Geographical Skills: Paper 3

A: Cartographic Skills
B: Graphical Skills
C: Statistical Skills
A: Cartographic Skills

Atlas maps

Latitude and longitude

Lines of latitude and longitude are used to locate places accurately on the Earth’s surface.

Lines of latitude

These imaginary lines run parallel to the equator, from e___ to w____. They divide the world into the n___________ and s___________ hemisphere. They are parallel but they are not the same length and get s_______ as they move away from the equator, reaching 90° at the poles.

How many important lines of latitude can you name?

Lines of longitude run from the top of the Earth to the bottom - n_____ to s______. They are not parallel as lines of latitude are - they meet at a point at the north and south poles and are called meridians. The lines start at the Prime or G___________ Meridian (0°) and move east and west to the International D_____ L_____ (180°).

Using atlas maps

Atlas maps show a range of information, such as:

- Countries and regions. Settlements and political borders.
- Physical features, such as relief.
- Thematic maps, such as climate and biomes.
- Global issues, such as global warming.
**Map projections:** There are different ways of projecting the world onto a map. The Mercator projection is probably the most familiar but the Peter's projection more realistically represents the true size and position of continents.

![Mercator](image1.png) ![Peters](image2.png)

**GCSE Exam question**

**Question 1 Issue evaluation**

Study **Figure 1**, a map showing the location of ten of the world’s top ten megacities (2014).

1. On **Figure 1**, add the names of the **two** megacities to the correct boxes.

   Use the information in the table below.  

<table>
<thead>
<tr>
<th>Megacity</th>
<th>Latitude</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lagos</td>
<td>6 °N</td>
<td>3 °E</td>
</tr>
<tr>
<td>São Paulo</td>
<td>24 °S</td>
<td>46 °W</td>
</tr>
</tbody>
</table>

   [1 mark]

2. Which **one** of the following is the correct latitude and longitude for Jakarta?

   Shade **one** circle only.
Identify patterns or distributions on maps

When asked to describe patterns or distributions on maps, think about **PEA!**

**Pattern**

**Example**

**Anomaly**

1. **Pattern** - Give an overview. Is the pattern even or uneven? Consider the spread.
2. **Examples** - State where things are that support your pattern are - be specific.
3. **Anomalies** - Are there any oddities or gaps? These are anomalies and you need to identify where they are.

**GCSE Exam Question**

Study Figure 4, which shows the distribution of major earthquakes.

Figure 4
Describe the distribution of earthquakes shown in figure 4

Ordnance Survey Maps

Maps are produced at different scales. The scale of the map is how much smaller the map is than the area it represents.

**Ordnance Survey Maps**

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**Landranger Maps**

1:50,000 scale means 2cm on the map means 1km on the ground.
It covers a larger area, but shows less detail.

**Explorer Maps**

1:25,000 scale means 4cm on the map means 1km on the ground.
It covers a smaller area, but shows more detail e.g. footpaths.

**Grid references**

Ordnance Survey maps are covered in a series of blue gridlines. These gridlines can be used to pinpoint locations through a unique number known as a grid reference.

A four-figure grid reference is a handy way of identifying any settlement on a map. Four figure references are useful if you’re trying to describe the position of a large feature such as a forest or settlement.

Grid references are easy, as long as you remember that you always go along the corridor before you go up the stairs.

- Write down the four-figure grid references for the following:

  1. Picnic site _______________________
2. Church with a tower
3. Youth hostel
4. Campsite
5. Castle
6. Car Park

Grid references continued....

A four-figure reference on an Ordnance Survey map equals an area on the ground of one square km. One kilometre is quite a large area. To be more accurate we need to use a six-figure grid reference. This pinpoints a place exactly to within 100 metres.

