TEACHING STATISTICS ONLINE

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Rationale

- Most of the postgraduate students in Faculty of Health Sciences are doing an MSc by coursework and Research report
- Most are not at Medical school (international and off-site e.g. Chris Hani Baragwanath or Sterkfontein Hospital)
- Research report counts for 30-50% of total.
- 600 students are doctors training to be specialists registered for a MMED with a 30% RR
- Employed by Department of Health to manage the wards in the academic hospitals
- Therefore employed full-time including one or two nights per week saving lives

Suitability to conduct research

- Most never done any research
- Those who last did it at least 4 years ago
  - 5th year medicine – ½ years intern, 1 years community service and then to registrar
- Problem areas
  - Protocol development
  - Data analysis
  - Writing skills
  - Computer skills

The problem

- Up until 2011 the MMED degree was optional – graduated 20-30 per year.
- From this year completion of the degree is obligatory – need to graduate 150 per year in four years time
- Legacy of 15 years without MMEDs
  - Very few supervisors
  - Lack of research culture
  - Lack of all types of research skills

Toxic combination

- Research report is a problem
  - No skills
  - No time to attend courses to learn skills
  - Very few good supervisors from which to learn skills (apprentice model) – usually overloaded with students
- Result – medical graduates who are the best of the bunch feel incompetent and so

Try to avoid research thus 20 graduates per year

Now all have to complete

Proposal

- Make projects very simple thus only requiring simple statistics – descriptive and two way comparison
- Make training relatively simple and secret and very time flexible
- Present as many courses as possible as web-based curriculum
- Don’t assume any knowledge
- Small modules thus allowing for 15 minutes on a Sunday afternoon and another 15 minutes on Tuesday night
- Always present for revision
- Some assessment – gives sense of competence

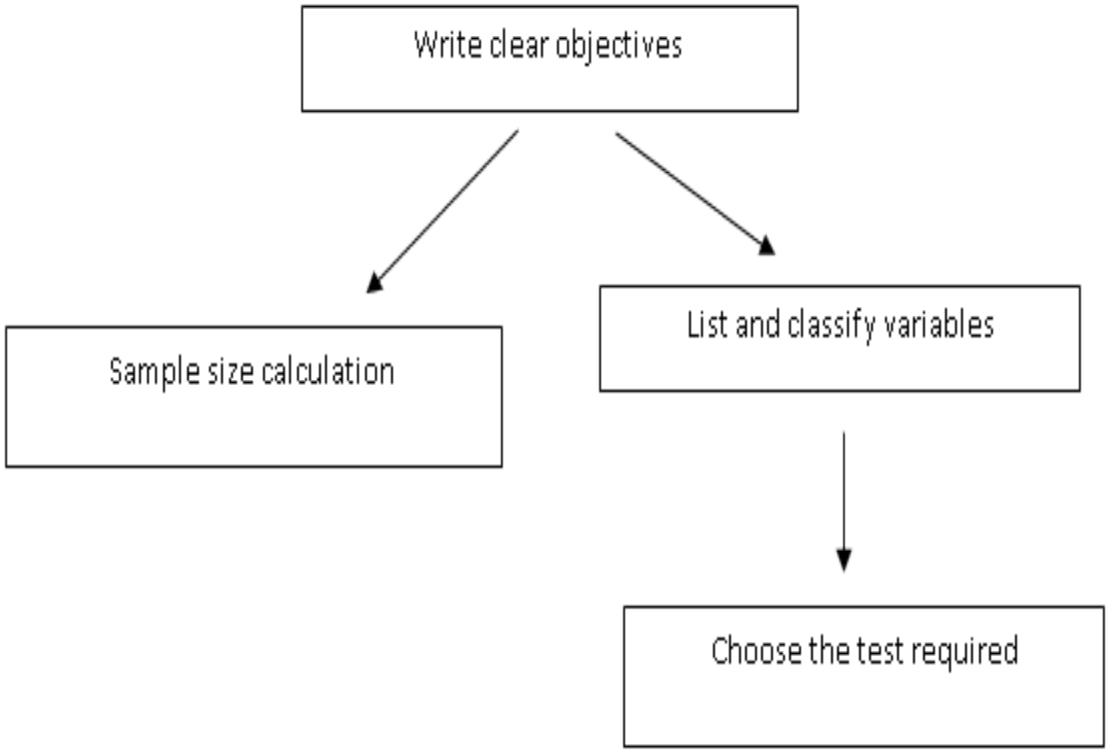
Statistics course

- Provide
  - Logic of data analysis
  - basic stats training
  - Excel training
- To use free statistical software if possible
  - And as little as possible – you don’t have to learn a whole stats package to do one or two statistical tests
- To allow for frequent self-assessment – no shame
- Medical science based
- (Staff could also log on to course in order to upskill without students knowing)

