

Frequency Polygons

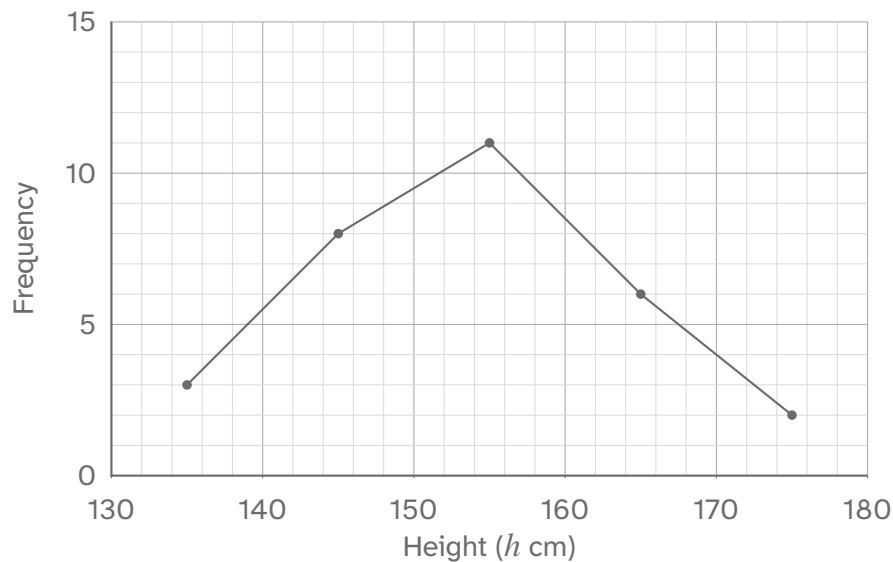
Solutions

For Pearson Edexcel GCSE Mathematics (1MA1) • Foundation tier

Each question is shown in grey, followed by the working, one step per line. The final answer is in a box. *Marks* shows how the marks are usually given in the exam, and **Tip** points out a common mistake.

1 (3 marks)

The frequency polygon shows information about the heights, h cm, of some students.



(a) How many students are shown on the frequency polygon?

Each point shows the frequency of one class.

Read the height of each point: 3, 8, 11, 6, 2

Add them: $3 + 8 + 11 + 6 + 2 = 30$

Answer: 30

Marks: 1 mark for adding the frequencies. 1 mark for 30.

- (b) Joe says, “The greatest height is 11, so the modal class is 11”
Explain why Joe is wrong.

11 is the frequency (the number of students), not a height.

The modal class is the class with the highest frequency.

The highest point is above 155, the midpoint of $150 < h \leq 160$.

So the modal class is $150 < h \leq 160$.

Answer: 11 is a frequency; modal class is $150 < h \leq 160$

2 (3 marks)

The table shows information about the times, in minutes, that 35 people spent in a shop.

Time (t minutes)	Frequency
$0 < t \leq 10$	4
$10 < t \leq 20$	9
$20 < t \leq 30$	12
$30 < t \leq 40$	7
$40 < t \leq 50$	3

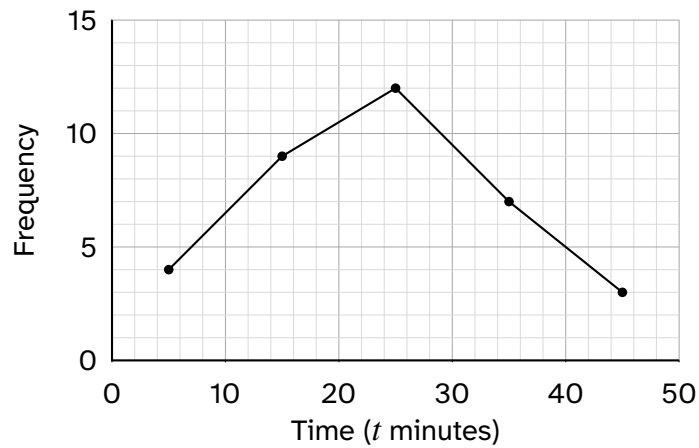
- (a) Draw a frequency polygon for this information.

Find the midpoint of each class: 5, 15, 25, 35, 45

Plot each frequency above its midpoint:

(5, 4), (15, 9), (25, 12), (35, 7), (45, 3)

Join the points in order with straight lines.



Answer: Points at midpoints joined

Tip: Plot at the **midpoints** (5, 15, 25, ...), not at the ends of the classes (10, 20, 30, ...). Use straight lines, and don't join the last point back to the first.

