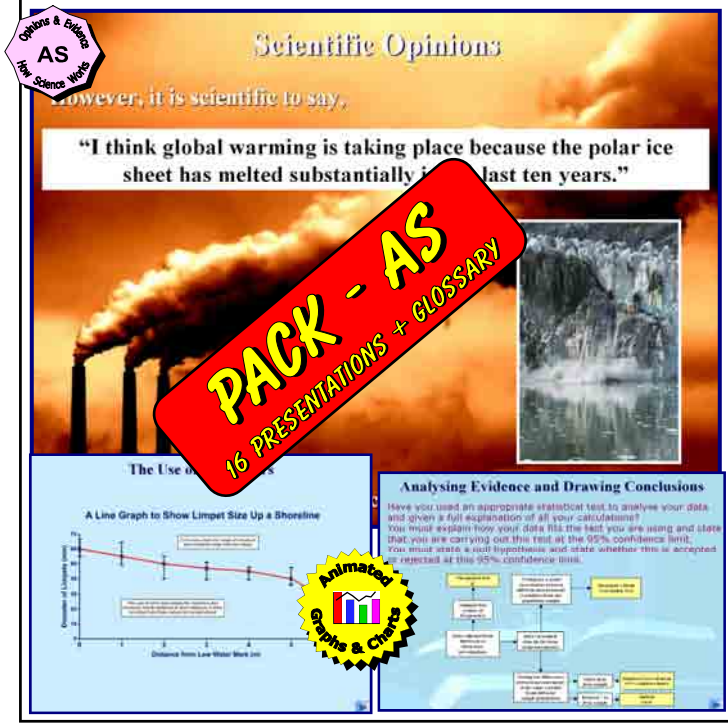
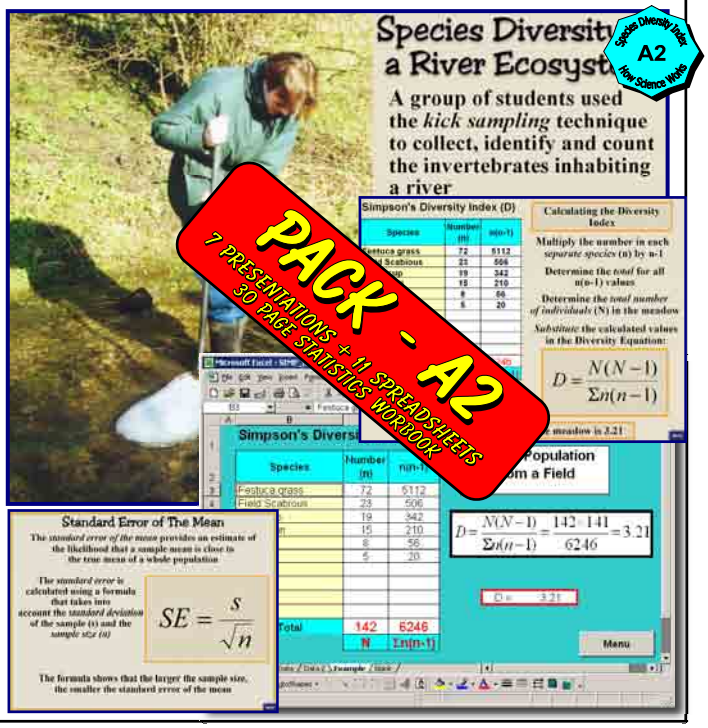
HOW SCIENCE WORKS

AQA ✓ OCR ✓ EDEXCEL ✓ WJEC ✓

- INTERACTIVITY FEATURES THROUGHOUT
- SUITABLE FOR TEACHING AND STAFF TRAINING
- SUITABLE FOR INTERACTIVE WHITEBOARDS
- THE AS PACK OFFERS PROGRESSION FROM KS4
- COMPLEMENTS OUR CORE THEORY PRESENTATIONS

The fundamental subject matter of 'How SciencWorks' is brought to life in an engaging way by powerful imagery, animations and interactivity. Pack **AS** covers 16 different elements of 'How Science Works' - including Presenting and Analysing Data, Opinions & Evidence and Science & Society. Pack **A2** focuses on the statistical analysis of data and provides both explanatory presentations and associated xls spreadsheets. Both packs are perfect for class teaching and staff training purposes. The presentations can be used with an interactive whiteboard, digital projector or on standalone or networked PCs. You just need PowerPoint 2000 or later to run or personalise the original presentations. A low cost upgrade is available for schools/colleges who have purchased How Science Works for KS4 - see order form for further details.





