Cambridge Assessment International Education

Geographical skills

Teacher guide

Cambridge O Level Geography 2230

For centres in Brunei

For examination from 2021

Version 1

Cambridge Pathway

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Introduction

In order to understand the world around us geographers spend time posing questions, collecting data and then interpreting their findings. These same skills of enquiry are developed throughout the Cambridge O Level Geography 2230 program. Learners are then assessed on their understanding and application of these skills in the geographical investigations of Component 2

This guide aims to help you to teach your learners about geographical investigation and support them as they develop the skills involved.

The guide contains the following sections:

- Enquiry skills for geographical investigations
    1) Identifying aims and hypotheses / guiding questions
    2) Enquiry skills to collect data
    3) Data presentation techniques
    4) Analysis
    5) Making conclusions
- Interpreting exam questions
- Example learner answers
- Worksheets for use in the classroom
- Example examination questions

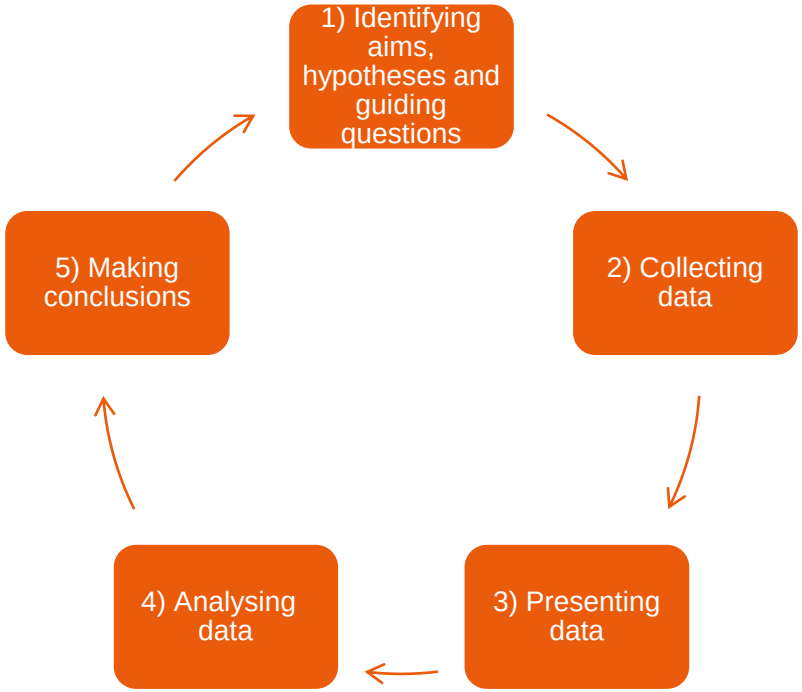
Support for Cambridge O Level Geography

Our School Support Hub www.cambridgeinternational.org/support provides Cambridge schools with a secure site for downloading specimen and past question papers, mark schemes, grade thresholds and other curriculum resources

This O Level syllabus shares content with other IGCSE™ and O Level Geography syllabuses. For further support see the School Support Hub for IGCSE Geography (0460) and O Level Geography (2217).

Enquiry skills for geographical investigations

The enquiry skills which support geographical investigations form a simple framework that identifies each stage involved in the process of collecting, analysing and understanding geographic data. Each stage is shown in the diagram below. The following pages outline some example classroom activities you can use to develop your learners understanding of these.



Enquiry skills for geographical investigations	
Identifying aims and hypotheses / guiding questions	A topic for study is recognised through observation, discussion, reading or previous study. The hypotheses are designed to test the issue, question or problem.
Collecting data	Primary data is collected, such as undertaking questionnaires, mapping or sketching, observation, recording counts or measurements. A pilot study can be used to test whether or not data collection methods will work.
Presenting data	Results are recorded and presented in an appropriate form, using a variety of maps, graphs etc.
Analysing data	Findings are analysed and interpreted in response to the issue / question / problem with reference to relevant geographical concepts.
Making conclusions	Conclusions are drawn from the findings and evaluations are made related to the original objectives. It should be possible to make judgements on the validity of the original hypothesis, and to critically evaluate the data collection methods chosen.

