

GCSE Maths: Cumulative frequency graphs (Higher): answers

GCSE Maths - Statistics - Higher - Lesson 24.13

Answers. Final answers to the worksheet questions. Full step-by-step solutions for every question are free at websink.site/gcse/maths/ch24-statistics/higher/cumulative-frequency-graphs/

Exercise 24M Cumulative frequency graphs Non-calculator

- 1 The table shows the heights of 60 plants.

Height	Frequency
$10 < h \leq 20$ cm	5
$20 < h \leq 30$ cm	12
$30 < h \leq 40$ cm	24
$40 < h \leq 50$ cm	14
$50 < h \leq 60$ cm	5

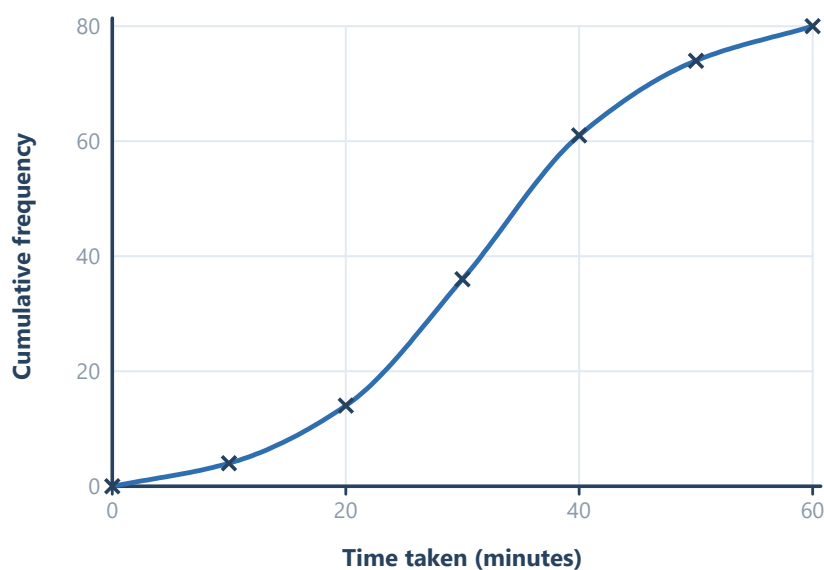
Work out the cumulative frequency for each class.

Answer: 5, 17, 41, 55, 60

- 2 Use the table in question 1 to draw a cumulative frequency graph.

Answer: See the cumulative frequency graph in the solution

- 3 The graph shows the times, in minutes, taken by 80 workers to complete a task. Use the graph to estimate (a) the median, (b) the lower quartile, (c) the upper quartile, (d) the interquartile range.



- (a) Median

Answer: 31.5 min

- (b) Lower quartile

Answer: 23.5 min

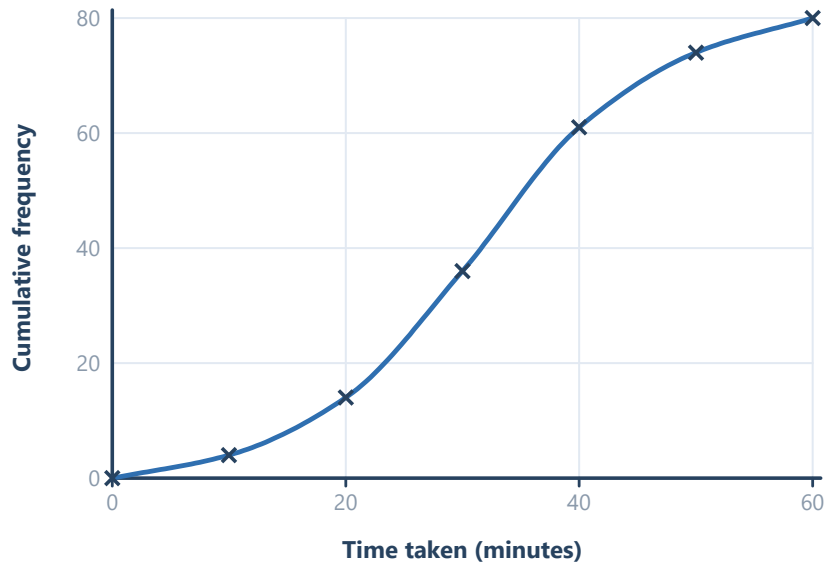
(c) Upper quartile

Answer: 39.5 min

(d) Interquartile range

Answer: 16 min

- 4 Use the same graph to estimate (a) the number of workers who took more than 45 minutes, (b) the number of workers who took less than 25 minutes, (c) the percentage of workers who took less than 20 minutes.



