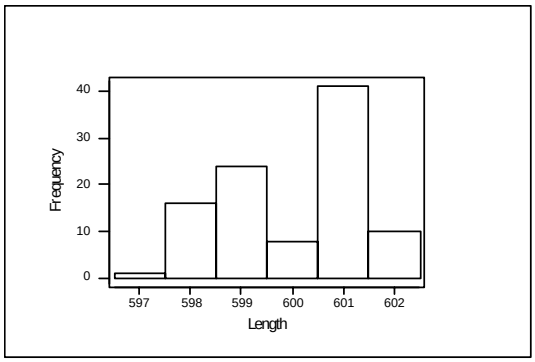
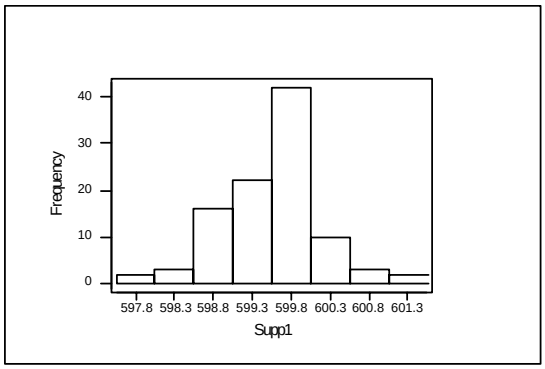
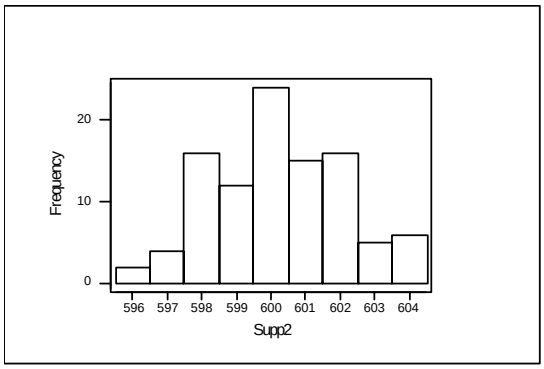
Outline Solutions to Tutorial Sheet 1

1. Retrieve the worksheet in Minitab, cut and paste into Excel and use the *Chart Wizard.*

2.







The histogram from the plant (top) is bimodal while the distributions of lengths from each supplier are symmetrical and bell-shaped.

3. To deal with unequal class widths in Minitab, first select *Graph→Histogram*, select the column with the task times in *Graph Variable* then go to *Options…*
For *Type of Histogram* select *Density*. Finally, to reproduce the histogram with the classes as on page 20 of the lecture notes, select *CutPoint* under *Type of Intervals* and in the *Define intervals using values* box, list out the values where you want the rectangles to meet (separated by spaces). For example, for classes of 10-20, 20-30, 30-50, 50-75 you would simply enter 10 20 30 50 75.

   The shape of this distribution is positively skew (or skew to the right).

4. (a) The mean, $\bar{X}$ = 21.9/9 = 2.43cm.

   In order the values are 1.9 2.1 2.2 2.2 2.5 2.5 2.7 2.8 3.0

   The middle value (the median) is then 2.5cm.

   (b) In metres these would be 0.0243m and 0.025m respectively.

5. *Stat→Basic Statistics→Descriptive Statistics*
gives the mean task time as 36.6 seconds and the median as 33.0 seconds.

The mean is rather larger than the median because the data is positively skew (i.e. there is a substantial number of relatively large values which is dragging the mean up). The preferred measure of 'average' would be the **median**.

6.

		Mean	*Median*
Camshaft lengths (mm)	*Plant*	600.07	600.6
	Supplier 1	599.55	599.6
	Supplier 2	600.23	600.2

The histograms in question 2 show that the plant lengths are bimodal while both suppliers distributions are symmetrical. Thus it may be better to report the two modes for the plant data rather than either the mean or the median. These would be approximately 599 and 601.

As for each supplier, the mean is about the same as the median – as you would expect for a symmetrical distribution. The mean would then be preferred as a measure of location.

On average, camshafts from supplier 1 are slightly longer than those from supplier 2, but the difference is marginal and likely to be a chance sampling effect.