Basic process

- 2 components
  - Statistics for protocols
  - How to analyze data
- Not just about the statistics
  - Need to understand what you need to do before that
  - There is some logic to the choice of test

Statistics for protocols



Listing and classifying variables

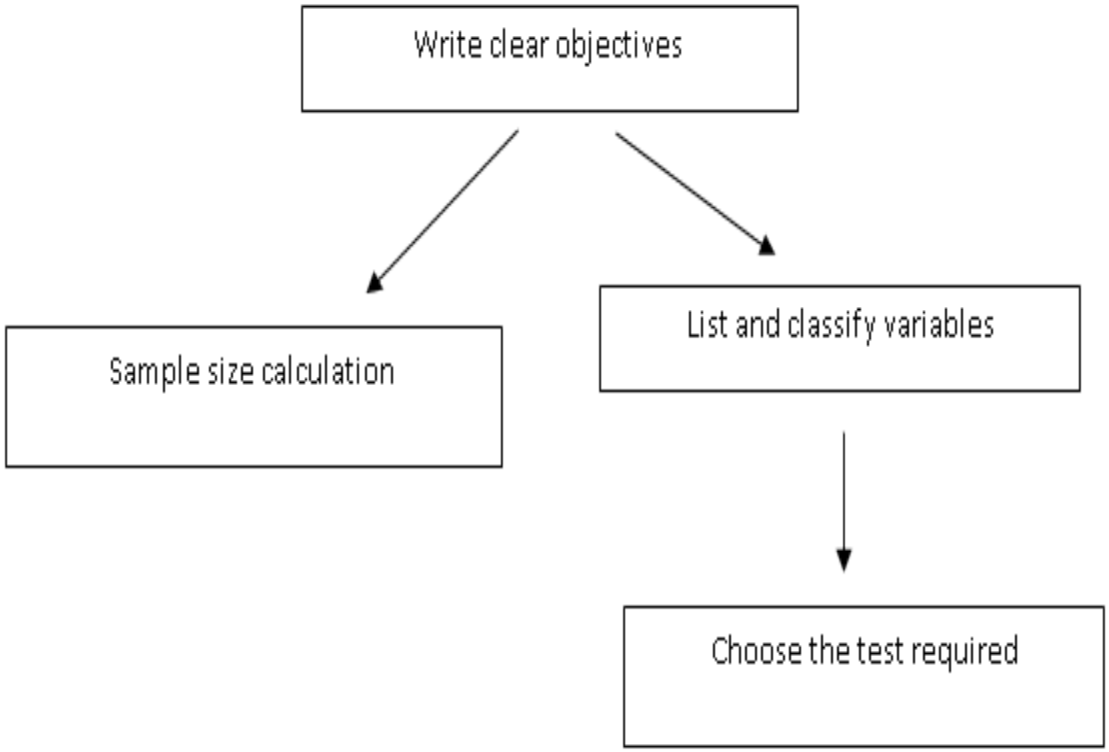
As background reading, please see Basic Statistical language – then:

1. Create a list of all the variables that you plan to collect during your research in a table with three columns (as indicated below). As an example, if we use the data from the data collection sheet 2 we will get a list as follows:

Variable	**Data obtained**	**Type of variable**	
		Para / non-para	**Numbers / categories / ordinal**
Age			
Gender			
Weight			
Height			
Loves dogs			

