

Cartographic Skills

L.O. To be aware of the various cartographic skills and when to use them

Cartographic Skills

The term **cartography** is derived from two words:

‘Carto’ = map

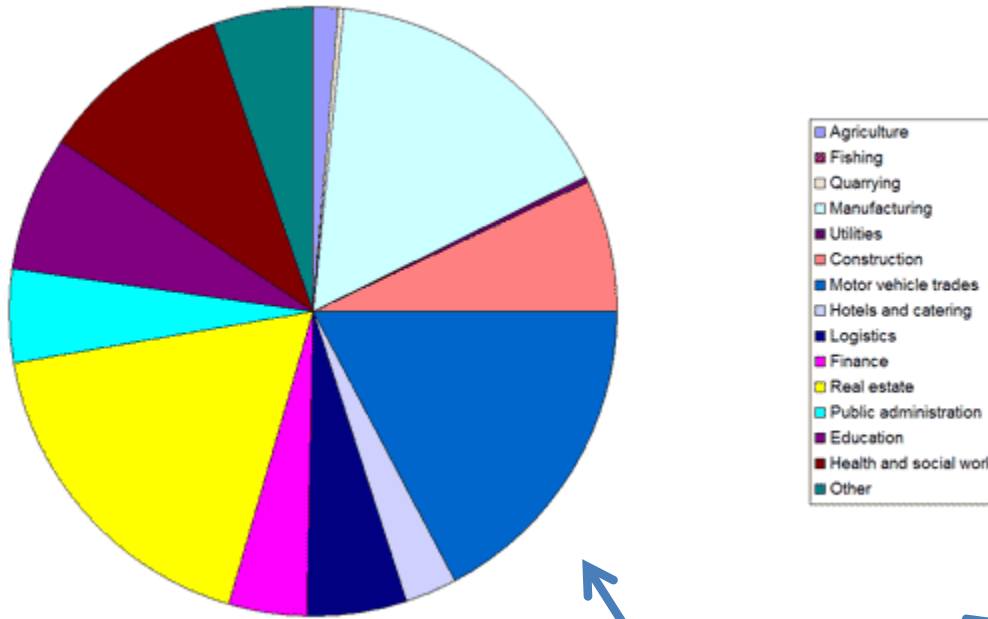
‘graphy’ = write/draw

Cartography therefore means map making

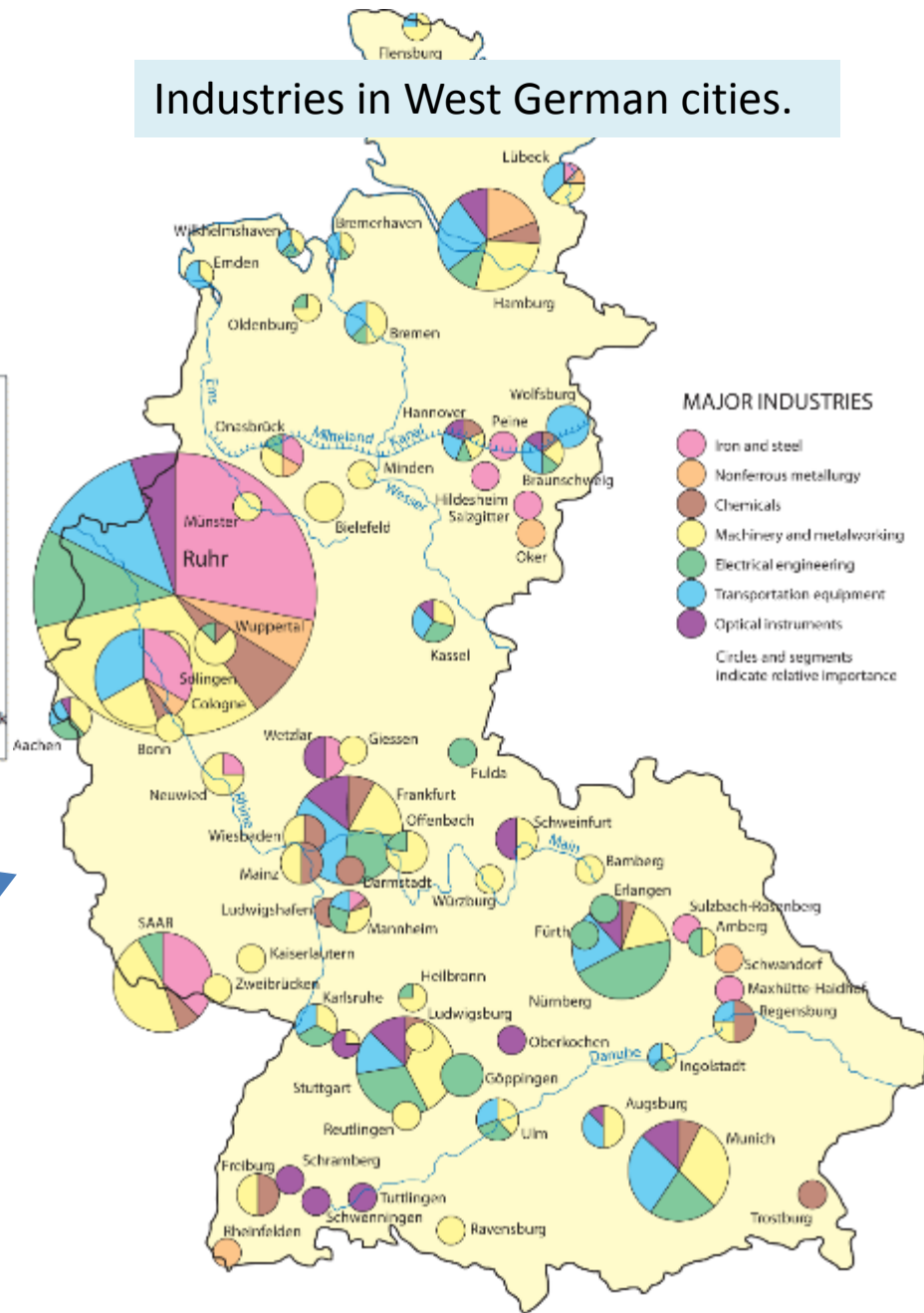
Proportional Divided Circles

- Proportional Divided circles are pie charts that are proportional in **area** to the value of data they represent.
- These can be plotted cartographically i.e. onto maps.

Employment data, for a rural ward in south-east England



Industries in West German cities.



Comment on the effectiveness of these techniques

5 **Figure 1a** shows census Council Tax Band data for housing in four neighbourhoods in the London Borough of Bromley (2001) which are typical of a large city:

- 1 inner city
- 2 a former council estate in the outer suburbs
- 3 privately built housing in the outer suburbs
- 4 rural–urban fringe.

Council Tax Bands reflect the value of housing and thus indirectly the wealth of those living in the housing.

