

# Edexcel Geography A-Level

## Fieldwork Section 3 - Data Presentation Essential Notes



## Introduction

This is a **comprehensive guide** to the many ways of presenting data. It is necessary to take your raw data and produce **tables, graphs** and use **statistical analysis** techniques (discussed in a separate document) to discuss relevant data. Very little marks are awarded for your choice of presentation technique; however, your mark will be limited if there is not a range of presentation methods used. The techniques we'll discuss are below:

### Graphs and Charts

- Bar charts
- Pie charts
- Radar Graphs
- Line Graphs
- Histograms
- Box Plots
- Kite Diagrams
- Pictograms
- Triangular Graphs
- Scatter Graphs
- Logarithmic Scales
- Lorenz Curve

### Cartography

- GIS
- Map and Image Overlays
- Isoline Maps
- Dot Maps
- Choropleth Maps
- Flow Lines

### Qualitative Presentation

- Photographs
- Quotes/Mindmaps

### Numerical Analysis

- Central Tendency
- Dispersion

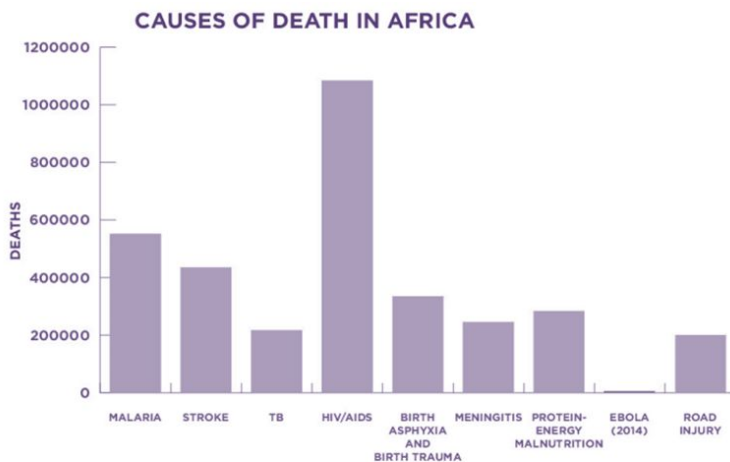
It should be noted that some data within this guide has been created and manipulated to show the data presentation methods, and is not entirely accurate. Unless the graph has been taken from an external source (as referenced) it should be assumed that the data within the figure is false. This data has been manipulated to show clear data presentation methods that will serve as an educational resource for data presentation, rather than resources you can use as valid sources within your investigation.



## Graphical Data Presentation Methods

### Bar Charts

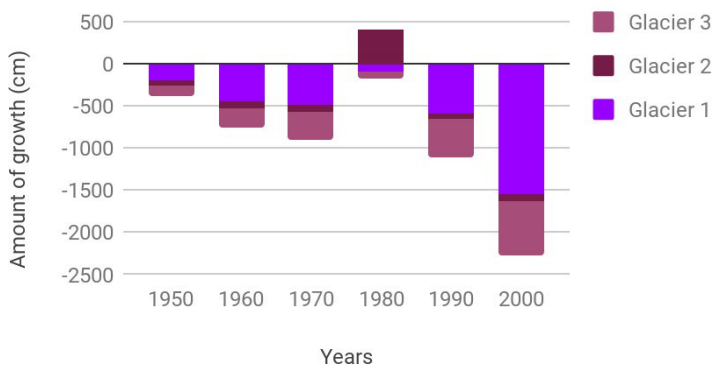
Bar charts are useful when **tracking a change** (normally over time), or when **comparing factors** across different groups. The horizontal axis (x) usually contains the **independent variable**, which could be time, or the groups that will be compared.



SOURCE: WHO GLOBAL HEALTH ESTIMATES  
 ALL FIGURES FROM 2012, EXCEPT EBOLA (2014)  
 EBOLA DATA LAST UPDATED: OCTOBER 25

A **simple bar chart** has the **independent variable** on the **horizontal axis** and the **dependent variables** on the **vertical axis**. This is useful to identify **relationships or correlations** between a **subject** (e.g. number of deaths) and a **factor** (e.g. types of deaths). If the changes in your data are gradual and your data is **categorical**, you should consider whether a line graph would be more suitable to determine trends.

### Amount of Glacier growth from 1950 - 2000



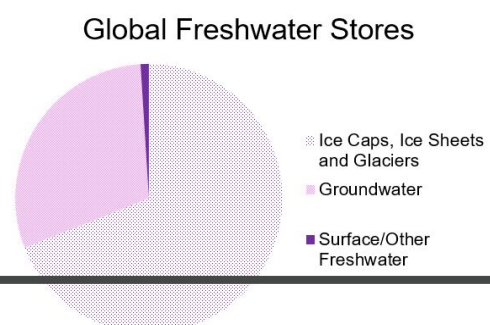
For multiple subjects, a **stacked bar chart** could be more suited, which uses a **colour scheme** to separate the subjects. Ensure the colour scheme is obvious, has a clear **key**, and each subject can be defined in **greyscale**.

Bar charts can be simplistic and, although useful, higher level candidates should also use more technical data presentation.

### Pie Charts

Pie charts are a useful way of presenting a wide range of data, especially that which is from **questionnaires** and **foot count/traffic surveys** (although useful, **make sure not to overuse them**). Sometimes just writing the **numeric figures** is sufficient, or using a **compound bar graph**, which could both be used instead of a pie chart. Pie charts allow **easy interpretation of data** by the reader, but **can also be misread**. When creating a pie chart it is recommended that:

- It is **2D**
- The **data is not labelled**
- The **segments have no gaps** between them



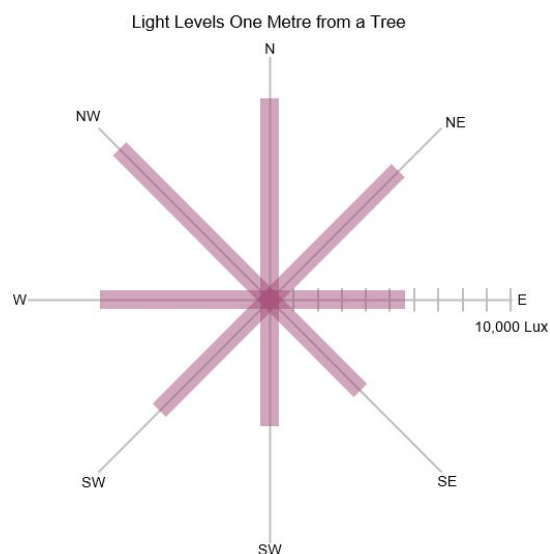
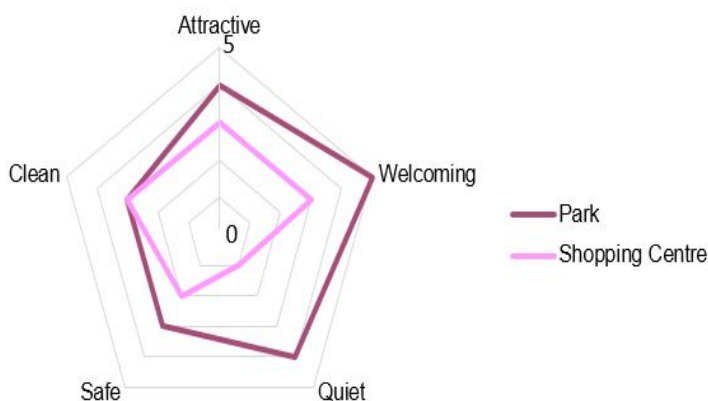
- The **colours are clear** and the different segments could be identified if the document was printed in greyscale (patterns are useful)
- The **key is explicit and easy to understand**
- There are not **too many segments**