Write down the six figure grid references for the following:

1. Picnic site
2. Church with a tower
3. Youth hostel
4. Campsite
5. Castle
6. Car Park

Symbols

When drawing a map, it is important to include as much information as possible. However, adding a lot of detail can make a map confusing, so symbols (images, abbreviations and letters) are used to represent the main items.
The exam board is expecting you to know the main symbols used by the Ordnance Survey. However, there is no need to learn the meaning of every symbol, as a map extract will always be accompanied by a key. However, it is important to at least learn some of the basic symbols so that map reading becomes easier.

- **Green bits** mean woodland (various types).
- **Blue areas** are either water, tourist information or motorways.
- **Roads** are colour coded. Blue= motorways, red= 'A' roads, orange/ brown = 'B' roads, yellow= local roads and white= tracks.
- **Contours** are thin brown lines that join areas of equal height at 10 metre intervals e.g. 10m, 20 m and 30 m above sea level.
- To help with height black dots with figures next to them are written on maps.

Draw the correct symbol in the box using the key for OS Maps.

<table>
<thead>
<tr>
<th>Church with tower</th>
<th>Cemetery</th>
<th>Quarry</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main Road</td>
<td>Marsh</td>
<td>Rivers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motorway</td>
<td>Coniferous Wood</td>
<td>Windmill</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Footpath</td>
<td>Camp Site</td>
<td>Mixed Woodland</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parking</td>
<td>Radio/ TV Mast</td>
<td>Non-coniferous woodland</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information Centre</td>
<td>Post Office</td>
<td>Public convenience</td>
</tr>
</tbody>
</table>

**Scale**

The scale of a map allows a reader to calculate the size, height and dimensions of the features shown on the map, as well as the distance between different points.
The scale on a map is the ratio between real life distances and how many times it has been shrunk to fit it on the map.

The maps in your exam will have a scale of 1:50 000 (where 1 cm = 50,000 cm on the ground or 500 m or 0.5 km) or a scale of 1:25 000 (where 1 cm = 25,000 cm on the ground, or 250 m or 0.25 km).

**Remember!**

- 1:25 000 map 1 km = 4 cm on the map.
- 1:50 000 map 1 km = 2 cm on the map.

### Straight line distances

Straight line distances between locations can be calculated as follows:

- Simply place your ruler over both points and measure the distance in-between in cm.
- Convert into kilometres using the scale line.
- Or by multiply your answer by 0.5 (1:50 000 map) or by 0.25 (1:25 000 map).

**Practice question:**

If the distance between a church and a campsite is 16 cm, what would the real-life distance be on a:

a) 1:50 000 scale map _________

b) 1:25 000 scale map _________

### Curved line distances

Measuring the distance along a curved or winding route such as a road or river is more complicated. This can be done by either using a piece of string or by splitting the road or river into straight sections. The easiest way to measure the distance along a winding route is by using a piece of paper or string.
Another method is to take a piece of string and place one end at the starting point.

- Carefully lay the string along the road or path, following the curves as closely as you can.
- When you reach the end mark it on your string with a pen.
- Now straighten the string along the scale line to work out the real-life distance.

Remember!
Take a ruler and a piece of paper / string into the exam to help you use the scale!

Compass direction

In the exam you will be expected to know the 8-point compass, shown below:

- The top of an OS map is always north.
- Remember to give the direction from one point to another.

Can you think of a rhyme to help you remember the points of the compass?
Practice questions

From the black star draw:
1. A green circle 3 squares north.
2. A blue square 1 squares south.
3. A yellow triangle 3 squares south east.
4. A pink heart 1 square north west.
5. A brown circle 3 squares east.
6. An orange square 5 squares west.
7. A purple heart 3 squares south west.

Contours, spot heights and gradients

Relief is a term geographers use to describe the shape and height of the land. OS maps use two systems to illustrate relief, spot heights and contour lines.

Contour lines

S____ heights

C________ lines

G_________
A contour is a line drawn on a map that joins points of equal height above sea level in 10 metre intervals. Therefore, every point on a 50 metre contour line is 50 metres above sea level. Contours on OS maps are coloured light brown. The diagram below shows the link between the shape of a hill and the contours representing it on a map.

- Lines that are close together show a s_______ slope.
- Lines that are far apart show slopes that are g________.

