HIGHER

# 6.11 Cumulative Frequency: 30-minute Pack

EDEXCEL 1MA1 · Calculator allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

**Answer ALL questions. Show all your working.**

**1** The box plot below shows the number of goals scored by a football team in each of its last 32 matches.




**(a)** Write down the median number of goals scored. **(1)**

.....

**(b)** Work out the interquartile range of the number of goals scored. **(1)**

.....

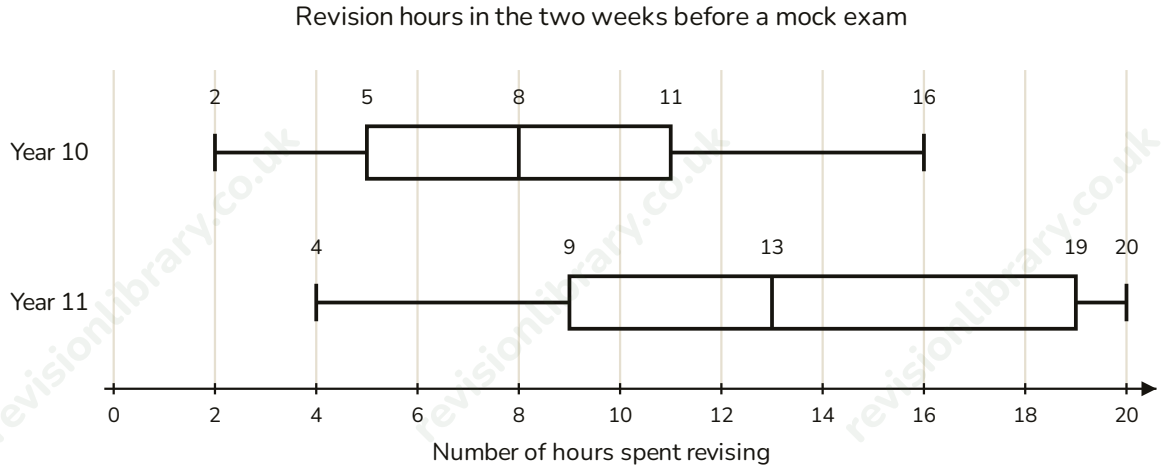
**(c)** The team is said to have had an "attacking game" if it scored more goals than the upper quartile. Estimate the number of matches, out of the 32, in which the team had an attacking game. **(2)**

**(Total for Question 1 is 4 marks)**


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**2** Box plots showing the number of hours spent revising in the two weeks before a mock exam are shown below for a sample of Year 10 students and a sample of Year 11 students.

Year 10: minimum = 2, lower quartile = 5, median = 8, upper quartile = 11, maximum = 16
Year 11: minimum = 4, lower quartile = 9, median = 13, upper quartile = 19, maximum = 20




**(a)** Find the interquartile range for Year 10 and for Year 11. **(2)**

**(b)** Compare the revision times of the Year 10 and Year 11 students, using the median and the interquartile range. **(2)**

**(Total for Question 2 is 4 marks)**


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**3** A box plot has been drawn to represent the delivery times of 200 parcels sent by a courier company. Using the definition of the upper quartile, estimate how many of the 200 parcels had a delivery time longer than the upper quartile.

**(Total for Question 3 is 2 marks)**

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**4** The table shows the time taken to finish a puzzle (minutes) for 120 items, in grouped classes.