1) Identifying aims, hypotheses and guiding questions

Geographical enquiry is all about asking questions.

- *How are we affected by geographical concepts?*
- *How are places similar or different to one another?*
- *Do geographical processes operate differently in different places?*

Broad questions like these could be used to identify a specific issue to be studied. These questions might be informed by observations of the world, concepts that have been covered in class, or recent events. Once an issue has been identified, hypotheses which allow systematic testing can be established.

For example:

Learners have been studying river processes.

They could investigate how river characteristics vary from the source to the mouth.

Question: Do all rivers share the same characteristics?

Hypotheses:
1. There is an inverse relationship between bedload size and distance from the source
2. There is a direct relationship between river width and distance from the source

In the classroom

To help your learners to understand how an issue can be developed into a specific hypothesis, you could try some of the following activities:

- Using images to stimulate geographical questioning
- Thinking about the geographical concepts affecting your local area
- Reviewing examples of hypotheses
- Using past paper materials.

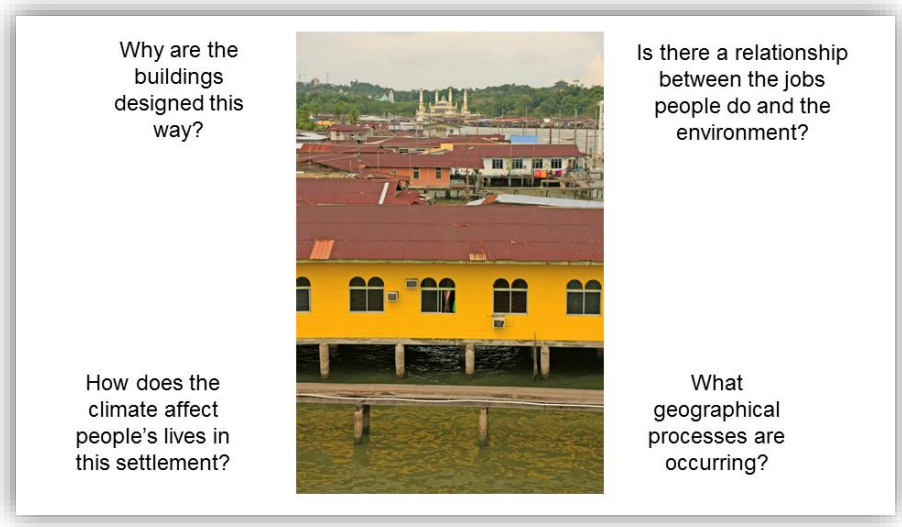
Examples of *some* of these strategies are shown on the following pages.

1) Identifying aims, hypotheses and guiding questions

Using images to stimulate geographical questioning

Using images is a useful way to stimulate discussion and encourage learners to ask geographical questions.

You could practise this skill with your learners on any of the themes in the syllabus as part of your lessons. To begin with, you may want to add questions as prompts like those shown, but eventually you could encourage learners to develop their own questions and hypotheses independently.



What economic processes are occurring?

Tourism is present here.

Hotels have been built to allow tourists to visit this area.

Tourists are likely to be attracted here due to the beaches and good climate.

Money spent by tourists will improve the local economy

Potential hypotheses

- *Tourism is having a positive effect on the local economy*
- *The greater the number of tourists, the more environmental damage caused*
- *Increased levels of tourism encourages the sustainable management of natural resources*

1) Identifying aims, hypotheses and guiding questions

Using past paper materials

In the examination, learners will not be expected to generate their own hypotheses. They will be expected to understand how their subject knowledge relates to the hypotheses given.

It is useful to share past paper questions with learners so that they become familiar with the sorts of questions they may be asked.

Below are some activities using past paper materials which you could try with your learners.

1) Suggesting additional hypotheses

Give learners the two hypotheses shown in the examination paper and ask them to suggest additional hypotheses. This type of activity encourages learners to analyse the hypotheses and then apply their subject knowledge to suggest additional examples.

Hypothesis 1: *The gradient of the river bed becomes steeper as distance downstream increases.*

Hypothesis 2: *River velocity becomes faster as distance downstream increases.*

2) Completing the contextual questions

In the examination, there are often questions which assess learners' contextual understanding of the hypotheses. Practising these is useful to demonstrate how the hypotheses link to geographical concepts.