PACK - AS

16 PRESENTATIONS + GLOSSARY

PROVIDING PLENTY OF INTERACTIVITY AND FEEDBACK WHICH ACTIVELY ENGAGES STUDENTS IN THEIR OWN LEARNING

Presentations in AS Pack 'How Science Works'	Number of Slides
1. Opinions & Evidence	16
2. Hypothesis & Prediction	21
3. Types of Variable	22
4. Conducting a Fair Test	17
5. Accuracy, Precision & Sensitivity	21
6. Selecting & Using Apparatus	20
7. Reliability, Validity & Error	24
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9. Principles of Graph Drawing	19
10. Types of Graphs -1 (Non Linear)	22
11. Types of Graphs - 2 (Linear)	22
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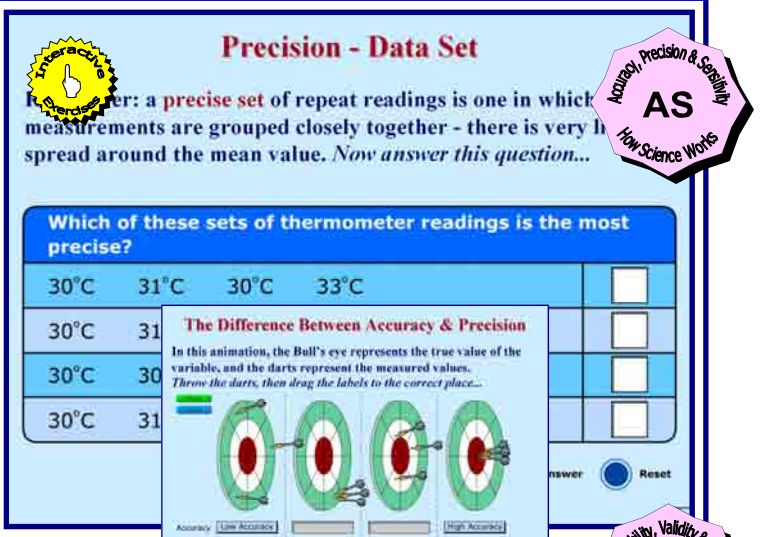
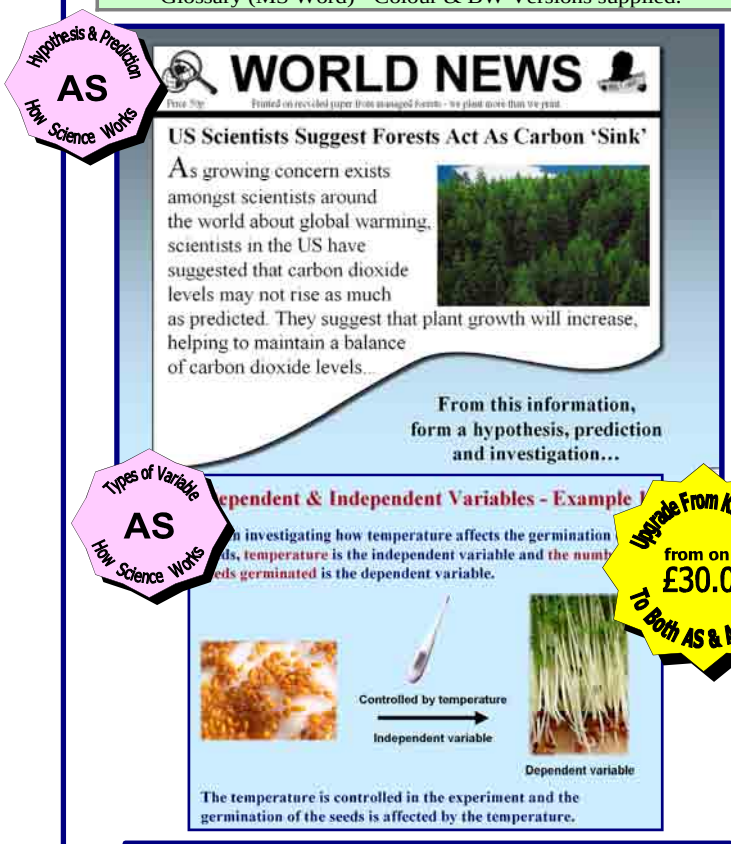
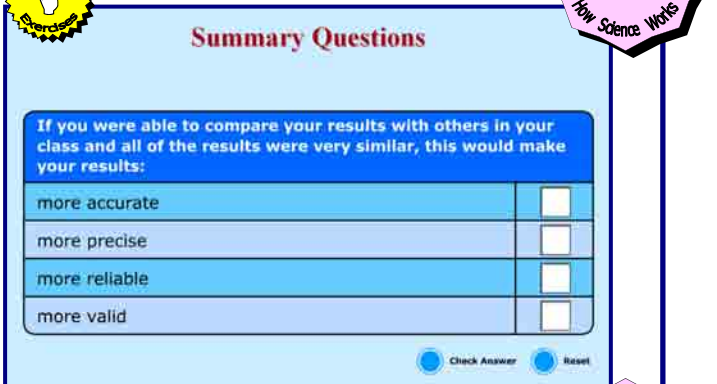
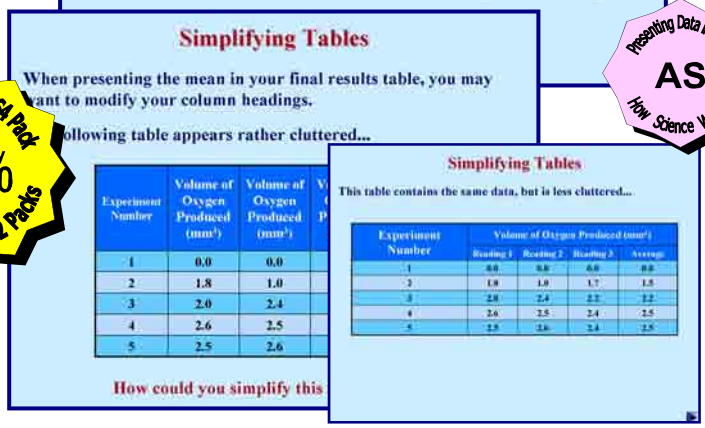
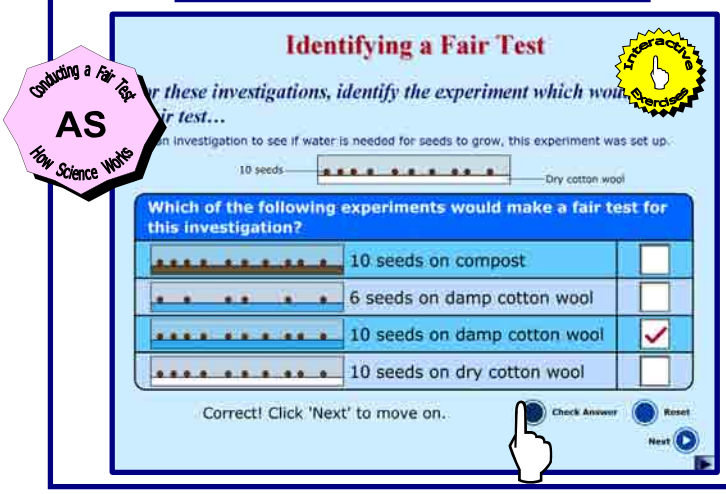
13. Recognising Mathematical Relationships	14
14. Investigations & Practical Skills (AS)	27
15. Biological Drawings	22
16. Science & Society	28
Glossary (MS Word) - Colour & BW Versions supplied.	

