Work through these tasks during the year to prepare for AS Unit 2 (and A2 Unit 4A)
Your teacher will require you to submit your tasks periodically

Name: ______________________________________________________________________

Teachers: ____________________________________________________________________
Introduction
At AS you will have a skills paper which lasts for one hour. The focus of this will be on either the Rivers or Population topic. It is essential that you acquire/develop your Geographical skills during the year to prepare yourself for this very important exam. Moreover, you will have a further skills exam at the end of A2, so once you have acquired the skills at AS you will need to keep using them at A2! The rest of this page is lifted directly from the AQA website to give you an idea of all the skills that are required. The rest of the booklet will then provide you with tasks to help you practice these skills.

Skills Checklist
Candidates will need to develop a variety of basic, investigative, cartographic, graphical, applied ICT and statistical skills. They will need to develop a critical awareness of the appropriateness and limitations of different skills and resources. The level of accuracy, sophistication and detail are all expected to be greater at AS than at GCSE, and similarly between AS and A2. Candidates will need a basic mathematics set, including a calculator.

Basic Skills
- annotation of illustrative material, base maps, sketch maps, OS maps, diagrams, graphs, sketches, photographs etc
- use of overlays
- literacy skills.

Investigative Skills
- identification of aims, geographical questions and issues, and effective approaches to enquiry
- identification, selection and collection of quantitative and qualitative evidence, including the use of appropriate sampling techniques, from primary sources (including fieldwork) and secondary sources.
- processing, presentation, analysis and interpretation of evidence
- drawing conclusions and showing an awareness of the validity of conclusions
- evaluation, including further research opportunities
- risk assessment and identification of strategies for minimising health and safety risks in undertaking fieldwork.

Cartographic Skills
To include at AS use of:
- atlas maps
- base maps
- sketch maps
- Ordnance Survey maps at a variety of scales – squares, circles, semi-circles, bars
- maps showing movement – flow lines, desire lines and trip lines
- choropleth, isoline and dot maps.

In addition, to include at A2:
- weather maps – including synoptic charts
- detailed town centre plans.

Graphical Skills
To include at AS use of:
- line graphs – simple, comparative, compound and divergent
- bar graphs – simple, comparative, compound and divergent
- scatter graphs – and use of best fit line
- pie charts and proportional divided circles
- triangular graphs
- radial diagrams
- logarithmic scales
- dispersion diagrams.

In addition, to include at A2:
- kite diagrams.

ICT Skills
- use of remotely sensed data – photographs, digital images including those captured by satellite
- use of databases, eg census data, Environment Agency data; meteorological office data
- use of geographical information systems (GIS)
- presentation of text and graphical and cartographic images using ICT.

Statistical Skills
To include at AS:
- measures of central tendency – mean, mode, median
- measures of dispersion – interquartile range and standard deviation
- Spearman’s rank correlation test
- application of significance level in inferential statistical results.

In addition, to include at A2:
- comparative tests – Chi-squared, Mann Whitney U Test.
Section A: Basic Skills

To include:
• annotation of illustrative material, base maps, sketch maps, OS maps, diagrams, graphs, sketches, photographs etc
• use of overlays
• literacy skills.

Task 1: Sketches

**Sketch** High Force and **annotate** (not just simple labels) the main features of the waterfall in the space below right (this waterfall is discussed in your textbook). **TIP** – **SKETCH** AND DON’T DRAW A DIAGRAM FROM THE SIDE, WHICH IS HOW YOU WOULD NORMALLY SHOW HOW A WATERFALL IS FORMED

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**Task 2a: Completion of graphs and annotation** – Fill in the blanks based on the figures given below:

<table>
<thead>
<tr>
<th>Month</th>
<th>Precipitation</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>March</td>
<td>148</td>
<td>6</td>
</tr>
<tr>
<td>April</td>
<td>108</td>
<td>7</td>
</tr>
<tr>
<td>May</td>
<td>99</td>
<td>9.6</td>
</tr>
<tr>
<td>June</td>
<td>105</td>
<td>11.8</td>
</tr>
</tbody>
</table>

Tip: always use the same shading as they use on the paper, whether this is solid or some sort of pattern

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**Task 2b: Write the number of the statement on the graph in the correct place:**

1. Evapo-transpiration is at its highest
2. Rainfall is about 2 mm higher than the previous month
3. Temperatures are at their lowest
**Task 3: Annotation of photos.** Use the space around the picture to annotate and explain how this headland has developed over time. Crucially, use named erosion/weathering processes. Do you know where this is?

