Histograms

A histogram displays the frequency of either continuous or grouped discrete data in the form of bars. There are several important features of a histogram which distinguish it from a bar chart.

- The bars are joined together.

- The bars can be of varying width.

- The frequency of the data is represented by the area of the bar and not the height (though in the case of bars of equal width, the area is directly proportional to the height of the bar and so the height is usually used as the measure of frequency).
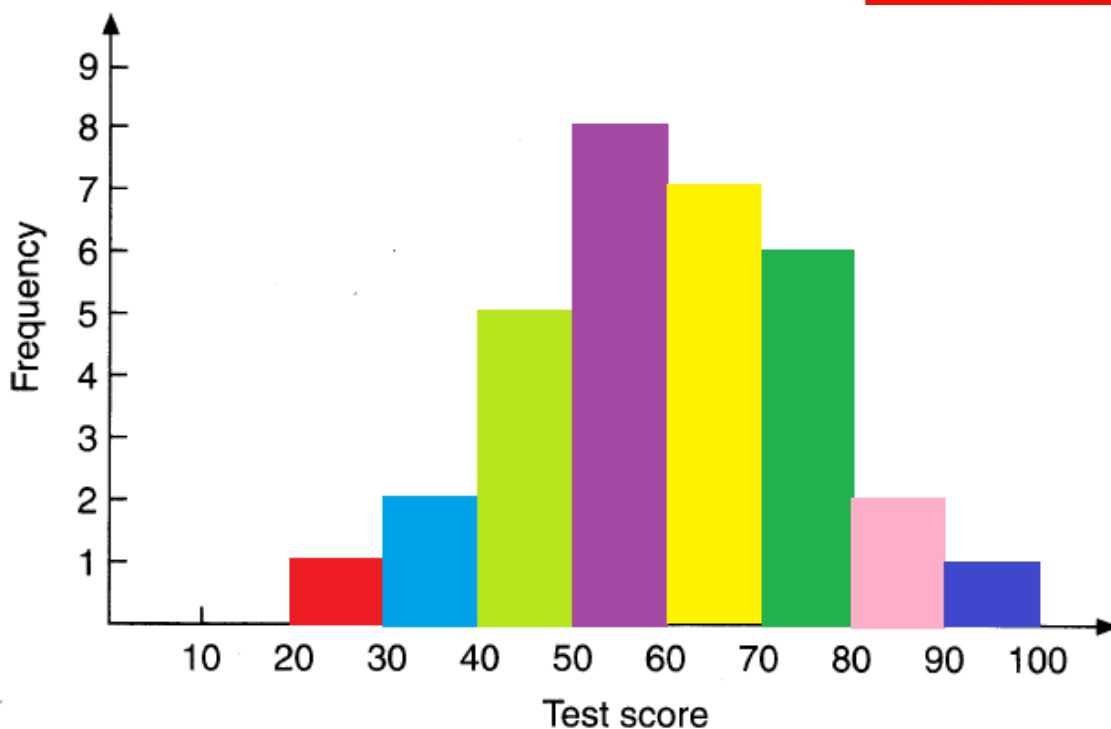
Worked example

The table shows the marks out of 100 in a maths test for a class of 32 students. Draw a histogram representing this data.

Test marks	Frequency
1–10	0
11–20	0
21–30	1
31–40	2
41–50	5
51–60	8
61–70	7
71–80	6
81–90	2
91–100	1

All the class intervals are the same. As a result the bars of the histogram will all be of equal width. and the frequency can be plotted on the vertical axis.

So far the work on histograms has only dealt with problems in which the class intervals are of the same width. This, however, need not be the case.

Worked example

This graph is misleading because it leads people to the conclusion that most of the sunflowers were under 1 m, simply because the area of the bar is so great. In actual fact only approximately one quarter of the sunflowers were under 1 m.