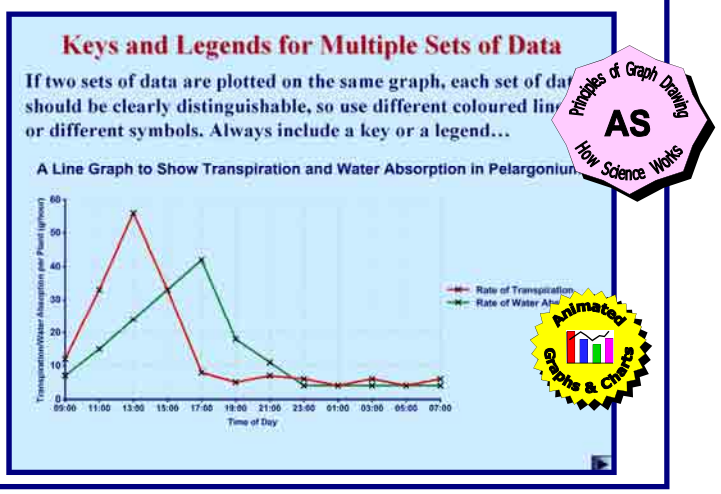












PACK - AS

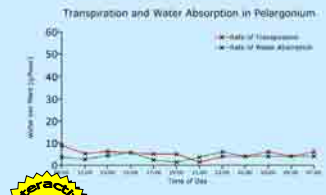
16 PRESENTATIONS + GLOSSARY

PROVIDING CLEAR EXPLANATIONS OF THE PRINCIPLES OF DESIGNING AND CONDUCTING SCIENTIFIC INVESTIGATIONS

Principles of Graph Drawing AS How Science Works

What's Wrong with These Graphs?