$40 < x \leq 60$: 25

$60 < x \leq 80$: 9

$80 < x \leq 100$: 22

$100 < x \leq 120$: 28

$120 < x \leq 140$: 18

$140 < x \leq 160$: 18

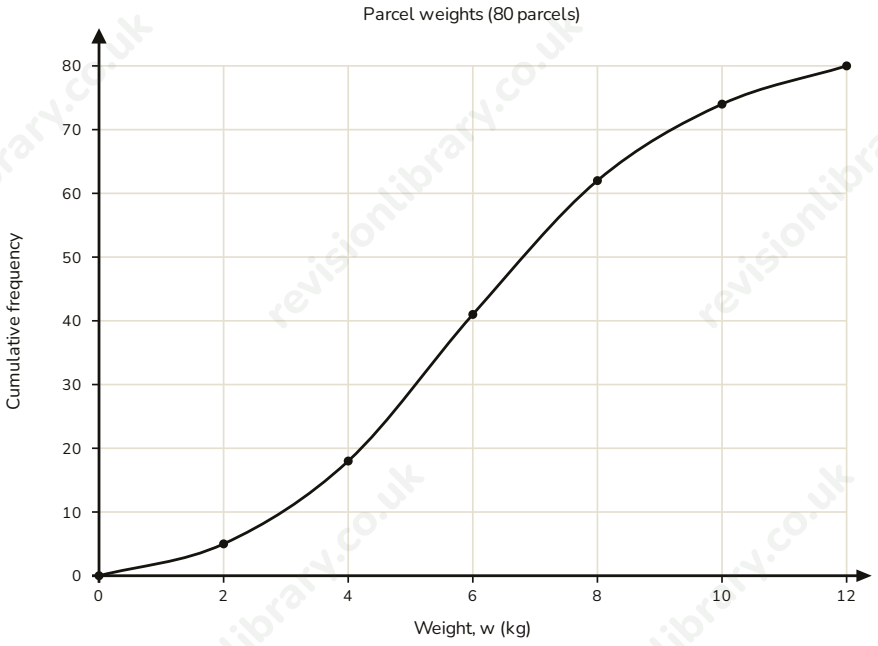
Work out the cumulative frequency for each class, in order.

**(Total for Question 4 is 2 marks)**


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**5** A delivery depot records the weights, w kg, of 80 parcels sent in one day.

| Weight, w (kg) | Frequency |
|---|---|
| $0 < w \leq 2$ | 5 |
| $2 < w \leq 4$ | 13 |
| $4 < w \leq 6$ | 23 |
| $6 < w \leq 8$ | 21 |
| $8 < w \leq 10$ | 12 |
| $10 < w \leq 12$ | 6 |




**(a)** Complete the cumulative frequency table below. **(2)**

| Weight, w (kg) | Cumulative frequency |
|---|---|
| $w \leq 2$ | 5 |
| $w \leq 4$ | 18 |
| $w \leq 6$ | … |
| $w \leq 8$ | 62 |
| $w \leq 10$ | … |
| $w \leq 12$ | 80 |

**(b)** Write down the coordinates you would plot to represent the class $6 < w \leq 8$. **(1)**

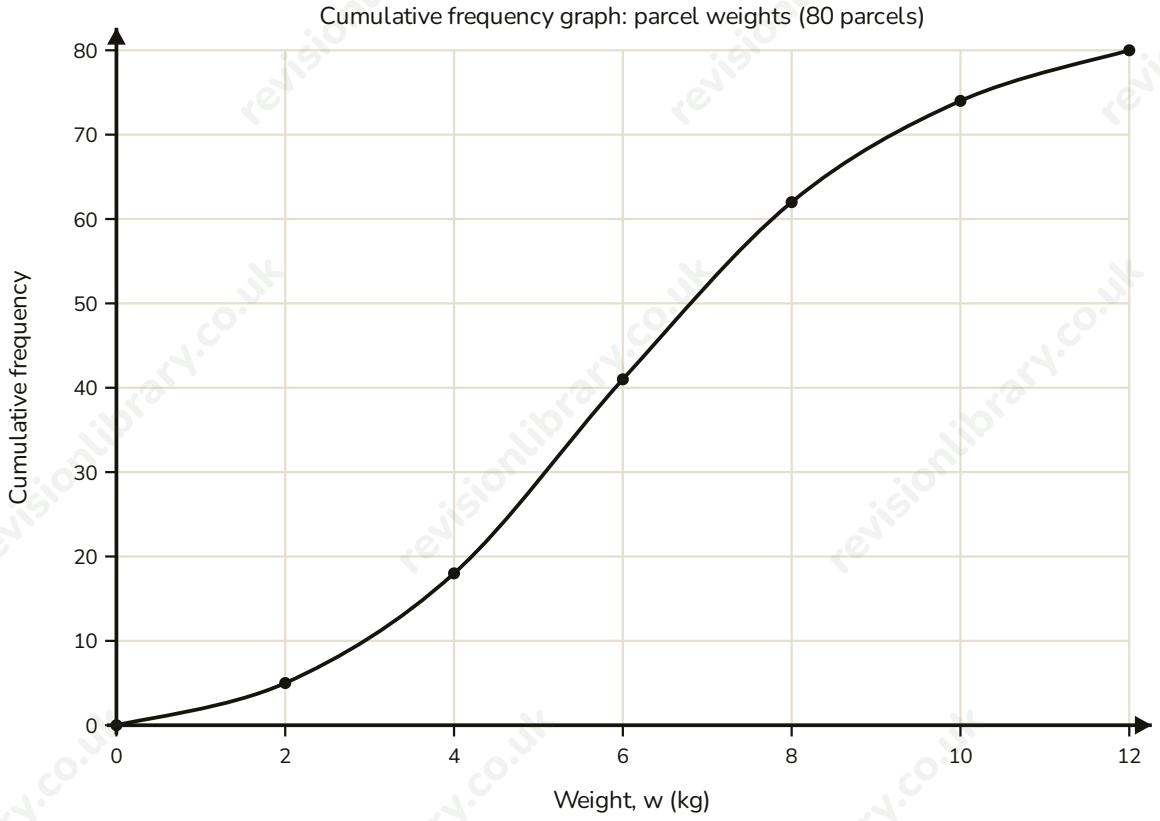
.....