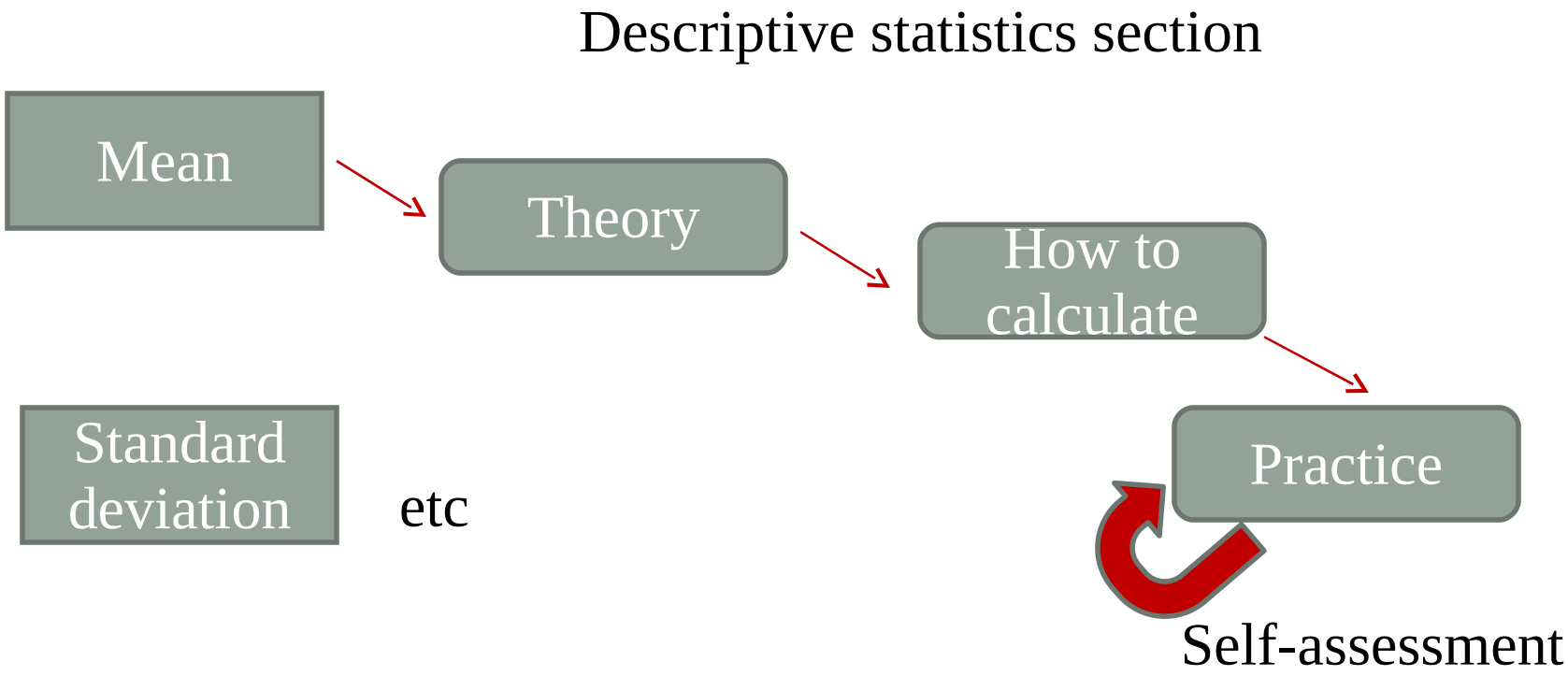
2. Then decide for each variable collected what data you will obtain (or how you will measure the variable) and what type of variable it is. For the

