

Week 28

IGCSE Mathematics

Homework bundle for this week

本周作业合集

exercises.lol

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9. Statistics

Starter Quiz · 课前小测

IGCSE Mathematics Name: _____ Score: _____

- A two-way table sorts data by how many features at once?
☐ two
☐ one
☐ three
☐ none
- Find the mean of 4, 7, 7, 2, 5.

- A grouped class runs from 10 to 20. What midpoint do you use as its value?

- Out of 120 people, 30 chose tea. Find the angle of the tea slice on a pie chart (degrees).

- As one quantity increases, the other also increases. This is:
☐ positive correlation
☐ negative correlation
☐ zero correlation
☐ no data
- Cumulative frequency is:
☐ a running total of the frequencies
☐ the most common value
☐ the largest minus the smallest
☐ the frequency divided by class width
- A class has frequency 25 and class width 10. Find the frequency density.

- A table where you make a mark for each value, then count, is a _____ table.

- Find the mode of 4, 7, 7, 2, 5.

10. On a bar chart, the height of each bar shows the:

- ☐ frequency
- ☐ angle
- ☐ midpoint
- ☐ range

9. Statistics

IGCSE Mathematics

1. two

A two-way table cross-tabulates two features (e.g. gender vs transport).

2. 5

$(4 + 7 + 7 + 2 + 5)/5 = 25/5 = 5.$

3. 15

$(10 + 20)/2 = 15.$

4. 90

$(30/120) \times 360 = 90^\circ.$

5. positive correlation

Both rising together is positive correlation.

6. a running total of the frequencies

Each point adds the next class frequency to the total so far.

7. 2.5

$25 \div 10 = 2.5.$

8. tally

A tally table records each value with a mark before counting.

9. 7

7 appears most often.

10. frequency

Bar height represents the frequency of that category.

E9.2 Interpreting statistical data

Name: _____ Class: _____ Date: _____ **Total: 13 marks**

KEY WORDS frequency table 频数表 • interquartile range 四分位距 • data 数据
• quartiles and interquartile range 四分位数和四分位距 • interpreting statistical data 解读统计数据

Objective

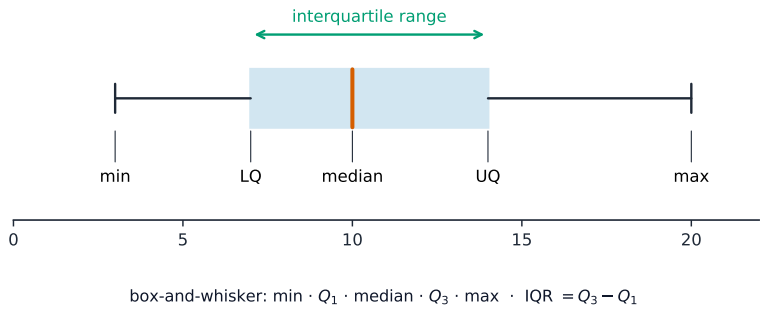
Build the skills to answer Extended exam questions on **interpreting statistical data** 解读统计数据 — the **mean, median, mode and range** 平均数、中位数、众数、极差, the mean from a **frequency table** 频数表, and the **quartiles and interquartile range** 四分位数和四分位距.

You must be able to:

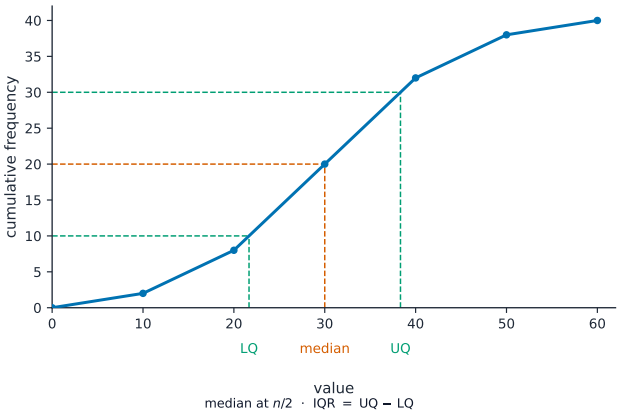
- find the mean, median, mode and range of a data set
- find the mean from a frequency table
- find the median, quartiles and interquartile range

1 Worked examples

■ Averages and spread



The box length is the interquartile range



A cumulative frequency curve gives the median and quartiles

- **Mean** = $\frac{\text{sum}}{\text{count}}$; **median** = middle (in order); **mode** = most common; **range** = max – min.
- **Mean from a frequency table:** $\frac{\sum(\text{value} \times \text{frequency})}{\sum \text{frequency}}$.
- **Interquartile range** 四分位距 = $UQ - LQ$ (ignores extreme values).