...k at the following graphs. Select the error that has been made from the choices provided.

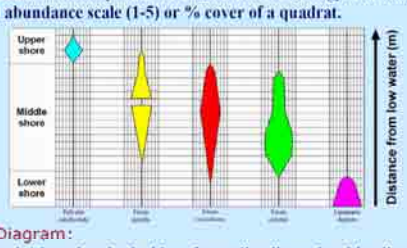


Interactive Exercises

Types of Graph - 1 AS How Science Works

Kite Diagrams

A kite diagram is commonly used for coastal marine ecology. The data plotte... is usually an abundance scale (1-5) or % cover of a quadrat.



For a Kite Diagram:

a) The data is plotted on both sides of a median line - thus kite diagrams always have a symmetrical aspect.

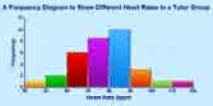
b) The y-axis shows distance from a fixed reference such as low water mark.

c) There can be gaps in the distribution of a species, e.g. this can be due to sandy outcrops amongst rocks as is the case for F. spiralis in the above chart. Therefore, care must be taken when interpreting kite diagrams - however they are good at showing zonation.

Types of Graph - 1 AS How Science Works

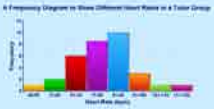
Frequency Diagrams

...equency diagram (or 'frequency chart') looks ...bar chart, but shows the frequency for ...ed data (discrete or continuous). ...equency diagram has no gaps between the ...umns.



Sometimes a frequency diagram is mistakenly referred to as a histogram.

N.B. Many biological references still mistakenly use the terms histogram and frequency diagram as alternatives - which they are not.



For a Frequency Diagram...

a) A frequency diagram uses frequency on the y-axis. Frequency is simply indicated by the height on the vertical scale.

b) The columns (and therefore the group intervals) must be of equal width.

c) There are no gaps between the bars.

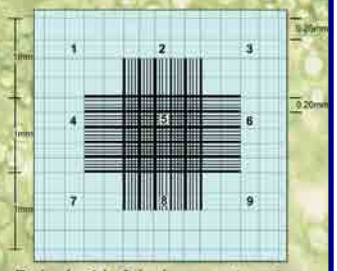
d) The x-axis is either a continuous scale or a sequence of consecutive intervals. Intervals should be written centrally under the columns.

Types of Graph - 2 AS How Science Works

Growth of a Yeast Cell Population

A student used a haemocytometer to count the number of yeast cells in a culture over a period of 5 hours.

Time (hours)	Number of yeast cells
0	30
1	86
2	240
3	657
4	1840
5	5158



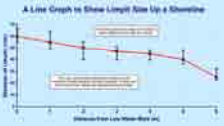
Etched grid of the haemocytometer

Types of Graph - 2 AS How Science Works

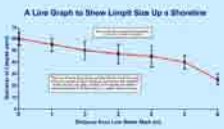
The Use of Error Bars

...re are two main ways of showing error bars...

- ...lot the mean of the readings with the ...error bars above and below showing the range of the results. The error bars in this case indicate the maximum and minimum readings.



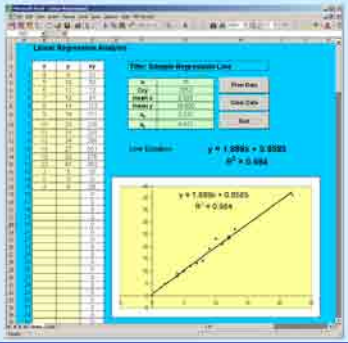
- Plot the mean of the readings with the error bars showing the standard deviation of the results. The error bars in this case indicate the reliability of the results. (Two thirds of results are within 1 standard deviation of the mean).



Interpreting Data & Drawing Conclusions AS How Science Works

Line of Best Fit - Linear Regression

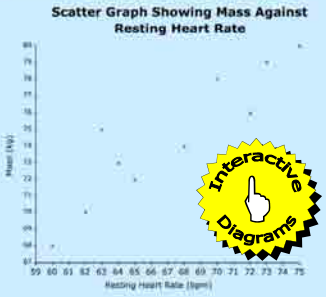
To find the precise line of best fit we can use a statistical proces... calculate the equation for the line - this line is called the regre... line...



Interpreting Data & Drawing Conclusions AS How Science Works

Line of Best Fit

...g the line of best fit to the most appropriate place on the graph. ...'Check Answer' to show the best position for this line...