## Radar Graphs

Radar graphs are most effective at displaying data from **environmental quality surveys**, or data about different locations. Data from various locations can be overlaid or compared on different charts.

It is important that all of **the scales are in the same direction**. All of the positive, highest scores should be in the same area of the graph (either all in the middle or all surrounding the outside). For example, rather than having quiet, welcoming, and **unsafe** all on the outside, it should be quiet, welcoming, and **safe** as shown in the radar graph. There is no limit to the amount of data sets that you can use, but using **too many sets may make the graph confusing**.

Radar Graph Showing Environmental Quality in Jakarta

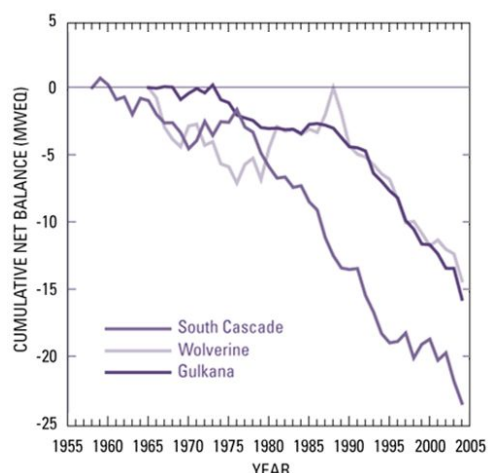


Similar to a radar graphs, **rose graphs** use **multi-directional axes** to represent data, but with bars instead of lines. Rose graphs use **compass directions** for the axes directions, and you should define how far from a central point you are measuring when collecting the data. They could be useful for assessing forest cover (light levels), noise levels or wind speed, though there are many other possibilities. If you were investigating noise in a city centre area, you could use a rose graph over a **wider area** (10 metres in each direction).

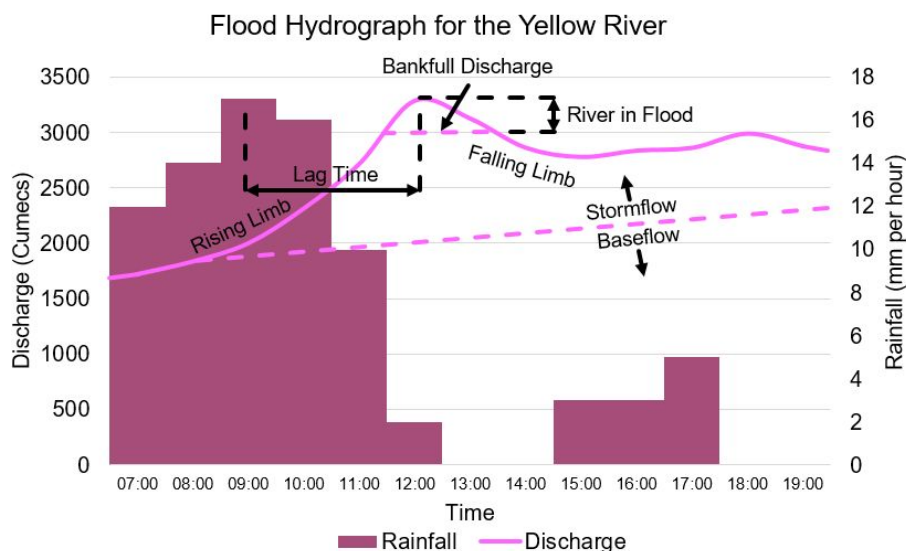
## Line Graphs

Line graphs are useful for **tracking a change, usually over time**. In line graphs, the change that is being tracked will usually be a **gradual change** so that every point can be joined up in one line. A **key** could be used to track how **several factors change** over the same period.

Source: <https://pubs.usgs.gov/fs/2009/3046/>



Line graphs may be simplistic as stand alone graphs, but can also be used in **combination graphs**. For example, Flood Hydrographs use bar charts (precipitation) and line graphs (river discharge). You can create combination graphs by selecting 'Combo Chart' in data formatting programmes.

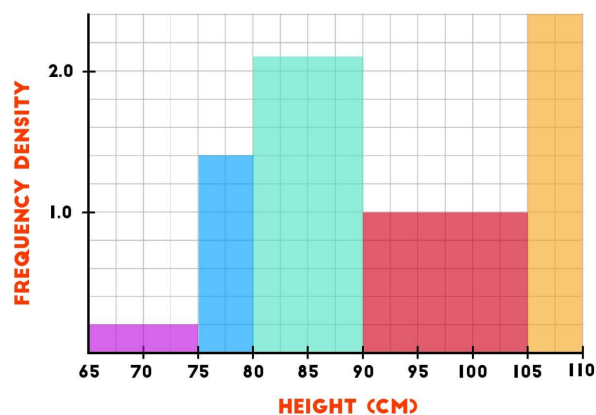


## Histograms

Histograms are simply **bar charts of varying thicknesses**; for data with **different class widths**, a histogram is most appropriate. The **area** of a histogram's bar (the **frequency density** multiplied by the **class width**) is the frequency of your reading.

For example, in the figure, the red box represents a frequency of 15 people between the height of 90cm and 105cm.

There are histogram generators online, or use Excel - type all your data into a table, then highlight the table and click insert statistical chart.



Source: [www.pythagorasandthat.co.uk](http://www.pythagorasandthat.co.uk)

## Box Plot

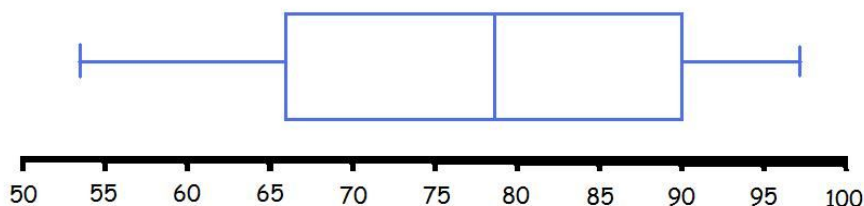
Box plots (sometimes called a Box and Whisker graph) are a pictographic way to represent the **median, range and interquartile range**. They are used to compare the spread of results and can be used to compare multiple sets of **continuous data**.