**(c)** The cumulative frequency graph for this data is shown above. Use the graph to estimate the median weight of a parcel. **(2)**

**(Total for Question 5 is 5 marks)**


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**6** Parcels weighing more than 7 kg attract a delivery surcharge. Use the cumulative frequency graph for the parcel weights to estimate the percentage of parcels that attract the surcharge.




**(Total for Question 6 is 2 marks)**


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**7** A distribution of delivery-driver ages has median 40, lower quartile 25 and upper quartile 44.

**(a)** Find the interquartile range. **(1)**

.....

**(b)** By comparing the distance from the median to each quartile, comment on the skew of the distribution. **(2)**

**(Total for Question 7 is 3 marks)**

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**8** A student has recorded the following five-number summary for a data set, and claims it represents a valid box plot.

Minimum = 8, Lower quartile = 15, Median = 12, Upper quartile = 20, Maximum = 25

Explain why this five-number summary cannot be correct, and state what must be true instead.

**(Total for Question 8 is 3 marks)**


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# Mark scheme · 6.11 Cumulative Frequency: 30-minute Pack

## Question 1

(a) 2 cao **B1**

**(a) Answer: 2 goals**

(b) 3 cao **B1**

**(b) Answer: 3 goals**

(c) recognising that exactly 25% of matches lie above the upper quartile, i.e. 1/4 x 32 oe **M1**

(c) 8 cao **A1**

**(c) Answer: 8 matches**

## Question 2

(a) Year 10 IQR = 6 cao **B1**

(a) Year 11 IQR = 10 cao **B1**

**(a) Answer: Year 10: 6 hours; Year 11: 10 hours**

(b) median comparison in context ft, e.g. Year 11 students typically revised for longer than Year 10 students, since their median (13 hours) is higher than Year 10's (8 hours) **B1**

(b) IQR/spread comparison in context ft, e.g. the amount of time Year 11 students spent revising was more variable/spread out than Year 10's, since their IQR (10 hours) is greater than Year 10's (6 hours) **B1**

**(b) Answer: Year 11 students revised for longer on average (higher median) and their revision times were more variable (higher IQR) than Year 10 students.**

## Question 3

recognising that the upper quartile is the value below which approximately 75% of the data lies, so 25% lies above it oe **M1**

50 parcels cao **A1**

**Answer: 50 parcels**

## Question 4

adds frequencies progressively (at least 3 correct) **M1**

25, 34, 56, 84, 102, 120 cao **A1**

**Answer: 25, 34, 56, 84, 102, 120**

## Question 5

(a) $w \leq 6$ : 41 cao **B1**

(a) $w \leq 10$ : 74 cao **B1**

**(a) Answer: 41 and 74**

(b) (8, 62) cao **B1**

**(b) Answer: (8, 62)**

(c) identifying the median position as the 40th value (n/2 = 40) and interpolating between (4,18) and (6,41) **M1**

(c) awrt 5.9 kg (accept 5.5-6.3) **A1**

**(c) Answer: awrt 5.9 kg**

## Question 6

reading/interpolating cumulative frequency at w = 7, awrt 51-52 **M1**

awrt 36% (accept 33-39%) **A1**

**Answer: awrt 36%**

## Question 7

(a) 19 cao **B1**

**(a) Answer: 19**

(b) comparing (median - LQ) = 15 with (UQ - median) = 4 **B1**

(b) ft: negatively skewed, since the lower quartile is further from the median than the upper quartile is (a longer tail on the low side) oe **B1**

**(b) Answer: Negatively skewed**

## Question 8

identify the contradiction: the median (12) is less than the lower quartile (15) **B1**

valid explanation, e.g. the lower quartile is the value below which approximately 25% of the data lies, and the median is the middle value with 50% of the data below it, so the median must always be greater than or equal to the lower quartile oe **B1**

correct statement of what must change, e.g. the median value must be at least 15 (and no more than 20); the data must have been recorded or plotted incorrectly oe **B1**

**Answer: The summary is invalid because the median (12) is less than the lower quartile (15); the median must be at least 15.**


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