Understanding Statistics and Spreadsheets
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This activity aims at providing students with a deeper understanding of statistics, whilst additionally acting as an exercise that will help them with the uses of spreadsheets covering the Board of Studies requirements.

For example, we commonly ask the question;
The average number of Matches in 8 boxes is 45. How many Matches must be in a 9th box for the new average to be 47?

Most Mathematics teachers will multiply 8 x 45 and 9 x 47 and subtract the two answers to calculate the number of Matches needed for the 9th box. But after performing this spreadsheet activity, many students will suggest other methods of arriving at this answer. Maybe adding the 'missing 2' to each of the existing scores, plus 47 is quicker? Make your decision after completing the steps below…

Computing skills targeted by this activity (from BOS Computing Skills Assessment 2003):

5. Demonstrate basic spreadsheet skills as they create, work with and modify files
Indicators
a.   Use cell addresses to locate cells
b.   Insert and format text, numbers and formulae in cells
c.   Select a range of cells
d.   Use basic mathematical operations (+, −, *, /, ^) to construct simple formulae
e.   Construct formulae using absolute and relative cell references
f.   Use basic functions (SUM, AVERAGE, MAX, MIN, COUNT)
g.   Sort information according to desired criteria
h.   Fill cell contents using commands (Fill Down, Fill Right)
i.   Create appropriate charts based on spreadsheet data
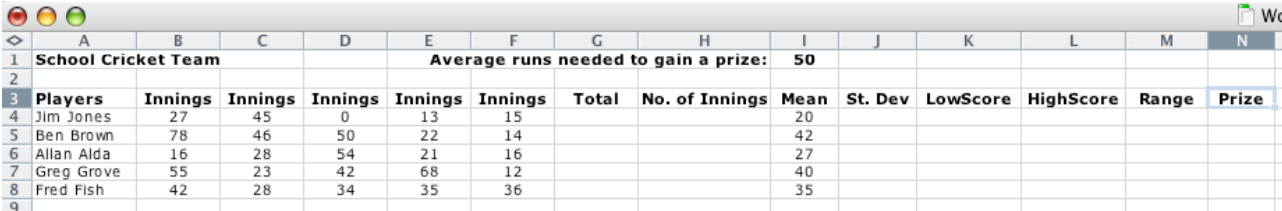j.   Set a print area of a spreadsheet

Mathematics skills targeted by this activity:
1.   Calculate the mean and range of a set of scores
2.   Understand how additional scores can be added and their effects on the mean and range.
3.   Understand how scores can be added or modified to affect the mean and standard deviation

Activity
We are going to construct some information in a Spreadsheet. This will be centred around a Cricket team and their batting details. We will cover each of the Computing Skills listed above and also work towards a better understanding of statistics, particularly mean and standard deviation.

You will need to enter the details outlined below (don't enter the Means);

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	School Cricket Team					Average runs needed to gain a prize:			50					
2														
3	Players	Innings	Innings	Innings	Innings	Innings	Total	No. of Innings	Mean	St. Dev	LowScore	HighScore	Range	Prize
4	Jim Jones	27	45	0	13	15			20					
5	Ben Brown	78	46	50	22	14			42					
6	Allan Alda	16	28	54	21	16			27					
7	Greg Grove	55	23	42	68	12			40					
8	Fred Fish	42	28	34	35	36			35					
9														

Class questions and discussions;
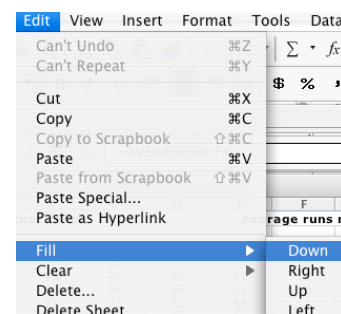
We will first look at some basic terms and expressions;
1. What appears in cell A3? [Indicator 5a]

2. Give an example of a cell containing text. [Indicator 5b]

3. Give an example of a cell containing numbers. [Indicator 5b]

4. What is displayed in the cells A4:A8? . [Indicator 5c]

5. In cell G4 use the formula Sum(B4:F4) to calculate Jim's total runs. [Indicator 5f]

6. Fill down to copy this formula for the other batters. Now view the formula for another player and notice how *relative* addresses have been used. Discuss relative addresses. [Indicator 5e, h]

7. Compare different methods of performing fill Down, ie From menus or using specific short cuts.

8. Use the Count formula Count(B4:F4) to count the innings for each player (in the No. of Innings column) by entering the formula in H4 then filling down. [Indicator 5f, h]

9. Use respective formulae to complete the table. Discuss and contrast results.
   Mean: Average(B4:F4),   StDev: STDEVP(B4:F4),   LowScore: Min(B4:F4),
   HighScore: Max(B4:F4),   Range: L4 – K4,   Prize: If(I4 ≥ $I$1, "Prize", "N")
   Note: the Prize is an extension formula which is very useful with spreadsheets. A user can change the value of cell I1 to have prizes awarded to certain students whose average is greater than or equal to that value. [Indicator 5f]

10. Discuss the formula used for the prize, specifically with respect to *absolute* referencing. Does this formula need the $-sign used twice? [Indicator 5e]

11. Fill down each formula. [Indicator 5h]

12. Insert a column before column D, by clicking on the D and choosing 'Columns' from the 'Insert' menu. [Indicator 5b]

13. Enter the heading 'Innings', then add a score for Jim so that his average goes up by 4 runs. Alter the score you entered for Jim until his average is exactly 4 more than the previous.