(iii) The students decided that **Hypothesis 2**: *The bedload becomes more rounded downstream* was partly true. Use evidence from Fig. 4.6 and Table 4.2 to explain why they reached this conclusion.

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..... [2]

(iv) Explain why pebbles (bedload) generally become more rounded downstream.

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..... [2]

2) Collecting data

Once learners have established their hypotheses, they can then consider what data they need to collect and how they should do this.

They should be able to demonstrate their understanding of a range of concepts:

- how geographers sample data, when each sampling technique is appropriate and how it is used
- what equipment should be used in different contexts and how it is used
- how geographers ensure the data collected is reliable

The sorts of skills learners would be expected to demonstrate in the examination are summarised here. There is further detail on this in the syllabus.

- Questionnaires, including factors influencing the successful design of questionnaires and the practical considerations of conducting them.
- Observation, e.g. observations of river features and how these can be recorded using field sketches and annotated photographs.
- Counts, e.g. pedestrian and traffic counts and suitable methods to record these.
- Measurements and the importance of planning the layout of the recording sheet, the location of instruments and the sampling methods used to provide reliable data. They should know what measurement equipment is required in different settings and how to use it.

In the classroom

To help your learners to identify what data is relevant to the hypotheses and how this could be collected, you could try some of the following activities:

- Identifying appropriate equipment to test a specific hypothesis
- Describing equipment use and how it can be made reliable
- Using past paper materials

2) Collecting data

Identifying appropriate equipment

Providing learners with images of equipment is a useful way of familiarising them with the techniques geographers use to collect data. In this example learners use the images of equipment to decide which techniques would be most appropriate to collect the data needed to test the hypothesis.

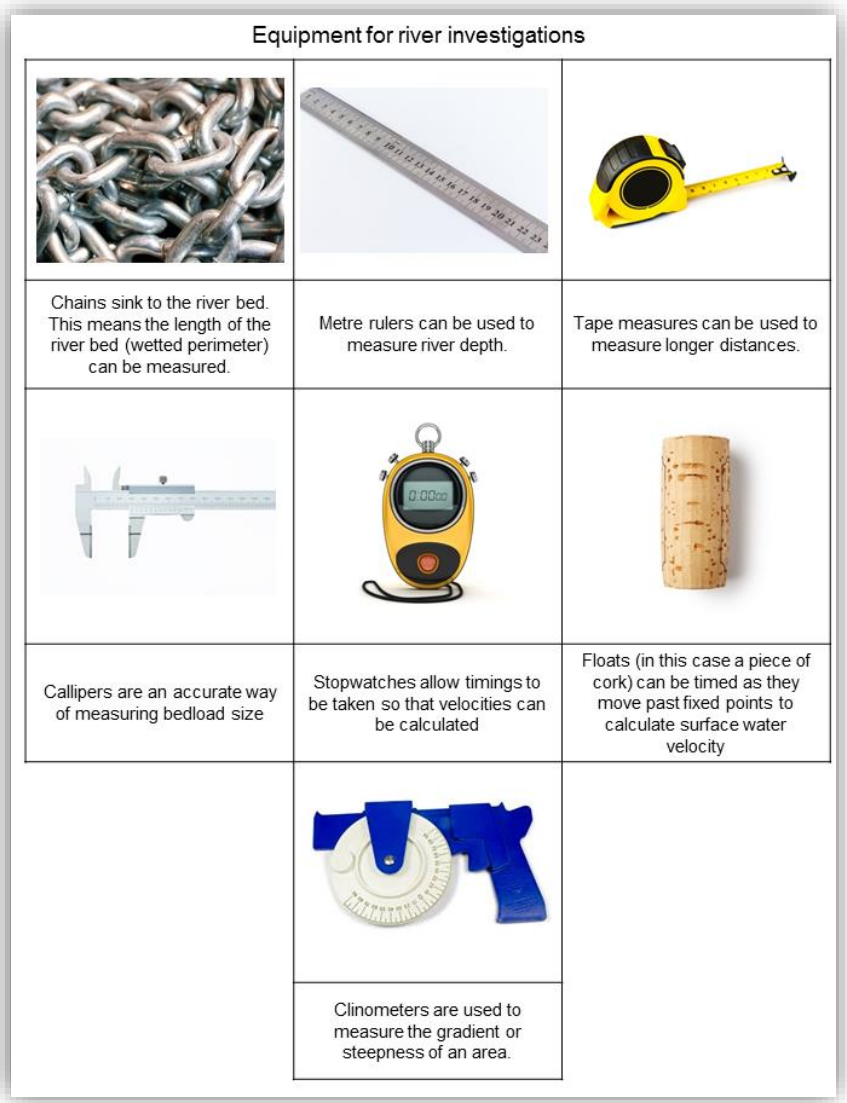
It may be useful to provide sheets showing equipment relevant to specific fieldwork settings. To begin with, you might want to include a brief description of what the equipment does. As learners become more familiar with the equipment, you could remove this information, or even ask them to recall it as they would in the examination.

