Statistics

Guidance for tutors

| Outcome	S8	Student can consistently:	Draw and interpret histograms.
How the topic is examined	- Examined through the exam paper. - This topic is examined on both calculator and non-calculator papers. - There are several types of questions that could be examined. - Drawing a histogram for data with unequal class intervals. - Determining a frequency distribution from a histogram given the frequency densities or information about one of the class intervals.		
Prior knowledge	- Students should be confident: - Multiplying and dividing without a calculator - Simplifying a fraction - Converting between a fraction and decimal. - Rearrange formulae (AEx8)		
Suggested tuition approaches	- A histogram is a graphical way of representing continuous (measured) data. It can be drawn when data is presented in the form of class intervals. Note that the intervals will likely be of unequal size. - Students should understand that in a histogram the area of the bars represent the frequency of the particular class interval. So the bigger the area the greater the frequency. Therefore, for each bar we need to work out a frequency density. - There are several types of questions that could be examined. - Drawing a histogram for data with unequal class intervals. - Determining a frequency distribution from a histogram given the frequency densities or information about one of the class intervals. - Regardless of what students have been asked to do in the question they will likely need to find or use frequency densities. - The formula for frequency density is calculated using $Freqeuncy\ density = \frac{Frequency\ of\ class\ interval}{Width\ of\ the\ class\ interval}$ - To find the set of frequencies, students would need to rearrange this formula ($Frequency\ =\ Freq\ Den\ \times\ Width$) - The class width is the difference between the upper limit of the class and the lower limit.		

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We will draw a histogram for the following data (in black in the table)

Make two extra columns. One for the class width and one for the frequency density.

Height (cm)	Frequency	Class Width	Frequency Density
0 < x ≤ 10	6	10	6 ÷ 10 = 0.6
10 < x ≤ 20	24	10	24 ÷ 10 = 2.4
20 < x ≤ 30	37	10	37 ÷ 10 = 3.7
30 < x ≤ 50	28	20	28 ÷ 20 = 1.4
50 < x ≤ 100	25	50	25 ÷ 50 = 0.5

Now we draw a series of bars between the limits of each interval and the height of the bars is the frequency density.

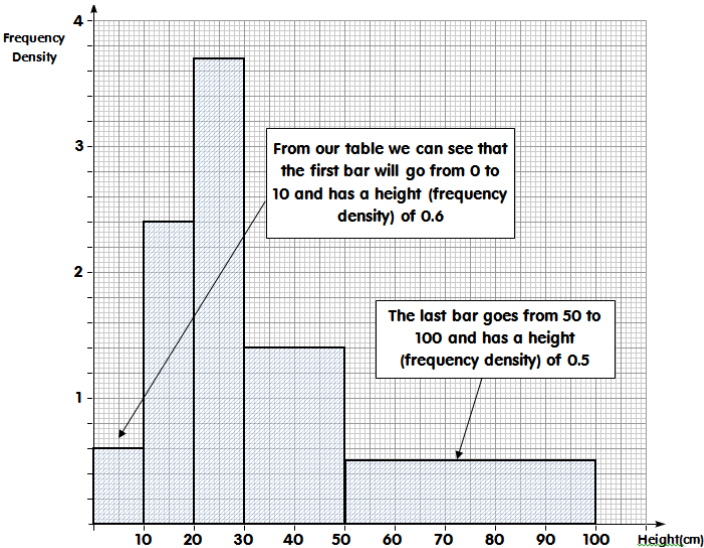Find the set of frequencies for the following histogram.
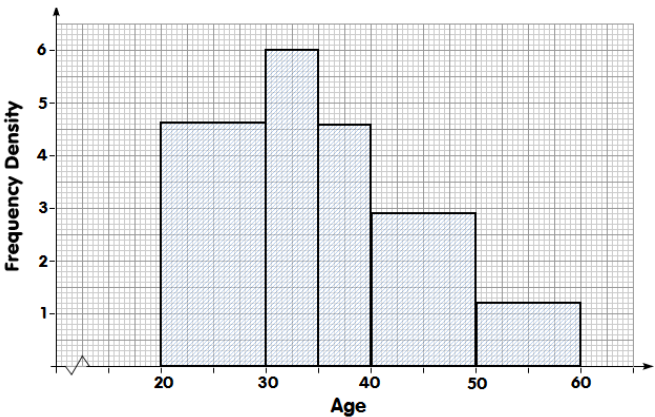
Remember frequency is calculated by multiplying the frequency density by the class width.

You should make a table of results.

Height (cm)	Frequency
20 < x ≤ 30	10 x 4.6 = 46
30 < x ≤ 35	5 x 6 = 30
35 < x ≤ 40	5 x 4.6 = 23
40 < x ≤ 50	10 x 2.9 = 29
50 < x ≤ 60	10 x 1.2 = 12

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From our table we can see that the first bar will go from 0 to 10 and has a height (frequency density) of 0.6

The last bar goes from 50 to 100 and has a height (frequency density) of 0.5

- Encourage students to shade in the bars (lightly or diagonal shading) as the exam scripts get scanned into a computer and it is important the examiner can see the areas/heights of the bars. It is advisable to use a pencil.
- Occasionally students may not be told the frequency density scale. Instead they will be given information about the frequency of one of the bars. From this students need to work out the frequency density (height of the bar) and then they can work out the other bars.

Common errors and misconceptions	- Students make lots of mistakes reading off values from the scale. Encourage them to work out what one small square represents before they start the question. - Students struggle to calculate the set of frequency densities, particularly when it is on a non-calculator exam. To help give students plenty of practice on diving by 10, 20, 50 etc… - Mistakes are common when multiplying by decimals. Remind students that the frequencies should be whole numbers. - Students shade in the wrong area in pen and cannot change it. Students should always use a pencil in case mistakes like this happen.

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Suggested resources	• Questions
	    o http://www.cimt.org.uk/projects/mepres/allgcse/bkb8.pdf (pp 132 - 140)
	    o https://corbettmaths.files.wordpress.com/2013/02/histograms-pdf.pdf
	• Past GCSE Questions
	    o https://keshgcsemaths.files.wordpress.com/2013/11/109_histograms.pdf
	• Video tutorial
	    o http://corbettmaths.com/2012/08/20/drawing-histograms/
	    o http://corbettmaths.com/2012/08/19/finding-frequencies-from-histograms/
	    o http://corbettmaths.com/2012/08/23/reading-histograms-and-a-gcse-questions/