A box plot is easy to draw:

1. Draw an **appropriate scale horizontally** - Make sure your scale includes your maximum and minimum results, and should be for the variable you measured (e.g. the height of waves, time taken to erode, etc)



2. Draw a **small vertical line** where the median occurs. Repeat this for the maximum, minimum, upper and lower quartile (see later on how to calculate these values).
3. Join up the median, upper and lower quartile to form a box. Finally, draw a horizontal line connecting the maximum and minimum to the central box. Your diagram should look similar to the figure.

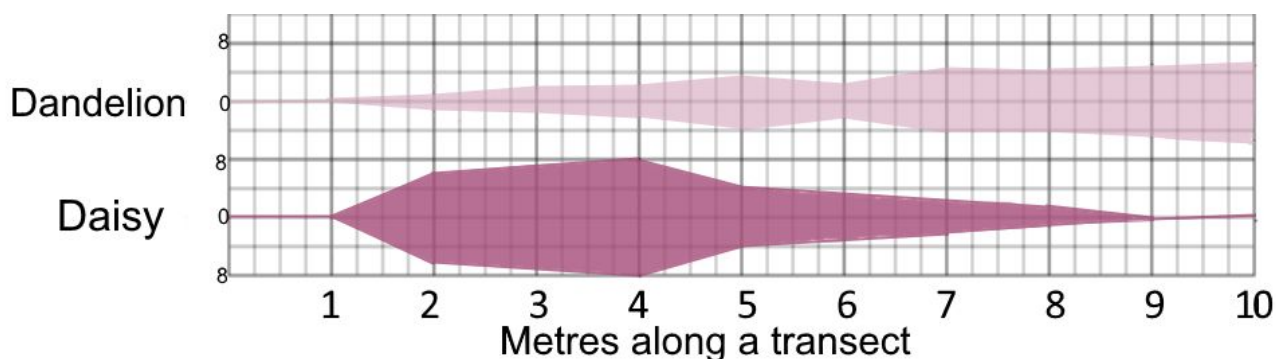


### Kite Diagram

Kite diagrams show the **changes in frequency** of a factor over a **measured distance**, usually along a **transect**. **Multiple factors** being counted along the same transect can be shown in kite diagrams, which make them useful for **comparing spatial distribution** - especially of **plants and animals**.

Drawing kite diagrams:

Distance along transect (metres)		1	2	3	4	5	6	7	8	9	10
Plant	Daisy	0	12	14	16	8	6	4	2	0	0
	Dandelion	0	2	3	4	7	5	8	8	9	10



How a kite diagram works:

1. **Y axis** - the y axis works like a **mirror**. In each **section** (e.g. the daisy section), the y axis should be as **wide** as your **largest piece of data**. In the **middle** of your section is **zero**, which is the **line of symmetry/ mirror line**. Each side of the mirror line goes up to **half of the largest piece of data**. In this example, the largest number is **16**, so each side of the mirror line goes up to **8** (because 8 is **half** of 16).


















- Plotting points** - to plot points, your **value** should be **halved** and each half should be plotted on **either side of the mirror line**. This will create a **symmetrical shape** when all the points are plotted and joined up.
- Labelling** - all of your sections should be **labelled** with the **factor** you are measuring and the **distance** of the transect. On your y axis, you should also label **numbers**. Make sure to label the **zero line (mirror line) and the maximum value** (half the highest value). All of the sections (daisy, dandelion etc.) should be the **same size** so that you can **compare**. **Do not change the size of the sections** on the same graph. Always use the **biggest number** in the **entire** set of data to work out how wide your section should be.

## Pictograms

Pictograms use **icons** or **pictures** to display sets of **discrete data** (data that has a **finite** count, i.e. **cannot have a decimal point**). Each icon represents a number, so that a completed pictogram will show the **frequency of a factor in different sets of data**. The icon usually resembles what is being counted. Here is an example of a completed pictogram that has been created from a building use survey.

A pictogram showing the different types of buildings on Main Street:

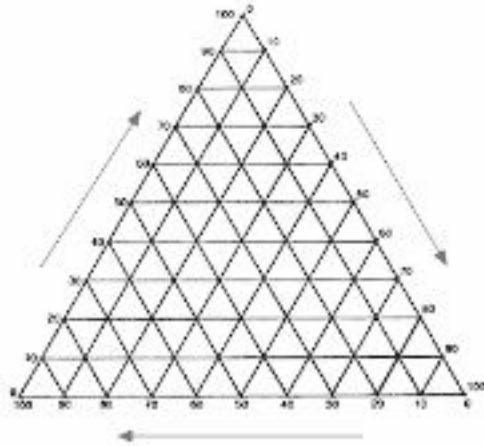
Residential 		18	<b>Key:</b>  1 icon = 1 building  E.g.  = 1 house  Overall - 41 buildings on Main Street
Industrial 		1	
Commercial 		8	
Entertainment 		5	
Public Building 		3	
Transport 		2	
Services 		4	

Pictograms are useful for presenting **simple counts** in interesting and understandable ways. However, pictograms can become **confusing** when there are **many numbers involved** because it would require **counting many icons**, which is **unclear**. To present larger counts, a key could be used which **condenses down** the counts into **ratios** (e.g. 1 icon = 10 buildings) but in doing this, you must ensure your counts all have the same **highest common factor**. For example, if you want to use a key of 1 icon = 10 buildings, your different building counts should all divide by 10. Using **half icons or quarter icons** to represent a smaller number becomes **messy and confusing**, so generally it is best to stay away from pictograms when many numbers are involved.





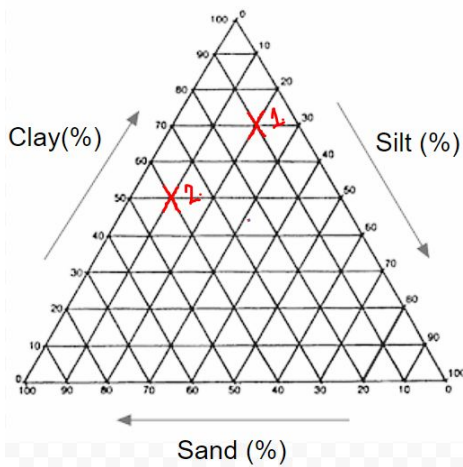
## Triangular Graphs



Triangular graphs **compare the composition** of different data sets by using **3 variables that add to 100%**. Each data set is **plotted** as a point on the triangular axis shown.

Each axis (side of the triangle) goes up to **100%**. The data you plot must be composed of **3 variables that collectively and exclusively** add to make 100%.

For example, a triangular graph could be used to show **soil content** in 10 different locations (the **data sets**). In these 10 different areas, the soil content is mainly a mixture of clay, silt and sand. Here is how some areas would be plotted on a triangular graph.