Answer shapes: M1 a correct method, A1 the correct answer.

2 Practice

2.1 Find the median and range of 4, 7, 7, 2, 5. [2]

2.2 Find the mode of 3, 5, 5, 5, 8, 9. [1]

2.3 Find the mean of 6, 8, 10, 12. [2]

3 Exam-style questions

3.1 The values 1, 2, 3 occur with frequencies 4, 5, 1. Calculate the mean. [3]

3.2 Here is a data set in order: 4, 6, 7, 9, 10, 12, 13, 15.

(a) Find the median. [2]

(b) Find the interquartile range. [3]

Solutions

Marking: **M1** a correct method, **A1** the correct answer.

2.1 ordered: 2, 4, 5, 7, 7 $\rightarrow$ median = 5; range = $7 - 2 = 5$.

2.2 mode = 5.

2.3 $\frac{6+8+10+12}{4} = \frac{36}{4} = 9$.

3.1 $\frac{1(4)+2(5)+3(1)}{4+5+1} = \frac{4+10+3}{10} = \frac{17}{10} = 1.7$.

3.2 (a) median = $\frac{9+10}{2} = 9.5$. (b) lower quartile = $\frac{6+7}{2} = 6.5$; upper quartile = $\frac{12+13}{2} = 12.5$; IQR = $12.5 - 6.5 = 6$.

6 One morning, a dentist has appointments for 10 patients.
The stem-and-leaf diagram shows the waiting time for 8 of these patients.

0	1	4
1	0	2 9
2	1	5 5

Key: 1 | 0 represents 10 minutes

The times for the two other patients, *P* and *Q*, are not shown in the stem-and-leaf diagram.

The mean waiting time of all 10 patients that morning is 16 minutes.
The range of waiting times is 26 minutes.
Patient *P* waits longer than patient *Q*.

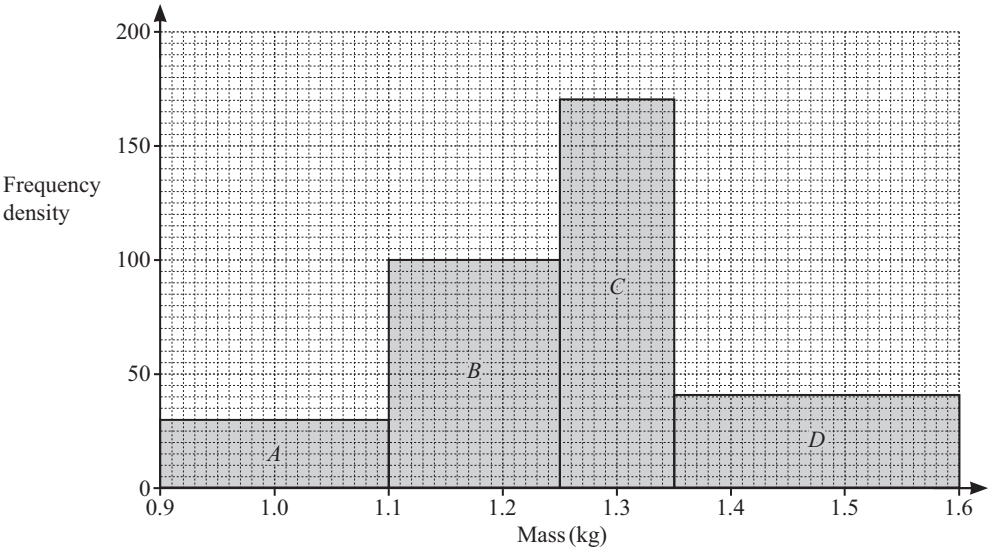
Find the waiting time for each of patient *P* and patient *Q*.

Patient *P* min

Patient *Q* min

[4]

16 The histogram shows information about the masses of some coconuts.
The masses are classified into four categories *A*, *B*, *C* and *D*.



