Geo Factsheet

Which Stats test should I use?

"Which statistical test should we use?" is a common question from Geography students. This Factsheet provides simple guidelines on when each type of statistical test should be used.

The choice of the correct statistical test is all-important - use the wrong test and the conclusions will be invalidated. Marks are only awarded for an *appropriate* - i.e. correct - use of statistics. The flowchart below can be used to identify the appropriate test. Table 1 overleaf gives examples of investigations and appropriate tests.
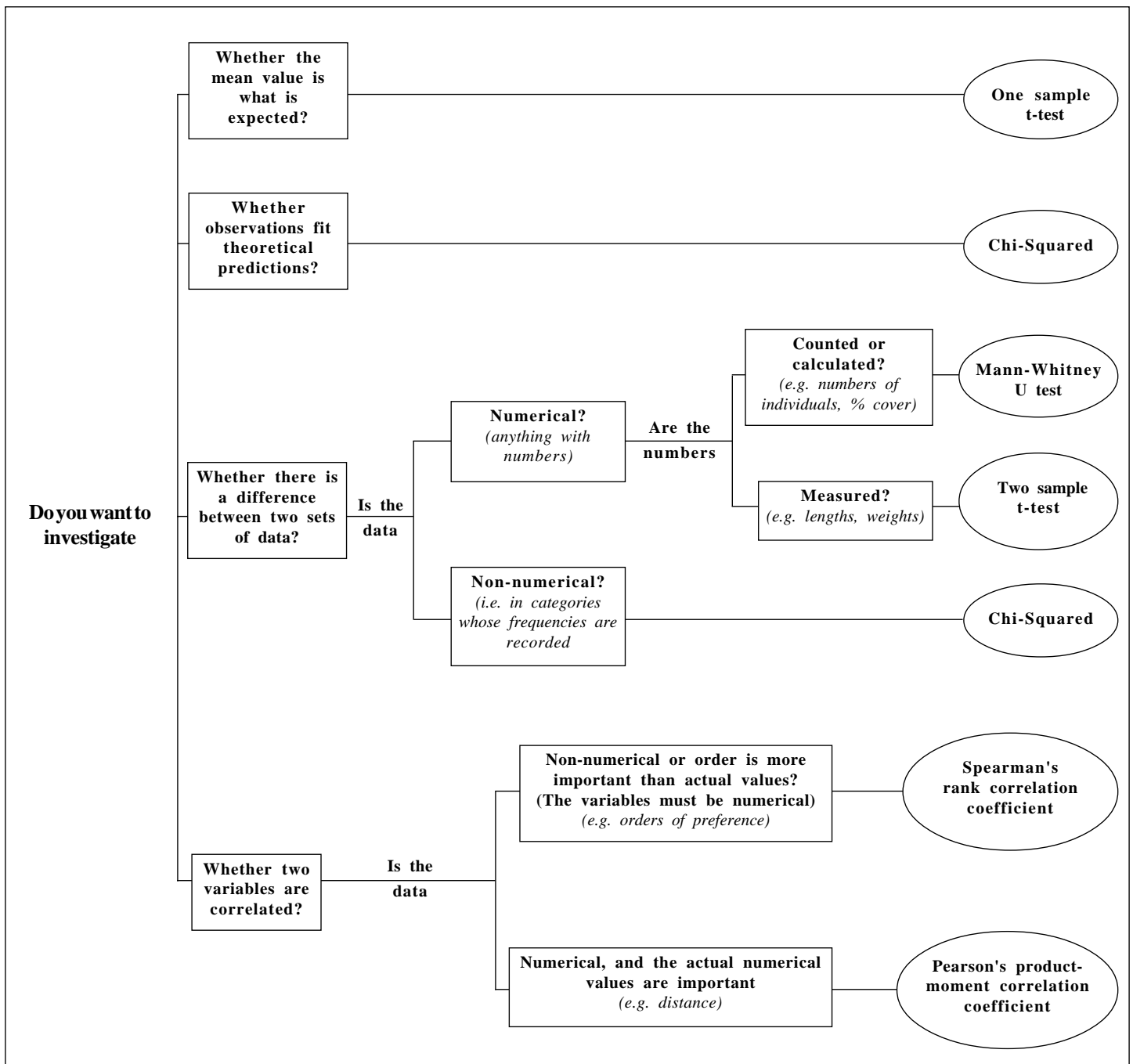
Fig 1. Deciding which test to use