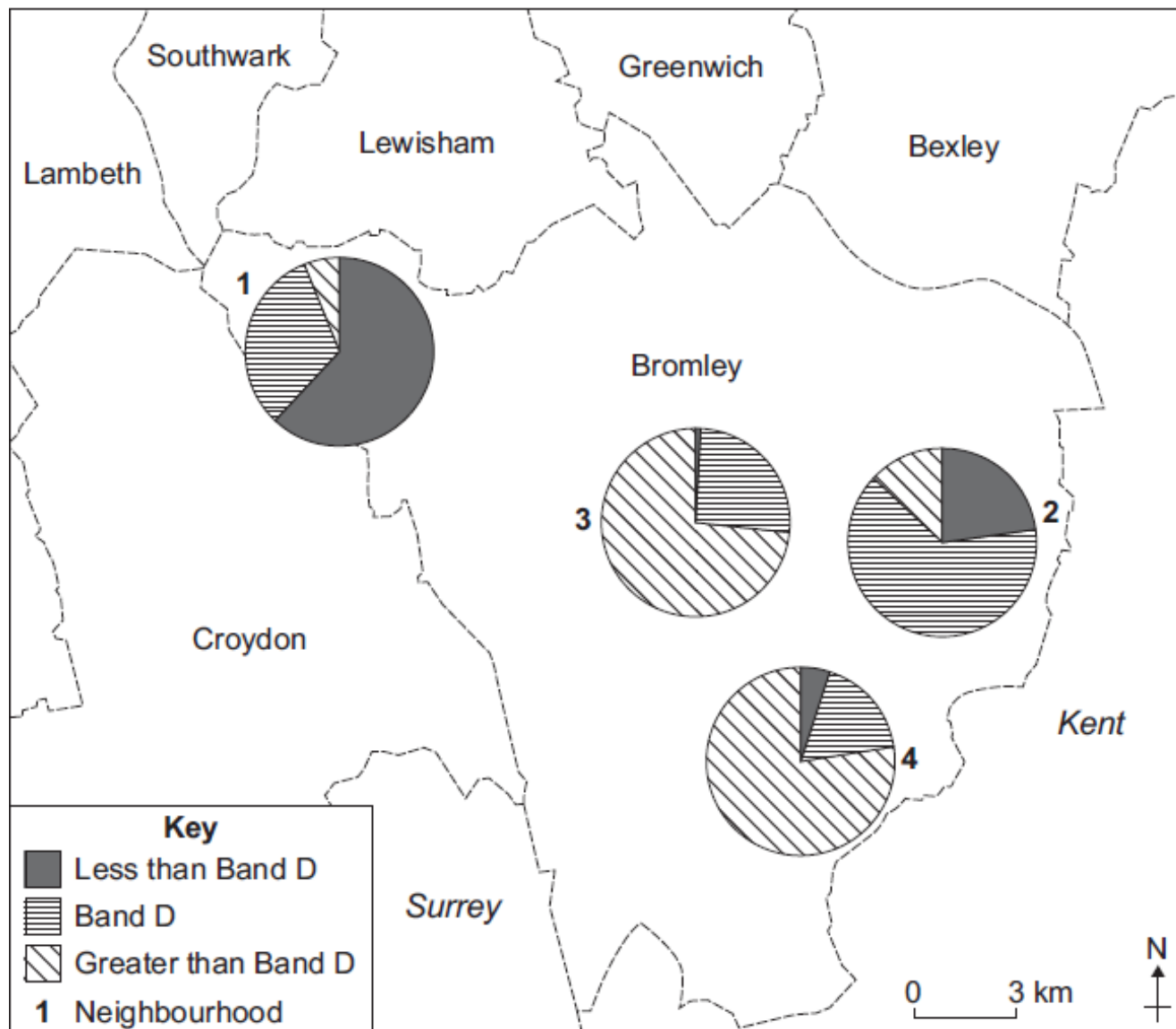
Band D is the average band for England and Wales.

Figure 1a

Neighbourhood	% less than Band D	% Band D	% greater than Band D	% total
1	61.95	31.94	6.11	100
2	23.01	63.97	13.02	100
3	1.09	25.82	73.09	100
4	5.27	17.50	77.23	100

Figure 1b shows the data in **Figure 1a** plotted on a map of the area.

See next slide and answer question underneath



- (a) A triangular graph could also be used to display the data in **Figure 1a**. Evaluate the suitability of a triangular graph and the presentational technique shown in **Figure 1b** for showing these data.

How well did you do?

Notes for answers

(12 marks)

This involves an assessment of both triangular graphs and divided pie charts (as on Figure 1b).

Triangular graphs show data on three axes, allowing three variables to be plotted, shown by one point. It is the only graph that can do this. The axes are scaled from 0 – 100 in a clockwise direction (this can be reversed). It can only be used for three sets of data that are expressed in % format and that totals 100.

A triangular graph presents the data in a very different way, showing clusters of points which have similar characteristics and thus are different from the other clusters. The data in Figure 1b enables each of the areas 1 - 4 to be located in a different part of the graph. Further data would be necessary to plot more points to establish whether these data are typical of the characteristics of urban areas. If the clusters of points are reinforced, this may well be the case. Thus, comparisons can be made about the three components and the areas, but if they are not located on a map, so the spatial element is lost.

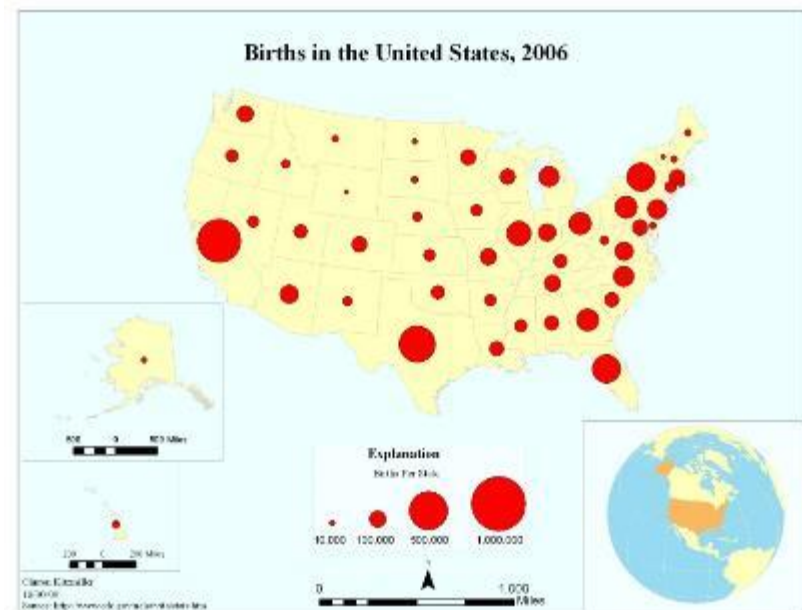
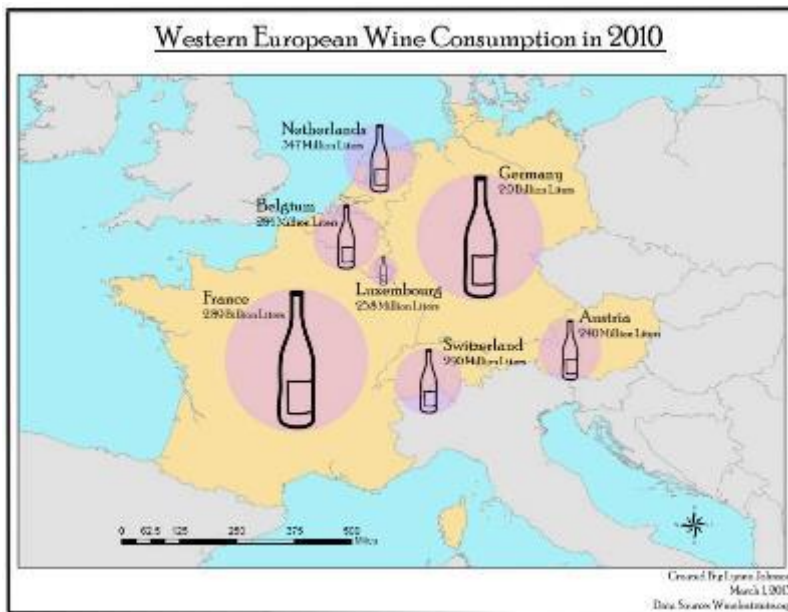
Divided pie charts give a clear visual impression of the relative proportions of the components, though actual amounts are not specifically shown. The components can be plotted as whole numbers or a % (as in this case) converted to a proportion of 360° of the circle. Thus, comparisons can be made between individual charts and similarities and differences in proportions identified. In this way, spatial patterns in the distributions can also be identified.

The technique depicts a great deal of information, so is very complex. The example shown has three components in four charts (12 items of data). This can make interpretation of data quite challenging.

These techniques emphasise different elements of the data and so can be seen as complementary. The candidate can suggest any viewpoint that is well argued.