Look at the hypotheses below.

1. Using the equipment sheet, decide which pieces of equipment you would need for this investigation.
2. For each piece of equipment you chose, explain why the measurements it produces would help you test the hypothesis.

Hypothesis 1:
The area of the cross section of the river channel increases downstream.

Hypothesis 2:
Average velocity of river flow increases downstream.



2) Collecting data

Describing equipment use and how techniques can be made reliable

Learners need to be able to describe how to use the types of equipment and techniques identified in the syllabus.

As well as being able to describe how they are used, learners also need to be able to explain how reliable results are gathered from them.

A summary table like the one shown on the right is a useful way to get learners to think about this. You can populate some elements of the table as in the example to support learners.

The completed table can then be used by learners when they are starting to practise applying this information to the examination questions.

Equipment and techniques

Equipment or technique	How it is used	Reliability
Pedestrian count	A site is selected and the number of people who pass by that point in a given time is logged	Depending on the hypothesis, the sites will need to be carefully selected. The time of day when the count is carried out also has to be considered depending on the hypothesis. The length of the count is important – too short and not enough data will be collected, too long and it may become impractical. Three repetitions at each site will allow an average to be taken.
Traffic count		
Land use survey		
Questionnaire		

2) Collecting data

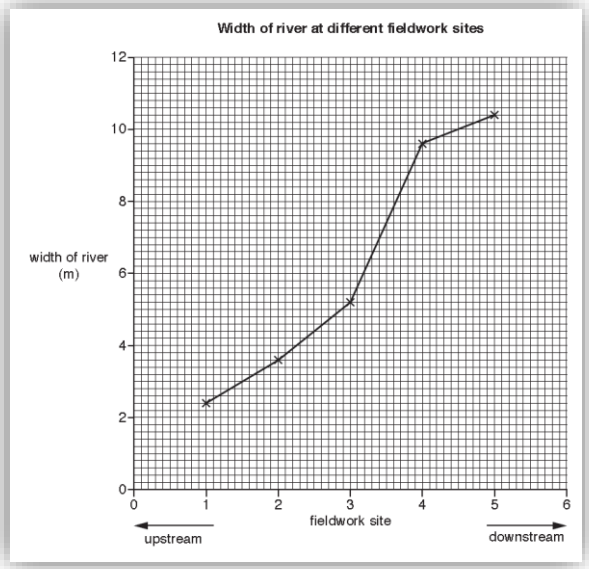
Using past paper materials

In the examination, learners will be expected to be able to explain how specific pieces of equipment, or techniques would be used. They will also need to be able to explain how the data would be sampled and how reliability is maintained.

It is useful to share past paper questions with learners so that they become familiar with the sorts of questions they may be asked. Below are some activities which you could try with your learners using past paper materials.