![Image of a headland](www.superbwallpapers.com)

**Task 4: Literacy Skills.** Using two colours, shade in factors discussed that are HUMAN reasons for the flood in one colour and PHYSICAL reasons in the other colour. There are two deliberate spelling mistakes in the text - can you identify them? Secondly, there is a one item of punctuation that is missing – can you identify it?

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**Terror Strikes Boscastle**

The residents of a Cornish village, situated at the bottom of a deep V-shaped valley, face an uncertain future following a horrific flood event yesterday.

A local resident said, “It was terrifying. The water rose very quickly following the huge thunderstorm that hit the area that afternoon. My house has been damaged badly. I wish my house had never been built next to the river”.

The flooding didn’t come as a total surprise though. The area has many streams that drop very quickly from the source and the lack of trees means that water is not soaked up. The compacted mudstone in the area is not particularly good at allowing water to soak into the ground too.

Boscastle has a history of flooding, yet people living in the area did not seem particularly prepared. People had restricted the river over the years by building artificial banks and had built on the flood plain, which seems to have made the situation worse.

No deaths have been reported, which has been describe as ‘miraculous’ by the RAF helicopter rescue team.

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Key: PHYSICAL =  
HUMAN =

TIP: IF YOU LOOK AT THE PAST PAPERS, THE OFTEN GIVE YOU SOME TEXT THAT WILL REQUIRE YOU TO EXTRACT INFORMATION. THEY WILL NOT ASK YOU TO FIND A SPELLING MISTAKE OR ADD PUNCTUATION, BUT THEY WILL EXPECT YOU TO SPELL THINGS CORRECTLY AND USE MORE ADVANCED PUNCTUATION IN YOUR WRITING.
Task 5: Diagrams
Using the population pyramid diagram on the right, what can you infer about the country depicted? What stage of the demographic transition model is it in?

Section B: Investigative Skills
- identification of aims, geographical questions and issues, and effective approaches to enquiry
- identification, selection and collection of quantitative and qualitative evidence, including the use of appropriate sampling techniques, from primary sources (including fieldwork) and secondary sources.
- processing, presentation, analysis and interpretation of evidence
- drawing conclusions and showing an awareness of the validity of conclusions
- evaluation, including further research opportunities
- risk assessment and identification of strategies for minimising health and safety risks in undertaking fieldwork.

These will be covered in the field trip. Your experiences on the trip and in the write-up will cover these. The key is then to attempt past papers (Unit 2 – section B) where you apply the knowledge gained.

Section C: Cartographic Skills
To include at AS use of:
- atlas maps
- base maps
- sketch maps
- Ordnance Survey maps at a variety of scales
- maps with located proportional symbols – squares, circles, semi-circles, bars
- maps showing movement – flow lines, desire lines and trip lines
- choropleth, isoline and dot maps.

In addition, to include at A2:
- weather maps – including synoptic charts
- detailed town centre plans.
Task 6: Atlas maps

6a). Suggest why Switzerland is popular for Winter sports ______________________________________________
_______________________________________________________________________________________________
_______________________________________________________________________________________________
_______________________________________________________________________________________________
_______________________________________________________________________________________________
_______________________________________________________________________________________________
_______________________________________________________________________________________________

6b). What is the name and height of the highest mountain on this map? _________________________________

6c). What is the distance from Milan to Turin? __________________________________________

6d). In which square would you find Basel? ________________________________________

6e). How high above sea level is Zurich? __________________________________________

6f). What mountain range is shown on this map? ___________________________
Task 7: Sketch map  Create a sketch map of the study area of Ringstead Bay (this can only be completed once you have been on the field trip!). TIP: THIS IS CRUCIAL. I HAVE SEEN A NUMBER OF QUESTION IN UNIT 2 WHERE THEY ASK YOU TO DO EXACTLY THIS.

Task 8: Ordnance Survey Maps  (YOU WILL NEED TO ASK YOUR TEACHER FOR THE OS MAP EXTRACT OF BURRATOR RESERVOIR FOR THESE QUESTIONS)

You will need to answer these questions on file paper – use the numbers in brackets to give an indication of how much you will need to write. Really push yourself in the longer questions.