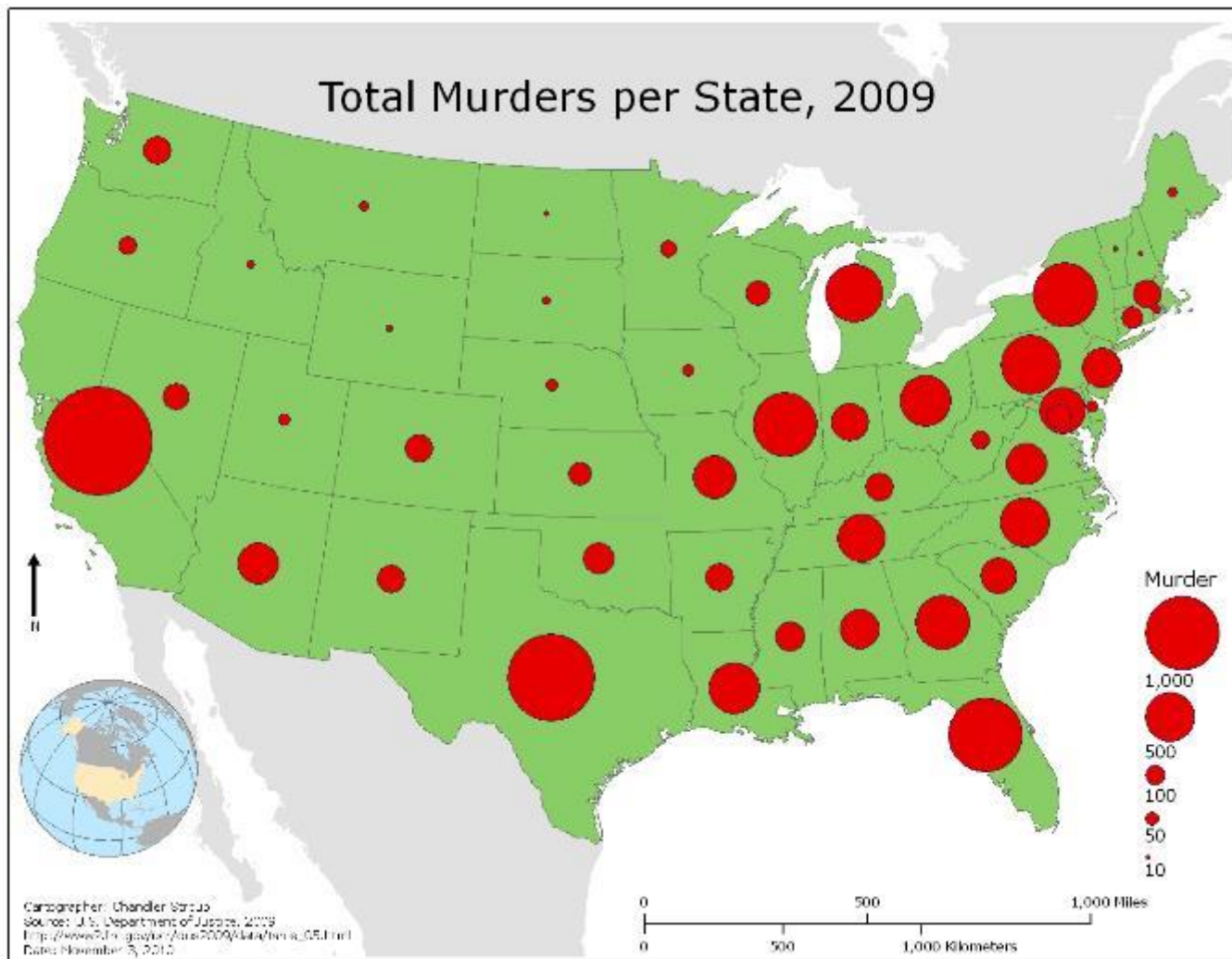
Proportional Symbols

- Proportional Symbols are symbols that are proportional in **area** to the value of data they represent.
- Forms- Squares, Circles, Pie Charts, Bar Graphs



Q. Describe the distribution of Murders

Q. Why might this map give a false impression of murder rates across the USA?



Plot proportional circles to show population

How to:

1. Use a calculator, compass and a pencil. Centre the dot on the correct geographical location.
2. Find square root of the value. This gives you the radius.
3. Multiply or divide the radius to get a value to find an appropriate scale.
4. Add title.
5. Extension – draw a key

Example

- Russia's population is 143 million. Square root is 11.9. You could draw a circle with a radius of 11.9 mm.
- These circles will be too large so divide all radii by 2.

Population proportional circles

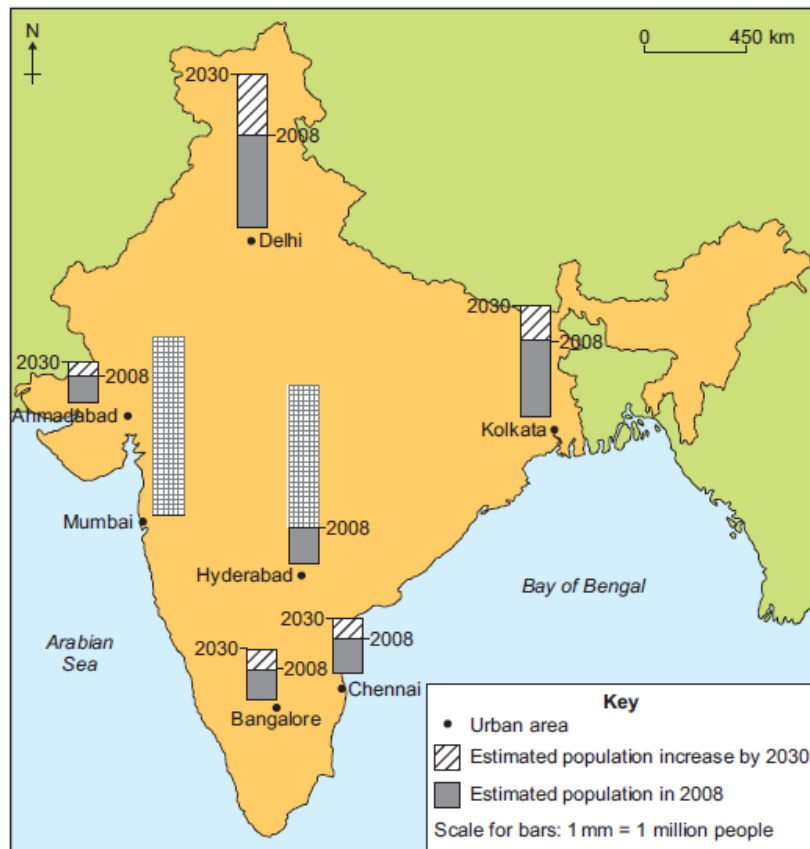


World Region	Population
Oceania	38 million
South Asia	1779 million
European Union	506 million
Sub-Saharan Africa	926 million
Central America	163 million
East Asia	1594 million
United Kingdom	64 million

Exam question- complete on paper

- 1 (c) Study **Figure 5** which shows estimated population change in India's largest urban areas between 2008 and 2030.

Figure 5



- 1 (c) (i) Complete **Figure 5** by adding the following data.

Urban area	Year	Estimated population (millions)
Hyderabad	2030	10
Mumbai	2008	19
Mumbai	2030	30

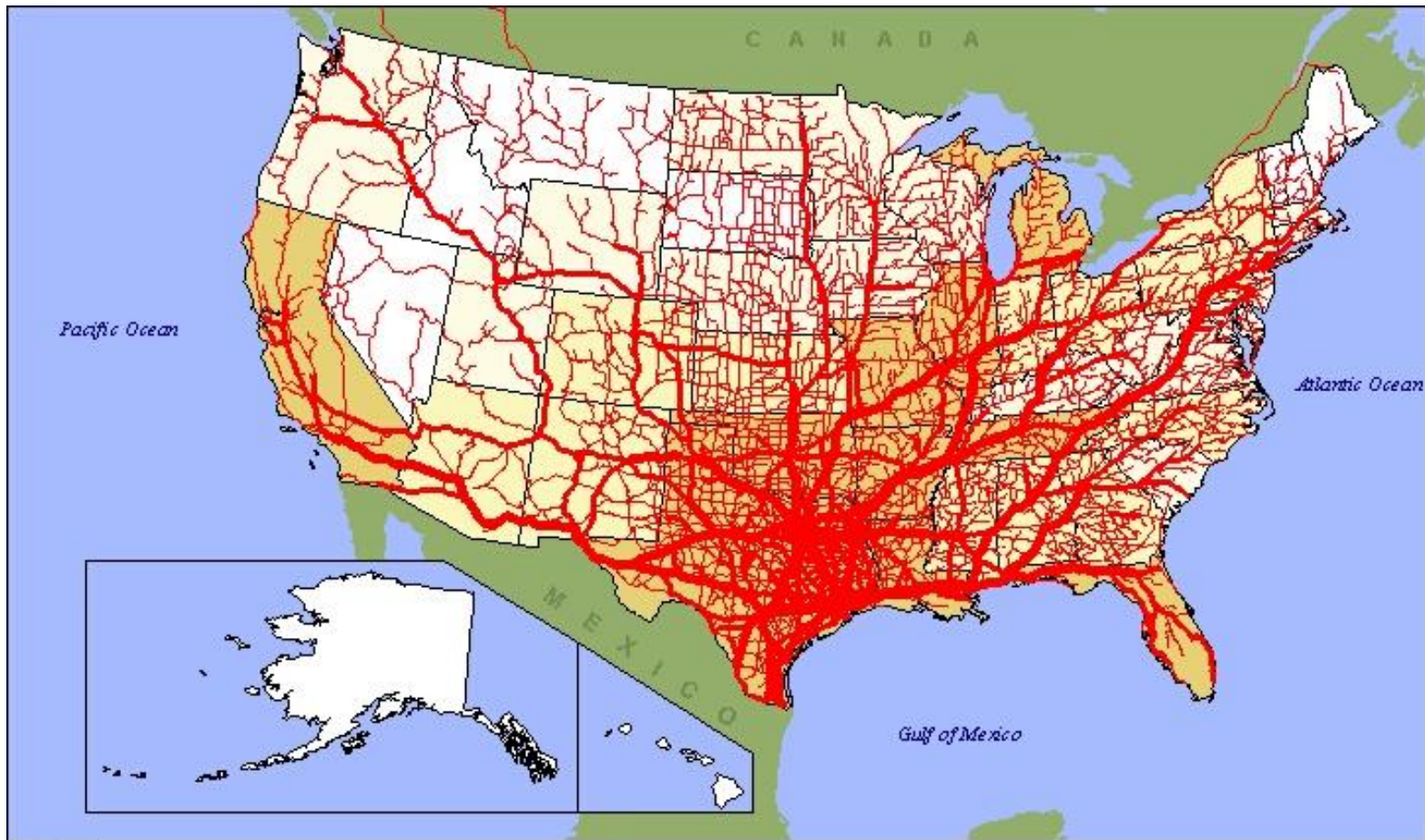
(3 marks)

- 1 (c) (ii) Suggest factors responsible for the changing populations shown in **Figure 5**.