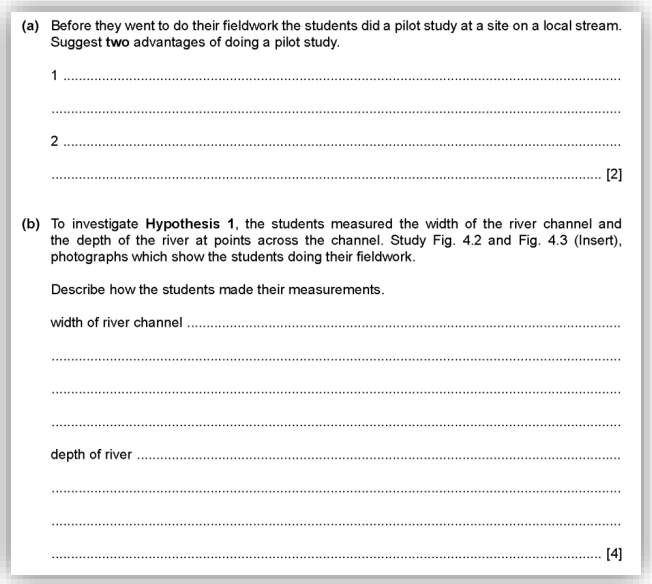
1) How did they collect the data?

In this example, you could give learners some of the data provided in the examination and ask them what techniques would have been used to collect it and how these would have been made reliable.



2) Answer the exam questions

Provide learners with a selection of questions that assess this element of the enquiry process.



(a) Before they went to do their fieldwork the students did a pilot study at a site on a local stream. Suggest **two** advantages of doing a pilot study.

1 .....

.....

2 .....

..... [2]

(b) To investigate **Hypothesis 1**, the students measured the width of the river channel and the depth of the river at points across the channel. Study Fig. 4.2 and Fig. 4.3 (Insert), photographs which show the students doing their fieldwork.

Describe how the students made their measurements.

width of river channel .....

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depth of river .....

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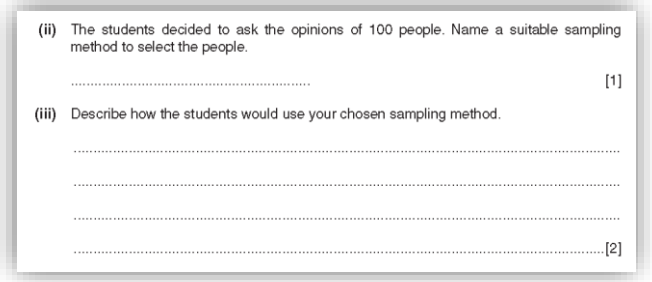
..... [4]



(ii) The students decided to ask the opinions of 100 people. Name a suitable sampling method to select the people.

..... [1]

(iii) Describe how the students would use your chosen sampling method.

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.....[2]

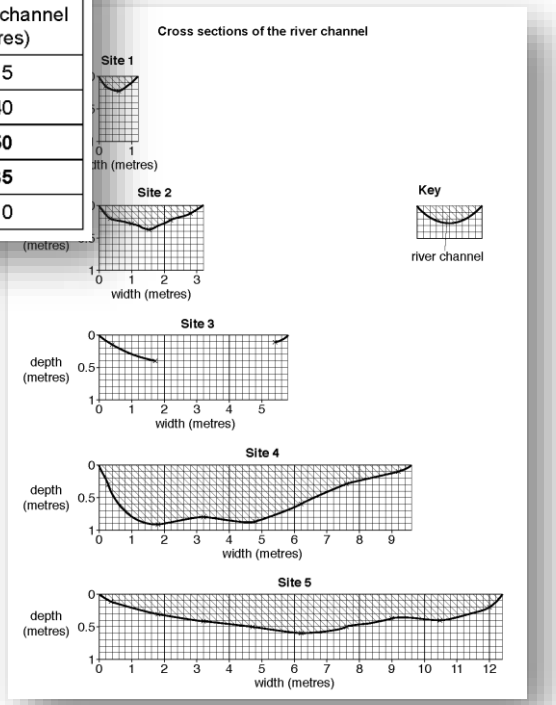
3) Presenting data

Using pre-prepared data

Practise is the key when helping learners to develop their understanding of how to present their data. A good way of doing this is to provide them with sets of data and ask them to plot this using different techniques. It is important that learners understand why geographers use different techniques to present data and how these different techniques can support the analysis of the results.