Spot heights

Are usually indicated by black dots with a height above sea level written alongside.

**Ordnance Survey practice questions**

Answer the following questions using the 1: 50 000 OS map extract on page 105 of the AQA textbook of the Swanage coast. Remember! *There is a key for the symbols used on page 352.*

1. Look at photograph B on p104 and the map extract. Which compass direction was the camera facing? ______________________________________________________________

2. Give the four figure grid reference of the following features:
   a) Parking at Shell Bay
   b) Studland Heath
   c) Lighthouse off Studland Bay
   d) Information Centre at Swanage
   e) Whitecliff Farm

   ____________
   ____________
   ____________
   ____________
   ____________

3. Give the six figure grid reference of the following features:
a) Triangulation pillar in 0177
b) Town Hall (TH) in 0378
c) Mast in 0181
d) Public convenience in 0383
e) Railway station in 0278

4. Using the scale at the bottom of the map (2cm = 1km) work out the **straight line distance** between:
   a) Ballard Point and Peveril Point
   b) Old Harry and South Haven Point
c) Anvil Point and Redend Point
d) Peveril Point and Anvil Point
e) The Pinnacles and Old Harry

5. What is the height of the land at 013776?

6. Describe the height and shape of the land at Ballard Down.

7. This area is popular with tourists. Write down or draw all the symbols on the map associated with tourism.

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**Drawing cross-sections**

- A cross-section is an imaginary ‘slice’ through a landscape.
- It shows the changes in relief along a chosen line.
- It is a graph which shows distance along the x-axis and height on the y-axis.
- When drawing a cross-section, the scale used on both axes must be chosen carefully to show a true representation of the landscape.
- Place the straight edge of a piece of paper along the chosen section.
  - Mark the start and finish of the section.
  - Mark contours along the paper.
  - Draw the axes of a graph and choose an appropriate vertical scale.
  - Lay the piece of paper along the horizontal axis.
- Mark each contour value on the graph paper.
- Join the points freehand with a curved line.

**Exam Practice** - Using the 1:50 000 OS map extract of the River Tees near Darlington on page 123 of the AQA GCSE geography textbook, draw a cross-section from 360110 to 380130.

**Interpreting the physical and human landscape** - Colour code which features are human and which are physical on the spider diagram.
1. **Relief** - the height and shape of the land. To describe the land accurately you need to use actual figures taken from spot heights or contour lines and include the units e.g. metres.

2. **Drainage** - the presence of water and where it flows. To describe the drainage, you need to comment on the direction they are flowing (highland to lowland), the drainage density (the total length of the rivers), the pattern of the rivers (see below) and any evidence of human activity (straightening the channel/building embankments).

3. **Settlement** - where and how people live. To describe settlement patterns, you need to know the difference between dispersed, nucleated and linear.

4. **Communication** - these can include many different types of transport, such as roads, railways, footpaths, ferries, airports, cycleways. To describe communication networks, you need to give such as length of feature, orientation (compass direction), patterns and density e.g. ring road. Roads, canals and railways often follow flat land, footpaths often follow river valleys.
5. **Land Use** – this is the way land is used or has been changed by people. To describe land use you need to use the **map key** and give **specific examples** to support your statements. Examples of land use which can be seen on OS map include:

- Woodland (coniferous or non-coniferous)
- Coastal deposits (marsh)
- Urban areas (housing, settlement)
- Fields (white on OS maps)
- Quarries
- Industrial areas (Wks)
- Tourist sites (blue symbols)
- Recreation

**Practice questions**

Using the OS 1:50 000 map extract of the River Tees near Darlington answer the following questions.

a) Describe the **relief** of the land in 3311.

____________________________________________________________________

____________________________________________________________________

b) Describe the **drainage** of Staindale Beck in 3707.

____________________________________________________________________

____________________________________________________________________

c) Describe of the pattern of **settlement** in 3810 (High Worsall).

____________________________________________________________________

____________________________________________________________________

d) Describe the route of the Teasdale Way **footpath**.