Marks: 2 marks for a fully correct polygon. 1 mark for points at the correct heights but at the ends of the classes, or for four correct points.

(b) Write down the modal class.

The modal class is the class with the highest frequency.

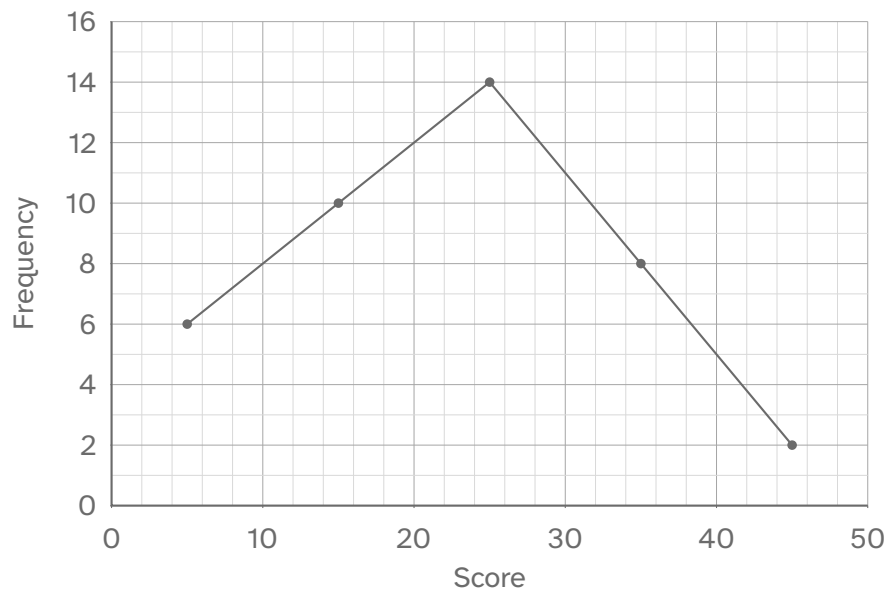
The highest frequency is 12.

Answer: $20 < t \leq 30$

3 (4 marks)

The frequency polygon shows information about the scores, s , of some students in a quiz.

No student scored more than 50



- (a) Use the frequency polygon to complete the frequency table.

Each point is plotted at the midpoint of its class.

For example, the point above 5 is for $0 < s \leq 10$.

Read the height of each point.

Score, s	Frequency
$0 < s \leq 10$	6
$10 < s \leq 20$	10
$20 < s \leq 30$	14
$30 < s \leq 40$	8
$40 < s \leq 50$	2

Answer: 6, 10, 14, 8, 2

Marks: 2 marks for all five correct. 1 mark for three correct.

- (b) What fraction of the students scored more than 30?
Give your answer in its simplest form.

More than 30: the classes $30 < s \leq 40$ and $40 < s \leq 50$

$$8 + 2 = 10 \text{ students}$$

$$\text{Total: } 6 + 10 + 14 + 8 + 2 = 40 \text{ students}$$

$$\text{Fraction} = \frac{10}{40} = \frac{1}{4}$$

Answer: $\frac{1}{4}$

Marks: 1 mark for $\frac{10}{40}$ (or equivalent). 1 mark for $\frac{1}{4}$.

4 (3 marks)

The table gives information about the masses, m grams, of 50 apples.

Mass (m grams)	Frequency
$100 < m \leq 120$	4
$120 < m \leq 140$	10
$140 < m \leq 160$	15
$160 < m \leq 180$	12
$180 < m \leq 200$	6
$200 < m \leq 220$	3

- (a) Find the class interval that contains the median.

$$\text{Total: } 4 + 10 + 15 + 12 + 6 + 3 = 50 \text{ apples}$$

The median is halfway between the 25th and 26th masses.

$$\text{First two classes: } 4 + 10 = 14 \text{ apples}$$

$$\text{First three classes: } 14 + 15 = 29 \text{ apples}$$

So the 25th and 26th are both in the third class.

