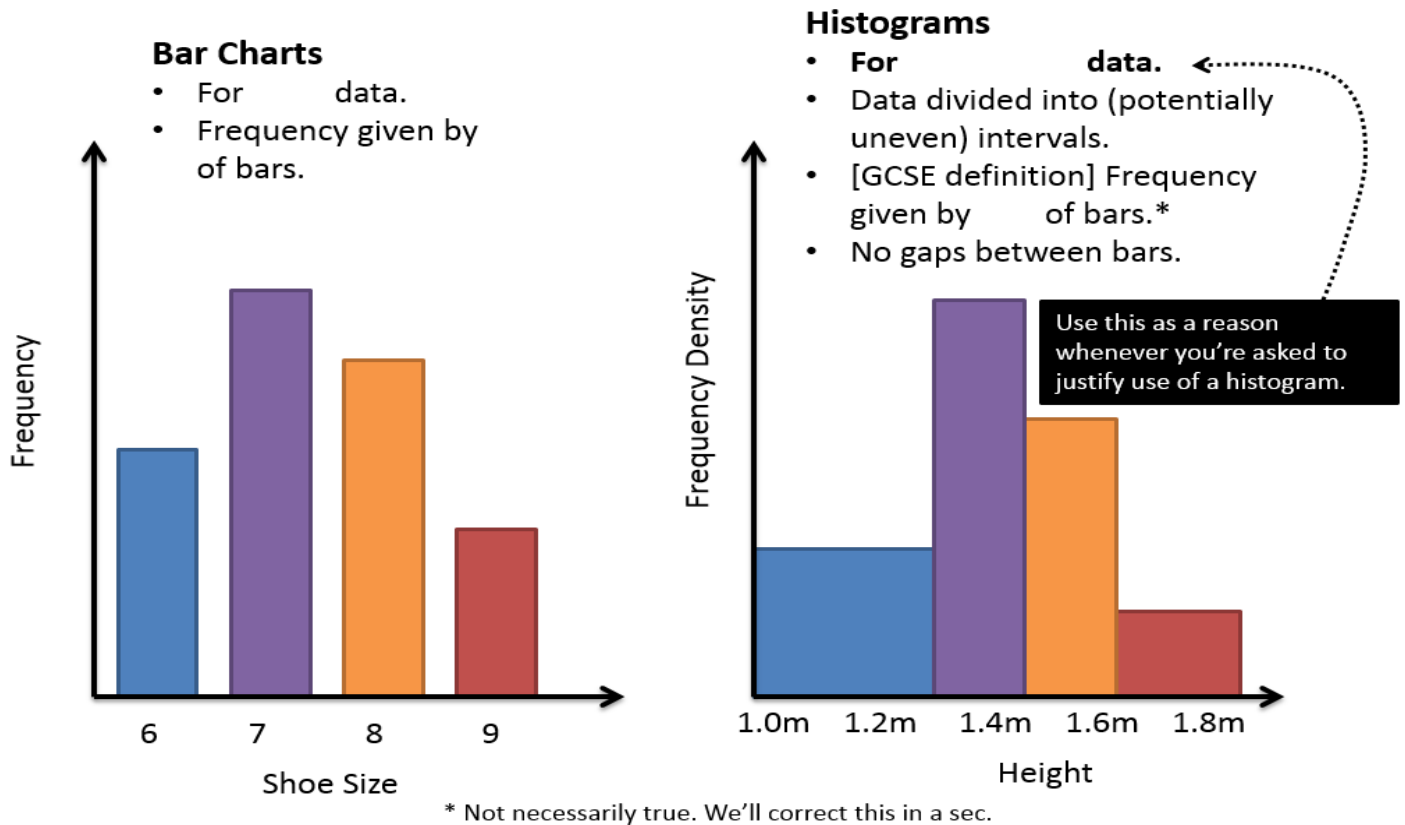## Histograms

You should remember from GCSE that there are some important differences between bar charts and histograms. We will consider 4 important skills.