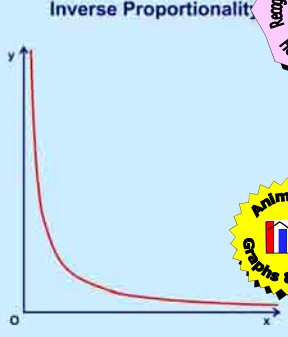
Interactive Diagrams

Recognising Mathematical Relationships AS How Science Works

Inverse Proportionality

The magnitude of a such a curve's gradient always decreases as x increases.

A graph of inverse proportionality is a symmetric curve.



The equation between x and y is of the form

$$y = \frac{k}{x}$$

where k is the constant of proportionality.

k can be estimated from points of data and then used to predict other values.

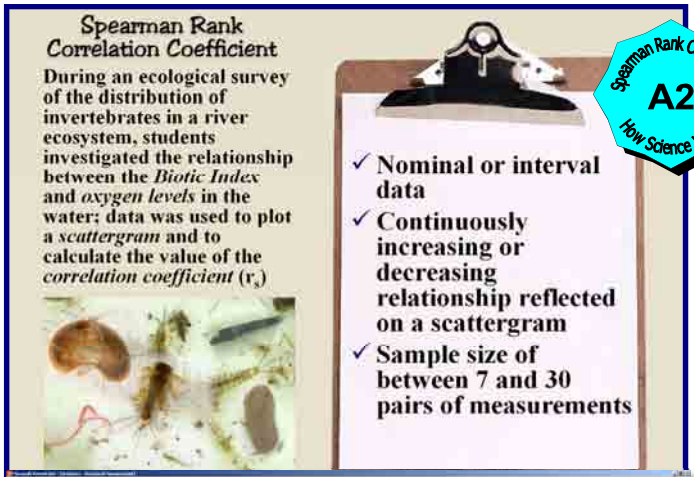
Animated Graphs & Charts

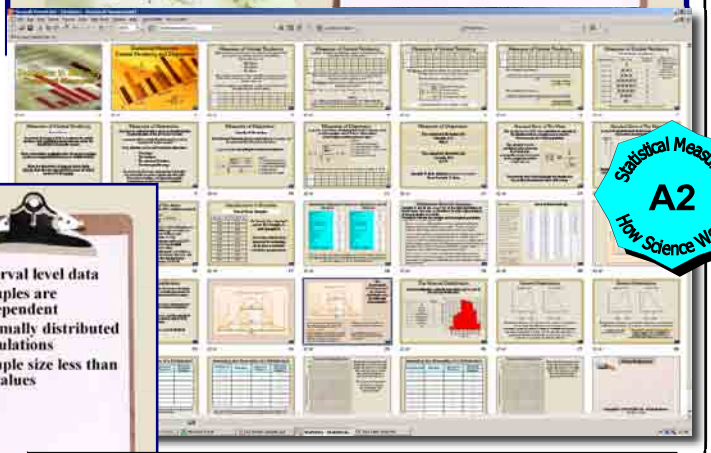
PACK - A2

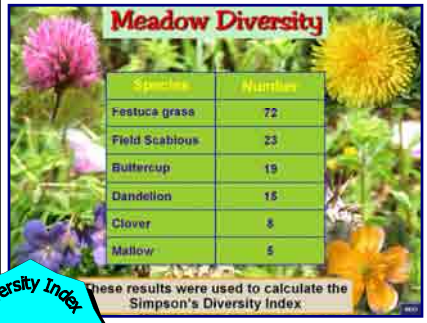
7 PRESENTATIONS + 11 SPREADSHEETS
30 PAGE STATISTICS WORKBOOK

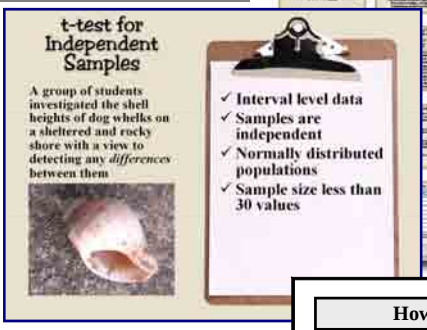
CLEARLY EXPLAINING THE PRINCIPLES OF STATISTICAL ANALYSIS AND PROVIDING THE NECESSARY TOOLS