**Area 1: Clay - 70%, Silt - 20%, Sand - 10%.**

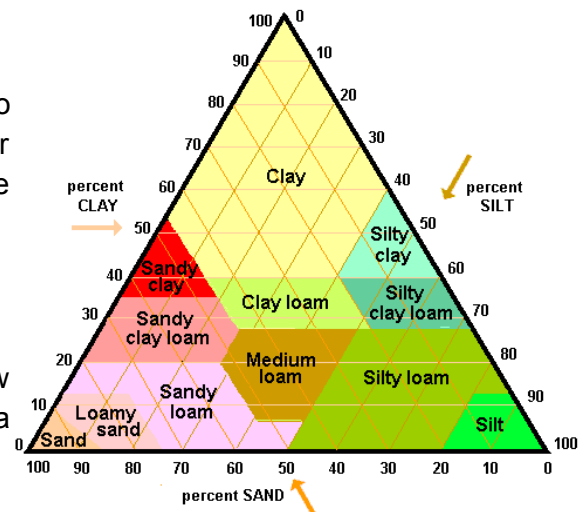
**Area 2: Clay - 50%, Silt - 10%, Sand - 40%.**

The easiest way to **plot points** is to read **horizontally from the left axis**, then **diagonally downwards from the right axis**, then **diagonally upwards from the bottom axis**. Ensure you label each point plotted as well as each axis.

Furthermore, you could split your graph up into **predetermined definable areas**, so that wherever your points lie indicates what your point could be defined as. Here is an example:

Source: <http://oneplan.org/Water/soil-triangle.asp>

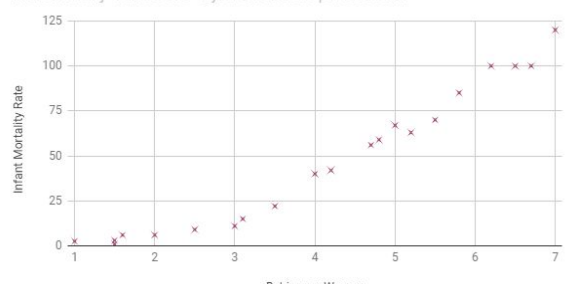
When your points are plotted, the graph easily show what the composition of your data set means in a **geographical context**.



## Scatter Graphs

Scatter graphs are used to show the **relationship** or **correlation** between an **independent variable** and a **dependent variable**. Every piece of data is plotted like a coordinate on an axis: the **x axis** is the **independent variable**, i.e. the **cause**. The **y axis** is

Babies per Woman vs. Infant Mortality Rate (Globally)  
 Infant Mortality - number of 0 - 5 year olds that die per 1000 born.



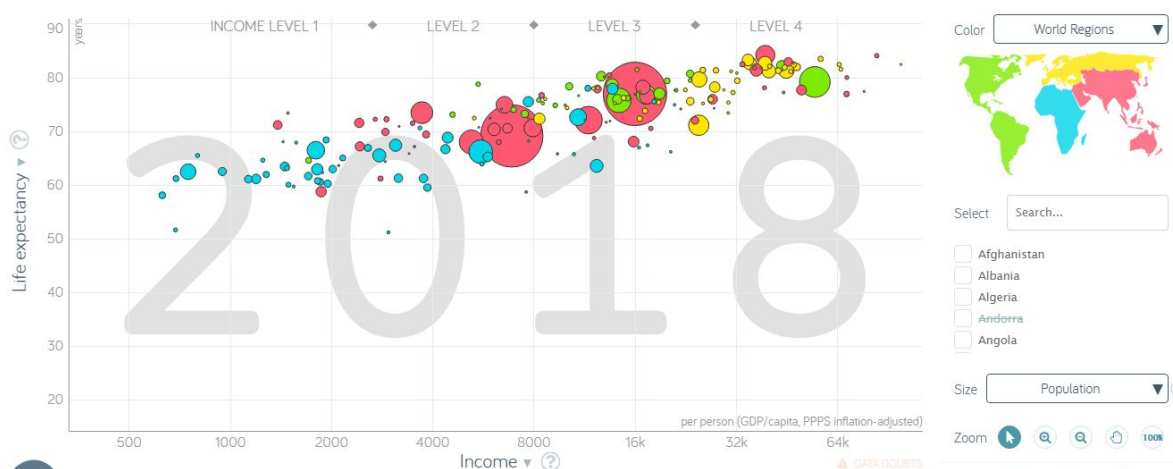


the **dependent variable**, i.e. the **effect**. Scatter graphs are useful in proving that a variable has a definite effect on a factor that is being observed in your investigation. If you are considering using a scatter graph, ensure that you have enough data collected so that a **clear** correlation can be identified.

If you want to **compare** how **multiple factors** are affected by the **same independent variable**, the different factors could be colour coded so your graph is **clear**. Ensure that you include a **key** so that each factor's colour code is obvious.

A **line of best fit** can be drawn on a scatter graph, which shows the **average trend** of your scatter graph. A line of best fit can be added on some softwares such as Microsoft Excel, or it can be drawn by you. A good way to check if a line of best fit is **accurate** is if there are approximately an **equal number of points above and below your line**, **excluding anomalies by circling them**.

**Bubble charts** are a type of scatter graph where the size of the plotted point also shows another **variable**.



Source: [https://www.gapminder.org/tools/#\\$chart-type=bubbles](https://www.gapminder.org/tools/#$chart-type=bubbles)

This bubble chart from Gapminder uses the size of the dots to show the country's population size. Using this type of graph allows 3 separate sets of data to be presented on one graph. However, a bubble chart should only be used if the information is **relevant** to your investigation. Ensure you indicate within your key what the size of your bubbles refer to.

## Logarithmic Scales

A **logarithmic scale** is a **non-linear** scale where numbers within a **large range** are **condensed** down into a **smaller, easier to understand scale**.

The **mathematical function** 'log' has a **base number**, which indicates how your raw data is condensed. The maths can be complicated, but log can be applied to your data by the **'log' button on your calculator or on a spreadsheet**, meaning all you have to do is **input your data**. Different base numbers can be used, but  $\log_{10}$  is most commonly used (10 is the base number here). In instances where  $\log_{10}$  is used, every time your **raw data increases by  $1^{10}$** , your

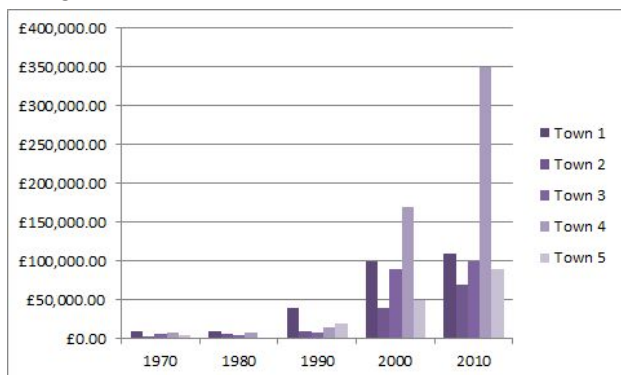


**logarithmic scale goes up by 1.** This table shows the logarithmic scale that would be created when inputting certain numbers, and it also shows what would appear on your calculator when typing your raw data in.