1. What is the highest point on the map (give 6 figure reference, name and actual height)  (3)
2. If you were stood at Sheepstor village, would I be able to see the following:
   a) Norsworthy Bridge 567 694? (1)
   b) Quarry 543 687 (1)
   c) Burrator Lodge 553 685 (1)
3. What is the length of the dam to the southeast of Burrator Reservoir?  (2)
4. How far is it (km) from Sheeps Tor to Sharpitor, as the crow flies?  (1)
5. Compare the relief of grid square 56 68 with that of 54 70 (4)
6. Describe the land use in grid square 55 67 (3)
7. What evidence of industry is there in grid squares 54 67 and 54 68? (3)
8. What is found at the following:
   a) 578 673 (1)       b) 543 687 (1)       c) 543 701 (1)       d) 560 676 (1)       e) 557 679 (1)
   f) 541672 (1)       g) 552 671 (1)       h) 560 697 (1)       i) 561 707 (1)       j) 579 697 (1)
9. What direction is the village of Sheepstor from Sheeps Tor? (1)
10. If you were at Yennadon Down in which direction would you have to go in order to get to Sheeps Tor? (1)
11. Using map evidence and your own knowledge (perhaps think about what a Tor is & Geology) explain why you think planners felt it was suitable to construct a reservoir in this area (6)
12. How does Crofts Plantation differ from Flat Wood in terms of the vegetation? (2)
13. What are the black dots in the reservoir? Once identified, why do you think they are not just in straight lines? (3)
14. If you were to drive around the reservoir in a circular route (and you stuck to the roads) what would be the shortest possible distance in km? (3) (You may need string for this!)

THERE ARE 45 MARKS IN TOTAL FOR THESE MAP SKILLS TASKS.

Task 9: Contours. There is a red dot on the map, which marks the confluence of the stream that occupies Ashes Hollow with the Quinny Brook. Can you draw on the watershed of this drainage basin?

Task 10 Map skills: Transect production

If you look at the diagram on the right, the red line has been drawn from one side of the valley to the other and then I have made the program display the elevation profile of this transect. You can see that there is a large hill to the west, it then flattens in the valley floor (no contours) and then increases in height to the eastern side of the transect. On the next page you will be shown how to draw one of these.
10a). Now have a go at this worked example. I have started the process for you and provided a commentary:

1. I drew a relief map of a fictitious island (the blue shading represents the coast and therefore sea level (0m)).

2. The red line is the transect that we are trying to turn into a relief transect/cross section.

3. The pencil lines are the contours (I didn’t have a brown pencil at home!) and you will see the height recorded next to them.

4. I scanned across the map and worked out that the highest height was 50 metres and the lowest height was 0 metres. This then enabled me to work out the range required for the Y axis on the graph below the map.

5. The X axis is as long as the map above it – the two Y axes match up to the start and finish of the red transect line.

6. As I moved from left to right along the red transect line every time I encountered a contour line I then worked out the height and then placed a dot on the graph below it. For example, on the graph above going from left to right the first contour was 0 metres. The dashed green line then shows where I put the 0 metre dot on the graph below that point. I have then done the same for the 10 metre contour. A little further on, I did the same for the 50 metre contour. You need to add all the dots and then connect the dots to produce a line graph. N.B. You don’t need to draw dashed line like I have done; this was just to show you what I was doing!!

10b). On a piece of graph paper, have a go at creating a relief cross section/transect for the following:
Task 11: Cartographic skills - Desire lines/ flow lines etc.

Sometimes a simple pie chart or bar chart doesn’t really tell the whole story. It is far better to actually place the data on to a map to provide the spatial dimension. That is what has been started here. A traffic count has taken place on the Denmead Road and also on the A3 (the pink dots). Using the scale for the width of the arrow of 1cm =10 cars add the following on to the graph:

<table>
<thead>
<tr>
<th></th>
<th>A3 Going NE</th>
<th>A3 Going SW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic Count</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>Denmead Road Going NW</td>
<td>Denmead Road Going SE</td>
<td></td>
</tr>
<tr>
<td>Traffic Count</td>
<td>32</td>
<td>14</td>
</tr>
</tbody>
</table>

N.B. The same technique could be applied but in slightly different ways. For example you could actually draw over the roads to represent the volume of traffic going along it. I have shown this on the A3 going NE towards Cowplain. Equally, you could use proportional circles, squares etc. to show data. This scan of a map from your text book shows how proportional squares can be used – circles or semi-circles or bars could be sued for this too.
Task 12: Desire Lines
These are lines drawn directly from the point of origin to the final destination (unlike the flow line shown above on the A3 where the line actually represents the route taken. You need to produce a desire line map to show the origin of visitors to East Head Spit (the red dot) on the map below using the figures in the table.