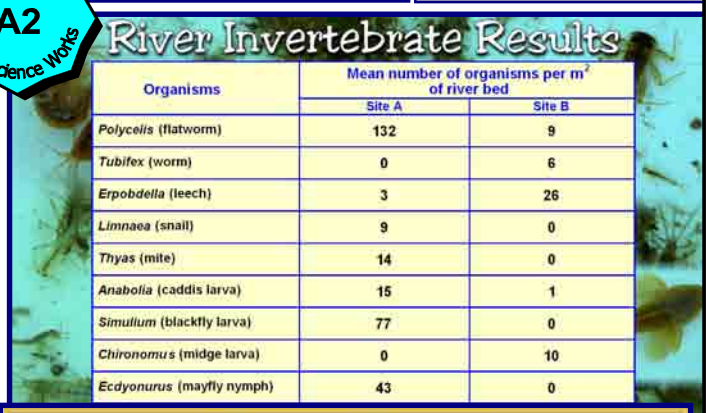
Presentations & Spreadsheets in A2 'How Science Works'	Number of Slides
Presentations	
Investigations & Practical Skills A2	31
Statistics - Introduction	30
Statistics - Statistical Measures	34
Statistics Tests - Chi Squared	29
Statistics Tests - Spearman Rank Correlation Coefficient	14
Statistics Tests - Student's t-Test	12
Statistics - Simpson's Diversity Index	12
Statistical Spreadsheets	
General Statistical Measures (inc. Standard Error)	
Chi Squared	
Linear Regression	
Normal Distribution	
Ranking Data	
Spearman Rank Correlation Coefficient - One tailed	
Spearman Rank Correlation Coefficient - Two tailed	
t-test (One-tailed)	
t-test (Two-tailed)	
Simpson's Diversity Index	
Spearman Rank Correlation Coefficient - One tailed	
Statistics Workbook (MS Word) - 30 pages.	