- (a) Show that there are 10 coconuts in category *D*.
- [1]
- (b) Two of the coconuts from those in category *C* and category *D* are chosen at random.
- Find the probability that both are from category *D*.
- [3]
- (c) Calculate an estimate of the mean mass of the coconuts.

23 The table shows some information about the mass of each of 200 oranges.

Mass (m grams)	$180 < m \leq 200$	$200 < m \leq 210$	$210 < m \leq 215$	$215 < m \leq 230$
Frequency	32	64	74	30

(a) Calculate an estimate of the mean mass of an orange.

..... g [4]

(b) Sarah draws a histogram to show this information.
The table shows the height of one of the bars for this histogram.

Complete the table.

Mass (m grams)	$180 < m \leq 200$	$200 < m \leq 210$	$210 < m \leq 215$	$215 < m \leq 230$
Height of bar (cm)			7.4	

[3]

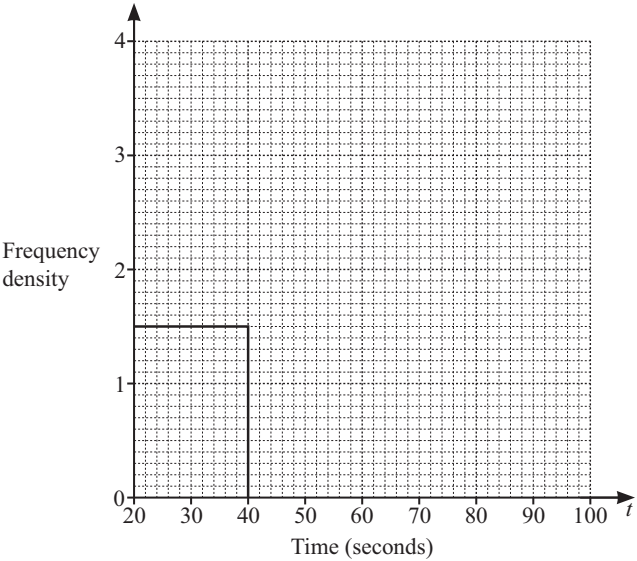
13 (a) 100 students solve a puzzle.
The table shows information about the time taken by each student to solve the puzzle.

Time (t seconds)	$20 < t \leq 40$	$40 < t \leq 60$	$60 < t \leq 100$
Frequency	30	40	30

(i) Work out an estimate of the mean.

.....s [4]

(ii) Complete the histogram to show the information in the table.

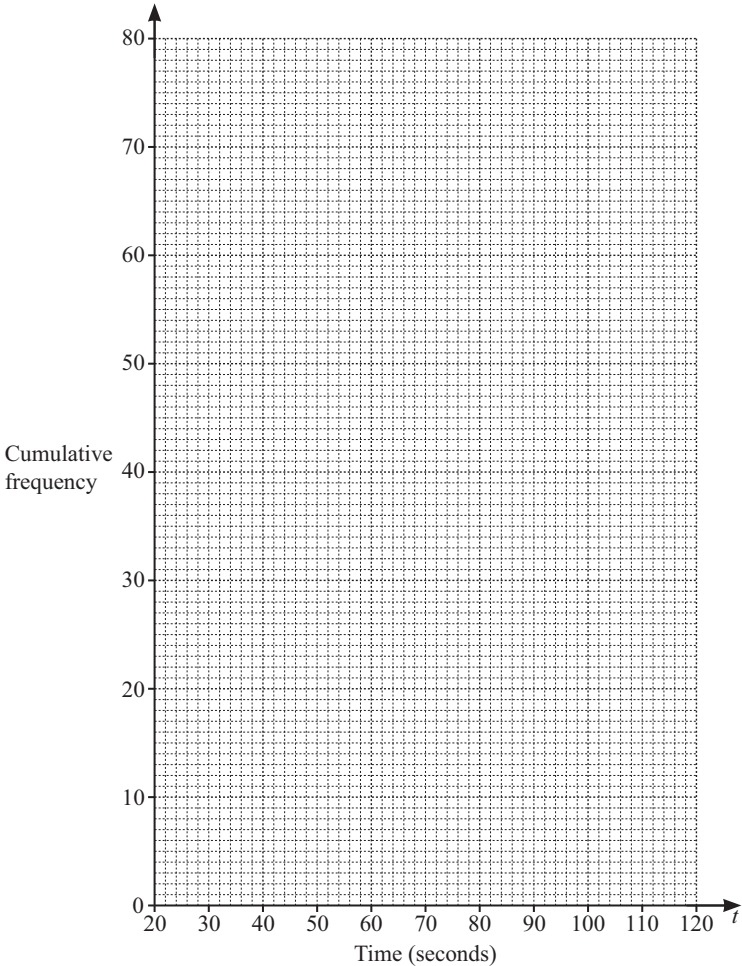


[2]