14. Repeat the activity for the other batters. Discuss the techniques used.

15. Looking at Jim's scores, alter one innings score so that his range will increase by 5, decrease by 5, etc. Discuss.

16. Change a score for Ben so that his Standard deviation will increase or decrease. Is it easy to add a score for Ben, so that his standard deviation remains the same? Discuss.

17. Change a score for Allan so that his Standard deviation will increase or decrease whilst his average increases/decreases, etc. Discuss.

18. In cells B9 and B10, construct the formulae which sums and averages the innings for the 5 batter's runs scored, Sum(B4:B8), Average(B4:B8). Discuss the functionality of the Sigma symbol. [Indicator 5d,f]

19. Use Fill Right ('Edit' menu Fill → Right) to add and average the batters' scores for all Innings. [Indicator 5h]

20. Give an example of a cell containing a formula. [Indicator 5b]

21. Discuss any outlier scores and their statistical effects.

22. Sort the Batters with averages from highest to lowest (Highlight information, 'Data' menu 'Sort…'). [Indicator 5g]

23. Insert a column chart based on the player's averages. (This is more difficult than necessary because the averages and the player names are not in adjacent columns.) [Indicator 5i]
    Some charting tips in Excel follow…

School Cricket Team
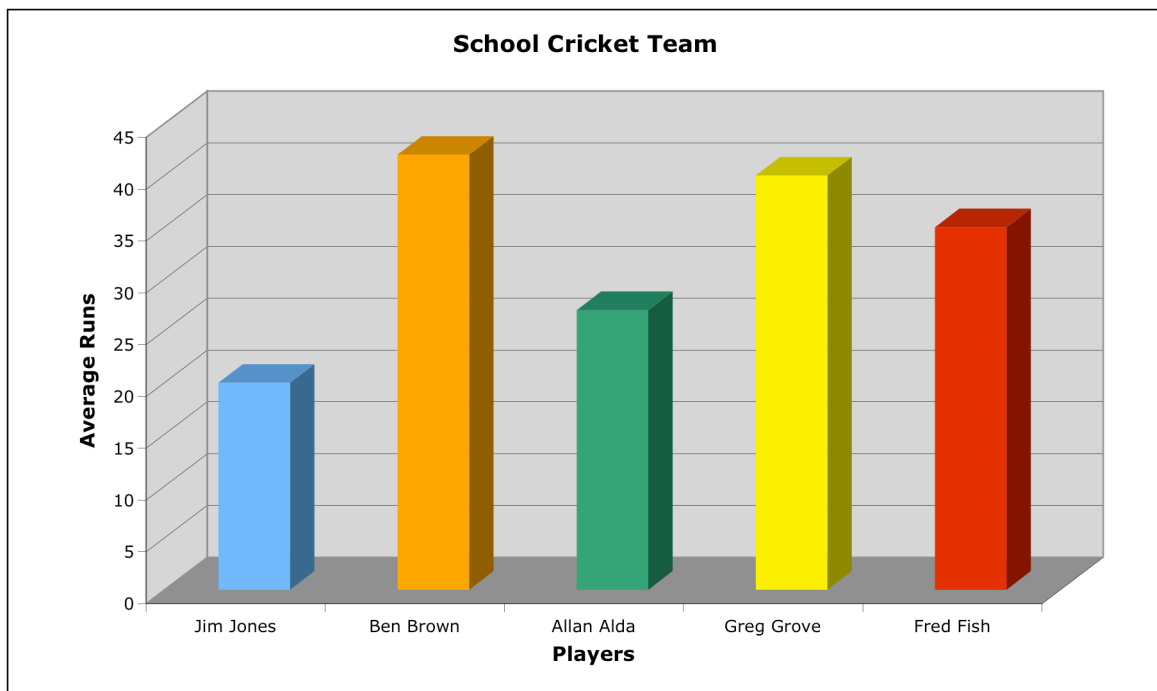
24. Set the print area to print the player's results including their averages. [Indicator 5j]
Highlight this area of detail and choose 'Printer Area' → 'Set Print Area' from the 'File' menu.
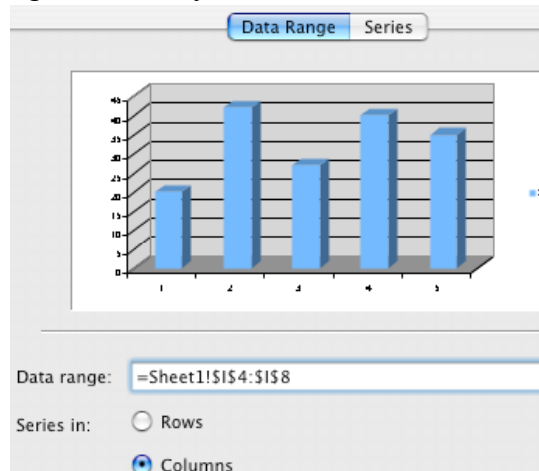
Creating the graph in Excel