Symbols to show movement

- These lines placed on maps show movement in the forms of arrows. They show **direction** and **amount of movement**. You may have to complete one in the exam and also comment on what it shows.
- **Flow lines** show the amount of movement along actual route
- **Desire lines/trip lines** show movement from origin to destination but take no account of the route taken.

Flow line or desire line?



U.S. Department of Transportation
Federal Highway Administration
Office of Freight Management and Operations
Operations Core Business Unit

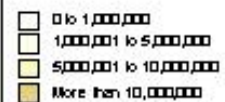
TEXAS

Total Combined Truck Flows
(1998)

Network Flows
(Tons)

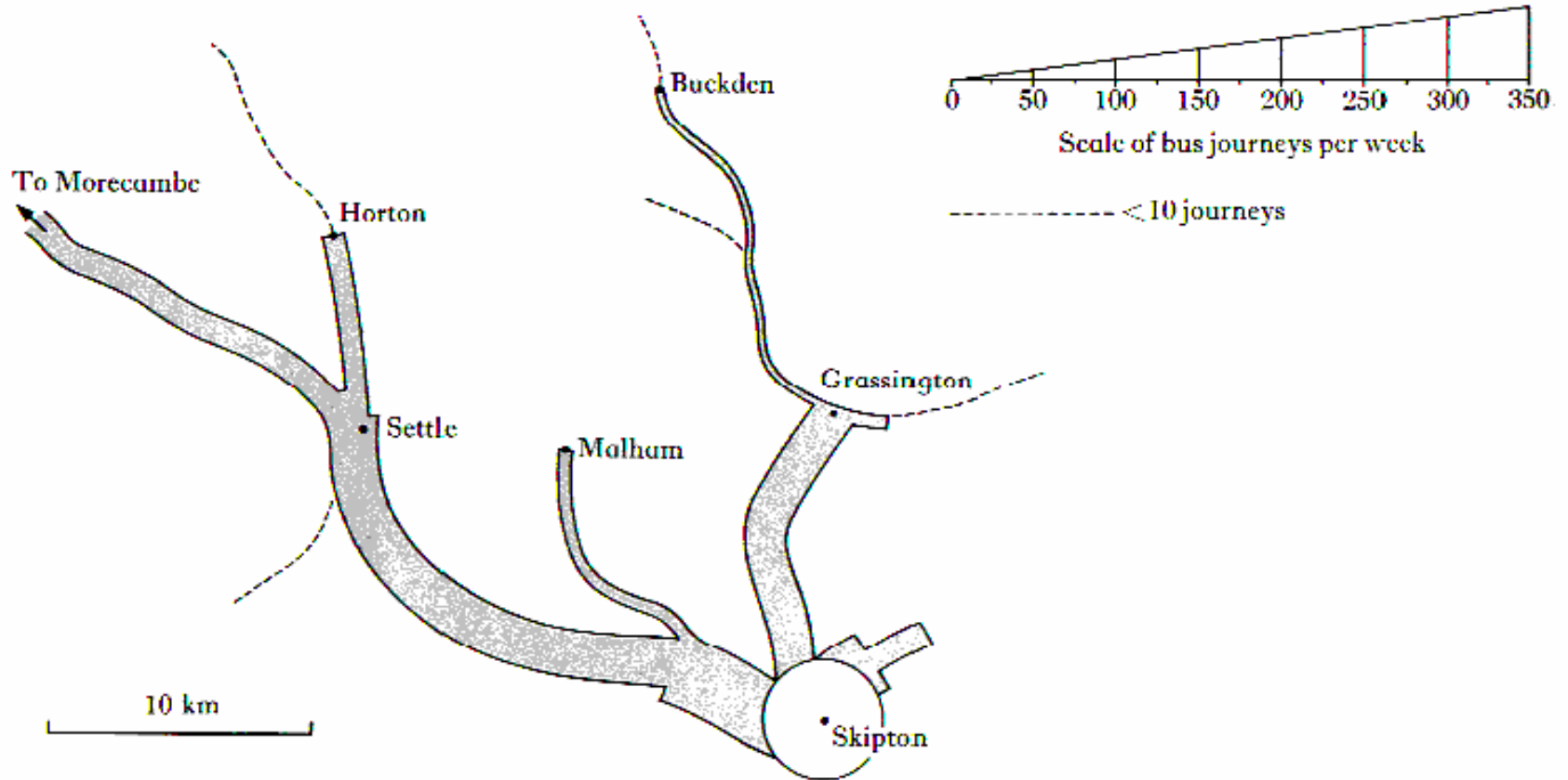


State to State
(Tons)

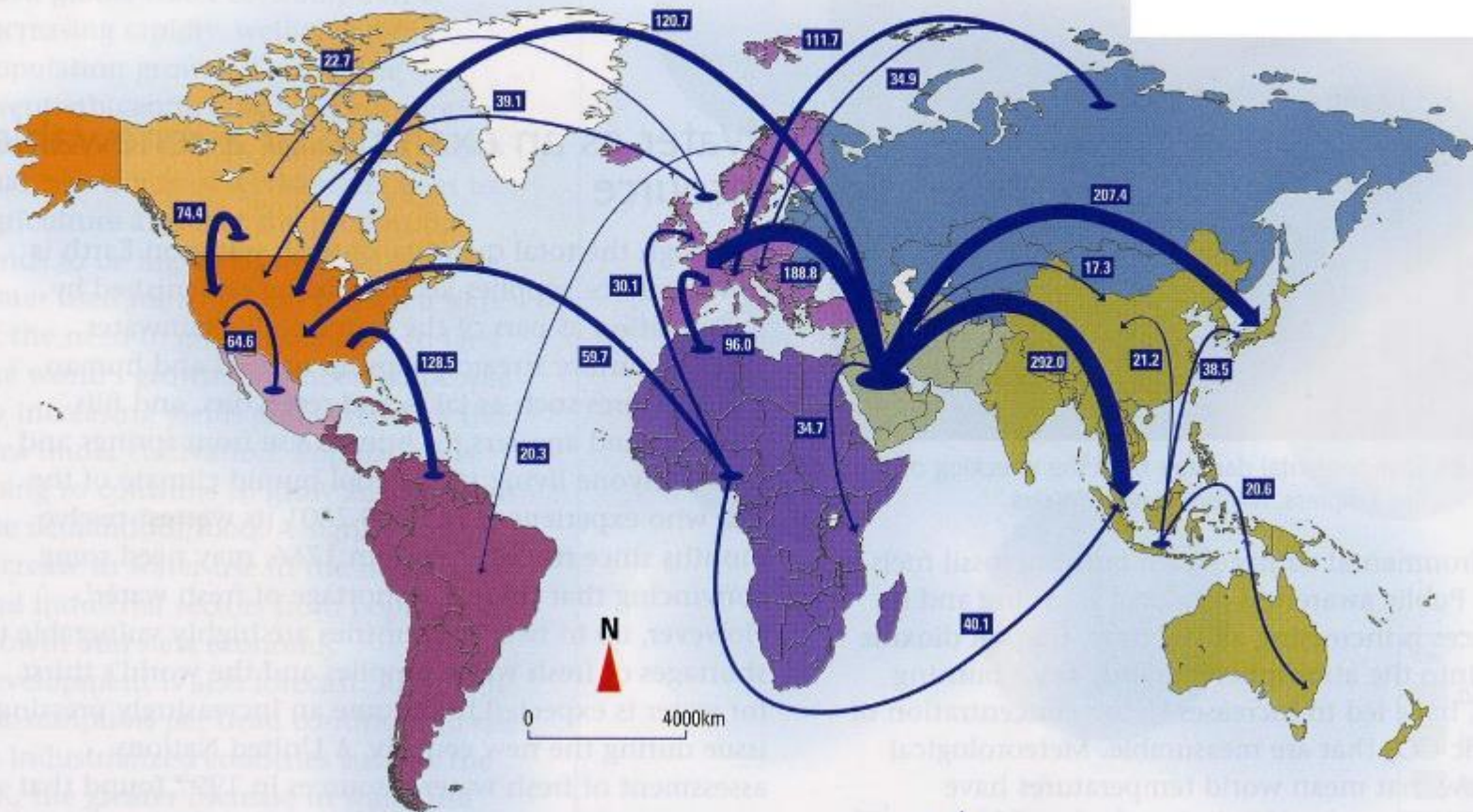


Flow line or desire line?

map showing journeys per week in Skipton.