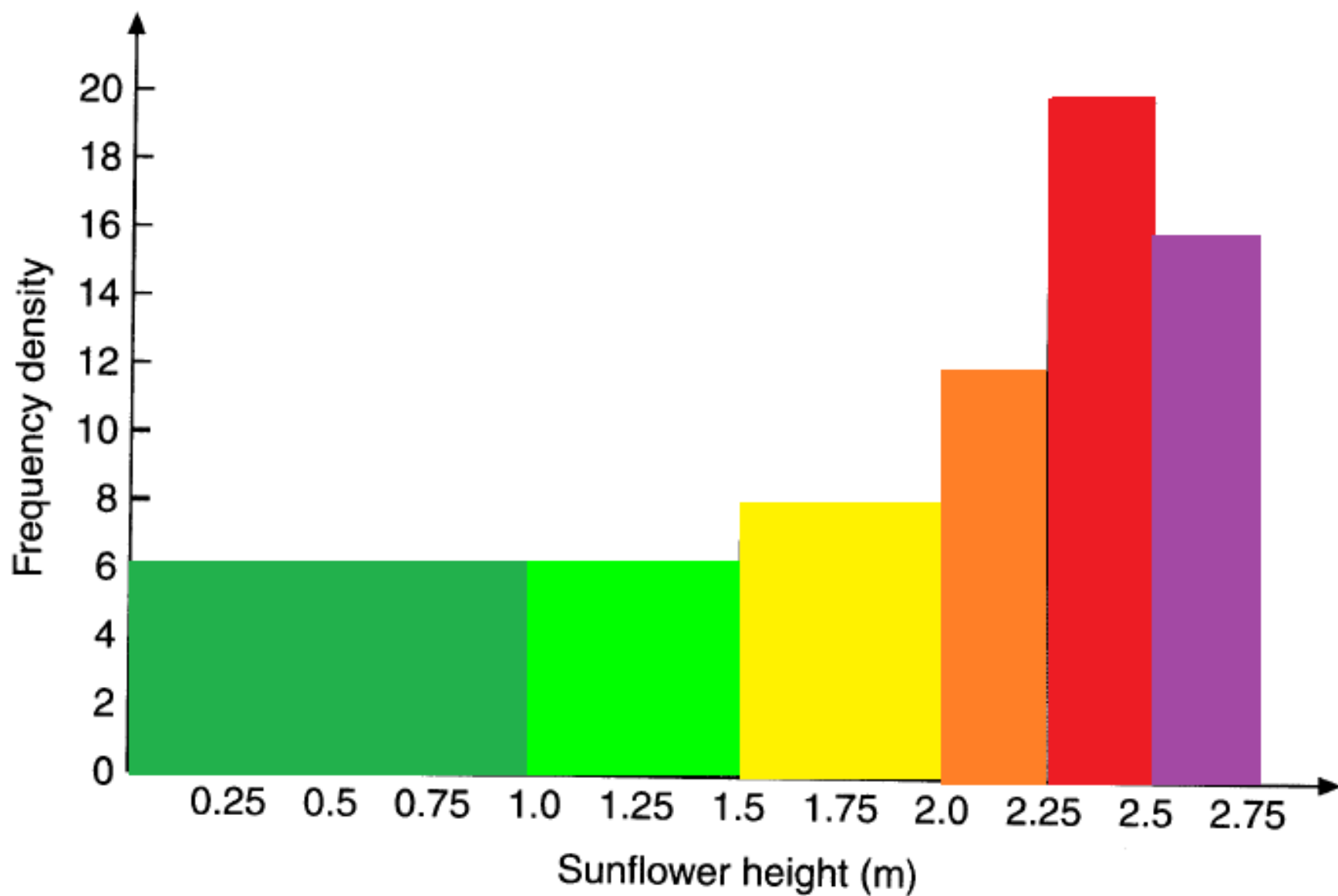| Height (m)	Frequency
$0 \leq h < 1.0$	6
$1.0 \leq h < 1.5$	3
$1.5 \leq h < 2.0$	4
$2.0 \leq h < 2.25$	3
$2.25 \leq h < 2.50$	5
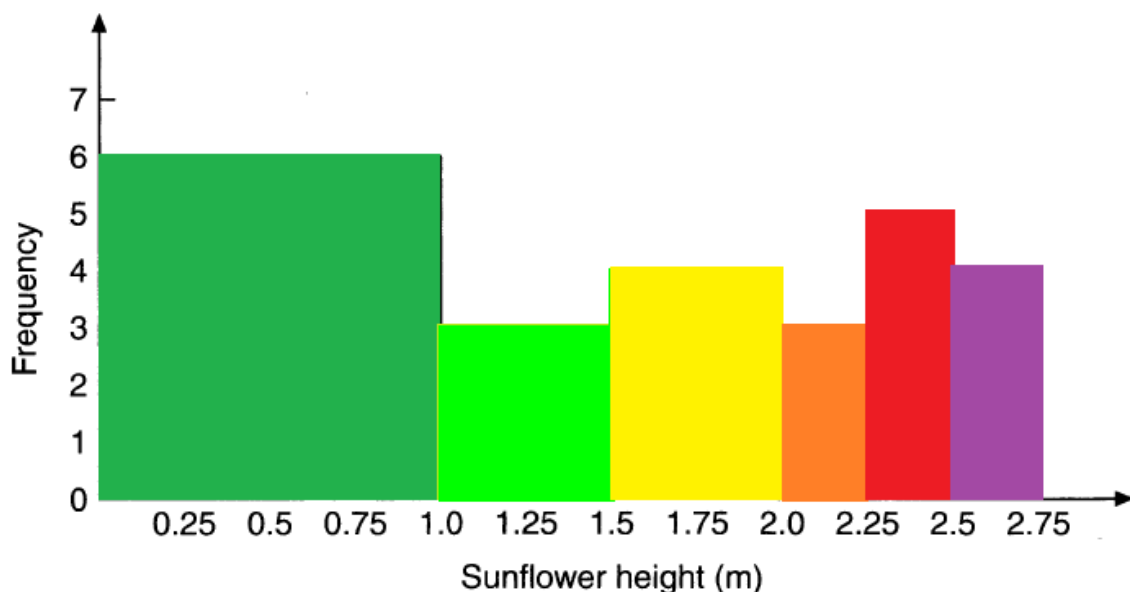
When class intervals are different it is the area of the bar which represents the frequency not the height. Instead of frequency being plotted on the vertical axis, **frequency density** is plotted.

$$\text{Frequency density} = \frac{\text{frequency}}{\text{class width}}$$

Why use a Histogram

- When there is a lot of data
- When data is
  - Continuous
    - a mass, height, volume, time etc
  - Presented in a Grouped Frequency Distribution
    - usually in groups or classes that are UNEQUAL