- (b) 80 adults solve the same puzzle as the students.
The cumulative frequency table shows information about the time taken by each adult to solve the puzzle.

Time (t seconds)	$t \leq 20$	$t \leq 40$	$t \leq 60$	$t \leq 80$	$t \leq 100$	$t \leq 120$
Cumulative frequency	0	12	36	60	74	80

- (i) On the grid, draw a cumulative frequency diagram.



[3]

- (ii) Use your cumulative frequency diagram to find an estimate for

(a) the median
..... s [1]

(b) the lower quartile.

- 15 The height of each of 140 basketball players is recorded.
The table shows the results.

Height (h cm)	$160 < h \leq 180$	$180 < h \leq 185$	$185 < h \leq 190$	$190 < h \leq 200$	$200 < h \leq 210$
Frequency	7	12	31	70	20

- (a) Calculate an estimate of the mean height.

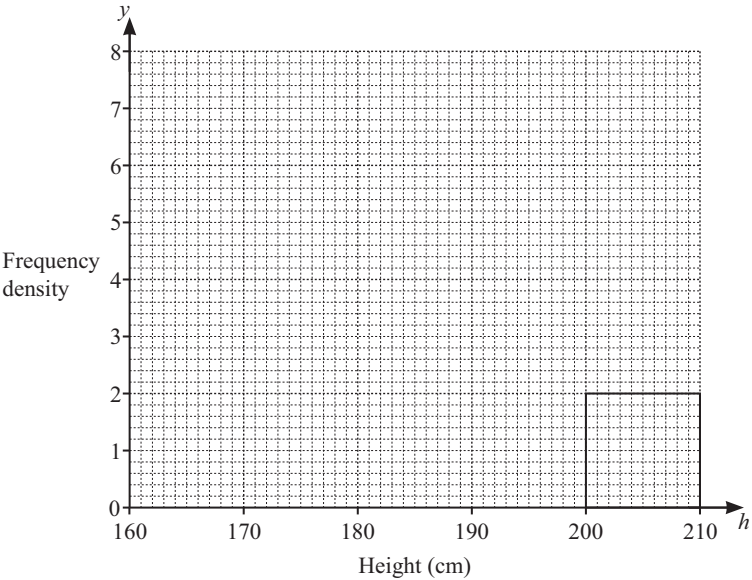
..... cm [4]

- (b) Two of the players are chosen at random.

Find the probability that both players have a height greater than 190 cm and no more than 200 cm.

..... [2]

(c) Complete the histogram to show the information in the frequency table.



[3]

16 Mateo invests \$1250 at a rate of $r\%$ per year compound interest. At the end of 6 years the total value of his investment is \$1484.

Calculate the value of r .

$r =$ [3]

IGCSE MATHEMATICS • EXERCISE SHEET

E9.4 Statistical charts and diagrams

Name: _____ Class: _____ Date: _____

Total: 20 marks

KEY WORDS correlation 相关性 • line of best fit 最佳拟合线 • pie chart 饼图
• scatter diagrams 散点图 • statistical charts and diagrams 统计图表

Objective

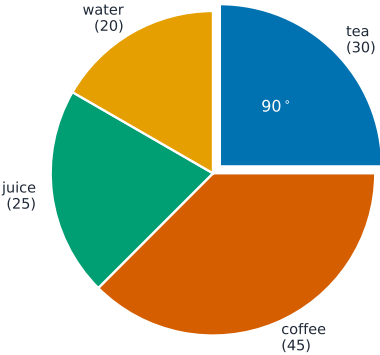
Build the skills to answer Extended exam questions on **statistical charts and diagrams** 统计图表 — the **pie chart** 饼图, and **scatter diagrams** 散点图 with **correlation** 相关性.