____________________________________________________________________

____________________________________________________________________

e) Describe all the types of **land use** in 3808.

____________________________________________________________________

____________________________________________________________________

**Drawing sketch maps from OS maps**

A sketch map is drawn to produce a simplified version of an OS map. It should focus on just a few key features, such as patterns of roads or rivers. Without lots of other information.

- Draw a **frame** using the same scale as the map.
- Divide the frame into **grid squares**. Write the **numbers** around the frame.
- Draw the features you need in **pencil**.
- **Label** and **annotate** your sketch as necessary.
- Add a **scale**, **north point** and **title**.

**GCSE Exam Question:**

a) Explain how the course of the meander may change in the future?

____________________________________________________________________________

____________________________________________________________________________
Using photos - geographers make use of three different types of photograph:

a) **Ground photos** are taken from the ground and usually focus on a particular feature e.g. a waterfall.

b) **Aerial photos** are taken from aeroplanes, helicopters or drones, looking down on a landscape. They often show large areas, such as stretches of coastline. There are two types of aerial photograph:

   - **Vertical** - look directly down on the ground.
   - **Oblique** - look at the landscape from an angle.

**Satellite photos** look directly down onto the earth but may be digitally processed with enhanced colours to make certain features show up more clearly. These false colour images can be used to show environmental factors such as pollution and deforestation.

**Drawing sketches from photographs**

In a similar way to a drawing a sketch map, a drawing from a photograph needs to identify the main features only.

- Draw a frame that is the same shape as the photograph.
Draw one or two major lines for guidance e.g. a hilltop or river.

- Decide which features you need to show and concentrate on those features.
- Labels (single words or phrases) and annotations (more detailed descriptions) should always be added.

**GCSE Exam Question**

Draw a **labelled sketch** of main coastal features in the box below. Label the following landforms on your sketch:

- Cave
- Stack
- Wave-cut platform

[4 marks]

3.2 Complete the following paragraph about how arches are formed.

Chose the correct words from the list below.

Cave faults arch

[2 marks]

Lines of weakness in a headland, such as ........................................ are eroded by the energy from waves. The rock wears away along a line of weakness to form a ......................... Over time, erosion may lead to the cave breaking through the headland to form an .................................

**B: Graphical Skills**

**Do you know your graphs?**

In the exam you will be expected to read and interpret information in a variety of ways, including graphs. When describing what a graph a shows remember:
When asked to describe patterns or distributions on graphs, think about **PEA!**

**Pattern**

**Example**

**Anomaly**

1. **Pattern** - Give an overview. Describe the overall trends and patterns.
2. **Examples** - Give some evidence to support your description. Be specific - quote figures.
3. **Anomalies** - Are there any oddities in the data/trends? These are anomalies.

1. **Bar graphs**

A bar chart is made up of columns all of the same width. The height of the bar is proportional to the quantity represented. The **vertical scale** should be used for % or absolute data. The **horizontal scale** axis should be used for discrete or categorical data. All bar charts should begin at zero on the vertical axis.

![Bar graph example](image)

**Advantages of bar graphs**

- Commonly used so easily understood.
- Show relative magnitudes very effectively.
- As the scale passes through zero positive and negative values can be presented on one graph.

**Disadvantages of bar graphs**

- Can be over complicated by including too many multiple bars.

2. **Histograms**

A histogram also uses bars with **no gaps** between them. It represents continuous data, for example over time. The values may all be part of a single sample and, the bars are effectively connected, a single colour or type of shading is used. There should be **equal class intervals between the bars**.
Advantages of histograms

- It is easy to see trends over time as the bars are together.

Disadvantages of histograms

- It can be difficult to read specific data as the bars are so close together.

3. Divided bar graph

It is possible to subdivide individual bars in order to show multiple data; this is called a divided bar.