Do you want to investigate

- Whether the mean value is what is expected? → **One sample t-test**
- Whether observations fit theoretical predictions? → **Chi-Squared**
- Whether there is a difference between two sets of data? → Is the data
  - Numerical? *(anything with numbers)* → Are the numbers
    - Counted or calculated? *(e.g. numbers of individuals, % cover)* → **Mann-Whitney U test**
    - Measured? *(e.g. lengths, weights)* → **Two sample t-test**
  - Non-numerical? *(i.e. in categories whose frequencies are recorded)* → **Chi-Squared**
- Whether two variables are correlated? → Is the data
  - Non-numerical or order is more important than actual values? (The variables must be numerical) *(e.g. orders of preference)* → **Spearman's rank correlation coefficient**
  - Numerical, and the actual numerical values are important *(e.g. distance)* → **Pearson's product-moment correlation coefficient**

Table 1. Statistical tests for various investigations

INVESTIGATION	WHAT IS MEASURED?	NULL HYPOTHESIS	STATISTICAL TEST	EXPLANATION
1. Whether different types of shops are found in different parts of the town centre.	The number of shops of each type under consideration in the different parts of the town centre. *(the average number per category must be at least 5).*	Ho: There is no difference in the distribution in types of shop.	Chi-squared	We are interested in a difference; the data concerns numbers of items in categories.
2. Whether big centres have different proportions of various classes of shop to smaller centres.	The number of shops of each type under consideration in the different centres. *(the average number per category must be at least 5).*	Ho: There is no difference in the distribution in types of shop.		
3. Comparing stream velocities in two locations.	Several measurements of stream velocity in each location (the *larger the sample, the easier to get a significant result*).	H_o: There is no difference in the stream velocities for the two locations.	Two-sample t-test	We are interested in a difference; the data is numerical and measured.
4. Comparing soil depth on two different slopes.	The soil depth at at least five sites (*the larger the sample, the easier to get a significant result*).	H_o: There is no difference in the mean values for the two slopes.		
5. Comparing percentage vegetation cover on two different slopes.	The percentage vegetation cover at at least five sites on each slope.	H_o: There is no difference in the % vegetation cover for the two slopes.	Mann-Whitney U-test	We are interested in a difference; the data is numerical and calculated or counted.
6. Comparing visitor numbers at two tourist "honeypots".	The number of visitors to each site on at least five occasions.	H_o: There is no difference in the visitor numbers at the two locations.		
7. Whether the population structure of a particular town differs significantly from national values.	The population structure of the town.	H_o: The population structure of the town is the same as the national structure.	Chi-squared	We are comparing observations (the town/ the actual alignment of stones) with what's predicted by the null hypothesis. (what would be expected from the national figures/ the stones being randomly aligned).
8. Whether glacial stones' long axes are aligned in the direction of ice flow.	The number of glacial stones with axes aligned between 0 and 20^0, 20^0 and 40^0, 40^0 and 60^0 etc, from magnetic north. *(The average number in each category must be at least 5).*	H_o: The glacial stones' long axes are randomly aligned.		
9. Whether the buildings in one area of a city are significantly older than others.	The ages of a suitable sample of people or buildings.	H_o: The buildings in this area have the overall average age for the whole city.	One-sample t-test	We are seeing whether the mean of a particular area is what we expect.
10. The relationship between altitude and soil depth.	The altitudes and soil depths for at least five locations.	H_o: There is no correlation between altitude and soil depth.	Pearson's Product-moment correlation coefficient.	We are interested in correlation, and are considering a numerical variable in which the numerical values are important.
11. The relationship between pebble size and position on the beach.	Mean size of pebbles at a minimum of five sites at varying distances from the sea on the same beach.	H_o: There is no correlation between pebble size and distance up the beach.	Spearman's rank correlation coefficient.	We are interested in correlation, but are more interested in the order than the actual figures.
12. Whether bigger shopping centres have a smaller proportion of food shops.	Proportion of shops that are food shops at at least five shopping centres of varying sizes.	H_o: There is no correlation between size of centre and proportion of food shops.		