Flow line or desire line?



▲ Figure 5.34 Major international trade movements in crude oil in 1999 (million tonnes)

Flow line maps

Good

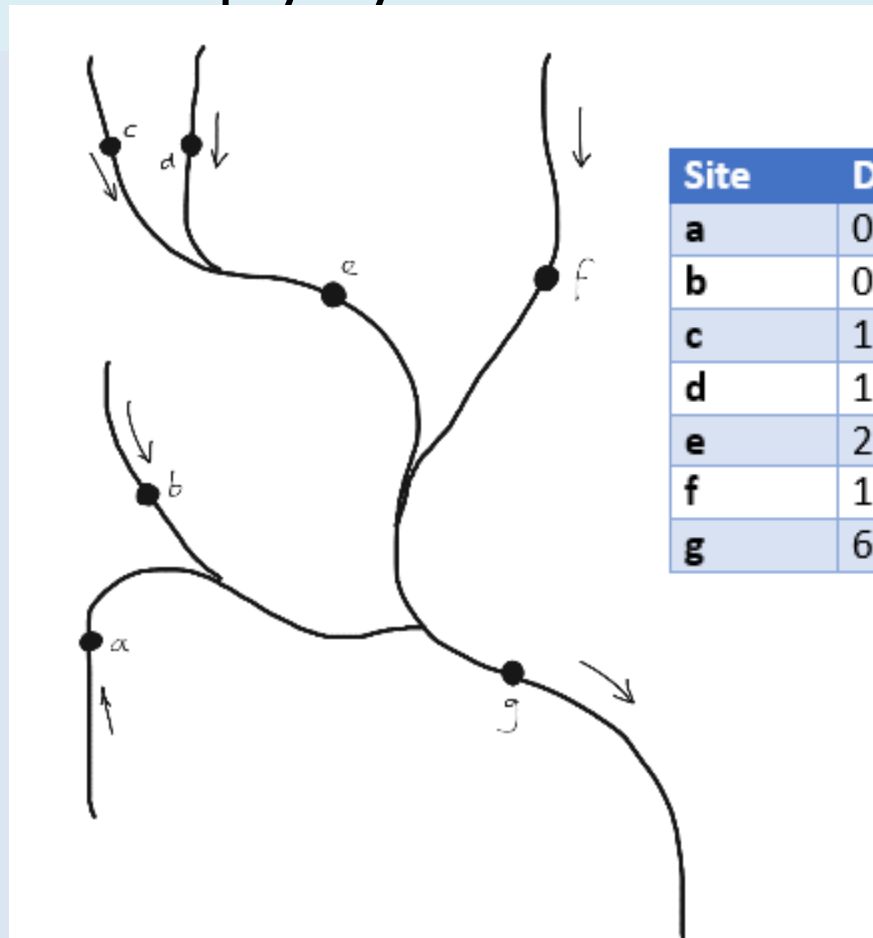
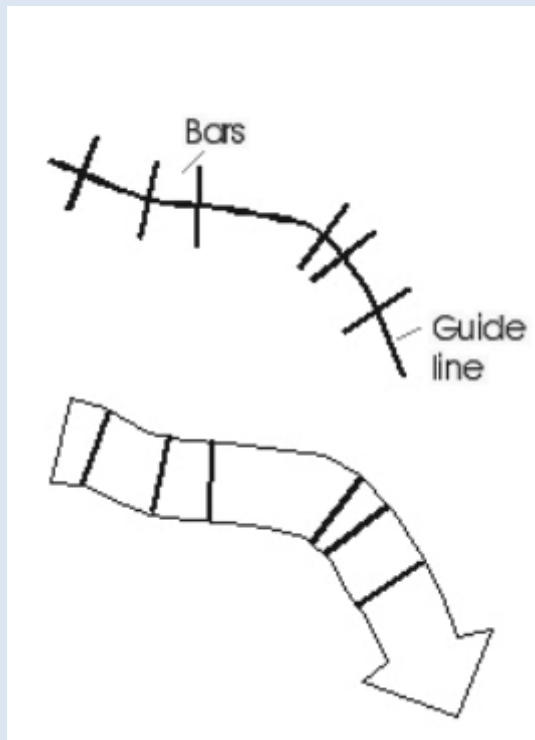
- Straight forward visual impression
- Can see sequences- e.g. how tributaries feed main rivers
- Scale / width of lines shows proportions

Bad

- In order to achieve a clear image
 - Real distance is distorted
 - Direction is distorted

Flow line activity

- Plot discharge data onto the map. Discharge in cumecs could be shown as millimetres e.g. $5 \text{ m}^3/\text{s} = 5\text{mm}$. You could multiply by 10 to show more clearly.



Site	Discharge (cumecs)
a	0.4
b	0.9
c	1.1
d	1.2
e	2.6
f	1.1
g	6.5

Trip lines



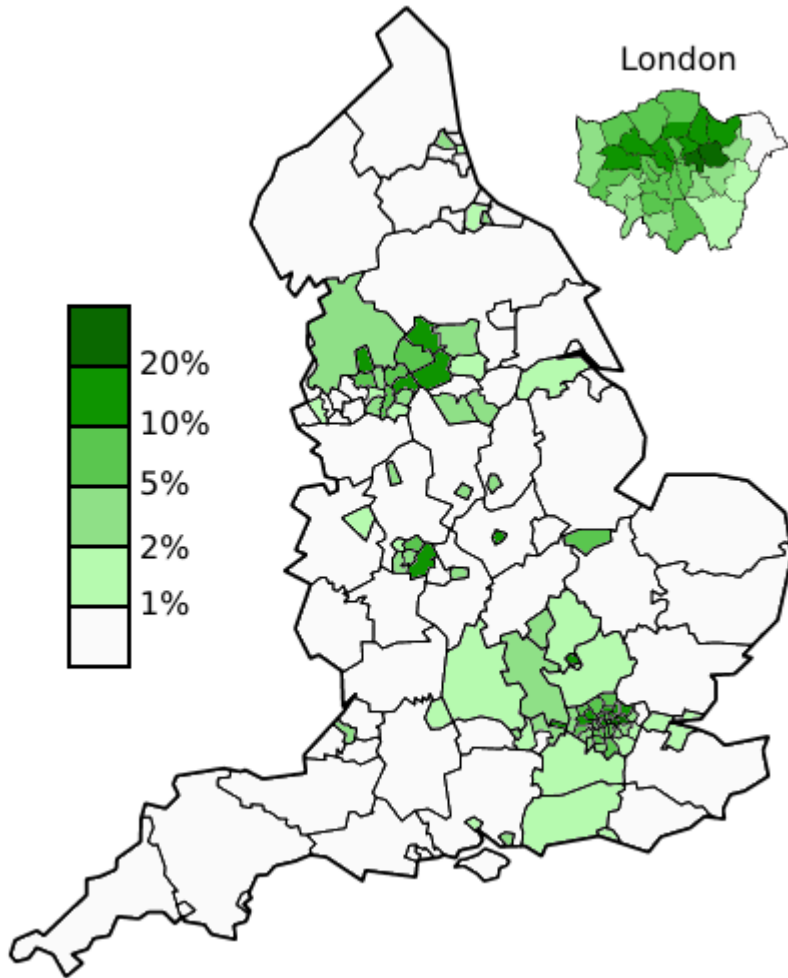
Trip lines

- The simplest map for showing movement, shows journeys from a starting point to a central point.
- Typically used to map school catchment areas or comparing the 'sphere of influence' of towns etc.