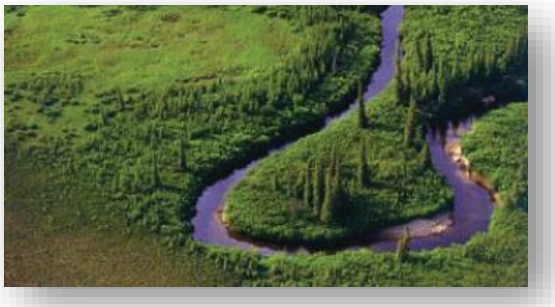
Students' measurements at site 3

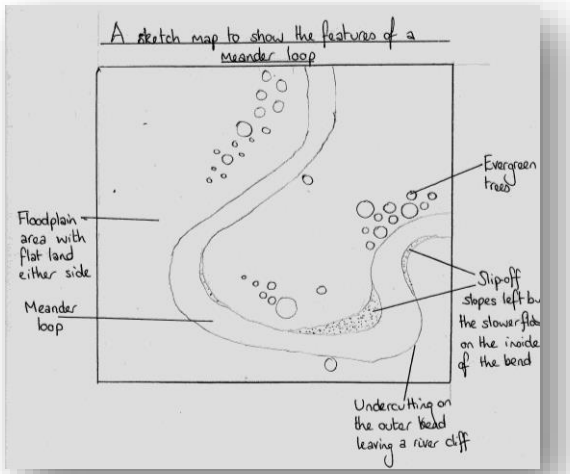
Distance across channel width (metres)	Depth of channel (metres)
0.4	0.15
1.7	0.40
2.9	**0.50**
4.2	**0.35**
5.4	0.10



Drawing field sketches and sketch maps

Asking learners to draw field sketches and sketch maps from photographs is an excellent way of getting them to practise this skill. An example of this is shown below.





4) Analysing data

Supporting learners to analyse geographical data

It is important that learners understand what geographical analysis is. It might be helpful to think of it like this.

> Analysing geographic information involves identifying patterns, relationships and connections.
> Once patterns emerge from the data, they should be explained using geographical concepts.

To help learners to analyse their data, we can break the process into steps like the ones shown on the right.

Questions can help learners to break down the process of analysing their data.

Steps for geographical analysis

1) The first stage is to encourage learners to **describe** the trends in each of the data sets by referring to their graphs and any other data they are provided with.
    a. What relationships are present between your variables? (e.g. positive correlation / negative correlation / no clear relationship)
    b. Can you identify any patterns in the data? Is it equally distributed or very concentrated?
    c. Are there any clear trends in the data you can identify?
2) The next stage is to encourage your learners to **explain** the results using geographical theory and locational knowledge.
    a. What geographical processes normally operate in the environment that was studied?
    b. Do any of these processes help to explain the data?
    c. How does the data agree or disagree with the processes you would expect to see in the environment studied?
3) Can they identify any **anomalous** data? Can they explain this? For example:
    a. Cross-sectional area of the river is smaller / larger than expected in one area due to the effect of human activity or tributaries
    b. Pebble size and shape shows an unexpected result in one area due to the effect of rock type
4) Learners should be encouraged where possible to l**ink** data sets together.

5) Making conclusions

How to make conclusions

As with analysing data, it might be useful for learners to practise making conclusions using a series of steps.

1) Summarise the trends, patterns or relationships that were present in the data
2) Explain how the data either supports or rejects the hypotheses that were tested.
3) Use their understanding of geographical concepts to explain why the data either did or did not support the hypotheses being tested.

The students agreed to investigate the following hypotheses:

Hypothesis 1: *The river becomes wider and deeper downstream.*

Hypothesis 2: *The bedload becomes more rounded downstream.*

Using past paper materials

Learners can practise drawing conclusions using past paper materials

The students decided that **Hypothesis 2**: *The bedload becomes more rounded downstream* was partly true. Use evidence from Fig. 4.6 and Table 4.2 to explain why they reached this conclusion.