(a) More than 45 minutes

Answer: 11

(b) Less than 25 minutes

Answer: 24

(c) Percentage less than 20 minutes

Answer: 17.5%

- 5 Use the graph in question 3 to estimate the 90th percentile of the times.

Answer: 48 min

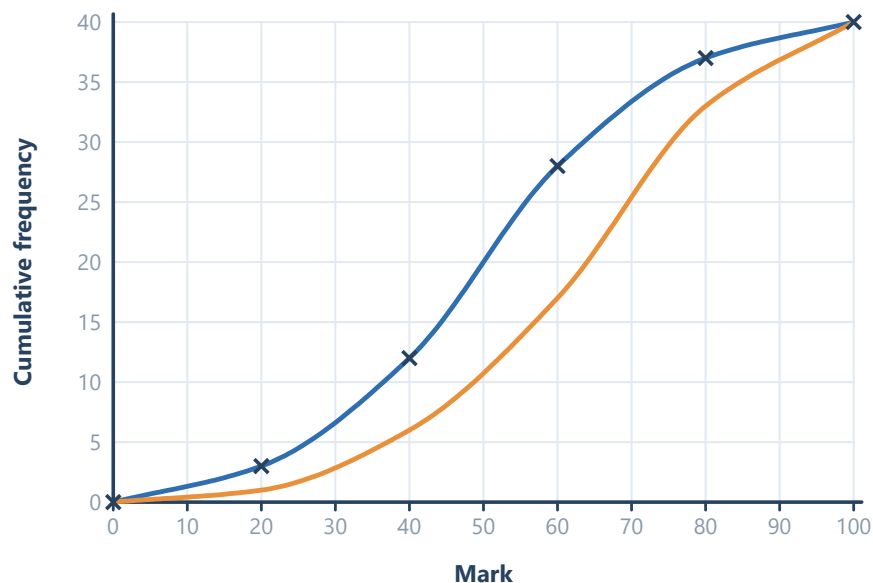
- 6 The table shows the marks of 100 students in a test.

Mark	Frequency
$0 < m \leq 20$	4
$20 < m \leq 30$	10
$30 < m \leq 40$	18
$40 < m \leq 50$	24
$50 < m \leq 60$	22
$60 < m \leq 80$	16
$80 < m \leq 100$	6

Draw a cumulative frequency graph.

Answer: See the cumulative frequency graph in the solution

- 7 The cumulative frequency graphs show the marks of 40 students in class A (blue) and class B (orange). (a) Estimate the median of each class. (b) Estimate the interquartile range of each class. (c) Compare the two classes.



- (a) Medians

Answer: Class A about 50, class B about 64

- (b) Interquartile ranges

Answer: Class A about 28, class B about 26

- (c) Comparison

Answer: Class B did better on average (median 64 compared with 50). Class A has the larger IQR so its marks are more spread out.

- 8 The cumulative frequency graph in question 3 shows the times of 80 workers. The company gives a bonus to the fastest 15% of workers. Estimate the longest time that a worker can take and still get the bonus.

Answer: 18.5 min

- 9 Use the graph in question 3 to estimate the number of workers who took between 25 and 45 minutes.

Answer: 45

- 10 Explain why cumulative frequency is plotted at the upper boundary of each class, not at the midpoint.

Answer: The cumulative frequency counts everything up to the end of the class, so it belongs at the upper class boundary.

- 11 A cumulative frequency curve passes through (0, 0), (10, 12), (20, 40), (30, 70) and (40, 80). (a) How many values are in the class $20 < x \leq 30$? (b) What percentage of all the values are 20 or less?

- (a) Values in $20 < x \leq 30$

Answer: 30

(b) Percentage 20 or less

Answer: 50%

12 The table is partly completed.

Time, t (minutes)	Frequency	Cumulative frequency
$0 < t \leq 10$	6	6
$10 < t \leq 20$	14	?
$20 < t \leq 30$	?	45
$30 < t \leq 40$	9	?
$40 < t \leq 50$	?	60

Complete the table.

Answer: 20, 25, 54, 6

13 A cumulative frequency graph for 120 values has median 38, lower quartile 30 and upper quartile 50. Estimate how many values are between 30 and 50. Explain your answer.

Answer: 60