Premedical course
Solution to MINITAB practical 6

Question 1. If the data are entered into a column named IQ the output should look something like the following.

```
MTB > TTest 100 'IQ';
SUBC>   Alternative 0.

TEST OF MU = 100.00 VS MU N.E. 100.00

             N      MEAN    STDEV   SE MEAN        T    P VALUE
IQ          25     95.44    10.83      2.17    -2.10      0.046

MTB > TInterval 95.0 'IQ'.

             N      MEAN    STDEV  SE MEAN   95.0 PERCENT C.I.
IQ          25     95.44    10.83     2.17  (   90.97,   99.91)
```

We may deduce that the mean IQ of the children in the study is rather low. The difference from 100 is significant at the 5% level, and this is reflected in the 95% confidence interval not (quite) containing the value 100. The width of the confidence interval, however, suggests that a larger sample, if it were available, would be useful.

Question 2. First it is necessary to create a column to contain the (signed) differences between the two sets of readings. Then we perform a one-sample t-test. Both the one-tailed and the two-tailed tests have been illustrated, though the latter is to be preferred even though the purpose of the treatment was to *lower* serum cholesterol. Adequate interpretation would involve knowing more about the treatment given, what would be regarded as a worthwhile reduction in serum cholesterol, over what period the study had been carried out, how the subjects had been selected, why there was no control group and whether there was a possibility of regression to the mean.

```
MTB > Let 'drop' = 'before'- 'after'
MTB > TTest 0 'drop';
SUBC>   Alternative 0.

TEST OF MU = 0.0000 VS MU N.E. 0.0000

             N      MEAN    STDEV   SE MEAN        T    P VALUE
drop        11    0.1909   0.3208    0.0967     1.97      0.077

MTB > TTest 0 'drop';
SUBC>   Alternative 1.

TEST OF MU = 0.0000 VS MU G.T. 0.0000

             N      MEAN    STDEV   SE MEAN        T    P VALUE
drop        11    0.1909   0.3208    0.0967     1.97      0.038
```

Question *3*. It should be relatively clear from the table of data that the method of data collection was to count cells in whole crypts until at least 500 cells had been collected. It is therefore inappropriate to compare total cells between the two media, but one should find the 'labelling index' as the proportion of cells which are labelled. We have actually used percentages. The two-sample t-test is appropriate; this is available in alternative forms, depending whether the data for the two samples are in separate columns or in a single column with another column providing an index to the two treatments. Here we have used the former scheme. We have assumed equal variance for the two media.

```
MTB > Let 'a index' = 100* 'a prolif'/ 'a total'
MTB > Let 'b index' = 100* 'b prolif'/ 'b total'
MTB > TwoSample 95.0 'a index' 'b index';
SUBC>   Alternative 0;
SUBC>   Pooled.

TWOSAMPLE T FOR a index VS b index
          N      MEAN     STDEV   SE MEAN
a index  10     29.84      2.52      0.80
b index  10     27.85      2.79      0.88

95 PCT CI FOR MU a index - MU b index: ( -0.50,  4.49)

TTEST MU a index = MU b index (VS NE): T= 1.68  P=0.11  DF=  18

POOLED STDEV =       2.66
```

There is no significant difference between the treatments, but if a difference of 4% was regarded as important then we would have to conclude that the study was too small, as both zero and 4% lie in the 95% confidence interval for the difference between the means.

The study could be enlarged in two ways: either more cells could be counted per replicate, or more replicates could be counted. [How might you decide which of these was better?]