Choropleth maps

- Maps in which areas are shaded or patterned in proportion to the measurement of the variable being displayed on the map, such as population density or per-capita income.
- Choropleth maps provide an easy way to visualize how a measurement varies across a geographic area or it shows the level of variability within a region.

Choropleth maps



% of Muslims in UK areas

Choropleth maps

- Q. Comment on the effectiveness of a choropleth map as a means of showing geographical distribution of a statistical variable.

Choropleth maps – uses and limitations

Good

- ✓ **Easy to construct**
- ✓ **Visually effective** you can see clear visual patterns.

Bad

- ✗ **Abrupt Changes** - Sharp delineations between zones within a choropleth map can lead to the mistaken impression that the measured variable changes abruptly at the zone line.
- ✗ **Hidden Anomalies** - Zones within a choropleth map can hide anomalous data.
- ✗ **Inexact Figures** - Pure choropleth maps show a representation of data, but cannot show the data itself. The portions of the map in a given colour represent a range, not a number.

Isoline maps/diagrams

Isolines are lines that are drawn on a map to represent **points of equal value**. There are many different types and uses:

- Contour lines to show height
- Temperature (isotherms) on an urban heat island
- Travel times for commuters (isochrones)
- River velocities (isovels) to show the pattern of velocity in a river cross section

Isoline maps

Good

- Spatial
- Represent equal values along their length.
- Can keep point information as well for accuracy on map
- Can add colour- density shading to enhance patterns/ trends

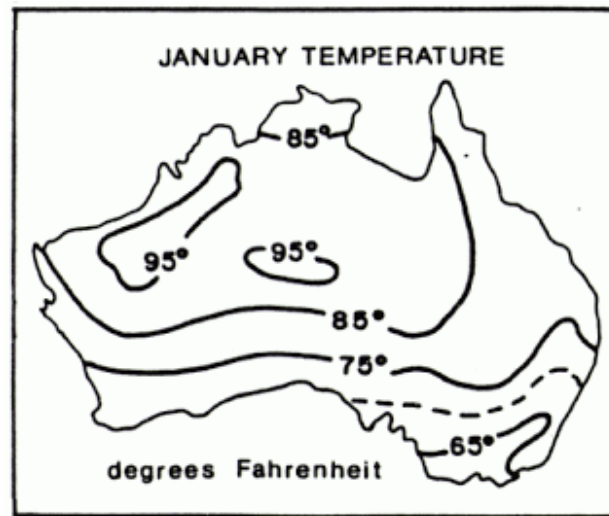
Bad

- Allow flexible interpretation of data- may be errors in the plotting

Isoline maps – uses and limitations

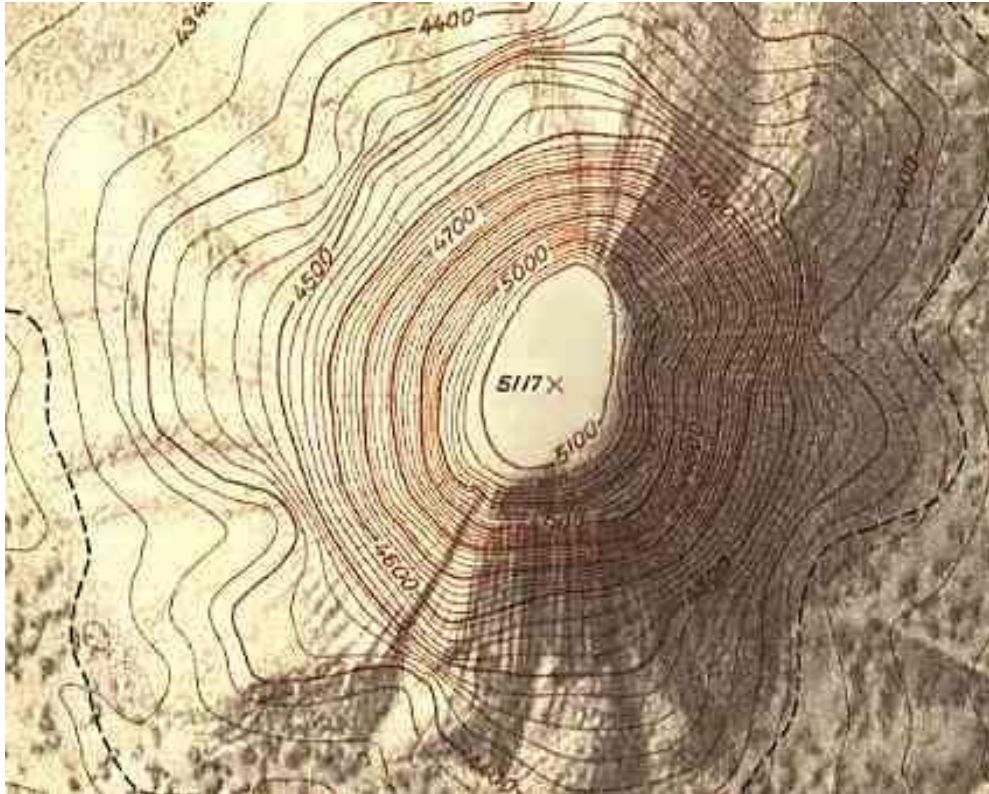
- Ideal for showing gradual change over space and avoids the abrupt changes which boundary lines produce on choropleth maps. Temperature, for example, is a phenomenon that should be mapped using isolines since temperature exists at every point (is continuous), yet does not change abruptly at any point (like population density may do as you cross into another census zone). Relief maps should always be in contour line form for this reason.
- The disadvantage of isolines are that they are unsuitable for showing discontinuous or 'patchy' distributions and a large amount of data is required for accurate drawing.
- **Task: When would you use isoline maps rather than choropleth maps.**

1) What does this isoline map show?



What is the variable? Where is the geographic area?

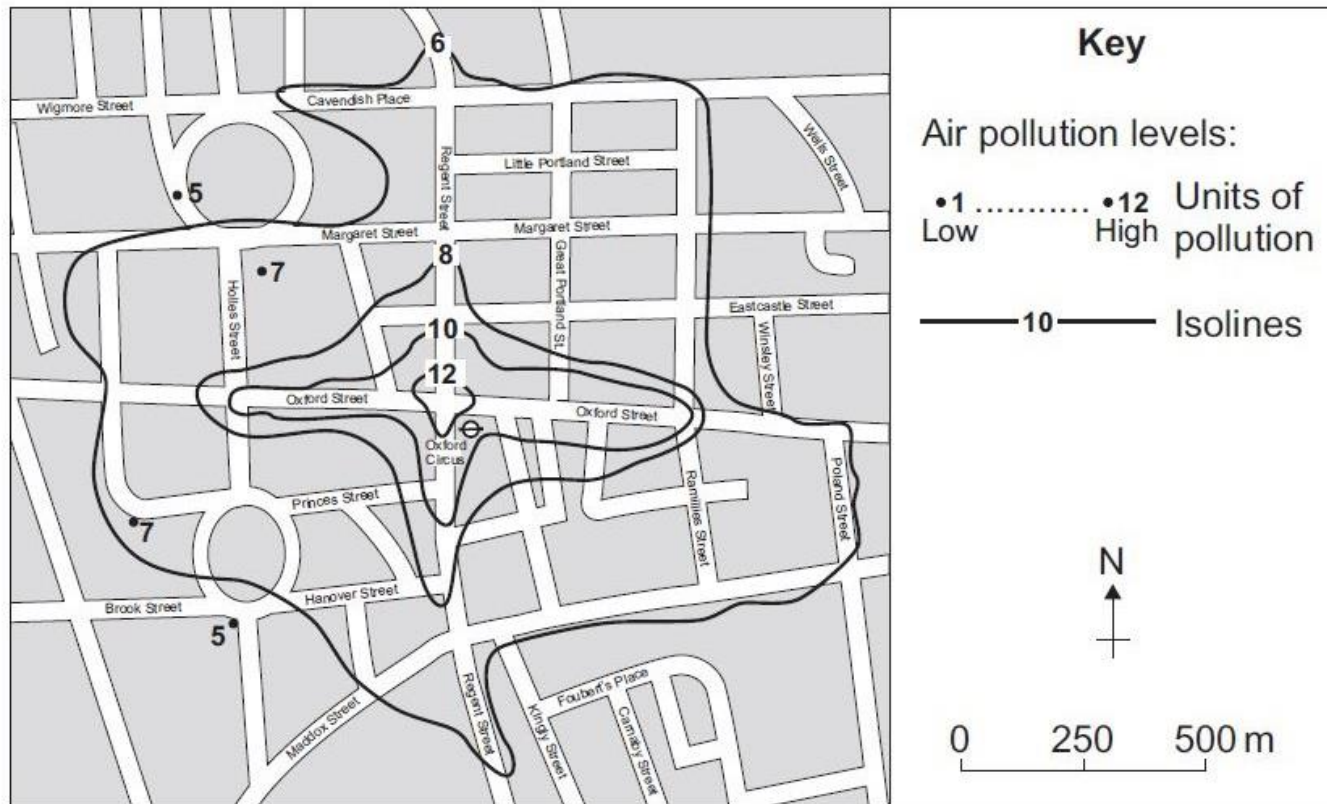
2) What does this isoline map show?