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..... [2]

They should use the mark scheme to help them plan their answers or self-assess their answers once they have written them.

evidence very angular / angular or slightly angular changes downstream supporting hypothesis (1)
OR
evidence very rounded / rounded or slightly rounded changes downstream supporting hypothesis (1)

evidence very angular / angular or slightly angular changes downstream showing an anomaly (1)
OR
evidence very rounded / rounded or slightly rounded changes downstream showing an anomaly (1)

Interpreting exam questions

It is important that learners understand what the exam question is asking them so that they can apply the relevant understanding, knowledge and skills.

Before even trying to answer the questions, you might want learners to identify what the question is asking them to do.

Some examples of this are shown below.

(a) Before they went to do their fieldwork the students did a pilot study at a site on a local stream. Suggest **two** advantages of doing a pilot study.

1 .....

.....

2 .....

..... [2]

Here, learners are required to apply their understanding of fieldwork techniques.

(b) To investigate **Hypothesis 1**, the students measured the width of the river channel and the depth of the river at points across the channel. Study Fig. 4.2 and Fig. 4.3 (Insert), photographs which show the students doing their fieldwork.

Describe how the students made their measurements.

width of river channel .....

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depth of river .....

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..... [4]

(iii) The results of the traffic survey are shown in Table 2 (Insert). Use these results to complete Fig. 4A, below. [2]

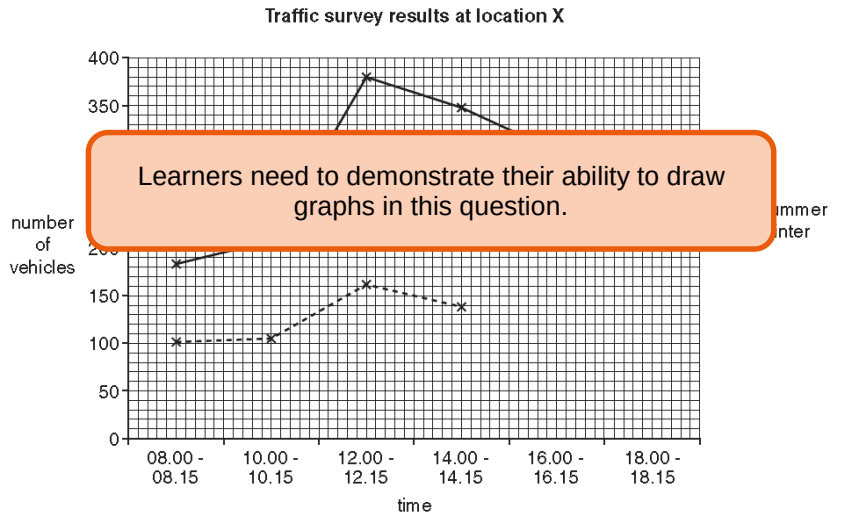


Fig. 4A

Learners need to demonstrate their ability to draw graphs in this question.

(iv) The students made the following conclusions about **Hypothesis 2**: *The amount of traffic is greater in summer than in winter because of tourism.*

The hypothesis is true at location **X**.

The hypothesis is false at location **Y**.

Support both of these conclusions with evidence from Figs 4A and 4B.

Location **X**

.....

.....

Learners must be able to analyse the data they have been given and draw accurate conclusions.

Example learner answers

Asking learners to assess the work of their peers is a very good way to get them used to the types of questions they might be asked and what examiners expect to see in their answers.

Shown here is an example of an exam answer and the associated mark scheme. Based on the mark scheme you could ask your learners to do a number of things:

- mark the work and then compare their scores with a partner, discussing any differences. This encourages them to justify the scores and interpret the mark scheme
- mark the work and then where learners have not scored full marks they could annotate the answer or rewrite it so it gains full marks. This encourages application of knowledge and a clear understanding of the mark scheme.

Mark scheme

(iii) Examples
More jobs means closer to home/less travel (1)
Reduces unemployment (1)
More money/higher income/reliable income (1)
Give local people a higher standard of living/better QoL (1)
More income for necessities / luxuries (1)
May improve local services e.g. education, hospitals (1)
Can generate further investment/local businesses/multiplier idea/boost local economy (1)

Example exam answer marked by a learner

(iii) Residents of Mar del Plata identified 'More jobs are created for local people' and 'Opportunities for local people to earn money' as the main advantages of tourism.

Explain why these are important for residents.