<table>
<thead>
<tr>
<th>County</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norfolk</td>
<td>1</td>
</tr>
<tr>
<td>Berkshire</td>
<td>3</td>
</tr>
<tr>
<td>Kent</td>
<td>5</td>
</tr>
<tr>
<td>Wiltshire</td>
<td>6</td>
</tr>
<tr>
<td>Staffs</td>
<td>1</td>
</tr>
<tr>
<td>Shrops</td>
<td>1</td>
</tr>
<tr>
<td>Devon</td>
<td>1</td>
</tr>
<tr>
<td>Cornwall</td>
<td>1</td>
</tr>
<tr>
<td>Essex</td>
<td>2</td>
</tr>
<tr>
<td>Northants</td>
<td>1</td>
</tr>
<tr>
<td>West Sussex</td>
<td>20</td>
</tr>
<tr>
<td>Hampshire</td>
<td>12</td>
</tr>
</tbody>
</table>

Task 13: Choropleth shading (note no ‘l’ after the h)
The lines are good, but do not show patterns. Have a go at a choropleth map by shading in the counties of origin to represent the number of people using the same figures as the desire line. I would use 4 categories and complete the table below:

<table>
<thead>
<tr>
<th>Range</th>
<th>Colour</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-</td>
<td></td>
</tr>
<tr>
<td>&gt;</td>
<td></td>
</tr>
</tbody>
</table>

N.B. choose the colours wisely- don’t just put any old colours down. Perhaps green, yellow, orange red or an increasingly dark shade of one colour. Exam papers may already provide the shading- you must stick to them.
Task 13: Isoline maps
These can be quite hard, but don’t panic! The weather map on the right has used a type of isoline (called isobars). They simply join up areas of equal value. Don’t worry about the coloured symbols – these are showing types of weather fronts; you simply need to look at the black lines. In fact, you have already come across something similar earlier in this booklet – contours serve exactly the same purpose.

13a). Have a go at completing the isoline maps from the past exam question on the left. The 5 cm isoline is missing. Label it as they have done the other lines.

13b). Identify and label the fastest part of the river on the bottom diagram and explain the relationship between this diagram and the one above (the same river in the exact same location). Use the space below the bottom diagram to construct your answer.
13c). I would like you to do is to produce an isoline map based on pedestrian count data around the CBD of Waterlooville.

N.B. I would use categories of 10- i.e. a line for 20, 30, 40 and 50-give it a go!

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**Task 14: Dot maps**

This is where the distribution of a geographical variable is plotted on a map using dots of equal size. Each dot has the same value and is plotted where that variable occurs. The value should be high enough to prevent overcrowding, but too large and some places will not reach the level required to gain a ‘dot’! The question and map (right) comes from a real exam paper. Using the map on the right:

14a). Describe the population distribution of Brazil

14b). Outline one strength and two weaknesses of this method of data presentation
Section D: Graphical Skills

To include at AS use of:
• line graphs – simple, comparative, compound and divergent
• bar graphs – simple, comparative, compound and divergent
• scatter graphs – and use of best fit line
• pie charts and proportional divided circles
• triangular graphs
• radial diagrams
• logarithmic scales
• dispersion diagrams.

In addition, to include at A2:
• kite diagrams.

You will have come across many of these before, but it is essential that you practice them.

Task 15: Line Graphs

This is a mixture of graph types! The MEDC/LEDC is plotted as a line graph and the value is plotted on the vertical axis (secondary axis). However, there is another type of graph plotted here called a compound line graph - this is where the differences between the points on the adjacent lines give the actual values - compound bar graphs are also common.

a). What was the percentage of LEDC industry in 1970? _____________________
b). What was the percentage of MEDC industry in 2005? _____________________
c). What percentage of LEDC industry did East Asia account for in 2005? ________________
d). What percentage of LEDC industry did South Asia account for in 1990? ________________
e). Describe the changes shown in the graph (continue on the next page)
Task 16: Bar Graphs

These are commonly used in exam papers. They can be simple, compound (stacked bar chart) or you could see one that shows positive and negative values. Examples are shown below:

**a).** What was the % population change in 1960 _____, 1970 _____, 1980 ________, 1990 _______ & 2000 _______?

**b).** No questions for the second graph- you have already answered these on the previous page (I just wanted to show you what a compound bar chart would like like).

Task 17: Scatter graphs – these have the potential to allow you to investigate the relationship between two sets of data. I have asked the computer to produce a *line of best fit*, which it has done with a black line. However, is there a result that looks particularly odd? This is called a *residual* and these are identified as points that lie some distance away from the line.

