either more than $1.5 \times$ (interquartile range) above the upper quartile or less than $1.5 \times$ (interquartile range) below the lower quartile.

- (a) (i) Find the values of Q_1 , Q_2 and Q_3 .
(ii) Find the interquartile range.
(iii) Identify any outliers.

[4 marks]

Question 4

- (b) Using your answers to part (a), draw a box plot for the data.



[3 marks]

Question 5

The number of daily Covid-19 vaccinations reported by one vaccination centre over a 14-day period are given below:

237	264	308	313	319	352	378
378	405	421	428	450	465	583

- (a) Given that $\sum x = 5301$ and $\sum x^2 = 2\,113\,195$, calculate the mean and standard deviation for the number of daily vaccinations.

[3 marks]

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Question 5

An outlier is an observation which lies more than ± 2 standard deviations away from the mean.

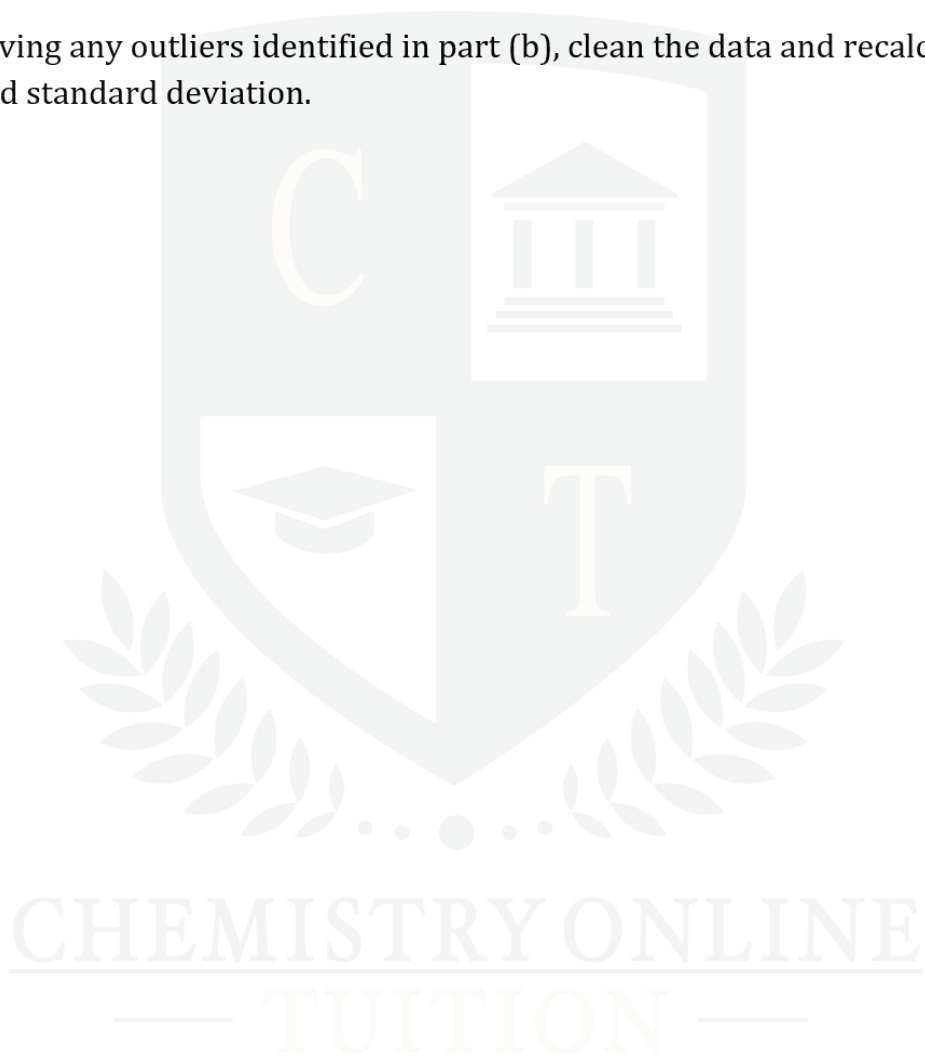
- (b) Identify any outliers for this data.

[2 marks]

Question 5

- (c) By removing any outliers identified in part (b), clean the data and recalculate the mean and standard deviation.