You must be able to:

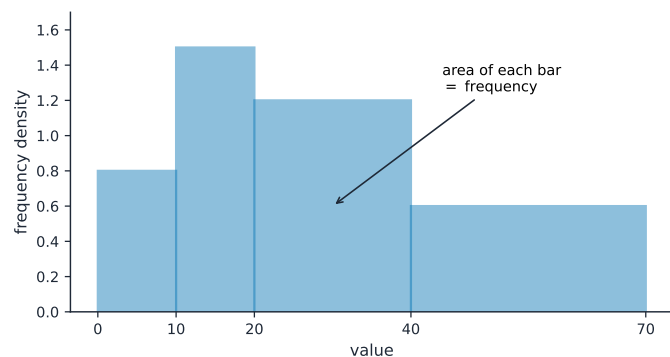
- find the angle of a pie-chart slice
- describe the correlation shown by a scatter diagram
- use a line of best fit to predict

1 Worked examples

■ Pie charts and scatter diagrams



A pie chart splits 360°; a scatter diagram shows a link



$$\text{density} = \text{freq} / \text{width} \cdot \text{area} = \text{frequency}$$

A histogram is another statistical chart

- **Pie chart:** slice angle = $\frac{\text{frequency}}{\text{total}} \times 360^\circ$. Tea 30 of 120 $\rightarrow \frac{30}{120} \times 360 = 90^\circ$.
- **Correlation** 相关性: **positive** (rise together), **negative** (one rises as the other falls), **zero** (no link).
- **Line of best fit** 最佳拟合线: one straight line through the middle of the points — use it to predict.

Answer shapes: **M1** a correct method, **A1** the correct answer.

2 Practice

2.1 Out of 90 people, 30 chose coffee. Find the angle of the coffee slice on a pie chart.[2]

2.2 A scatter diagram shows that as temperature rises, ice-cream sales rise. State the type of correlation. [1]

2.3 State what a **line of best fit** is used for. [1]

3 Exam-style questions

3.1 In a survey of 72 people, 18 walk to work. Find the angle of the "walk" slice on a pie chart. [2]

3.2 A pie chart slice for "bus" has an angle of 120° . The total number of people is 90. Find how many travel by bus. [3]

3.3 180 students each chose one favourite subject.

Subject	Maths	Science	English	Art
Students	60	45	50	25

(a) Calculate the angle for each sector of a pie chart. [3]

(b) A second school of 300 students draws a pie chart in which Maths has an angle of 120°. State whether more students chose Maths in the second school, showing a calculation.[3]

(c) A scatter diagram of “hours revised” against “test score” shows points rising from bottom left to top right, close to a straight line. Describe the correlation, and explain what the line of best fit is used for. [3]

(d) A student uses the line of best fit to predict the score for 20 hours of revision, well beyond the plotted data. Explain why this is unreliable. [2]

Solutions

Marking: **M1** a correct method, **A1** the correct answer.

2.1 $\frac{30}{90} \times 360^\circ = 120^\circ$.

2.2 positive correlation.

2.3 to predict a value (read one variable from the other).

3.1 $\frac{18}{72} \times 360^\circ = 90^\circ$.

3.2 $\frac{120}{360} \times 90 = \frac{1}{3} \times 90 = 30$ people.