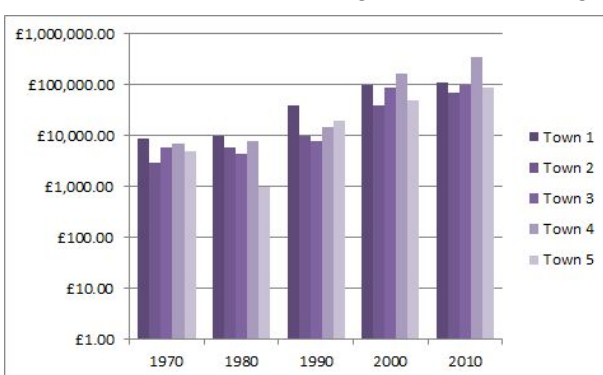
Raw number	$\log_{10}(x)$ format	Number that is used in your scale
10	$\log_{10}(10)$	1
100	$\log_{10}(100)$	2
1000	$\log_{10}(1000)$	3
10000	$\log_{10}(10000)$	4

The **Richter scale** is an example of a logarithmic scale, where a **4.0 magnitude** earthquake is **10 times stronger** than a **3.0**, **100 times stronger** than a **2.0**, and **1000 times stronger** than a **1.0**.

This scale is very useful when your raw data has a **very large range**, because it ensures smaller numbers are still **clear**. For example, this scale would be useful if some of your figures were in triple digits, and other figures were in six digits. In these two graphs, house price data in 5 towns is being compared. Note how the comparison is much clearer to see on the logarithmic scaled graph.



Without logarithmic scale.



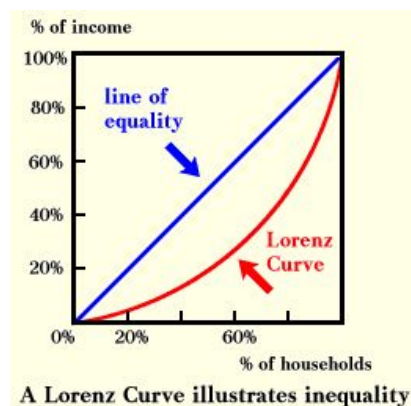
With logarithmic scale.

If logarithmic scales are used, make sure that you indicate this to avoid confusion.

## Lorenz Curves

A Lorenz curve is a **graphical representation** of the **distribution** or **equality** of something. A **straight, diagonal line from the origin** represents **perfect equality**. The **further away** the Lorenz curve is from this, the **more diverse the sample is** and the more unevenly the values are spread out. From a Lorenz curve, the Gini Coefficient can be calculated.

1. **Rank** the data



2. **Order** the data by Rank
3. Calculate the **proportion** (percentage) of each data from the total data
4. Calculate the **cumulative proportion** by increasing rank (calculate the running total from adding the percentage of each line in turn to the line before it)
5. **Graph** the ranks on the **x axis** against the cumulative proportion on the y axis.
6. Draw the **perfect equality** diagonal line.

## Cartographical Data Presentation Methods

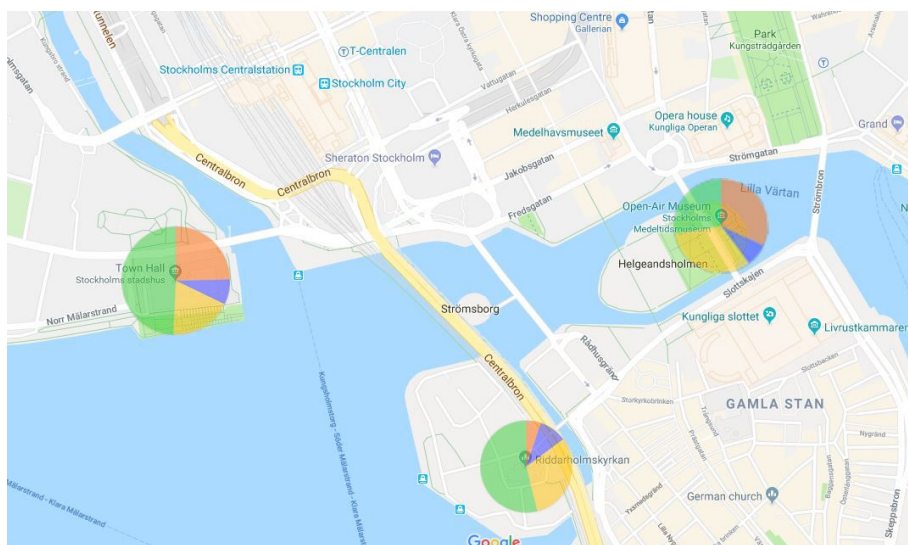
### GIS

A GIS (**geographic information system**) is a form of data analysis and presentation. Any **digital presentation of data** in comparison to its **location or spatial distribution** can be classed as GIS. For colleges with GIS software, this is often simple to create (so see your teacher for more specific guidance). For those without specific GIS software, any of the cartographic data presentation methods may be considered GIS, if you create them **digitally** rather than drawn by hand.

GIS is more **accurate** than hand drawing, as it minimises the **risk of human error** in drawing graphs or pinpointing locations. It can enable you to **display a large data set**, or multiple variables/information. For example, for each location sampled, a bar chart could display the average scores of several questions on an environmental survey or differing demographic characteristics along the rural-urban continuum. GIS is a key addition to create a high-level fieldwork report that looks **scientific** and **reliable**.

### Map Overlays

Overlaying graphs or other data such as pie charts on to maps can be a powerful tool to easily display data. This map uses **proportional pie charts** and Google Maps, to display **footcount survey data**. The larger the pie chart, the greater the number of people that were surveyed in the 10 minute data collection period at the: Stockholm Town Hall, Riddarholmen Church and Stockholm Middle-Ages Museum. The various colours represent the **different proportions of people by age** (years) in each survey location.



**Key:** 0-15  
 16-30  
 31-45  
 46+

Map Credit (Google, 2018)



You could also use graphs such as bar charts as an overlay on the map, or even **qualitative data** such as quotes from questionnaire respondents. These maps are **high level additions** and should **not be overused**. The graphs which you overlay should **not be too large**, which would obscure the map, **or too small** so that the segments are difficult to see. Always ensure the data presentation method can be easily understood. To overlay graphs onto a map, you can create the graphs digitally, remove any data labels/axis etc. and save them as an image. Then remove the background using the tools on a programme such as PowerPoint and move the image onto a map. You can then adjust the size of the image to make them proportional, but make sure that the image is cropped right to the edges of the pie charts, otherwise this would be inaccurate.