Answer: $140 < m \leq 160$

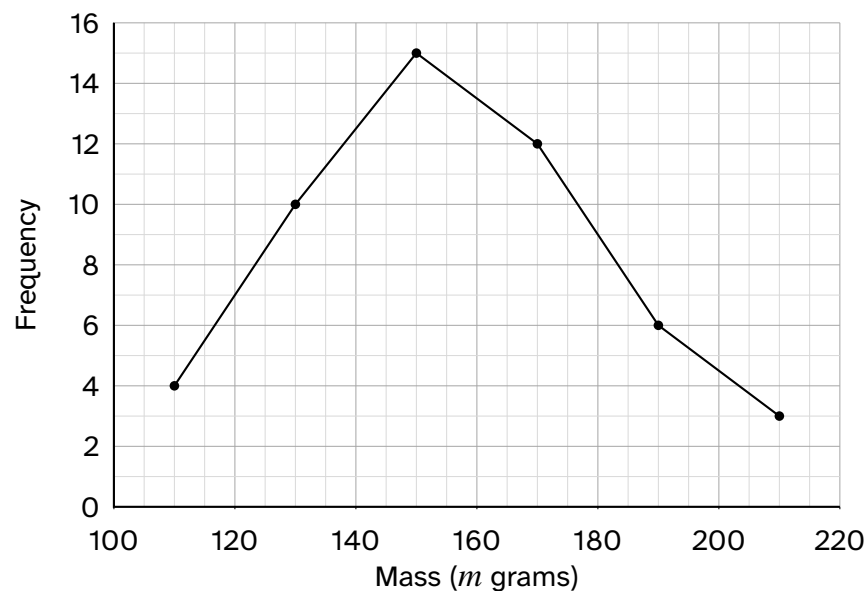
Tip: Count up through the frequencies to find where the 25th and 26th values are. Don't just pick the class in the middle of the table.

- (b) On the grid, draw a frequency polygon for the information in the table.

Midpoints: 110, 130, 150, 170, 190, 210

Plot (110, 4), (130, 10), (150, 15), (170, 12), (190, 6), (210, 3)

Join them with straight lines.



Answer: Points at midpoints joined

Tip: The classes are 20 g wide, so the midpoints are 10 g from each end: 110, 130, 150, and so on.

Marks: 2 marks for a fully correct polygon. 1 mark for five or six points at the correct heights (at the ends or midpoints).

5 (3 marks)

The table gives information about the masses, m kg, of 34 parcels.

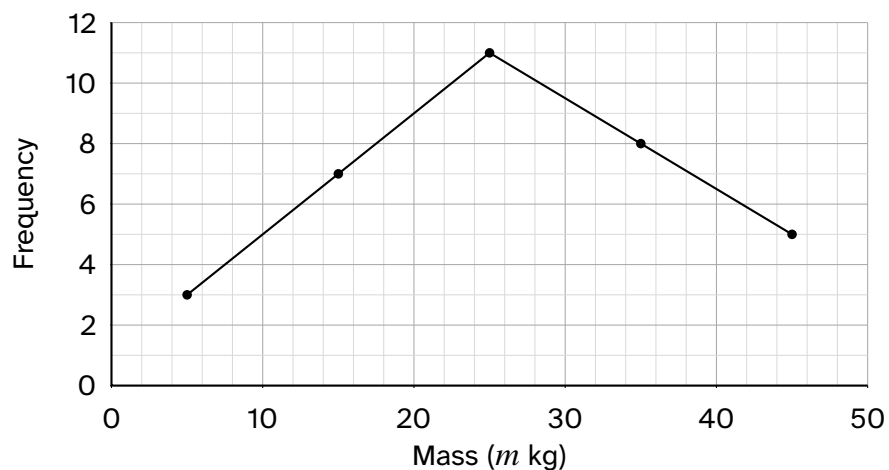
Mass (m kg)	Frequency
$0 < m \leq 10$	3
$10 < m \leq 20$	7
$20 < m \leq 30$	11
$30 < m \leq 40$	8
$40 < m \leq 50$	5

- (a) Draw a frequency polygon for this information.

Midpoints: 5, 15, 25, 35, 45

Plot (5, 3), (15, 7), (25, 11), (35, 8), (45, 5)

Join them with straight lines, using a ruler.



Answer: Points at midpoints joined

Tip: Don't draw a smooth curve through the points, and don't draw bars. A frequency polygon uses straight lines.

Marks: 2 marks for a fully correct polygon. 1 mark for four correct points, or for points at the ends of the classes.

- (b) Sam says, “*The heaviest parcel was 45 kg, because the last point of the frequency polygon is at 45*”

Explain why Sam could be wrong.

The points are plotted at the midpoints of the classes.

45 is the midpoint of $40 < m \leq 50$.

The heaviest parcel is somewhere in this class.

So it could be any mass more than 40 kg, up to 50 kg.