Statistics for protocols



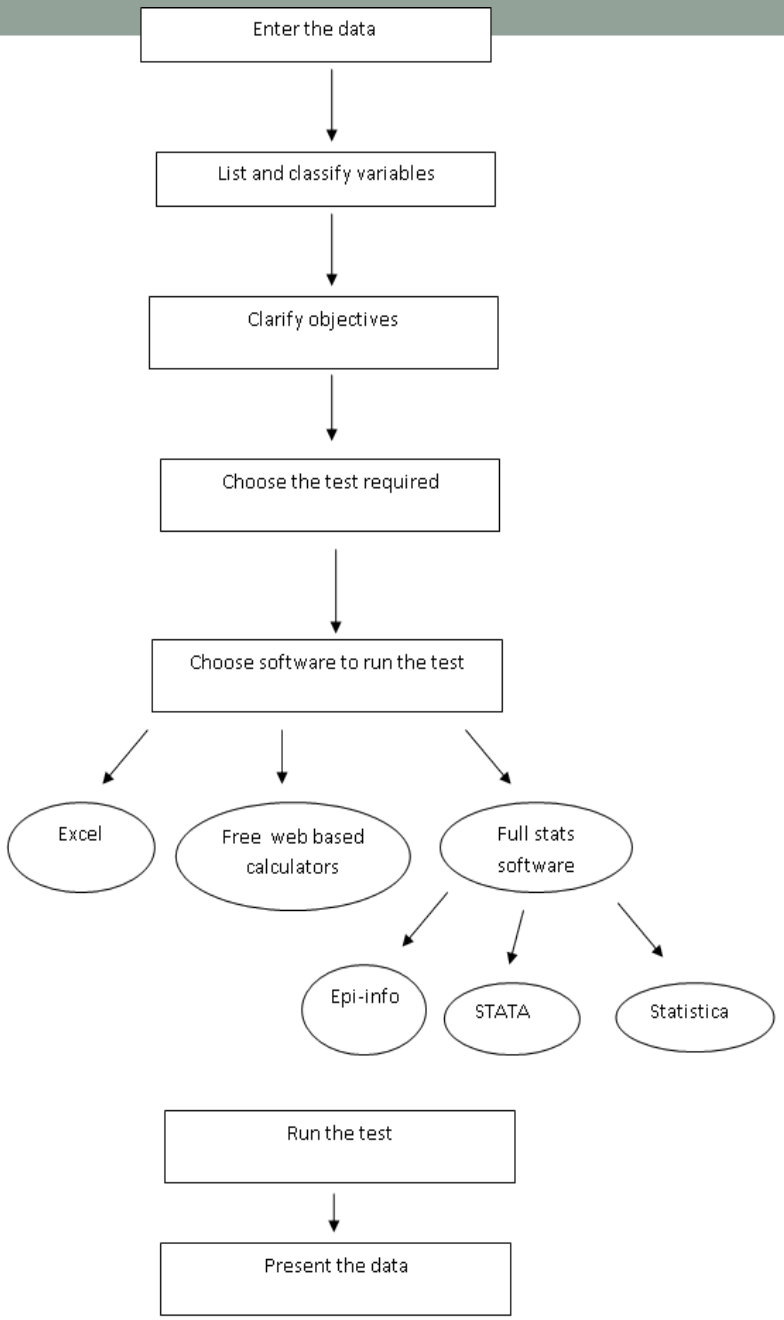
Objectives	**Num / ord / cat**	**Test**	**defined**	**Paired/unpaired**	**Non or Parametric**	**test**
To describe:	Numbers	Descriptive statistics			Parametric	Mean and standard deviation
	Numbers				Non- parametric	Median and confidence intervals
	Ccategories					Percentages / ratios
To compare:	Numbers	Compare groups	*2 group*	Unpaired	Parametric	Unpaired t-test
	Numbers			Paired	Parametric	Paired t-test
	Numbers			Unpaired	nonparametric	Mann-Whitney
	Numbers			Unpaired	Parametric diff SDs	Welchs corrected t-test
	Numbers			Paired	nonparametric	Wilcoxon matched pairs
	Numbers		*3-26 groups*	Unpaired	Parametric	One-way ANOVA
	Numbers			Paired	Parametric	Repeated measures ANOVA
	Numbers			Unpaired	nonparametric	Kruskal-Wallis
	Numbers			Paired	nonparametric	Friedman test
	Categories	Contingency table	*2 x 2*			Fishers exact (small numbers) or Chi ^{2} for bigger samples.
	Ordinals / categories		*Larger table*			Chi Square
To correlate:	Numbers	Correlation	*X and Y*		parametric	Pearson correlation
	Numbers				nonparametric	Spearman Correlation
	Numbers	Regression	*X and Y*			Linear Regression
	Numbers		*Y plus 2 or more X*			Multiple regression