These can be useful as they can give you an idea of a further area for investigation (i.e. go back and sample again).

**a).** Which point is a residual (circle it) and why do you think it might be there?

**b).** Pretend the point was not there- draw another line of best fit.
Task 18: Triangular graphs - These are plotted on special graph paper in the form of an equilateral triangle. It can only be used for a whole figure that can be broken into 3 components. Once plotted, clusters can emerge and classifications can also take place.

Task 18: Logarithmic scales

These can be difficult to interpret when compared to 'linear' scales. The Hjulstrom Curve/graph on the left utilizes logarithmic scales on both X and Y axes. They are used so that huge ranges of data can be included on the same graph: small values can be plotted as well as extremely large values. Each unit represents a 10 fold increase in values. Notice that the tick marks become more congested in the square when you move up to the next major line up on the X & Y axes – this is the main complication when reading log scales.

State the velocity at which particles of clay of 0.001 mm are eroded and the velocity at which pebbles of 10 mm are deposited.

18a). Clay particles of 0.001 mm are eroded at ......................... cm/sec.
18b). Pebbles of 10 mm are deposited at ......................... cm/sec.
Task 19: Radial Diagrams

These are really useful when a variable is a recurring event – i.e. monthly, annual, daily etc.

For example, the graph on the right (taken from your AS textbook) shows the number of pedestrians found in a city centre location at various time of the day in a 24 hour period. The times can be found around the outside and the line shows how many people were counted (0 is in the middle and each concentric circle as you move out is worth 10 people).

You can plot climate graphs in this way so that December is next to January, rather than being at two opposite ends of a bar chart. River regime etc. could also be plotted. Wind rose diagrams are shown in this way too.

19a). How many people were counted at 7am? _______________

19b). How many people were counted at 7pm? _______________

19c). Why do you think the line doesn’t join up from midnight to 6am? __________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________

19d). What was the maximum number of people counted and at what time did this occur? _______________

19e). Describe and explain the results shown _______________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________
Task 20: Dispersion Graphs

- These are displayed on a vertical scale using dots to represent the values.
- The can show the range of data in a data set
- Dispersion graphs can also show the pattern of distribution of a data set

The example on the right – from your textbook again – shows the annual rainfall in two different locations over a 16 year period. Therefore, each dot represents the total annual rainfall for a particular year: you should see 16 dots for SE England and 16 for North Nigeria.

20a). What is the range of values for:
- SE England = ______________
- North Nigeria = ______________

20b). What is the highest annual rainfall in the two data sets and where does it come from? ___________________________________________________________________________

20c). What is the lowest annual rainfall in the two data sets and where does it come from? ___________________________________________________________________________

Using your answers to Q20a and other information from the graph, compare the distribution of the data for the two locations. Extension: can you account for these differences? ___________________________________________________________________________

___________________________________________________________________________

N.B. WE WILL LOOK AT DISPERSION GRAPHS AGAIN WHEN WE COVER INTERQUARTILE RANGE.

Task 21: Proportional divided circles and Pie Charts

These should be familiar to you having completed many in Maths – I hope! Add up the total values for all the data. You then divide the data for one segment of the chart by the total and you then multiply that figure by 360 to calculate how many degrees are needed for that particular segment.

You can vary the radius of the circles to represent the total values if you have a number of pie charts on one map (this is when they are called proportional divided circles).
Section E: ICT Skills

- use of remotely sensed data – photographs, digital images including those captured by satellite
- use of databases, eg census data, Environment Agency data; meteorological office data
- use of geographical information systems (GIS)
- presentation of text and graphical and cartographic images using ICT.

These will be covered through the production of your field trip write-up.

Section F: Statistical Skills

To include at AS:
- measures of central tendency – mean, mode, median
- measures of dispersion – interquartile range and standard deviation
- Spearman’s rank correlation test
- application of significance level in inferential statistical results.

In addition, to include at A2:
- comparative tests – Chi-squared, Mann Whitney U Test.

Task 22: Mean

Add up all the data values in the data set and then divide that figure by the total number in the data set. The formula in the right shows this.

22a). Calculate the mean annual discharge of the river with the following discharge figures (all in m$^3$/second):
650, 467, 632, 711, 589, 494, 467 = __________

22b). What is the mean population increase for these groups of countries (all per 1000 per year):
23, 11, 34, 26, 31, 8, 31, 24, 9 = ______________

Task 23: Mode

This is the most frequent number that occurs in the data set. Using the data sets given in Q22a and Q22b, calculate the mode for each and record in the spaces below.