<table>
<thead>
<tr>
<th>Advantages of divided bar</th>
<th>Disadvantages of divided bar</th>
</tr>
</thead>
<tbody>
<tr>
<td>- It is easy to see the share of data sets as categories are colour-coded.</td>
<td>- It can be difficult to read specific data as some of the categories are small.</td>
</tr>
</tbody>
</table>

4. Pie chart

A chart is a circle divided into a segment; it shows the proportions of a total. Percentage figures are written inside or alongside the segments to interpret the diagram.
5. Line graph

A simple line graph shows how one variable changes against another over time. The variables must have something to do with each other. **Time** is shown on the horizontal axis and must have **equal spacing**. These graphs are appropriate when you want to show absolute changes in data over time.

<table>
<thead>
<tr>
<th>Advantages of line graph</th>
<th>Disadvantages of line graph</th>
</tr>
</thead>
<tbody>
<tr>
<td>Show changes over time clearly.</td>
<td>The scale needs to be carefully considered to show trends accurately.</td>
</tr>
<tr>
<td>Show a large amount of data on one graph.</td>
<td>Works better with smaller sets of data.</td>
</tr>
</tbody>
</table>
• Can be easily understood and require little explanation.

6. Pictograms

A pictogram uses a pictorial symbols or icon instead of a bar. All icons must be the same size but fractions of icons can be used to represent values in between e.g. half.

<table>
<thead>
<tr>
<th>Advantages of pictogram</th>
<th>Disadvantages of pictogram</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Represents data effectively.</td>
<td>• Can be difficult to draw as all icons must be the same size.</td>
</tr>
<tr>
<td>• A visual technique, so easy to interpret.</td>
<td>• It can be difficult to extract precise data from the diagram.</td>
</tr>
</tbody>
</table>
Study **Figure 1**, a graph showing changes in the amount of carbon dioxide (CO₂) in the atmosphere.

**Figure 1**

<table>
<thead>
<tr>
<th>Year</th>
<th>Amount of CO₂ (parts per million (ppm))</th>
</tr>
</thead>
<tbody>
<tr>
<td>1850</td>
<td>280</td>
</tr>
<tr>
<td>1870</td>
<td>300</td>
</tr>
<tr>
<td>1890</td>
<td>320</td>
</tr>
<tr>
<td>1910</td>
<td>340</td>
</tr>
<tr>
<td>1930</td>
<td>360</td>
</tr>
<tr>
<td>1950</td>
<td>380</td>
</tr>
<tr>
<td>1970</td>
<td>400</td>
</tr>
<tr>
<td>1990</td>
<td>420</td>
</tr>
<tr>
<td>2010</td>
<td>440</td>
</tr>
</tbody>
</table>

0   1   1 Describe the change in the amount of carbon dioxide in the atmosphere shown in **Figure 1**.

[2 marks]
Study Figure 1, ‘Energy in the United Kingdom’, in the resource booklet.

Describe the changing pattern of total energy consumption in the UK between 1970–2015.

[2 marks]

Study Figure 8, pie charts showing deforestation in Borneo, a country in south east Asia between 1980 and 2020 (estimate).

Complete the pie chart for 2020 (estimate).

Use the following information:

Rainforest = 35%  Deforested area = 65%

[1 mark]
Study Figure 8, which shows how the forested regions of the world changed between 2005 and 2009.

Figure 8

Key
- Average rate 2005–2009

% change

-1.50
-1.00
-0.50
0
0.50
1.00
1.50

East and South Africa
North Africa
West and Central Africa
East Asia
South and South East Asia
West and Central Asia
Europe
Caribbean
Central America
North America
Oceania
South America
World
Study Figure 5, two sets of data collected by students who were carrying out a geographical enquiry about traffic problems in a town centre.