Bar Charts
- For ____ data.
- Frequency given by ____ of bars.

Histograms
- For ____ data. ←
- Data divided into (potentially uneven) intervals.
- [GCSE definition] Frequency given by ____ of bars.*
- No gaps between bars.

Use this as a reason whenever you're asked to justify use of a histogram.

Not necessarily true. We'll correct this in a sec.

Example

1. Calculate the missing values in the table below

Weight (w kg)	Frequency	Frequency Density
0 < w ≤ 10	40	
10 < w ≤ 15	6	
15 < w ≤ 35		2.6
35 < w ≤ 45		1

2. Calculate the frequencies
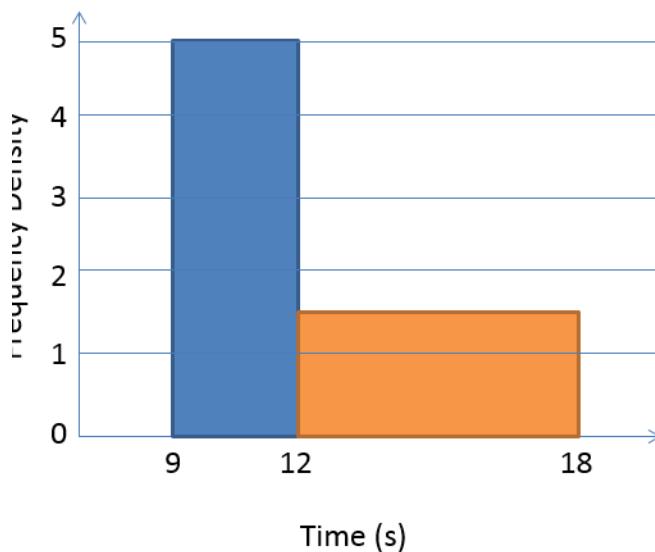
Frequency =

Frequency =

Frequency =
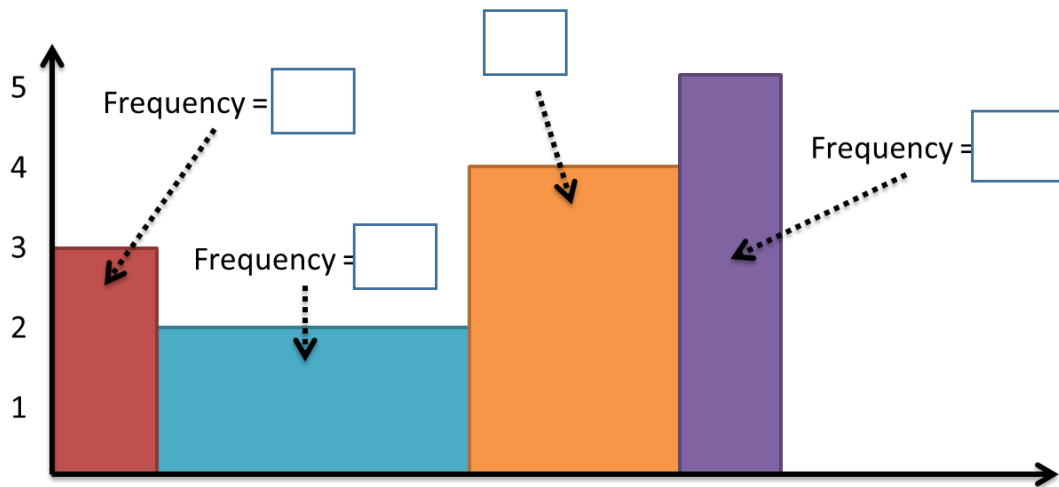
Frequency =

1. Let's consider the area of the bars:
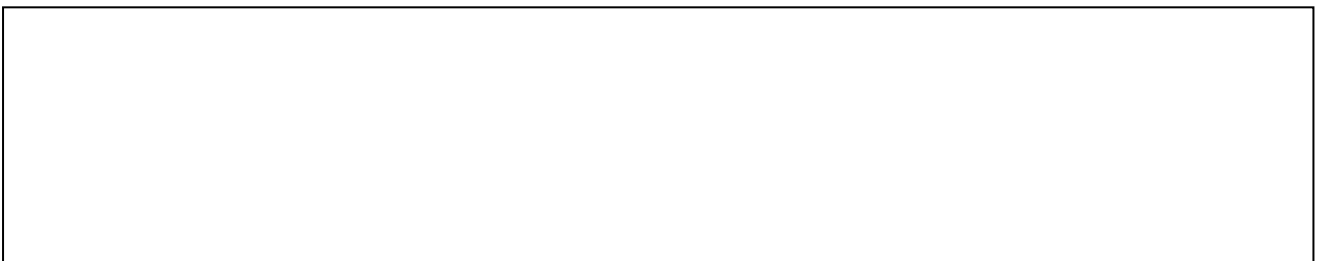
Example

There were 60 runners in a 100m race. The following histogram represents their times. Determine the number of runners with times above 14s.