Can then practice



At the end of each section have more comprehensive assessment

Statistics after collecting data

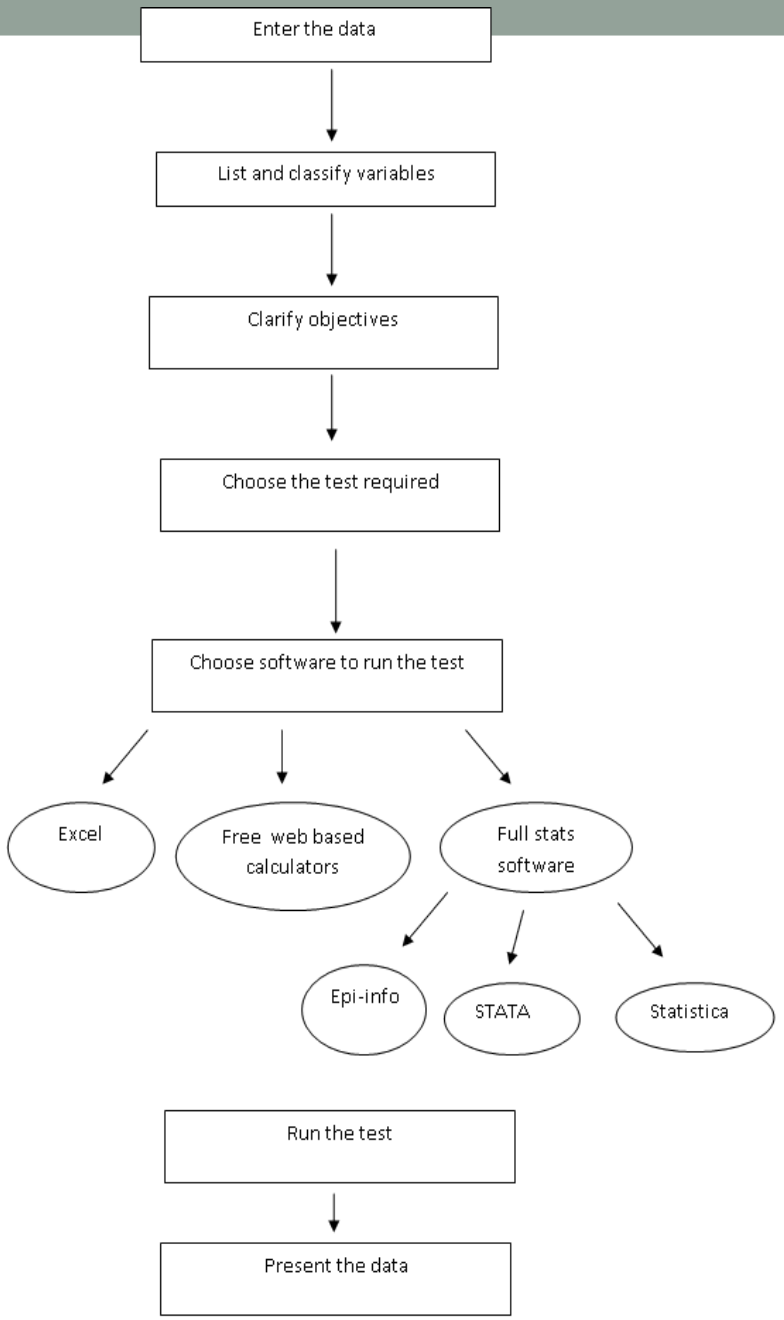


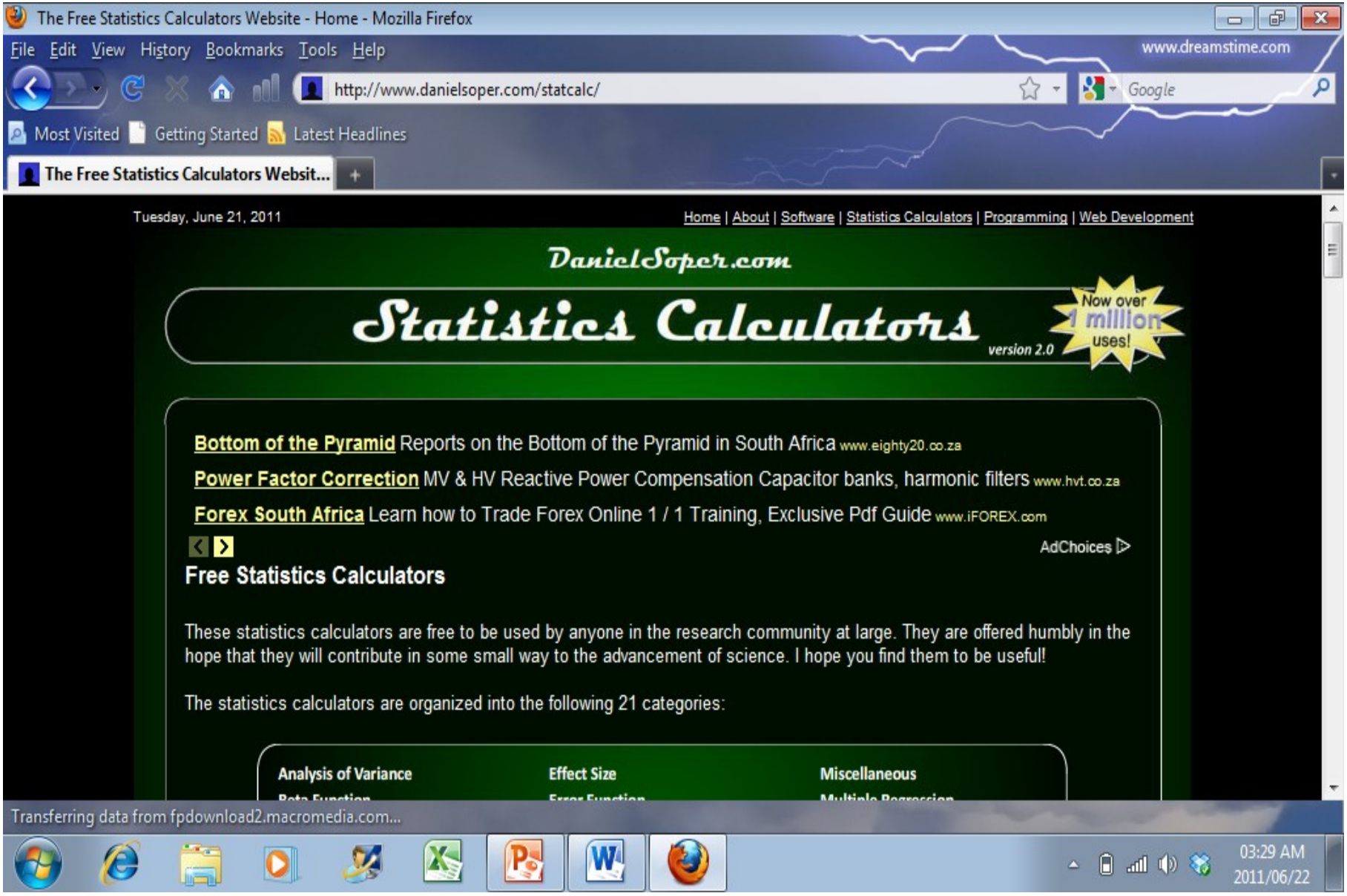
Enter the data

- Excel workshop
  - Basic features of Excel
    - Cell formats
    - Freeze panes
    - Rename sheets
    - Adjusting column width
  - How to enter data
    - Rows and columns
    - Numbers and categories