**Figure 5**

<table>
<thead>
<tr>
<th>Car ownership in the town</th>
<th>How people travelled to the town centre (sample of 100 people)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>Number of Cars</td>
</tr>
<tr>
<td>1950</td>
<td>3127</td>
</tr>
<tr>
<td>1960</td>
<td>4240</td>
</tr>
<tr>
<td>1970</td>
<td>4912</td>
</tr>
<tr>
<td>1980</td>
<td>5727</td>
</tr>
<tr>
<td>1990</td>
<td>6520</td>
</tr>
<tr>
<td>2000</td>
<td>7983</td>
</tr>
<tr>
<td>2010</td>
<td>8920</td>
</tr>
</tbody>
</table>

The following four methods were considered for presenting the data shown in Figure 5.

A Pie chart  
B Line graph  
C Proportional symbol map  
D Flow line map

Which method (A, B, C or D) would be most suitable for presenting each set of data?  
[2 marks]

<table>
<thead>
<tr>
<th>Data shown in Figure 5</th>
<th>Presentation method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car ownership in the town</td>
<td></td>
</tr>
<tr>
<td>How people travelled to the town centre</td>
<td></td>
</tr>
</tbody>
</table>
7. Population Pyramids

A population pyramid is a type of histogram showing the proportions of a population in different age and gender categories. It is usually shaded; males are the proportion of males are shaded blue and females are red/pink. Population pyramids show the structure of a population and the shape of the pyramid provides valuable information for the future provision of health care, schooling and housing.

Few people live into their old age so life expectancy is low.

A wide base indicates a high birth rate.

Steep sides ‘pyramid shape’ indicates high death.
8. Scatter graphs

A scatter graph shows the relationship between two variables by the distribution of dots. It is usual that the dependent variable is placed on the y-axis (Vertical), and the independent variable on the x-axis. Dots are plotted on the graph using the two sets of data as coordinates. The arrangement of dots can then be examined to see if there is a positive relationship (as one variable increases so does the other), a negative relationship (as one variable increases the other decreases) or no relationship (there is no recognisable pattern to the distribution of dots).

A best fit line is drawn that comes close to as many points on the graph as possible.

There are three possible relationships

<table>
<thead>
<tr>
<th>Positive</th>
<th>Negative</th>
<th>No relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Perfect Positive Correlation" /></td>
<td><img src="image2" alt="Perfect Negative Correlation" /></td>
<td><img src="image3" alt="No Correlation" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Advantages of scatter graphs</th>
<th>Disadvantages of scatter graphs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Shows a trend in the data relationship</td>
<td>• Hard to visualize results in large data sets</td>
</tr>
<tr>
<td>• Retains exact data values and sample size</td>
<td>• Flat trend line gives inconclusive results</td>
</tr>
<tr>
<td>• Shows minimum/maximum and outliers</td>
<td>• Data on both axes should be continuous</td>
</tr>
<tr>
<td></td>
<td>• Positioning the line of best fit is subjective</td>
</tr>
</tbody>
</table>

9. Choropleth maps

A choropleth map uses different colours or different densities of the same colour to show the distribution of data categories.
### Advantages of choropleth maps

<table>
<thead>
<tr>
<th>Advantage</th>
<th>Disadvantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Different colours or shading make it easy to interpret.</td>
<td>There may be significant variations at a local level e.g. within a region.</td>
</tr>
<tr>
<td>Data is presented by country/region/county which makes</td>
<td>A choropleth map suggests there are abrupt changes in boundaries, which is</td>
</tr>
<tr>
<td>it easy to see patterns and analyse.</td>
<td>not usually the case.</td>
</tr>
<tr>
<td>The data can be grouped so that is easy to see the</td>
<td>The intervals for the values need to be chosen carefully.</td>
</tr>
<tr>
<td>spread of values.</td>
<td></td>
</tr>
<tr>
<td>Give a good indication of how changes can happen over space.</td>
<td></td>
</tr>
</tbody>
</table>

### Isoline maps

An isoline uses lines of equal value to show patterns (‘iso’ means ‘equal’). Isoline maps can be tricky to draw but are a good way of showing patterns when put onto a base map.

Some of the most common types of isoline maps show weather and climate. The map opposite joins points of equal pressure as an isoline.

### Desire line map

A desire line map shows the movement of people or goods between places. They may also be proportional and show distances between places and show the spatial density of the data represented. They do not show the exact path of movement, however.