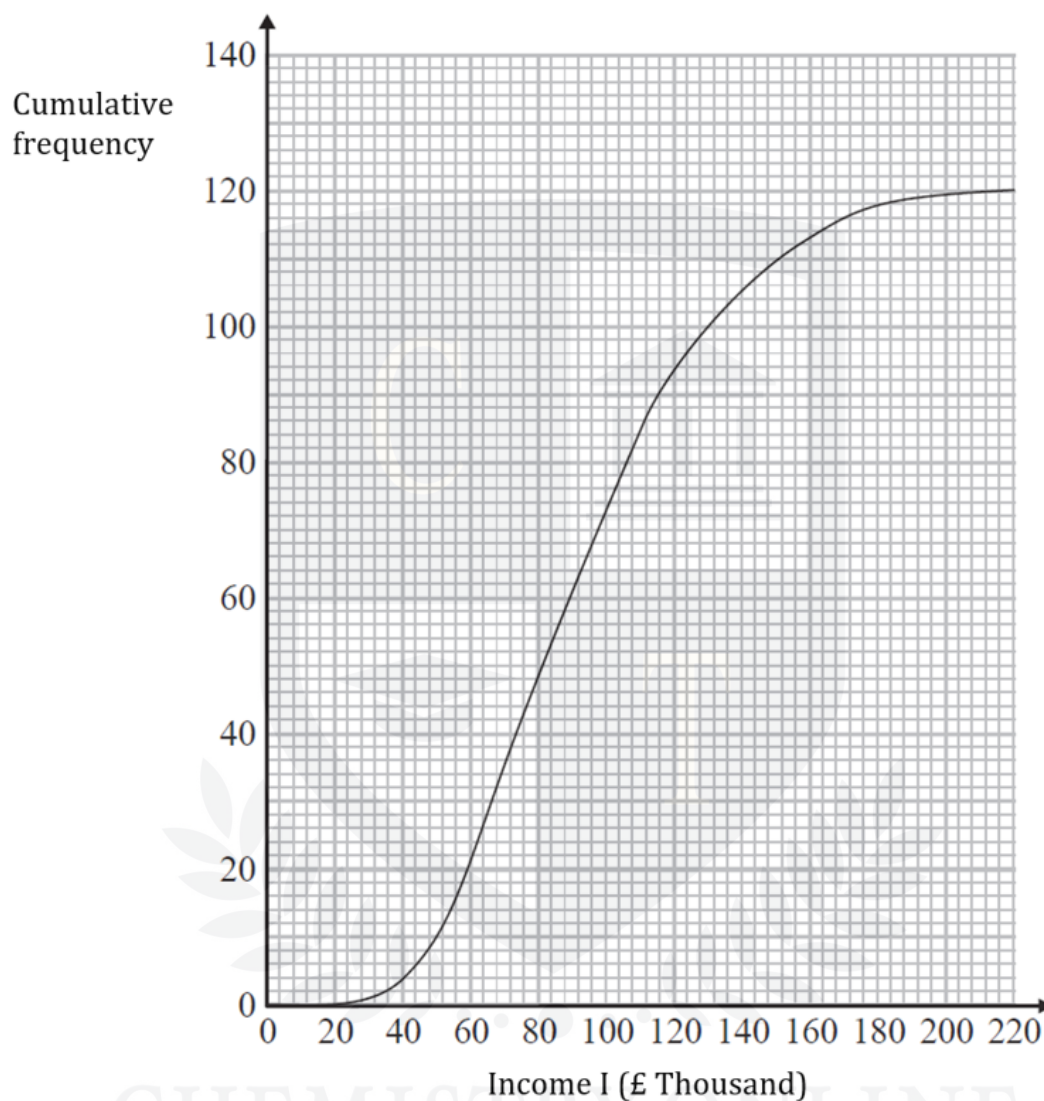
[3 marks]



Question 6



The cumulative frequency diagram below shows the distribution of income of 120 managers across a supermarket chain.



The income of a sample of 120 other employees across the supermarket chain are recorded in the table below.

Income I (£ Thousand)	Frequency
$0 \leq I < 20$	34
$20 \leq I < 40$	28
$40 \leq I < 60$	27
$60 \leq I < 80$	17
$80 \leq I < 100$	10
$100 \leq I < 120$	4

On the grid above, draw a cumulative frequency graph to show the data for the other employees and compare the income of managers and other employees.

[7 marks]

Question 7

Data from the large data set on labour force for countries in both North Africa and Central America is given below.

North Africa Labour force		Central America Labour force	
Algeria	11 820 000	Belize	120 500
Egypt	29 950 000	Costa Rica	2 229 000
Libya	1 114 000	El Salvador	2 774 000
Morocco	12 000 000	Guatemala	6 664 000
Sudan	11 920 000	Honduras	3 735 000
Tunisia	4 054 000	Mexico	54 510 000
Western Sahara	144 000	Nicaragua	3 046 000
		Panama	1 633 000

(a) Calculate the mean labour force per country for each region.

[2 marks]

Question 7

The standard deviation for countries in Central America is 17 163 173, to the nearest integer. Any value more than two standard deviations from the mean can be identified as an outlier.

- (b) Calculate the standard deviation for North Africa and state any countries, in either region, whose labour force would be considered an outlier.

[3 marks]