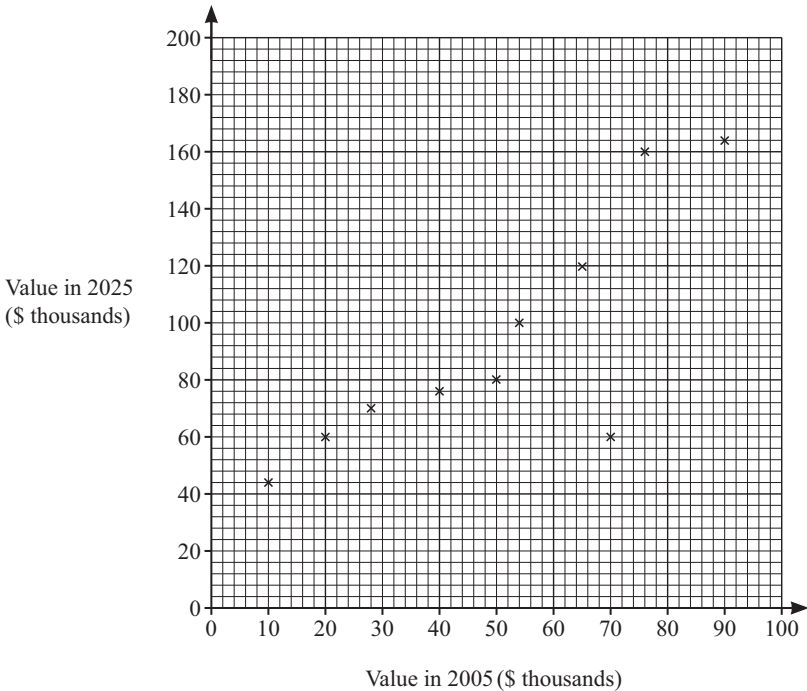
3.3 (a) Each student is worth $\frac{360}{180} = 2^\circ$; Maths 120°, Science 90°, English 100°, Art 50°.

(b) In the second school 120° represents $\frac{120}{360} = \frac{1}{3}$ of the students; $\frac{1}{3} \times 300 = 100$ students; that is more than 60, so yes — even though the two sectors have the same angle, the totals differ.

(c) Strong **positive** correlation — as hours revised increase, test score increases. The line of best fit summarises the trend and lets a score be estimated for a number of hours not in the data.

(d) 20 hours is outside the range of the data collected, so this is **extrapolation**; the pattern is not known to continue beyond the data — scores cannot exceed 100, so the trend must flatten.

6 The scatter diagram shows the value, in thousands of dollars, of ten paintings in 2005 and the value of the same paintings in 2025.



- (a) The value of one of the paintings in 2025 is less than expected.
Draw a circle around the point that represents this painting.

[1]
- (b) Another painting had a value of \$75 000 in 2005 and \$140 000 in 2025.
On the scatter diagram, plot this point.

[1]
- (c) Write down the number of paintings with a value of less than \$53 000 in 2005.

..... [1]
- (d) What type of correlation is shown on the scatter diagram?

..... [1]

IGCSE MATHEMATICS • EXERCISE SHEET

E9.6 Cumulative frequency diagrams

Name: _____ Class: _____ Date: _____

Total: 21 marks

KEY WORDS cumulative frequency 累积频数 • cumulative frequency diagrams 累积频数图
• percentile 百分位数 • frequency 频数 • quartile 四分位数

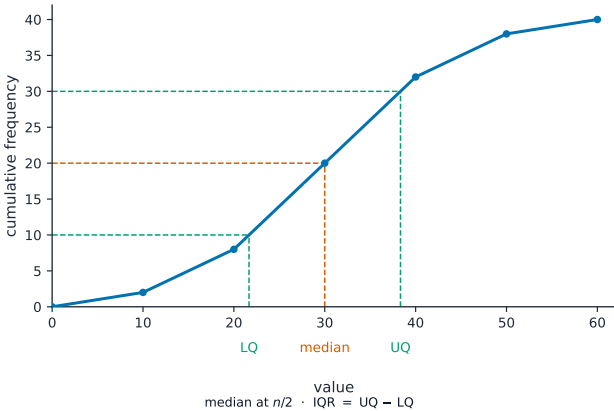
Objective

Build the skills to answer Extended exam questions on **cumulative frequency diagrams** 累积频数图 — the running total, and reading the **median, quartiles and percentiles** 中位数、四分位数、百分位数 from the curve.

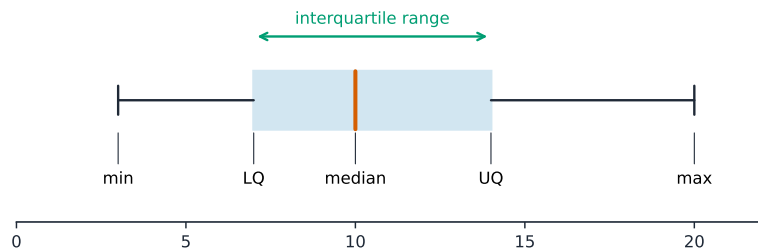
- You must be able to:**
- complete a cumulative frequency table
 - read the median and quartiles from a cumulative frequency curve
 - find the interquartile range

1 Worked examples

■ Reading a cumulative frequency curve



The cumulative frequency is a running total



box-and-whisker: min · Q_1 · median · Q_3 · max · IQR = $Q_3 - Q_1$

Quartiles from the curve feed a box-and-whisker plot

- **Cumulative frequency** 累积频数: add each frequency to the running total; plot at the **upper** end of each class.
- **Median** at $\frac{1}{2}$ of the total; **LQ** at $\frac{1}{4}$; **UQ** at $\frac{3}{4}$.
- **IQR** = UQ – LQ.