Devils Tower, Wyoming, USA

What is the variable? Where is the geographic area?

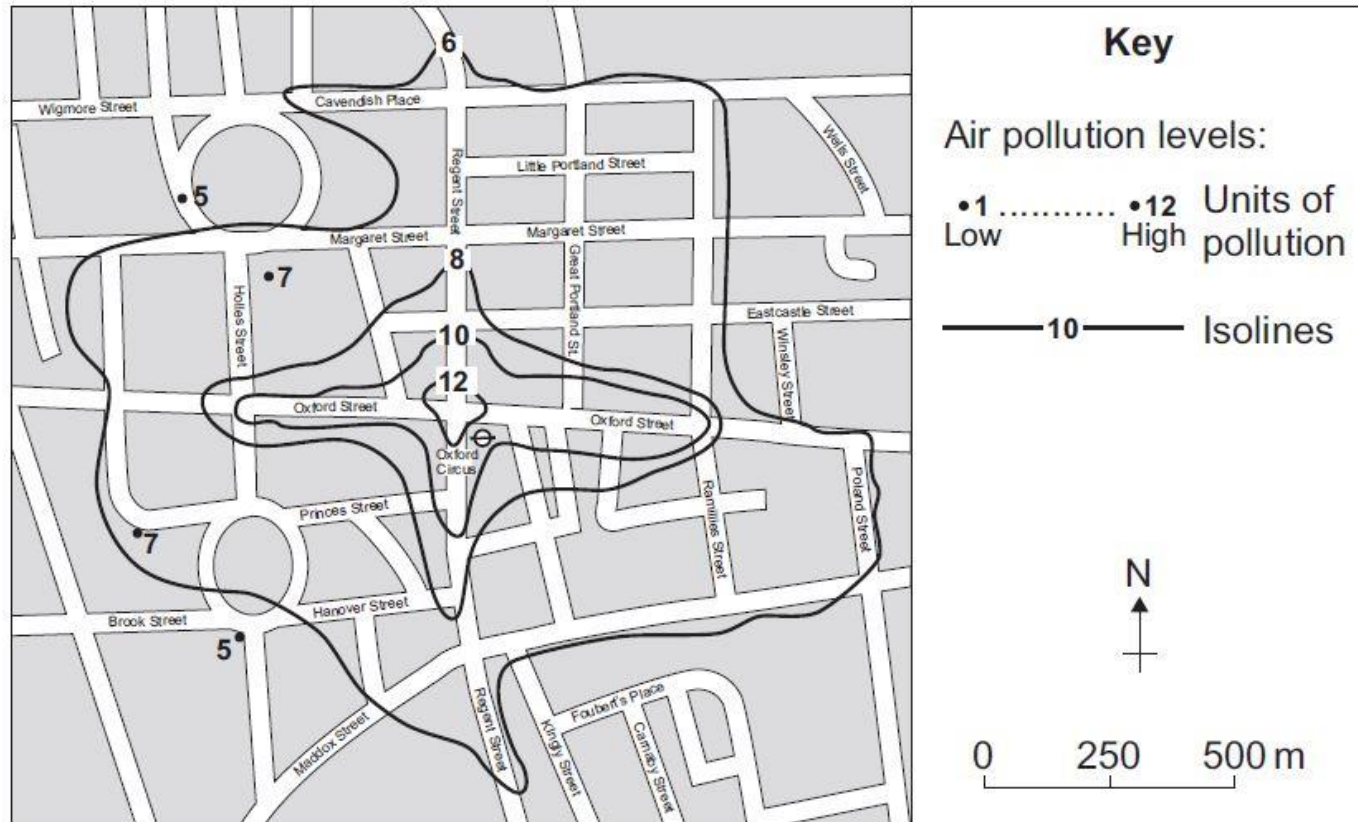
4) What does this isoline map show?



What is the variable? Where is the geographic area?

Study **Figure 5**, an isoline map of air pollution levels. The map was produced for a GCSE Controlled Assessment investigation on traffic pollution levels in Central London.

Figure 5



Describe the pattern of air pollution shown in **Figure 5**.

.....

.....

.....

.....

(2 marks)

The right lines – isoline do's and don'ts

- Isolines are lines that connect points of equal value.
- All points on the same isoline must have the same value.
- Isolines never cross, touch or split.
- Isolines are always closed curves even though the map might only show a portion of it (the rest is off the map).
- Isolines are gentle curved lines that do not have sharp corners
- Isolines usually are drawn in the same general direction as nearby isolines.