23a). Mode of Q22a = ________       23b). Mode of Q22b = ___________

Task 24: Median

You will do work on this from your field trip and draw ‘box plot’ diagrams. The median is the middle value in a data set when the data has been arranged in rank order. To calculate the median is quite easy. If there is an odd number, the formula on the right can be used. For example, if there are 15 values, the formula would be (15+1)/2 = the 8th number in the sequence. If there is an even number of values in the data set, then the median is the average of the two middle values. For example, look at the following two data sets:

2, 3, 3, 4, 5, 6 = There is an even number of values in this data set, so the median is the average of the middle two values (3+4)/2 = 3.5

7, 9, 10, 14, 16 = There is an odd number of values, so the median is the middle value = 10 (if you wanted to use the formula, (5+1)/2 = 3rd number in the data set, which is 10.

24a). Calculate the median for this data set: 3, 22, 5, 32, 21, 2, 54, 34, 9, 42, 31, 24 (TIP: YOU WILL NEED TO OUT THE NUMBERS INTO ORDER FIRST IN THE SPACE BELOW):

Task 25: Measures of dispersion – Range
This is a natural progression from the calculation of the median, which was attempted in task 24. If you just take the mean, median and mode of data sets then all the results could be the same, but they do not give an indication of how the data set has been distributed. This is why geographers look at measuring the level of dispersion.

25a). Measure the range of this data set (and write your calculations too): 3, 22, 5, 32, 21, 2, 54, 34, 9, 42, 31, 24

25b). Measure the range of this data set: 459, 321, 632, 234, 127, 265, 205, 322, 284

Task 26: Measures of dispersion - Interquartile range
The measurement of the range in task 25 is quite a crude figure. The measurement of the interquartile range provides a more detailed look at the level of dispersion.

Essentially, interquartile range requires you to rank the data in order and then split the data into 4 equal groups/ quartiles. The boundary between the first and second quartiles is called the ‘upper quartile’ and the boundary between the third and fourth quartiles is called the ‘lower quartile’.

To calculate the upper quartile (UQ) you use the formula top right

To calculate the lower quartile (LQ) you use this formula

The interquartile range (IQR) is calculated as follows:

\[ IQR = UQ - LQ \]

This gives an indication of the spread of the middle 50% of data around the MEDIAN value, thus giving a better indication of the spread of data around the median when compared to just the simple range figure.

**Worked Example:** 3, 22, 5, 32, 21, 2, 54, 34, 9, 42, 31, 24, 23, 21, 7, 45, 36

Ranked in order = 2, 3, 5, 7, 9, 21, 21, 22, 23, 24, 31, 32, 34, 36, 42, 45, 54.

- There are 17 numbers so the median is the 9th value \((17+1)/2\), which is 23.
- LQ: \((17+1)/4 = 4.5\) (i.e. the average of the 4th and 5th value): \((7+9)/2 = 8\)
- UQ: \(3(17+1)/4=13.5\) (i.e. the average of the 13th and 14th value): \((34+36)/2 = 35\)

Therefore, the interquartile range (IQR) is 35-23 = 12

26a). Calculate the IQR for the following data (clearly, rank them in order first, calculate the UQ figure and the LQ figure and then calculate the IQR):

23, 24, 12, 43, 25, 32, 27, 26, 13, 50, 42, 18, 33, 27, 46, 16, 33, 22
26b). Calculate the IQR for the following data:
459, 321, 632, 234, 127, 265, 205, 322, 284, 321, 245, 545, 421, 224, 578, 311

26c). The dispersion diagram on the right shows the amount of rainfall at various weather stations in Pakistan between 27-30 July 2010. Plot the data in the table below on to the dispersion graph.

<table>
<thead>
<tr>
<th>City</th>
<th>Total rainfall 27–30 July 2010 (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lahore</td>
<td>288</td>
</tr>
<tr>
<td>Peshawar</td>
<td>333</td>
</tr>
</tbody>
</table>

With the graph now complete, calculate the following:
i). Range _______________________________________

ii). Median _____________________________________

iii). IQR – use the space below
Task 27: Interquartile range and display of this information on ‘Box-and-whisker plots’.

The IQR can be displayed on a graph like the one shown above. If you look closely, the ‘whiskers’ represent the highest and lowest value in the data set. The ‘box’ represents the IQR (the middle 50% of the values) – the central line is the median value.