## Image Overlays

Similar to map overlays, image overlays may be used to display both a set of values and their location (often on a **smaller scale**). Using an image as a background may allow the use of **3D graphs** - such as 3D bar charts - to display data. For example, you could overlay the rates of erosion over an image of the coastline studied, hence showing localised variations in erosion rates.

3D graphs may look impressive, however caution must be taken to ensure that 3D graphs don't **overcomplicate** the image or **disguise trends** in data. If it's difficult to tell the start of the bar (and so the location of the data taken) or the height of the bars (and so the value of your dependant variable) - use 2D graphical presentation methods instead.

## Isoline Maps

Isoline maps use lines to present areas in which points are of an **equal value**. Isolines are drawn using **geospatial** data (data that is specific to a location), and overall they show how the **value of a factor changes spatially**.

For example, an isoline map could be drawn to show **pedestrian density** in a town centre:

Raw data from several pedestrian counts.



Isoline map for pedestrian density.



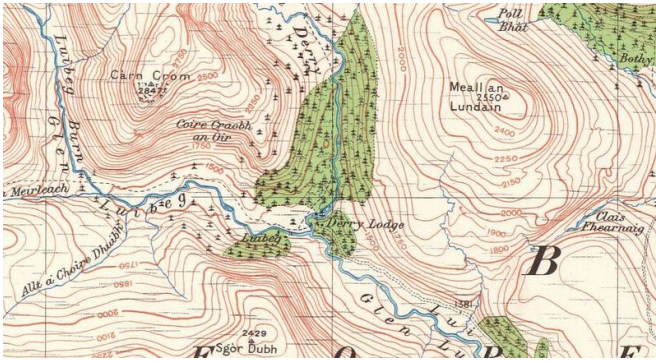
The isolines shown on the map are **10, 20, 30, 40, and 50**. Each of these lines show the **estimated** point at which a pedestrian count would show this number. Note that the lines show **estimations**





where there is a **lack of data**, which makes isoline maps useful. However, it is also important to consider as estimating values can lead to **inaccuracies** and may disregard trends.

The **10 line** separates numbers **10 and below** from higher numbers. The **20 line** separates all values **below or equal to 20 but more than 10**. The **30 line** separates all values **below or equal to 30 but more than 20**, and so on. To make the isoline map even clearer, a **colour code** could be added to emphasise the different sections. When using isoline maps, ensure your lines' values increase by the same amount (e.g. all of the isolines increase by 10 in this example).



Isoline maps can be used for anything that shows many **different geospatial values**, and they are often used in weather or topography (the contour lines on maps are isolines). Take this map of the Cairngorms in Scotland for example. Each line represents elevation above sea level, and each isoline increases by 500m. The isolines get closer together when the elevation increases rapidly.

Source: <https://cairngormwanderer.wordpress.com/page/18/>

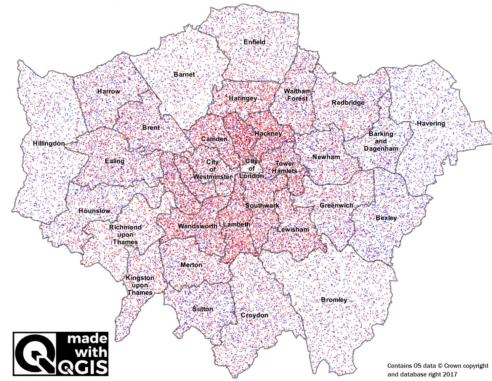
## Dot Map

A dot map is a cartographical data presentation technique that uses small dots on a map to show the **distribution** or **density** of an **observation**. Wherever you have a recorded observation, a dot is marked on that **exact location on the map**. If you have two observations in the same exact location, the dot can be placed slightly to the side so that it can still be seen. Eventually, the map will have enough dots that a clear pattern is shown, which indicates both **spatial distribution** of your observation and the **density** of your observation within certain areas.

What to consider when using a dot map:

- Collect a **large amount of data**. Dot maps are only useful when you have a lot of data so that a trend in **density** can be spotted. If you have a small amount of dots, your trends will be unclear. Make sure to choose something you are able to make **hundreds of observations** in.
- Use **appropriate dot sizes**. If your dots are too large, they may overlap meaning observations are lost. Ideally, your dot size should be large enough to create **density patterns** but small enough so that (if you were to zoom in) every dot could be seen. Compare the two dot maps (Source: <http://learnqis.uk/creating-statistical-dot-density-map-qgis/>). The first dot map clearly uses dots that are too large, as all of the map is concealed and there is no density pattern. The second map uses dots that are appropriate for the dot map.

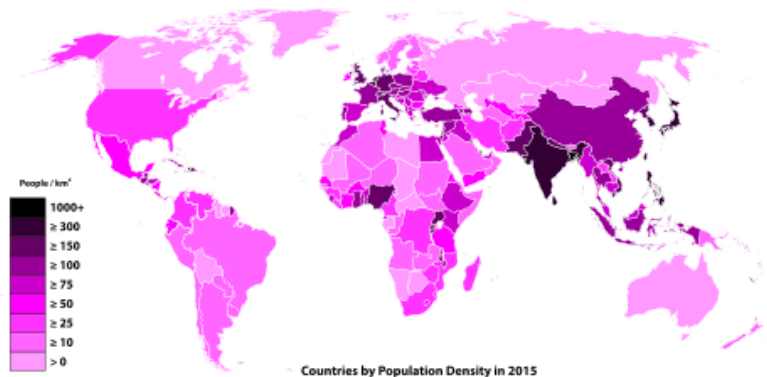




- What do your dots **represent**? **1 dot** could represent **1 observation (1:1)**, or it could represent **more than 1 observation (1:many)**. If you have a **large amount of data**, it may be useful to include a **key** where **1 dot represents more than 1 observation**, e.g. 1:10 ratio, where 1 dot actually represents 10 observations. You may also wish to include a **colour coordinated key**, where the colours of the dots show different observations.
- Is a dot map the most **appropriate** method for your data? If you are recording something that has a **yes/no** or **existent/non-existent** observation, dot maps can be useful. However, if you are recording something that **can be recorded on a continuum or scale**, a **choropleth map** may be more suited.

### Choropleth Map

A choropleth map uses **colouring** or **shading** in **predetermined areas** to show the **average prevalence** of a **phenomenon**. This factor can be recorded on a **scale** or **continuum**, and each colour indicates a different section (called **data classes**) of your scale.



Source: [https://simple.wikipedia.org/wiki/File:Countries\\_by\\_Population\\_Density\\_in\\_2015.svg](https://simple.wikipedia.org/wiki/File:Countries_by_Population_Density_in_2015.svg)

Choropleth maps are useful when analysing the **intensity/prevalence/frequency** of a phenomenon in different areas. **Patterns** can be spotted within your map, which makes choropleth maps useful for analysing factors that vary **spatially**.

