Outline Solutions to Tutorial Sheet 2

1. (a) Range = 3.0 – 1.9 = **1.1cm**
   (b) Ordered data : 1.9 2.1 2.2 2.2 2.5 2.5 2.7 2.8 3.0

   With 9 values the lower quartile is the $\left(\frac{9+1}{4}\right)$th highest value

   i.e. half way between the 2nd and 3rd highest values. Thus Q_1 = **2.15**

   Similarly the upper quartile is the $\left(\frac{3(9+1)}{4}\right)$th highest value

   i.e. half way between the 7th and 8th highest values. Thus Q_3 = **2.75**

   Then the IQR = 2.75 – 2.15 = **0.60cm**

2. The shape of the distribution is positively skew so the IQR is a suitable measure of variation (and the median is a suitable measure of location).

   The quartiles (Q1 and Q3) of a column of data can be found in Minitab under *Stat→Basic Statistics→Descriptive Statistics*. This gives:
   IQR = 43.50 – 24.00 = **19.50seconds**

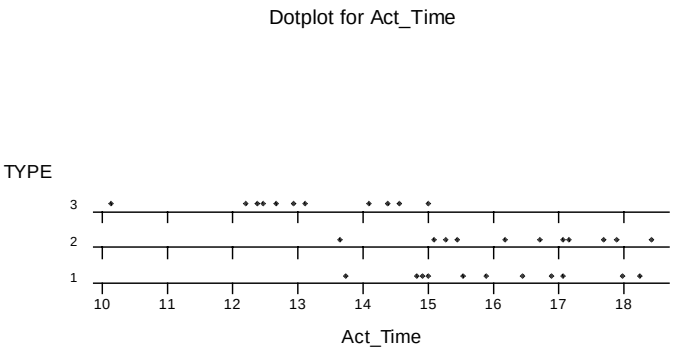
3.

		Mean	*S.D.*
Camshaft	*Plant*	600.07	1.34
lengths (mm)	*Supplier 1*	599.55	0.62
	Supplier 2	600.23	1.87

   On average, camshaft lengths are very similar but there is a marked difference in standard deviations. Most notably the variation in lengths from supplier 2 is considerably higher than that from supplier 1 (illustrated in question 5). This would suggest that, all other things being equal, the plant would prefer supplier 2 since their camshafts are more consistent with regard to length.

4. Enter all 33 values in one column (C1 say) and in another column (C2 say) enter eleven ‘1’s, eleven ‘2’s and eleven ‘3’s to indicate the corresponding type. The easiest way to do this is to use *Calc→Set Patterned Data*

   (a) Use *Graph→Dotplot*, enter C1 under *Variables*, check the *By variable* box and enter C2 in the box to the right. This gives:



(b) Use *Stat→Basic Statistics→Descriptive Statistics*, enter C1 under *Variables*, check the *By variable* box and enter C2 in the box to the right. This gives:

	TYPE	N	MEAN	MEDIAN	TRMEAN	STDEV	SEMEAN
Act_Time	1	11	16.030	15.930	16.048	1.412	0.426
	2	11	16.420	16.730	16.506	1.439	0.434
	3	11	13.078	12.910	13.188	1.378	0.416

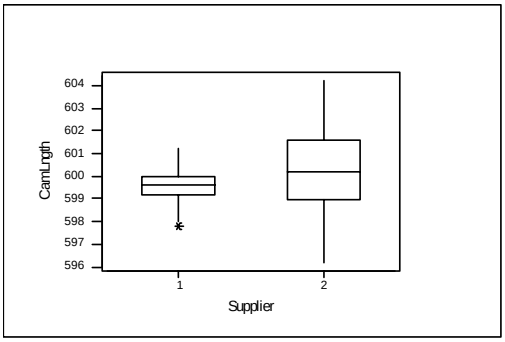
	TYPE	MIN	MAX	Q1	Q3
Act_Time	1	13.690	18.210	14.930	17.070
	2	13.650	18.420	15.300	17.730
	3	10.170	15.000	12.340	14.370

The means and standard deviations can be taken from here.

Conclusions

The standard deviations are very similar so there is not much to choose between them with regard to variation in activation time. However the means are rather different. In particular, the type C fire detection system activates about 3 seconds quicker than its nearest rival. This would probably make it the preferred option.

5. Use *Manip→Stack* to stack columns and store in a spare column (C4 say).
Use *Calc→Set Patterned Data* to enter the 100 ‘1’s and 100 ‘2’s (in C5 say)
Use *Graph→Boxplot…* enter C4 for *‘Y’* and C5 for *‘X’* and you should get:



The greater variation in lengths from supplier 2 is clearly shown.