Similar to Help function in Excel but more focussed

Statistics after collecting data

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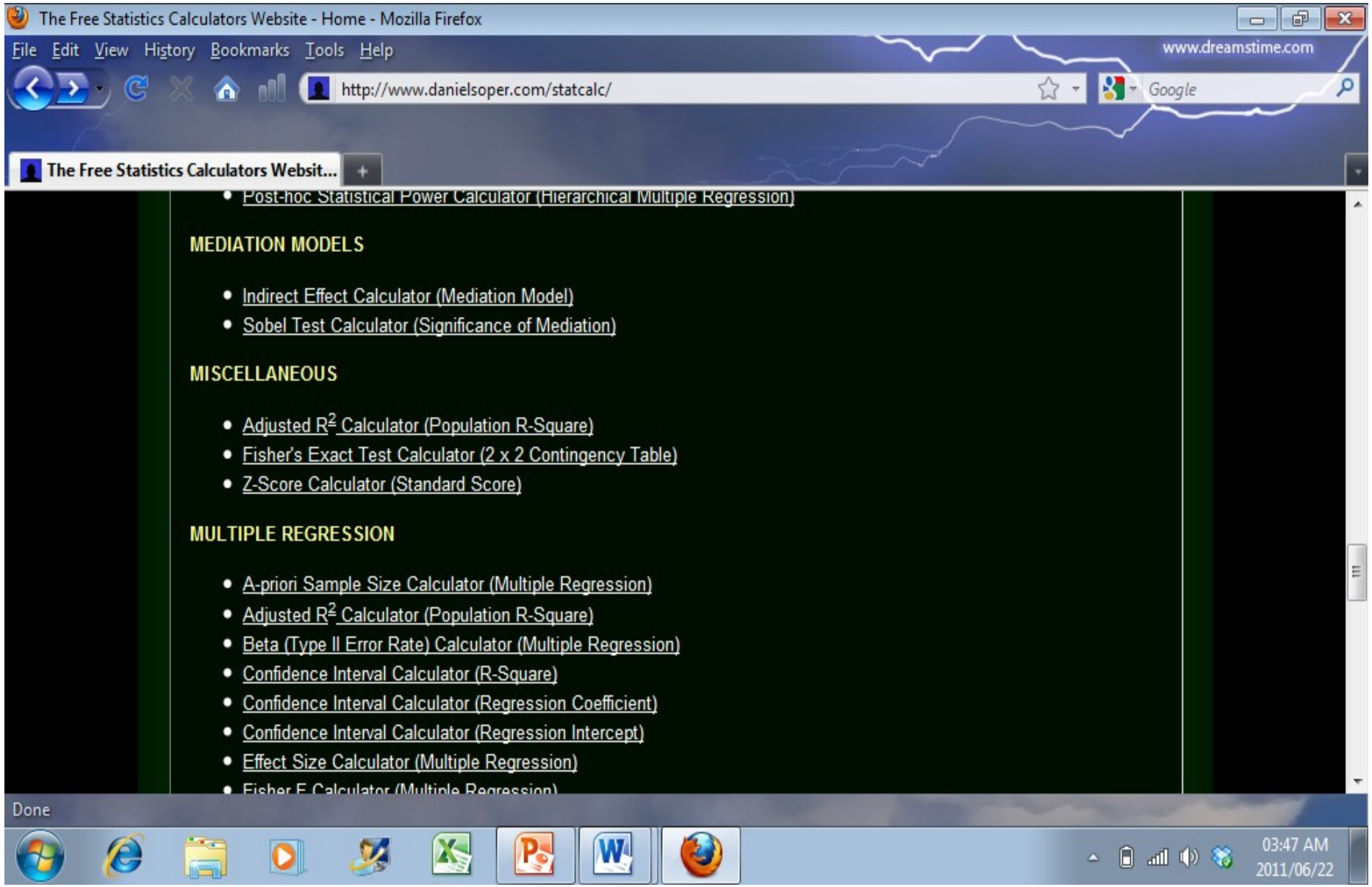
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Sobel Test Calculator (Significance of Mediation)
MISCELLANEOUS
Adjusted R^2 Calculator (Population R-Square)
Fisher's Exact Test Calculator (2 x 2 Contingency Table)
Z-Score Calculator (Standard Score)
MULTIPLE REGRESSION
A-priori Sample Size Calculator (Multiple Regression)
Adjusted R^2 Calculator (Population R-Square)
Beta (Type II Error Rate) Calculator (Multiple Regression)
Confidence Interval Calculator (R-Square)
Confidence Interval Calculator (Regression Coefficient)
Confidence Interval Calculator (Regression Intercept)
Effect Size Calculator (Multiple Regression)
Fisher F Calculator (Multiple Regression)
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Free Fisher's Exact Test Calculator for a 2X2 Contingency Table - Mozilla Firefox

File Edit View History Bookmarks Tools Help

www.dreamstime.com

http://www.danielsoper.com/statcalc/calc29.aspx

Google

Free Fisher's Exact Test Calculator fo...

This calculator will compute the one-tailed probability of obtaining a distribution of values in a 2x2 contingency table using Fisher's exact test, given the number of observations in each cell.

		Category 1	
		Group 1	Group 2
Category 2	Group 1	*a*	*b*
	Group 2	*c*	*d*

Where ***a***, ***b***, ***c***, and ***d*** are the number of observations in each cell.

Please supply the necessary parameters, and then click the 'Calculate' button.

a: 1

b: 9

c: 11

d: 3

Calculate

Done

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Conclusion

- No excuse not to learn the skills required to predict and analyze data for simple projects
  - Short modules in “non-stats speak”
  - Very time flexible
  - Can’t forget what they learnt on a fixed course because of revision potential
  - Can study in secret
  - Practice sessions will often be similar to real data
- Plan to also develop protocol development skills and writing skills course

Thank you