Things to consider:

- **Borders** - your sectioned **sub-areas** should be small enough so that your average value does not **ignore** obvious **variances** within your data. Your borders should also be large enough so that you can collect a sufficient amount of data within your **timeframe**. If you have many small areas that show the same observation, it may be worth **condensing** these areas into one larger area.





- **Colours and keys** - use colours that can be seen in **greyscale** and try to choose colours that can be distinguished from each other clearly. Your key should use quoted numbers rather than vague interpretations.

#### Clear numbers.

	<10%
	10-20%
	21 - 30%
	31 - 40%
	41 - 50%
	>50%

#### Vague description.

	Very Low
	Low
	Slightly Low
	Average
	Slightly High
	High

- **Number of Data Classes** - There should be a **compromise** in the number of data classes used in the key. If you have **too few** data classes, there may be a **generalisation** of your data. **Too many**, and the colours in your choropleth map could be **indistinguishable**.

## Flow Lines

Flow lines can **represent movement** of people, animals etc., to or from a specific place. They are best **not confused with desire lines**, which can have a different meaning.

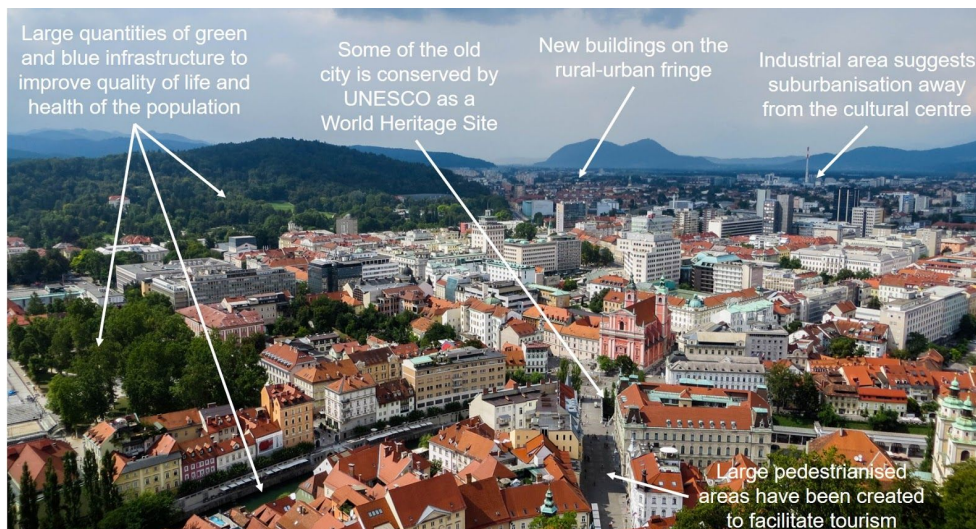
The example below shows the areas of Barcelona which students travel from, to reach St. Peter's School Barcelona. The **width of the arrow** is used to represent how many students travel from a particular area to the school. It is only a generic indication, but can be a useful tool, which could also represent migration, people travelling to an event etc. and is therefore most likely to be used in an Urban Environments or Changing Places fieldwork investigation. They are useful for analysis when **considered with additional sources** of data.



## Qualitative Data Presentation Methods

### Photographs

If you are using photographs as a method of data presentation then they should be **clearly annotated**, with information relating to your hypotheses. You may use **place names, geographic theories or observations** that you made when taking the photos to give them greater meaning and relate them to your investigation.



NE Ljubljana as seen from the Ljubljana Castle - It is appropriate to **state which direction the photograph is taken from** if known.

Map Credit: (Google, 2018)

Photographs are a great way to enrich your report and make it more stimulating to read. You may take pictures of large area, but analysing smaller areas in detail is just as important. You may want to take images of your survey sites. When taking photos consider:

- The **angle** which you are taking the photograph at - what does it show and what does it not show? Is it objective?
- Be careful not to photograph individual **people** as you do not have their permission.
- What is the area like that you are photographing? Is it **safe**? If not, it may be advisable to not take pictures if there is a risk, for example risk of your camera/phone being stolen.