Total frequency is known; therefore find total area and hence the 'scaling'.

Then use this scaling along with the desired area.

Frequency Density

Time (s)

9   12   18

2

Test Your Understanding

A policeman records the speed of the traffic on a busy road with a 30 mph speed limit. He records the speeds of a sample of 450 cars. The histogram in Figure 2 represents the results.

Frequency density
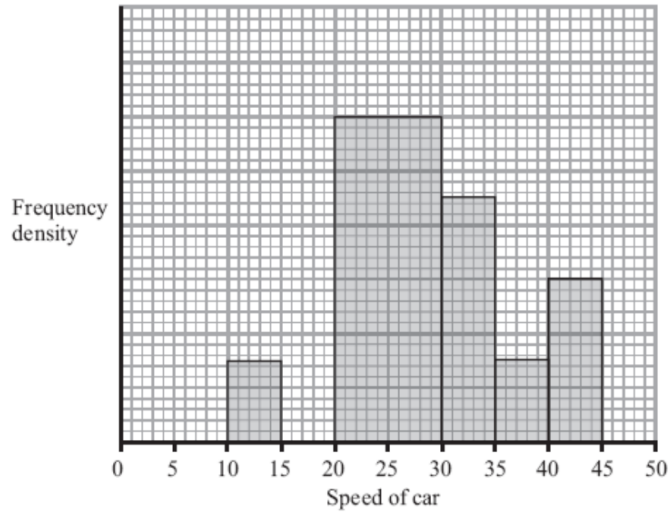
Speed of car

(a) Calculate the number of cars that were exceeding the speed limit by at least 5 mph in the sample.   *(4 marks)*

(b) Estimate the value of the mean speed of the cars in the sample. *(3 marks)*

(c) Estimate, to 1 decimal place, the value of the median speed of the cars in the sample.(2)

2. Let's Consider the gaps between the classes:

Example

Weight (to nearest kg)	Frequency	F.D.
1-2	4	
3-6	3	
7-9		

For simplicity we can set the scaling between area and frequency to be 1.