When drawing a desire line map, each line should be positioned accurately to show where it starts (source) and ends (destination).
12. **Flow line maps**

This technique indicates the **direction** and **volume** of movement, with the thickness of the line representing the volume. They show the movement between places by connecting the **source** with the **destination**.

![Flow line map example]

**Flow lines can be drawn on a base map but, but an appropriate scale is needed to avoid flow lines crossing over each other.**

13. **Dot maps**

Dots are used to represent a particular value of number and are located accurately on a map. The number and density of dots represents the data but it can be difficult to interpret accurately.

![Dot map example]

14. **Proportional symbols**

Proportional symbols are a useful way to show data on a base map where **spatial variations** can be seen.

![Proportional symbol example]

The area of the circle needs to be proportional to the data.
Study Figure 3, a choropleth map showing the percentage of the urban population living in slums in African countries (2010 estimate).

Figure 3

Key
% of urban population living in slums (2010 estimate)
- Above 90%
- 81 – 90%
- 70 – 80%
- Below 70%

02.1 Complete Figure 3 using the information below. [1 mark]

Estimated percentage (%) of urban population living in slums:
Tanzania – 80%

02.2 What is the estimated percentage of urban population living in slums in Ethiopia?
Shade one circle only.
A. Above 90%
B. 81–90%
C. 70–80%
D. Below 70% [1 mark]
Figure 8 is an isoline map of pedestrian flow in part of London using results from a 5 minute pedestrian count.

04.2 Complete the isoline for 100 pedestrians shown on Figure 8. [1 mark]

04.3 Describe the pattern of pedestrian flow shown on the completed map. [2 marks]

04.4 Suggest one alternative method of presenting the information shown on Figure 8. [1 mark]

04.5 Explain why the pattern of pedestrian flow shown in Figure 8 may not be accurate. [2 marks]
C: Statistical Skills

Geographers frequently use numbers and data sets. Statistics are an important part of any geographical investigation as they help to identify patterns and trends.

Remember!
In the exam you may be asked to spot weaknesses in the presentation of selected data. This might involve identifying incorrect labelling of axes or inaccurate interpretation of trends.

1. Measures of central tendency

Central tendency is a description of the ‘average’ within a data set. There are three ways of measuring the central tendency:

- **Mean**
- **Median**
- **Mode**

**Mean**
Calculated by adding up all the values in a data set and dividing by the number of values.

**Median**
This is the central point value in a ranked set of data. If there is an even number of values, the median lies halfway between the two central values.

**Mode**
This is the most common value in a data set. If there are no repeated values, there is no mode.

**Example of Mean**

Mean

Add all the numbers then divide by the amount of numbers

9, 3, 1, 8, 3, 6

\[
\frac{9 + 3 + 1 + 8 + 3 + 6}{6} = \frac{30}{6} = 5
\]

The mean is 5

**Example of Median**

Median

Order the set of numbers, the median is the middle number

9, 3, 1, 8, 3, 6

1, 3, 3, 6, 8, 9

The median is 4.5

**Example of Mode**

Mode

The most common number

9, 3, 1, 8, 3, 6

The mode is 3

3. Measures of spread

Central tendency is useful but they do not indicate how the values in a data set are spread around the average.

The range is the difference between the highest and lowest values.

**Example of Range**

Range

The difference between the highest number and lowest number

9, 3, 1, 8, 3, 6

9 - 1 = 8

The range is 8
4. Quartiles and inter-quartile range

Dispersion graphs are particularly useful because they show the range of data and are useful to make comparisons between data, such as sites. The inter-quartile range is a more accurate way of showing the spread of data because it does not include the extremities.

**How to calculate the inter-quartile range**

- The IQR is calculated by writing the all the data in rank order from lowest to highest or plotting it on a dispersion graph.
- The values are then divided into four equal groups or quartiles.
- The number of values is known as \( n \).
- The upper quartile (UQ) is calculated as follows:
  \[
  \frac{n + 1}{4}
  \]
- The lower quartile range (LQ) is calculated as follows:
  \[
  \frac{3(n + 1)}{4}
  \]
- The difference between these two values is known as the IQR.