In the space below, construct a box and whisker plot diagram for the following data sets (I have been nice and put the data sets in order for you already!) Clearly, you need to identify the highest and lowest figures, calculate the median and UQ and LQ. I have left space at the bottom of the sheet to complete your calculations:

<table>
<thead>
<tr>
<th>Data Set A</th>
<th>Data Set B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>14</td>
<td>12</td>
</tr>
<tr>
<td>14</td>
<td>13</td>
</tr>
<tr>
<td>16</td>
<td>13</td>
</tr>
<tr>
<td>18</td>
<td>14</td>
</tr>
</tbody>
</table>
Task 28: Measures of dispersion - Standard Deviation

Interquartile range measures the dispersion/spread of values around the **MEDIAN** value.

Standard deviation allows you to calculate the spread of data around the **MEAN** value.

It is best to actually have a go, rather than try to explain the process. The question on the left is taken from a past exam paper.

28a. Fill in the table and calculate the standard deviation (this is the formula) in the space below:

Rainfall variation in a location over a 12 year period is being investigated.

A standard deviation calculation has been started in the table below.

<table>
<thead>
<tr>
<th>Year</th>
<th>Rainfall in mm (x)</th>
<th>$x - \bar{x}$</th>
<th>$(x - \bar{x})^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>618.7</td>
<td>85.11</td>
<td>7,243.71</td>
</tr>
<tr>
<td>2</td>
<td>499.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>605.7</td>
<td>72.11</td>
<td>5,199.85</td>
</tr>
<tr>
<td>4</td>
<td>467.6</td>
<td>-65.99</td>
<td>4,354.68</td>
</tr>
<tr>
<td>5</td>
<td>697.6</td>
<td>164.01</td>
<td>26,899.28</td>
</tr>
<tr>
<td>6</td>
<td>667.4</td>
<td>133.81</td>
<td>17,905.12</td>
</tr>
<tr>
<td>7</td>
<td>603.3</td>
<td>69.71</td>
<td>4,859.48</td>
</tr>
<tr>
<td>8</td>
<td>360.4</td>
<td>-173.19</td>
<td>29,994.78</td>
</tr>
<tr>
<td>9</td>
<td>420.7</td>
<td>-112.89</td>
<td>12,744.15</td>
</tr>
<tr>
<td>10</td>
<td>554.1</td>
<td>20.51</td>
<td>420.66</td>
</tr>
<tr>
<td>11</td>
<td>409.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>498.4</td>
<td>-35.19</td>
<td>1,238.34</td>
</tr>
</tbody>
</table>

$\Sigma x = 6,403.1$  \hspace{1cm}  $\Sigma (x - \bar{x})^2 = 127,335.07$

\[
\sigma = \sqrt{\frac{\Sigma (x - \bar{x})^2}{n}}
\]

$\bar{x} =$

\(\sigma = \text{Standard deviation} \hspace{1cm} x = \text{Individual value} \hspace{1cm} \bar{x} = \text{Mean} \hspace{1cm} n = \text{Number in the sample} \hspace{1cm} \Sigma = \text{Sum of}
Standard deviation compares the data set to a theoretical ‘normal’ distribution. In a normal distribution:

- 68% of the data lies between + or – 1 standard deviation of the mean
- 95% of the data lies between + or – 2 standard deviations of the mean
- 99% of the data lies between + or – 3 standard deviations of the mean

A low standard deviation indicates that there is a high level of clustering around the mean value and that dispersion is narrow.

28b). What does your calculated standard deviation value suggest about rainfall variation at this location?

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_______________________________________________________________________________________________
_______________________________________________________________________________________________
_______________________________________________________________________________________________
_______________________________________________________________________________________________
_______________________________________________________________________________________________

Task 29: Spearman’s rank correlation test

If you look back at task 17 in this booklet, you were required to look at a scatter graph and add a line of best fit. In a scatter graph, you are plotting two variables against each other. What Spearman’s rank does it to assess empirically (numbers, objective etc.) the level of correlation between two variables.

**Stage 1**

Tabulate the data. Rank the two sets independently, giving the highest value a rank 1, and so on.

**Stage 2**

Find the difference between the ranks of each of the paired variables (d). Square these differences (d²) and sum them (∑d²).