Note the gaps affects class width!
Remember the frequency density axis is only correct to scale, so there may be some scaling. However in an exam scaling is unlikely to be required for F.D. if the F.D. scale is already given.
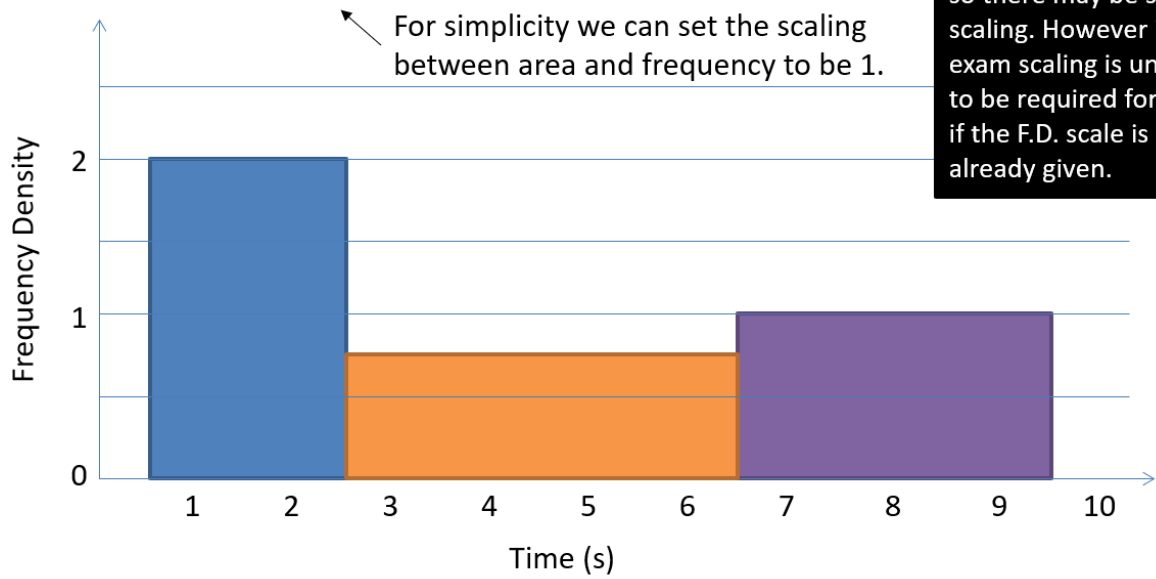
3. **Let's consider the width and height on the diagram**

An exam favourite is to ask what width and height we'd draw a bar in a drawn histogram.

Example:

The frequency table shows some running times. On a histogram the bar for 0-4 seconds is drawn with width 6cm and height 8cm. Find the width and height of the bar for 4-6 seconds.

Time (seconds)	Frequency
$0 \leq t < 4$	8
$4 \leq t < 6$	9

Tip:

 0 -4 class

Class width =   Drawn width =   Scaling =

Frequency Density (height) =   Drawn height =   Scaling =

4-6 class:

Test Your Understanding

[May 2009 Q3] The variable x was measured to the nearest whole number. Forty observations are given in the table below.
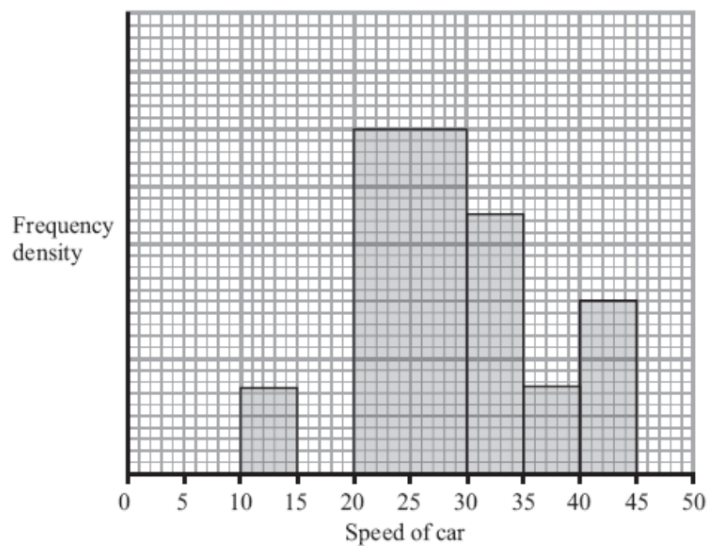
x	$10-15$	$16-18$	$19-$
Frequency	15	9	16

A histogram was drawn and the bar representing the $10-15$ class has a width of 2 cm and a height of 5 cm. For the $16-18$ class find

(a) the width,   **(1)**
(b) the height   **(2)**
of the bar representing this class.

4. Forming a frequency polygon

Recall that a frequency polygon can be drawn by using the midpoint of each interval.
This corresponds to the midpoint of the top of each bar in a histogram.

Frequency density vs Speed of car