Drawing histograms

Starter

1.   In pairs, compare the bar chart and histogram below. Write down the similarities and differences between a bar chart and a histogram
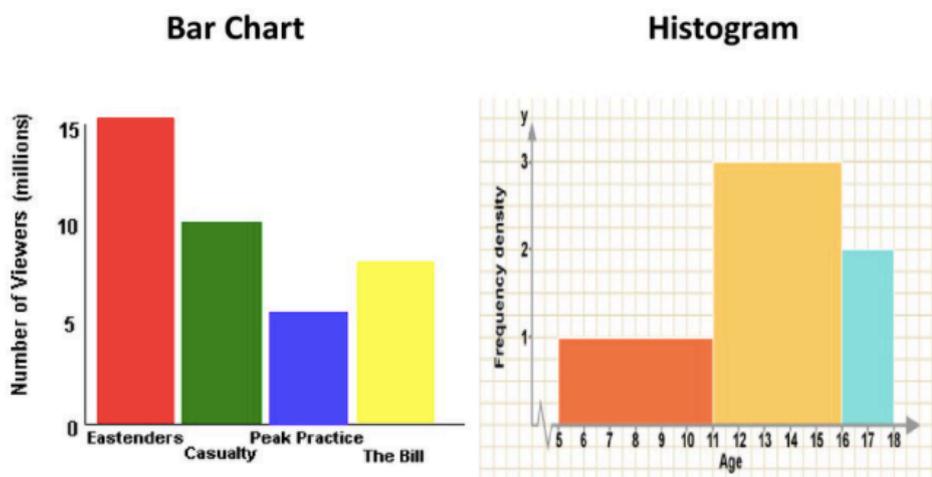
Notes

The horizontal axis on a histogram is a *continuous scale* so there must be no gaps between the bars. Histograms are used with *grouped data*.

Big idea: in a histogram, *the area of the bar equals the frequency of the group*

From this we can get the formula for the vertical scale, *frequency density*.

$$\text{Frequency density} = \frac{\text{Frequency}}{\text{Class width}}$$

N.B.   After drawing the histogram, check that the area of each bar equals the frequency.

Continuous class widths vs. non-continuous class widths

Histograms are easy to draw when there are continuous class widths i.e. the end of one interval is the start of the next.
For example, $10 \leq h < 20, 20 \leq h < 30, 30 \leq h < 40$ etc. *(See E.g. 1 below).*

They become much more difficult when the class widths are not continuous.
For example, $120-124, 125-129, 130-134$ etc. *(See E.g. 2 below).*

E.g. 1 The speeds of cars passing a particular point on the M1 was carried out. Draw a histogram to show the data.

Speed, v (mph)	$0 < v \leq 40$	$40 < v \leq 50$	$50 < v \leq 60$	$60 < v \leq 70$	$70 < v \leq 80$	$80 < v \leq 100$
Frequency	80	10	40	110	60	60

Working: Draw an extra row to the table as we need to calculate frequency densities

Use the formula $\text{Frequency density} = \dfrac{\text{Frequency}}{\text{Class width}}$

Speed, v (mph)	$0 < v \leq 40$	$40 < v \leq 50$	$50 < v \leq 60$	$60 < v \leq 70$	$70 < v \leq 80$	$80 < v \leq 100$
Frequency	80	10	40	110	60	60
Frequency density	2	1	4	11	6	3
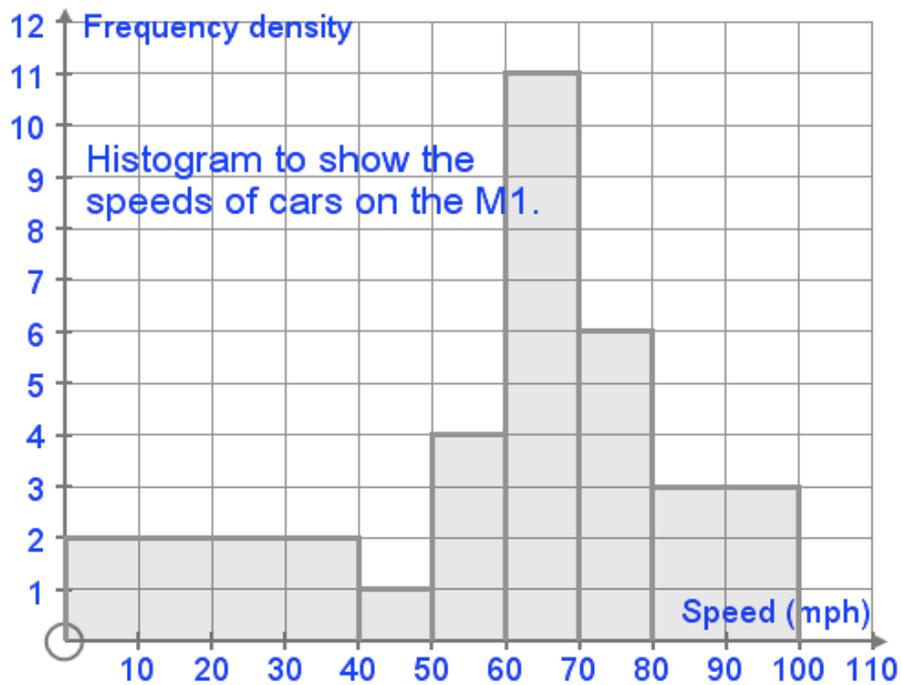
E.g. 2 The heights of a group of girls were measured to the nearest centimetre. Draw a histogram to represent the data. *Include 4 more columns with your table.*

Height (h, cm)	Frequency
152-153	64
154	43
155	47
156-159	96
160	12

Working: This histogram is much harder to draw because the class widths are not continuous — how can we draw a rectangle for class width 154?
The heights are measure to the nearest cm.
152–153 means 151.5—153.5
154 means 153.5—154.5
Fill in the rest of the table

Height (h, cm)	Frequency	Lower bound	Upper bound	Interval width	Frequency density
152-153	64	151.5	153.5	2	
154	43	153.5	154.5	1	
155	47				
156-159	96				
160	12				

Video: **Drawing histograms**

Solutions to Starter and E.g.s

Exercise
9-1 class textbook: p486 E14.4 Qu 1-6
A*-G class textbook: p442 E14.1 Qu 1-6
9-1 homework book: p167 E14.4 Qu 1-3
A*-G homework book: p125 E14.1 Qu 1-3

Summary
Histograms are used with ***grouped data***, with no gaps between the bars.
    Area of the bar equals the frequency of the group
The vertical scale is ***frequency density***.

$$\text{Frequency density} = \frac{\text{Frequency}}{\text{Class width}}$$

Homework book answers (only available during a lockdown)