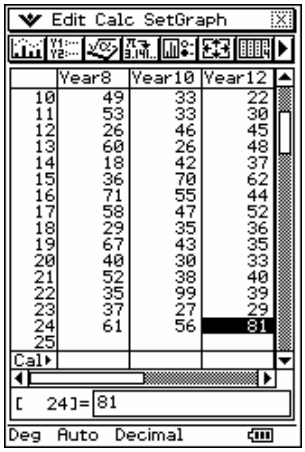
Older, yes…smarter, maybe?

Checkpoints

Activity 1 – Having a look at Box Plots.

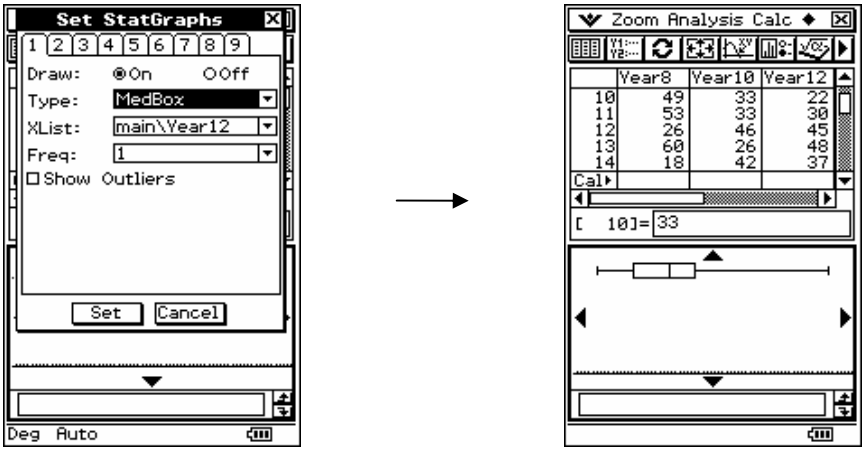
A. With the three samples entered into Statistics mode,



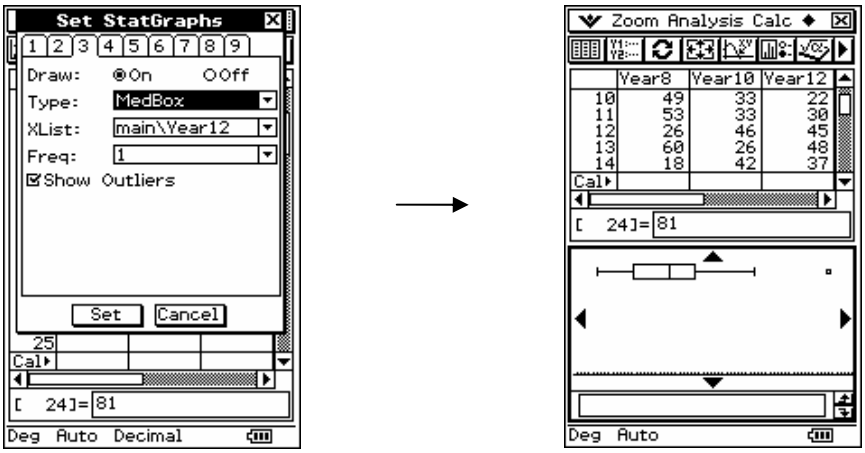
B. Tap Set StatGraph ( ) to set up the graph options for three StatGraphs (see below for StatGraph 3). Tap SET.

Answers.

1. With the settings as shown, tap .

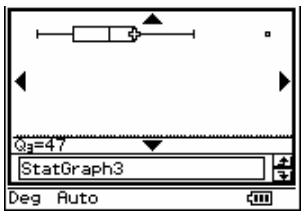


2. With the settings as shown, tap .



3. By plotting the maximum value as a separate point, then marking the next highest value with the 'whisker' of the Box Plot, this graph shows the gap between the maximum and the next highest value. This illustrates the distinction between the maximum value and the general trend of the sample.