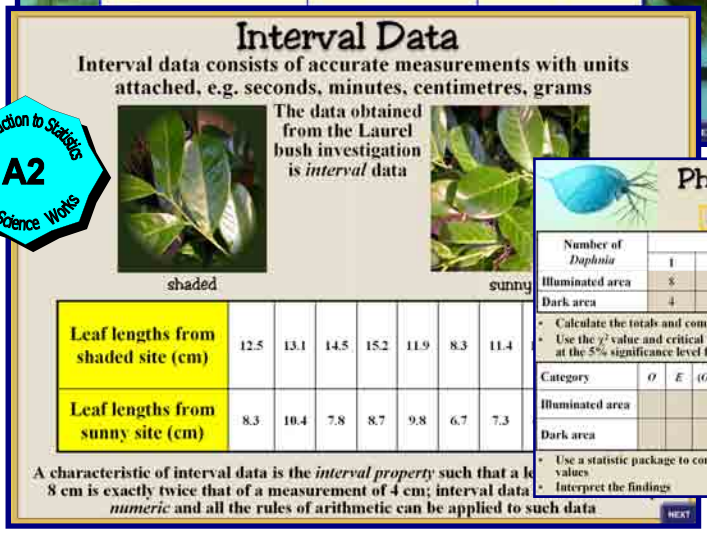


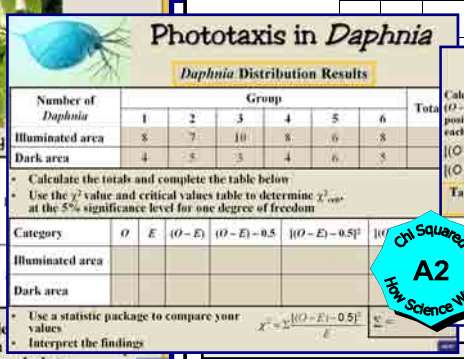


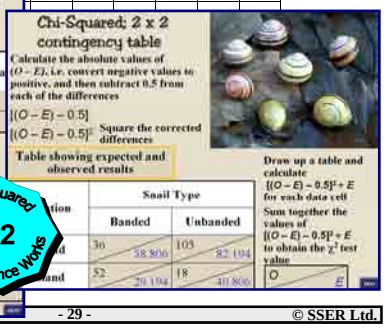








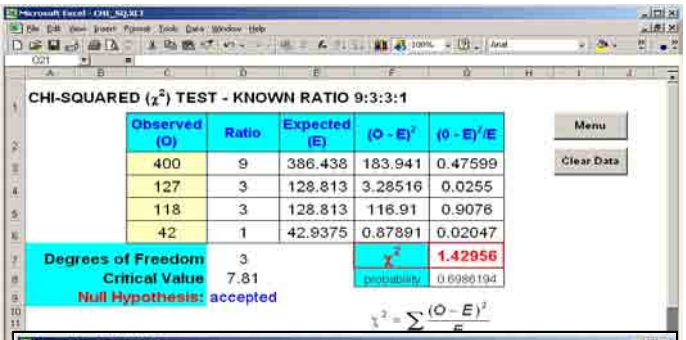


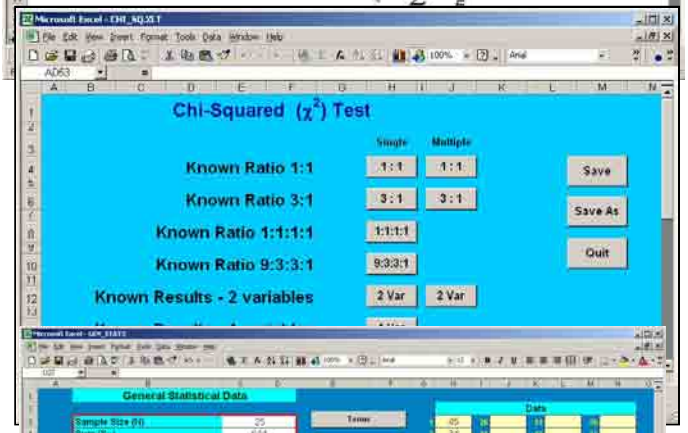


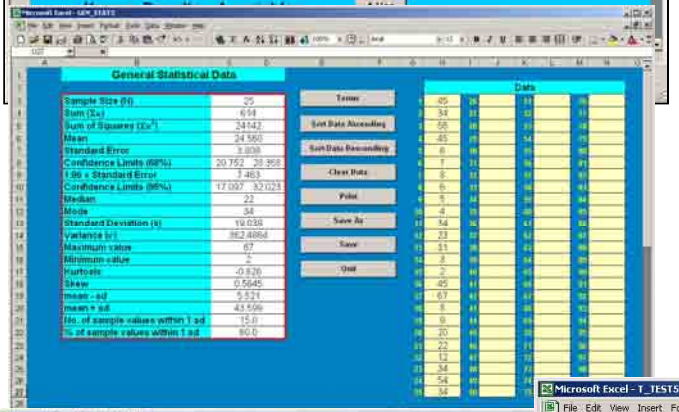
PACK - A2

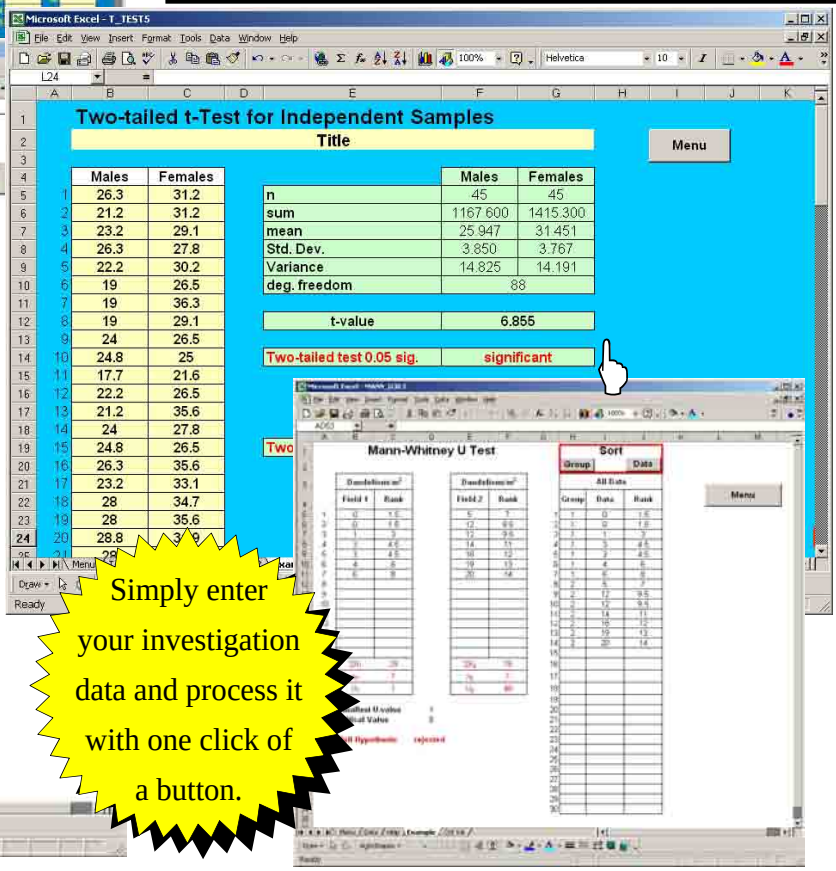
7 PRESENTATIONS + 11 SPREADSHEETS
30 PAGE STATISTICS WORKBOOK

STUDENTS CAN EASILY SELECT THE MOST APPROPRIATE STATISTICAL TEST AND THEN APPLY IT TO THEIR DATA









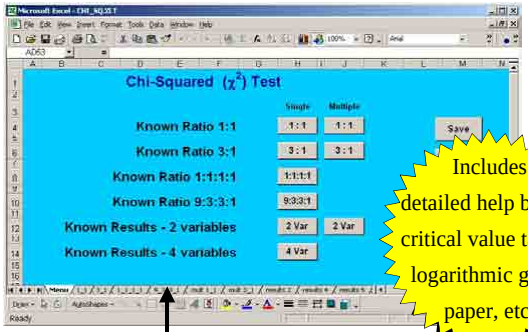
Simply enter your investigation data and process it with one click of a button.