ngs	Mean	S
	20	
	42	
	27	
	40	
	35	

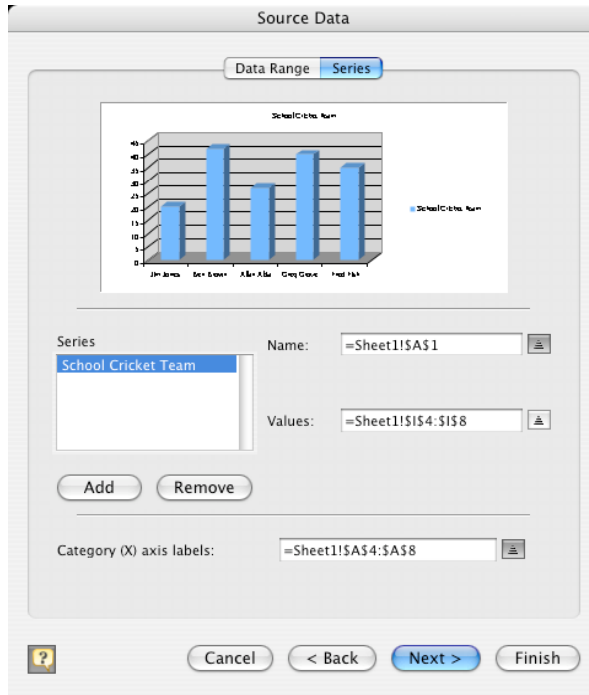1. Highlight the Mean column.

2. Click on the 'Chart Wizard' button or choose 'Chart…' from the 'Insert' menu. Then select a suitable chart such as the one shown below.
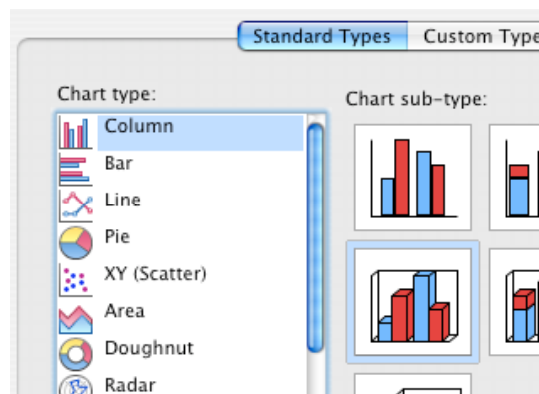

3. Click 'Next', the Data range is correctly shown and is in Columns.

Data range: =Sheet1!$I$4:$I$8

Series in: ○ Rows
            ● Columns

4. Click on the 'Series' button (next to the 'Data Range' button).

5. Complete the 'Name' and 'Category (X)' fields by clicking on the 'triangle' next to the field, selecting the Cell (or cells) that hold the information, then pressing the Return key. The fields are populated with the cell references. It is a good idea to use a cell reference for the name, for example, because then we can easily change the name of the graph by changing that specific cell (A1 in this case). This is preferable than to type the name "School Cricket Team" into the 'Name' field.

6. Click 'Next' again. We can fill in the vertical and horizontal axes headings on the 'Titles' tab, turn the legend off on the 'Legend' tab and alter gridlines, data labels, etc on other tabs.
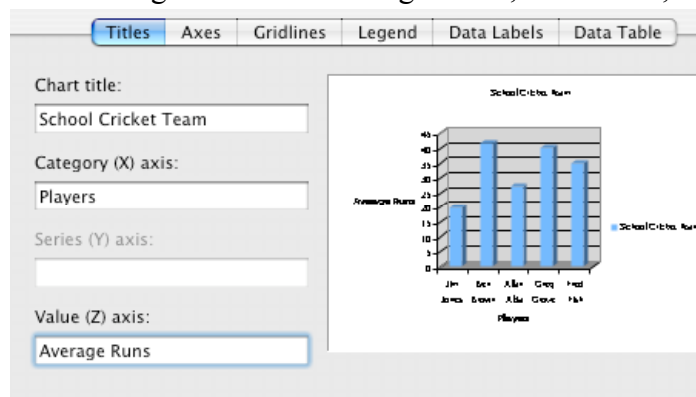
7. Finally, place the chart as an object in the Sheet. Then we can double-click elements to alter their looks. For example, if you double-click Average Runs, you can rotate the words so they appear vertical. Double-clicking on each of the columns in the graph allows you to change the colour of that column. (If it is difficult to just click on one column, hold the Apple-key while clicking.