Answer shapes: M1 a correct method, A1 the correct answer.

2 Practice

2.1 The frequencies of four classes are 5, 8, 10, 7. Write down the cumulative frequencies.[2]

2.2 A data set has a total cumulative frequency of 80. At what cumulative frequency do you read the median? [1]

2.3 At what cumulative frequency do you read the lower quartile if the total is 80? [1]

3 Exam-style questions

3.1 A cumulative frequency curve is drawn for 200 students' test marks.

(a) State the cumulative frequency at which you read the upper quartile. [1]

(b) From the curve, the lower quartile is 42 and the upper quartile is 63. Find the interquartile range. [2]

3.2 The cumulative frequencies 0, 6, 20, 45, 60 are given for five class boundaries. Find the total frequency, and the cumulative frequency used to read the median. [2]

3.3 The times, t minutes, taken by 80 students to finish a task are summarised below.

Time (t min)	$0 < t \leq 10$	$10 < t \leq 20$	$20 < t \leq 30$	$30 < t \leq 40$	$40 < t \leq 50$
Frequency	6	18	30	20	6

(a) Complete a cumulative frequency table and draw the cumulative frequency diagram.[4]

(b) Use your diagram to estimate the median and the interquartile range. [4]

(c) Estimate how many students took longer than 35 minutes. [2]

(d) Explain why every value read from this diagram is an **estimate**. [2]

Solutions

Marking: **M1** a correct method, **A1** the correct answer.

2.1 5, 13, 23, 30.

2.2 at $\frac{80}{2} = 40$.

2.3 at $\frac{80}{4} = 20$.

3.1 (a) at $\frac{3}{4} \times 200 = 150$. (b) $\text{IQR} = 63 - 42 = 21$.

3.2 total frequency = 60; the median is read at $\frac{60}{2} = 30$.

3.3 (a) Cumulative frequencies 6, 24, 54, 74, 80; points plotted at the **upper** class boundaries 10, 20, 30, 40, 50; a smooth increasing curve drawn through them.

(b) The median is at the 40th value, giving about 27 minutes. The lower quartile is at the 20th value, about 18 min, and the upper quartile at the 60th, about 32 min; interquartile range $\approx 32 - 18 = 14$ minutes.

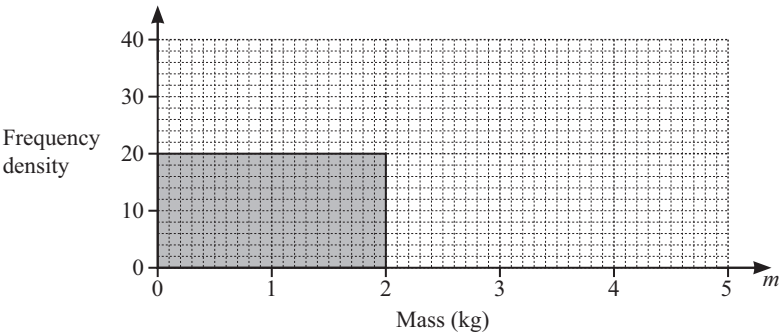
(c) Reading up from 35 gives a cumulative frequency of about 64; so about $80 - 64 = 16$ students took longer.

(d) The original data were **grouped**, so the individual times are no longer known; the curve assumes the values are spread evenly within each class, which is only an assumption — so every reading from it is an estimate.

25 Kai sorts parcels into two types, light and heavy.

Type of parcel	Mass (m kg)
Light	$0 < m \leq 2$
Heavy	$2 < m \leq 5$

The histogram shows some information about the number of parcels Kai sorts in one day.



(a) Find the number of light parcels.

..... [1]

(b) There are 102 heavy parcels.

Complete the histogram. [2]