How Science Works - Pack A2 - Using The Statistics Spreadsheets

THE CHI-SQUARED PROGRAMME

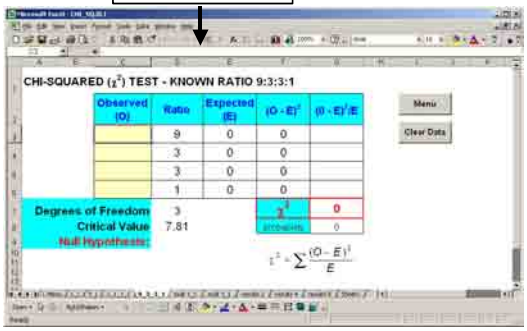
Opening Screen

The opening screen displays the various tests that van be performed using this programme. Select the ratio that you wish to test by clicking on the appropriate tab at the bottom of the page.

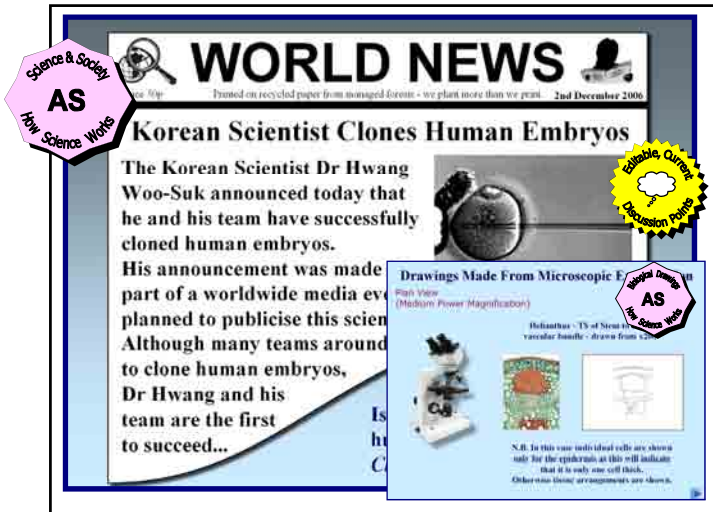


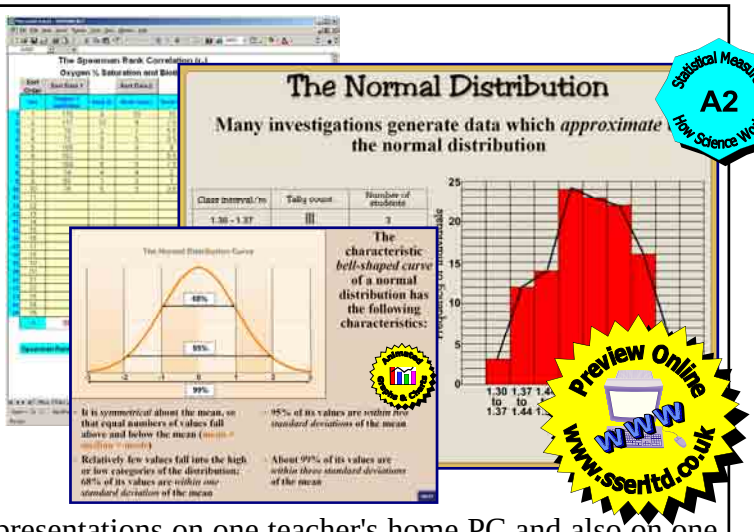
Includes detailed help books, critical value tables, logarithmic graph paper, etc.

9 : 3 : 3 : 1



Data may be printed and saved under a different file name or deleted to undertake another test without saving the initial data





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	BHASST	How Science Works - AS Biology CD ROM + Full Site Licence	£140	£164.50		
BIOLOGY (A2) How Science Works	BHA2CD	How Science Works - A2 Biology (7 Presentations, 11 Spreadsheets, etc.) CD ROM + Single User Licence	£70	£82.25		
	BHA2ST	How Science Works - A2 Biology CD ROM + Full Site Licence	£140	£164.50		
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