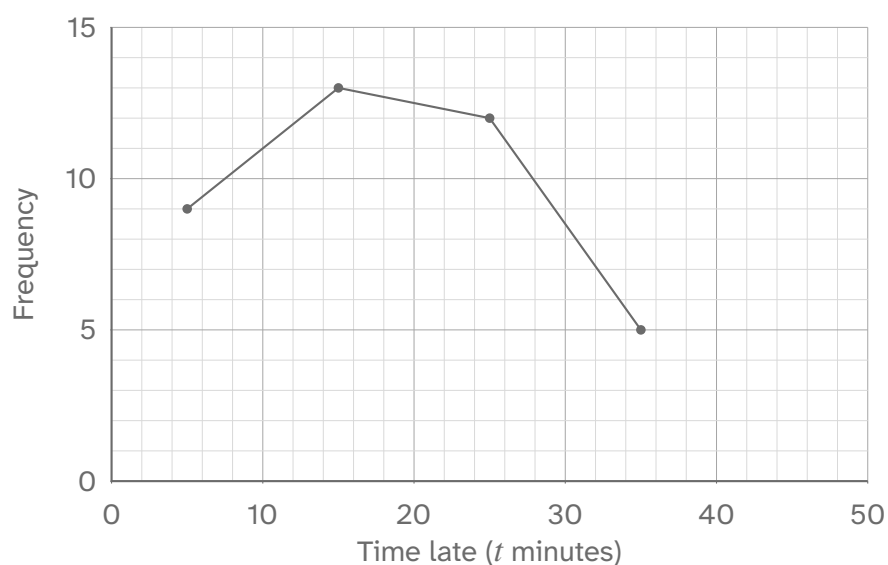
Answer: 45 is a midpoint; heaviest could be up to 50 kg

6 (2 marks)

The table gives information about how late, in minutes, 40 buses arrived at a bus station.

Time late (t minutes)	Frequency
$0 < t \leq 10$	9
$10 < t \leq 20$	13
$20 < t \leq 30$	10
$30 < t \leq 40$	5
$40 < t \leq 50$	3

Kofi draws a frequency polygon for the information in the table.



Write down **two** mistakes that Kofi has made.

The points should be at the midpoints: (5, 9), (15, 13), (25, 10), (35, 5), (45, 3)

Mistake 1: the point for $20 < t \leq 30$ is plotted at a frequency of 12. It should be at 10.

Mistake 2: there is no point for $40 < t \leq 50$. He should have plotted (45, 3) and joined it to (35, 5).

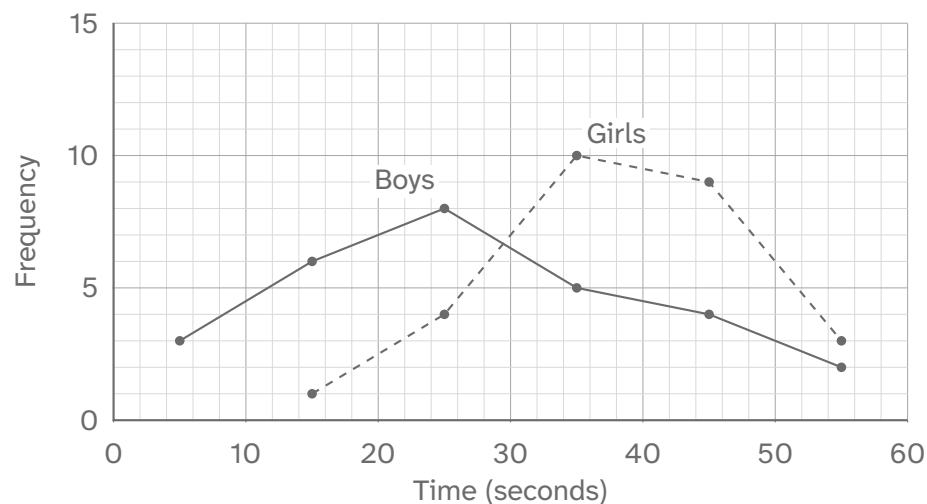
Answer: Point for $20 < t \leq 30$ plotted at 12 instead of 10; no point plotted for $40 < t \leq 50$

Tip: Check every point against the table: the midpoint of the class across, and the frequency up. Be precise about which point is wrong.

Marks: 1 mark for each correct mistake.

7 (2 marks)

The two frequency polygons show information about the times taken by some boys and some girls to solve a puzzle.



Compare the distributions of the times for the boys and the girls.

Average: the girls' polygon is further to the right.

So on average the girls took longer to solve the puzzle.

Spread: the boys' polygon covers a wider range of times (0 to 60 seconds).

The girls' times are all between 10 and 60 seconds.

So the boys' times are more spread out.

Answer: Girls longer on average; boys more spread

Marks: 1 mark for comparing the averages in context. 1 mark for comparing the spread.