C. By tapping [icon] (or `Analysis : Trace`) the cursor can be moved (with the Arrow Pad or on-screen arrows) through the critical values of the Box Plot, displaying the Five Number Summary at the bottom of the screen.



Answers.

4 & 5. Using the above technique the following information can be obtained,

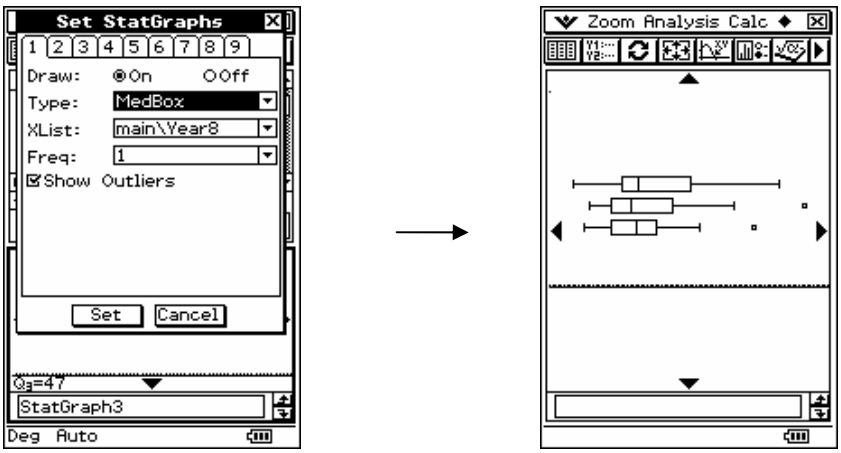
Sample	Minimum	Q1	Median	Q3	Maximum	Outliers
Year 8	18	35	41	59	90	No
Year 10	24	31.5	38	53	74 then 99	99
Year12	22	31.5	40.5	47	62 then 81	81

6. There is no way of determining the cause of these outliers and no reason to assume that they are the result of some sort of error. They do not lie beyond what could be considered the range of realistic values. For these reasons it is probably more appropriate to retain the outliers, but to favour resistant measures of centre and spread, like median and I.Q.R. rather than sensitive measures like mean and standard deviation.

Activity 2 – Having a look at three samples at once.

In `Set StatGraphs` make sure that each of the three graphs are turned `On` (i.e. `Draw: On` is tapped/selected for all three graphs).

By now tapping `Set` and then [icon], all three Box Plots are shown on the same axis. (The graph below has been resized using Resize)



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Answers.

1. The Box Plots seem to narrow from top (Year 8) to bottom (Year 12), indicating a decrease in spread / variation. The 'box' narrows, with a slight decrease in IQR between Year 8 (24 seconds) and Year 10 (21.5 seconds), and a more significant decrease between Year 10 and Year 12 (15.5 seconds). A similar pattern is visible regarding the range if the outliers are included. There is little change between Year 8 (72 seconds) and Year 10 (75 seconds) but there is a significant decrease between Year 10 and Year 12 (59 seconds). If the outliers were omitted this trend becomes more obvious, with the range falling from 72 seconds to 50 seconds to 40 seconds between Years 8 and 12.

2. There is visible improvement in concentration by the slowest (poorest performing) 50% of our samples. This is seen by the fall in Q3 (59 seconds in Year 8, 53 seconds in Year 10, 47 seconds in Year 12. With the outliers ignored, a similar trend is evident in the maximums (90 seconds in Year 8, 74 seconds in Year 10, 62 seconds in Year 12).

3. There seems to be little improvement, if any, in the concentration of the quickest (best performing) 50% of our samples. The median decreases from Year 8 (41 seconds) to Year 10 (38 seconds) but then increases to Year 12 (41.5 seconds). This fluctuation may be due to sampling error. The minimum shows similar variation, but no systematic decrease.

4. These answers can be easily reconciled as our samples suggest that, over the years, there are improvements in students who are poor at concentration but little change for students who are better at concentration. This ties in with the decrease in variation in concentration levels in the later years of schooling.