5. Percentage change

Percentage change is a good way to describe changes over time or compare sets of data.

**How to calculate the percentage change.**

- Work out the difference between the two numbers.
- Divide the increase by the original number.
- Multiply the answer by 100 to give a percentage.
- If it is a positive number there is an increase, if the answer is a negative number there is a decrease.

6. Describing relationships in bivariate data

The term bivariate data simply means the data for two variables that are related. Bivariate data is usually plotted as a scattergraph. The dependent variable is plotted along the side (\( y \) axis) and the independent variable is plotted along the bottom (\( x \) axis).

**Example of bivariate data**

- GDP and energy consumption is an example of bivariate data.
- We can expect the amount of energy consumed to increase as the wealth of a country (GDP) increases. So, energy consumption is dependent on GDP.
- Therefore, energy consumption can be said to be the dependent variable (\( y \) axis) and GNP the independent variable.
GCSE Exam Question

Question 2 The changing economic world

Study Figure 5, a table showing Gross National Income (GNI $) and Infant Mortality for a number of South American countries.

<table>
<thead>
<tr>
<th>Country</th>
<th>Gross National Income 2013 ($ per person)</th>
<th>Infant Mortality 2013 (per 1000 births)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>17 250</td>
<td>12</td>
</tr>
<tr>
<td>Brazil</td>
<td>11 690</td>
<td>12</td>
</tr>
<tr>
<td>Bolivia</td>
<td>2 550</td>
<td>31</td>
</tr>
<tr>
<td>Colombia</td>
<td>7 590</td>
<td>15</td>
</tr>
<tr>
<td>Chile</td>
<td>15 230</td>
<td>7</td>
</tr>
<tr>
<td>Ecuador</td>
<td>5 760</td>
<td>19</td>
</tr>
<tr>
<td>Guyana</td>
<td>3 750</td>
<td>30</td>
</tr>
<tr>
<td>Paraguay</td>
<td>4 010</td>
<td>19</td>
</tr>
<tr>
<td>Peru</td>
<td>6 270</td>
<td>13</td>
</tr>
<tr>
<td>Suriname</td>
<td>9 370</td>
<td>20</td>
</tr>
<tr>
<td>Uruguay</td>
<td>15 180</td>
<td>10</td>
</tr>
<tr>
<td>Venezuela</td>
<td>12 550</td>
<td>13</td>
</tr>
</tbody>
</table>

Study Figure 6, a scattergraph showing the information in Figure 5.

Figure 6

0 2 Complete the scattergraph by plotting the data for Uruguay.

GNI: 15 180

Infant mortality: 10

[1 mark]

0 2 3 Draw a line of best fit (trend line) on the scattergraph to show the relationship between GNI and infant mortality.

[1 mark]
02.4 Suggest one reason for the relationship between GNI and infant mortality shown on the scattergraph.

[2 marks]

02.5 Using the data in Figure 5, calculate the average infant mortality rate for the twelve countries shown.

Show your working in the space below.

[2 marks]
As part of an enquiry collecting primary physical geography data, a student measured pebble sizes at one location on a beach.

The results are shown in Figure 9.

**Figure 9**

<table>
<thead>
<tr>
<th>Sample</th>
<th>Pebble size in centimetres</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>11</td>
<td>21</td>
</tr>
</tbody>
</table>

Complete the dispersion graph below using the data for Sample 3 in Figure 9. [1 mark]
04.7 Suggest one way in which the data collection technique in Figure 9 could be adapted to make the sample more reliable.

[1 mark]

04.8 Using the data in Figure 9, calculate the interquartile range of the pebble size data. Show your working in the space below.

[2 marks]

Interquartile range = cm

04.9 Describe the pebble size data shown on the dispersion graph in Question 04.6.

[4 marks]