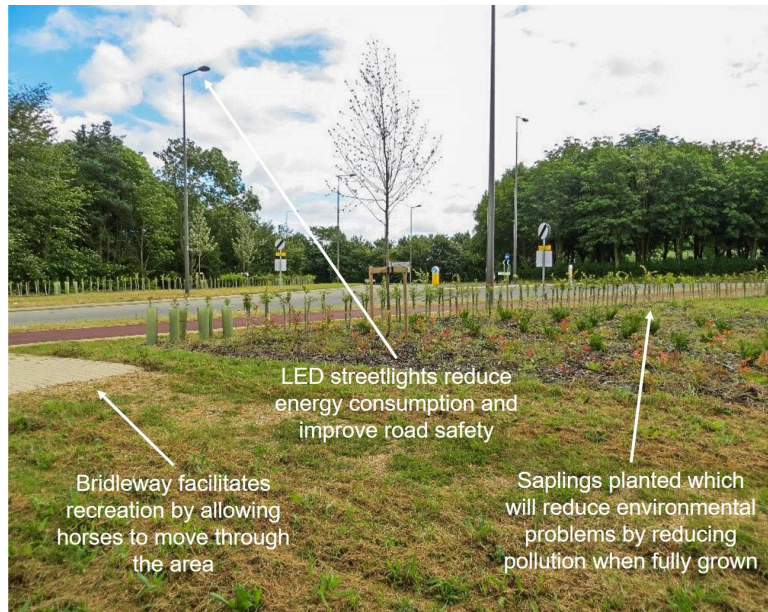




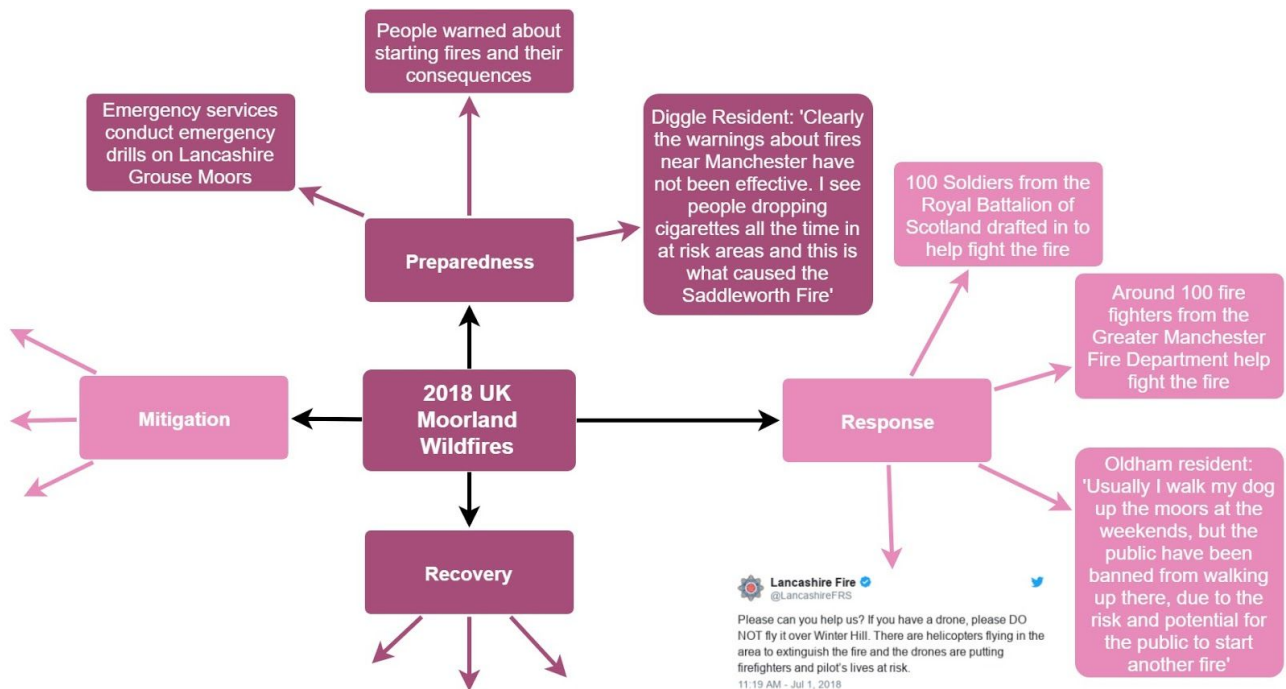
- Can you take pictures in the **same location** with the **same angle** at **different times** and then compare these later?
- Could you find images **online** and then photograph the same place yourself? What are the differences if there are any?

You can also compare pictures that you take to maps that may be online. You can use Bing Maps to find Ordnance Survey maps, and Google maps to show terrain and different places. This creates an insightful source of data presentation.

**Always annotate photographs** - no marks are awarded for 'pretty picture'!



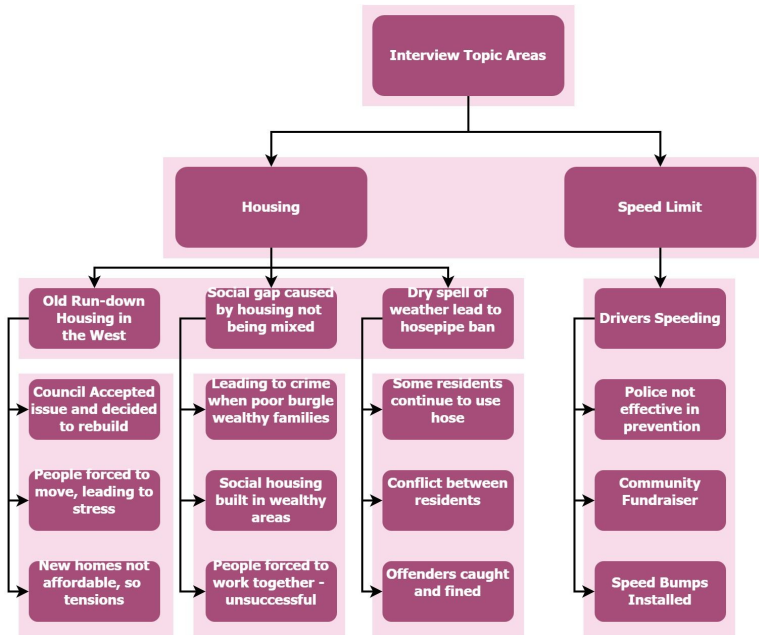
### Quotes/Mind Maps



Mind maps are another useful tool used to present a wide range of **qualitative** (and also quantitative) data. It may be useful when creating a mindmap to structure it around a part of the **core theory** - in the example above, the Hazard Management Cycle. This gives **clear structure** to the mind map and demonstrates your **knowledge of the geographical context** in your



investigation. It is important to ensure that you do not put **too much information** on the mind map, which would reduce its readability and effectiveness as a data presentation technique. You could also sort the data based on your hypotheses or the sub areas which you are investigating in your fieldwork.



A mind map could also take the form shown on the left, which codes and splits different areas from an **interview** into different topic sections, with each quote linking to the next. This can be useful not only for data presentation, but helping you to sort through the **relevant** sections of an interview transcript, which is likely to contain a lot of data raw data that will be **hard to analyse** otherwise.

### Word Clouds

Word clouds are very useful for presenting data from qualitative sources such as **questionnaires**. It would otherwise be difficult to present this data in an easily viewable form. Websites such as wordclouds.com allow you to **paste text**, such as questionnaire and interview transcripts. The **most common words** will appear larger, so you can easily assess the **themes** present.

You can also compare word clouds between different locations. It may be useful to remove words such as 'the', 'and', 'I' etc. as these are frequent, but offer no benefit when included. You should also be careful as phrases such as 'not welcoming' will be split into 'not' and 'welcoming' which may incorrectly suggest trends which are not present. You could hyphenate these phrases to overcome the problem. It may be best to include adjectives which provide the greatest insight in this qualitative format, but using only adjectives may omit other relevant data.



## Necessary Maths

For some of the graphs discussed previously, some simple maths values are needed for a graph to be drawn. These values are known as **measures of central tendency**.

The numbers below will be used as an example for each measure of central tendency.

13    25    79    82    1    45    49    45    67    45    1

### Mean:

The mean is calculated by **adding up all the data** and dividing by the **number of data items**.

For example, using the numbers above, the sum would be 452 and there 11 numbers, so the mean would equal 41.1 to 3sf.

### Mode:

The **most appearing number**. In the example above, the mode is 45.

### Median:

The median is the **midpoint** value. The data needs to be ranked first from lowest to highest value.

1    1    13    25    45    45    45    49    67    79    82

- When there is an **odd number** of data items, the **median is a whole number**. As in the example above, there are 11 data items, so the median is 45.
- When there is an **even number** of data items, the median lies across the **two items** at the midpoint. The median is therefore an **average** (mean) of the **two middle items**.

## Measures of Dispersion

The term 'measures of dispersion' refers to a group of statistical tests that describe data distribution.

### Range:

The range describes the **spread of the data**. Simply, **subtract the highest number from the lowest number**. In the example above, the range would be:  $82 - 1 = 81$

### Interquartile range:

The interquartile range shows where the middle 50% of the data lie. Anomalies should be ignored in this calculation.

- Find the **median** using the method above. (45)
- Find the **lower quartile** by calculating the **median of the lower half of the data**. (13)
- Find the **upper quartile** by calculating the **median of the upper half of the data**. (67)
- The **difference** between the lower and upper quartiles is the interquartile range. ( $67 - 13 = 54$ )