**Stage 3**

Calculate the coefficient (rs) from the formula:

\[ Rs = 1 - \frac{6 \sum d^2}{n^3 - n} \]

where  
\( d \) = the difference in rank of the values of each matched pair  
\( n \) = the number of pairs  
\( \sum \) = The sum of

The result can be interpreted on the scale:

<table>
<thead>
<tr>
<th>-1.0</th>
<th>0</th>
<th>+1.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perfect</td>
<td>No Correlation</td>
<td>Perfect</td>
</tr>
</tbody>
</table>

Negative correlation  Positive correlation

The thing we have to think about now is whether the correlation we have found is significant, or whether it could have occurred by chance.
Stage 4
Decide on the rejection level (α). This basically means how certain you wish to be that the correlation you have found could not have just occurred by chance. If you want to be 95% certain (a normal % used), the rejection level is calculated as follows:

\[ \alpha = \frac{100 - 95}{100} = 0.05 \]

Stage 5
Calculate the formula for \( t \):

\[ t = rs \sqrt{\frac{n - 2}{1 - rs^2}} \]

where \( rs \) = Spearman’s Rank Correlation Coefficient

\( n = \) the number of pairs

Stage 6
Calculate the degrees of freedom (df):

\[ df = n - 2 \]

Where \( n = \) the number of pairs

Stage 7
Look up the critical value in the t-tables, using the degrees of freedom (df, stage 6) and rejection level (α, stage 4). If the critical value is less than your \( t \)-value (stage 5), then the correlation is significant at the level chosen (95%).

I the critical value is more than you \( t \)-value, then you can’t be certain that the correlation could not have occurred by chance. This may mean one of two things:

1. The relationship is not a good one and it is thus not worth pursuing further
2. The size of the sample you are using is too small to permit you to prove a correlation (we may have this problem with 7 sites). If you increase the sample, then a statistically significant correlation may then emerge

The skill is whether you can interpret your results!
29a). This is from a past paper. A student collected data from 12 sites along a river. The null hypothesis was:

There is no relationship between distance from source and velocity of the river.

(a) Using the table below, complete the calculation of the Spearman’s Rank Correlation ($r_s$) co-efficient.

(6 marks)

<table>
<thead>
<tr>
<th>Distance from source</th>
<th>Distance</th>
<th>Velocity (metres per second)</th>
<th>Velocity</th>
<th>Difference between ranks ($d$)</th>
<th>$d^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>500m</td>
<td>12</td>
<td>0.28</td>
<td>7</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>800m</td>
<td>11</td>
<td>0.31</td>
<td>6</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>1.4km</td>
<td>10</td>
<td>0.68</td>
<td>2</td>
<td>8</td>
<td>64</td>
</tr>
<tr>
<td>1.6km</td>
<td>9</td>
<td>1.12</td>
<td>1</td>
<td>8</td>
<td>64</td>
</tr>
<tr>
<td>1.9km</td>
<td>8</td>
<td>0.34</td>
<td>3.5</td>
<td>4.5</td>
<td>20.25</td>
</tr>
<tr>
<td>2.5km</td>
<td>7</td>
<td>0.34</td>
<td>3.5</td>
<td>3.5</td>
<td>12.25</td>
</tr>
<tr>
<td>3.1km</td>
<td>6</td>
<td>0.25</td>
<td>8</td>
<td>-2</td>
<td>4</td>
</tr>
<tr>
<td>3.6km</td>
<td>5</td>
<td>0.24</td>
<td>8</td>
<td>-2</td>
<td>4</td>
</tr>
<tr>
<td>3.7km</td>
<td>4</td>
<td>0.12</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.2km</td>
<td>3</td>
<td>0.33</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.1km</td>
<td>2</td>
<td>0.20</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.8km</td>
<td>1</td>
<td>0.18</td>
<td>11</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$\Sigma d^2 = \phantom{1}\

Now substitute in the formula to complete the Spearman Rank Correlation

$$r_s = 1 - \left[ \frac{6 \Sigma d^2}{n^2 - n} \right]$$

$$r_s = 1 - \left[ \phantom{1} \right]$$

$$= 1 - \left[ \phantom{1} \right]$$

Rs (Spearman’s rank) = ________________________

29b). Now that you have calculated the Spearman’s rank coefficient, you need to see what statistical significance your result has (this is the part of the exam specification that states application of significance level in inferential statistical results). Look back at the instructions on the previous page and work from ‘stage 4’ onwards – you will need the 95% figure from the ‘t-tables’. Complete your workings out on the next page.
29c). With reference to your results in Q29a and Q29b, describe the relationship between distance from source and river velocity found in this river study. TIP: LOOK AT THE ACTUAL TABLE TOO.

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Good luck! Make sure you complete this booklet thoroughly. Read the section about skills in your textbook and attempt every past question during the year. See your Geography teacher(s) if you need any help.