Isoline practice

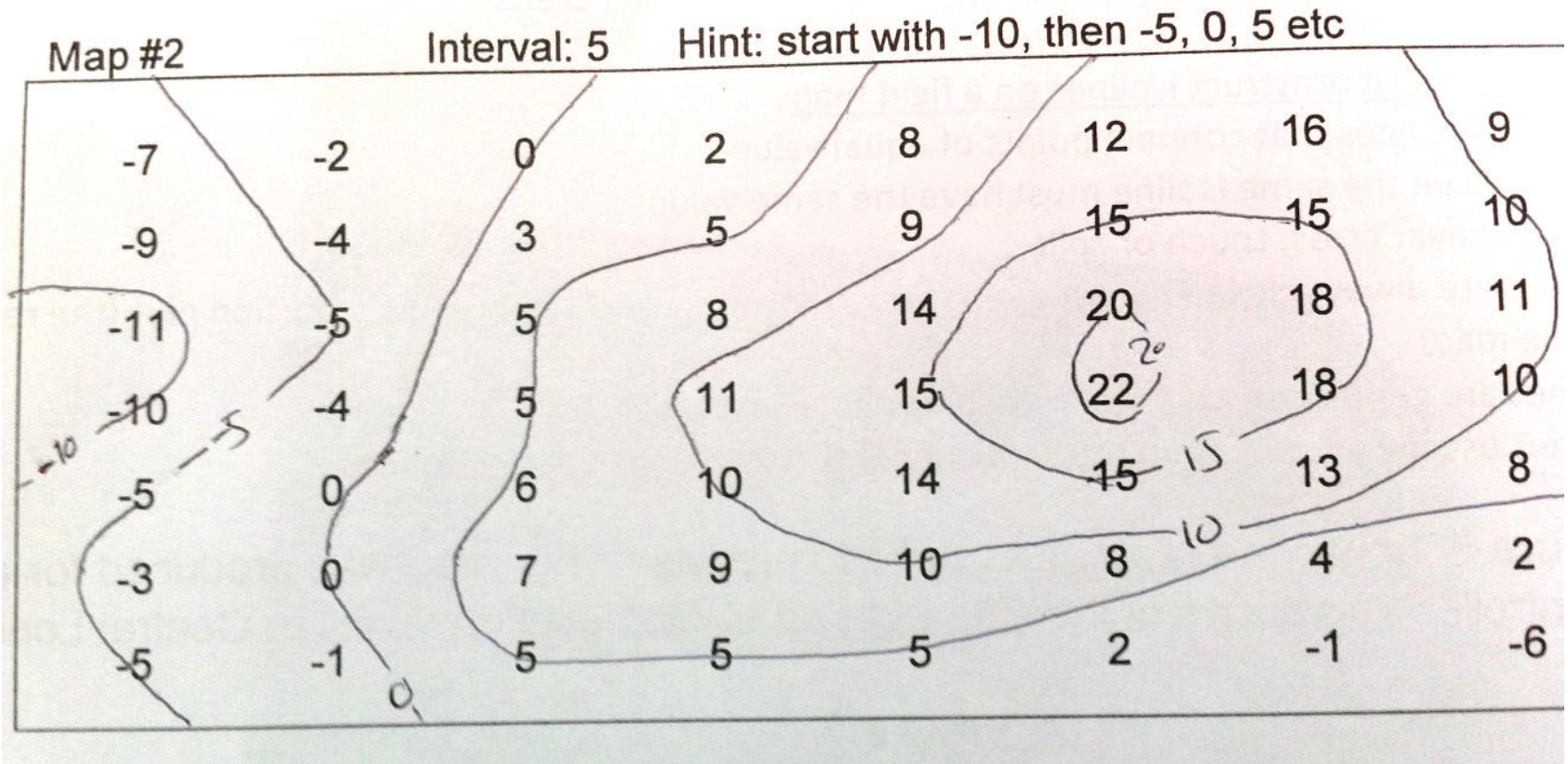
Map #2

Interval: 5

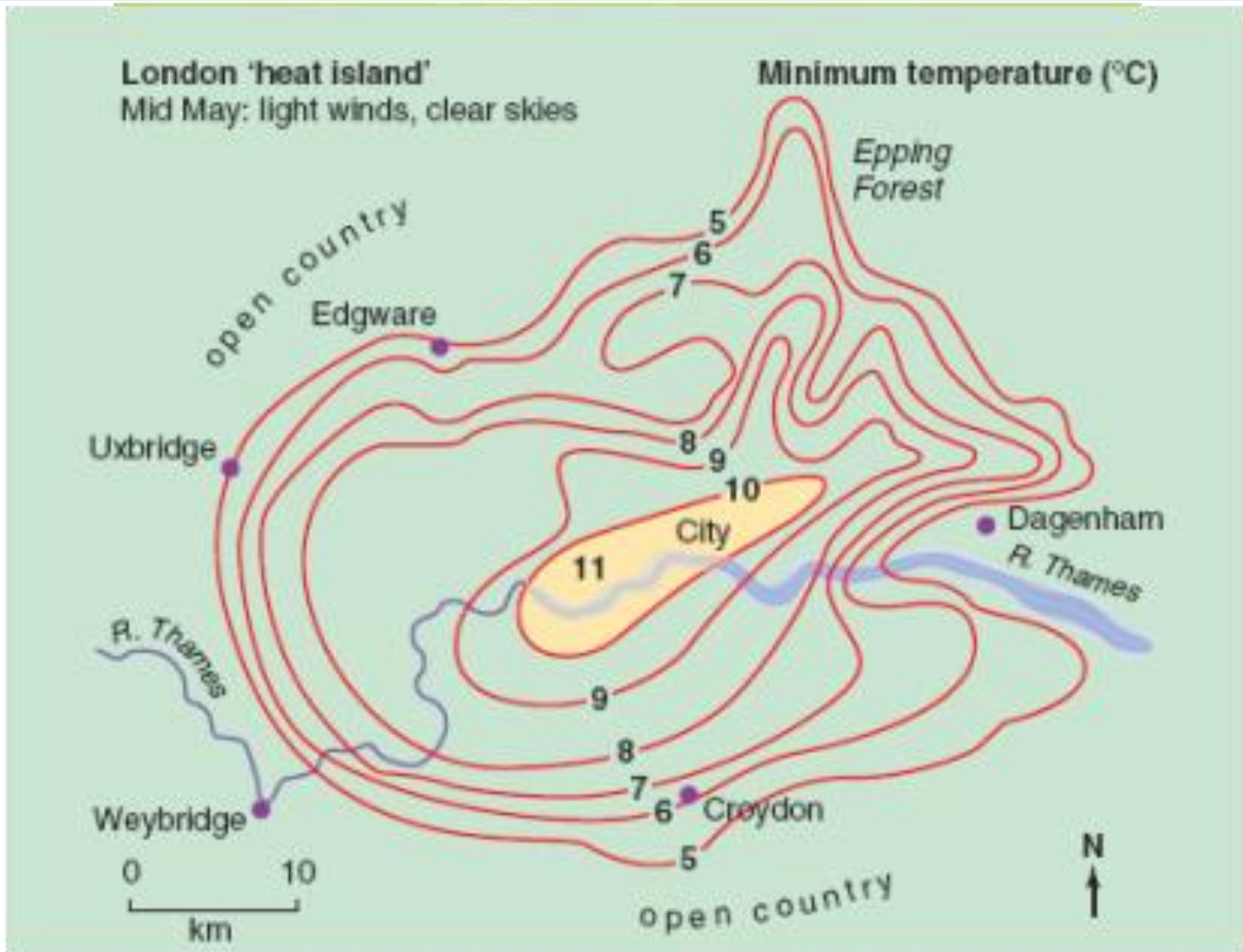
Hint: start with -10, then -5, 0, 5 etc

-7	-2	0	2	8	12	16	9
-9	-4	3	5	9	15	15	10
-11	-5	5	8	14	20	18	11
-10	-4	5	11	15	22	18	10
-5	0	6	10	14	15	13	8
-3	0	7	9	10	8	4	2
-5	-1	5	5	5	2	-1	-6

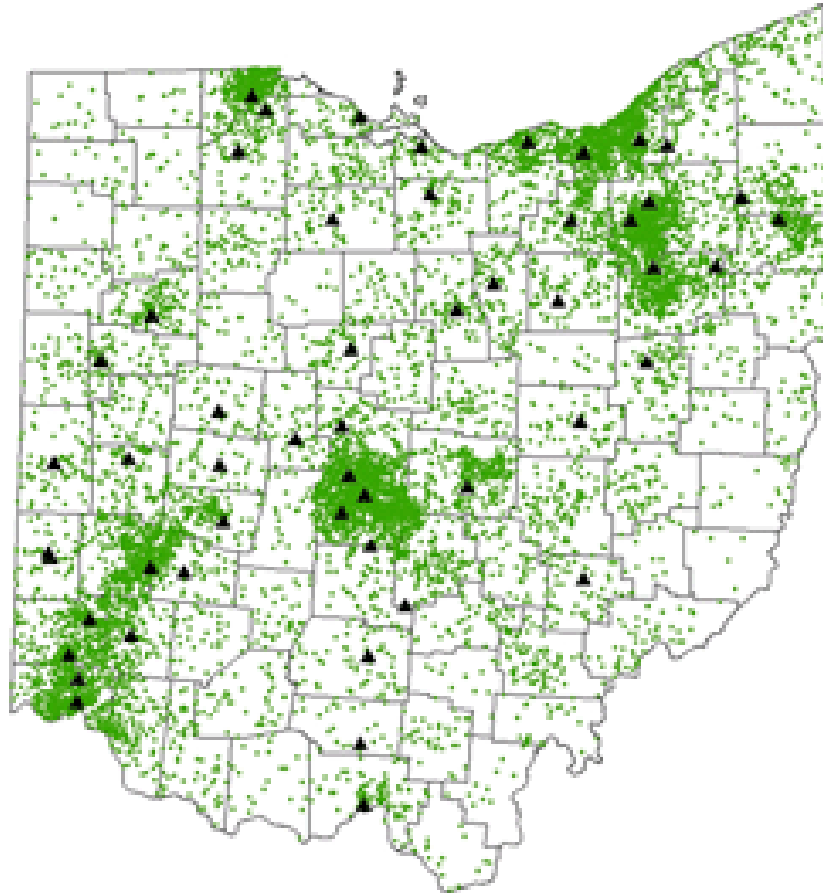
Answers – – Gentle round hill



Describe and suggest reasons for the isotherm map below.



Dot maps



Dot maps

Good

- Spatial -show density and distribution
- Accurate- can use a scale e.g. one dot represents 10 students
- Easy to plot

Bad

- Clustering may make it impossible to plot and interpret e.g. in urban areas
- Need one size of dot consistently

Dot Density Maps

- A **dot distribution map** (also known as *dot density map*) is a map type that uses a dot symbol to show the presence of a feature or phenomenon. Dot maps show a spatial pattern.
- **One-to-one**
- In a one-to-one dot map, each dot represents one single recording of a phenomenon. Because the location of the dot corresponds to only one piece of data, care must be taken to ensure that the dot is represented in its correct spatial location.
- **One-to-many**
- In a one-to-many, or dot-density map, each dot on the map represents more than one of the phenomena being mapped.
- In one-to-many dot distribution maps, the reader must be careful not to interpret the dots as actual locations, as the dots represent aggregate data and are often arbitrarily placed on a map.

Dot maps – uses and limitations

- They can show spatial patterns especially density really well. You can estimate numbers from a dot density map BUT....
- One disadvantage is that the actual dot placement may be random. That is, there may be no actual phenomenon where the dots are located. Second, the subjective nature of the dot size and spacing could give the map a biased view. If the dots are too numerous, it may be difficult for the reader to count the dots. This can cause the map to be ineffective in communicating its message.



Most people in the 19th Century thought plague and cholera was caused by bad air or 'miasma'

This is a very famous dot map used by a Doctor Snow to plot the distribution of cholera cases in London in the mid 19th century. What did it help him prove?