A lower unemployment rate can reduce crime rates as people do not need to commit crimes to get money. Jobs allow people to earn a living and achieve a good standard of living. They can afford more goods and services. People want to have more job opportunities so that they can provide their children good education and have good healthcare. Jobs also allow residents to become better trained and feel more self-satisfaction. Increasing income taxes means that more public goods will be provided by the government. [4]

Learner response

I would give this answer 3 marks out of 4.
The learner has given some reasons that are not directly relevant. For example there is no information about crime, so it cannot be shown that more jobs would have an effect on this. The statement about job satisfaction also does not relate directly to the statements given in the question.

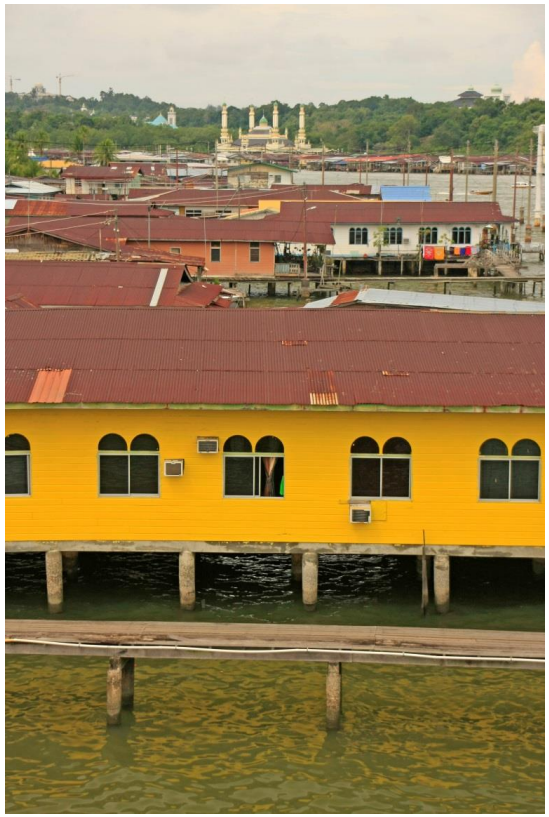
To improve the answer I would make it clearer that the money people earn through their jobs in tourism generates taxes that the government can use to improve education and health care.

Worksheets

Worksheet A: Asking geographical questions

Around the images below, record any questions you can think of that might lead to the development of a hypothesis, aim or guiding question. Some have been added to help you.

Why are the buildings designed this way?



Is there a relationship between the jobs people do and the environment?

How does the climate affect people's lives in this settlement?

What geographical processes are occurring?

Worksheet B: Asking geographical questions

Around the images below, record any questions you can think of that might lead to the development of a hypothesis, aim or guiding question. Some have been added to help you.

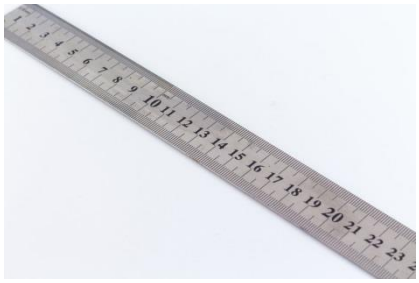
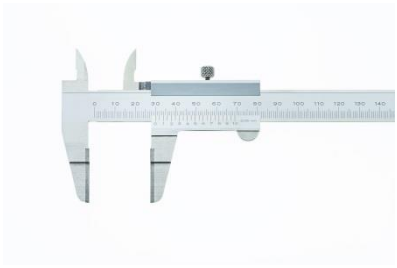
What coastal processes are occurring?

How are people influencing the environment?

What opportunities are being offered by the environment?

What economic processes are occurring?

Worksheet C: Equipment for river investigations

		
Chains sink to the river bed. This means the length of the river bed (wetted perimeter) can be measured.	Metre rulers can be used to measure river depth.	Tape measures can be used to measure longer distances.
		
Callipers are an accurate way of measuring bedload size	Stopwatches allow timings to be taken so velocities can be calculated.	Floats (in this case a piece of cork) can be timed as they move past fixed points to calculate surface water velocity.
		
	Clinometers are used to measure the gradient or steepness of an area.	

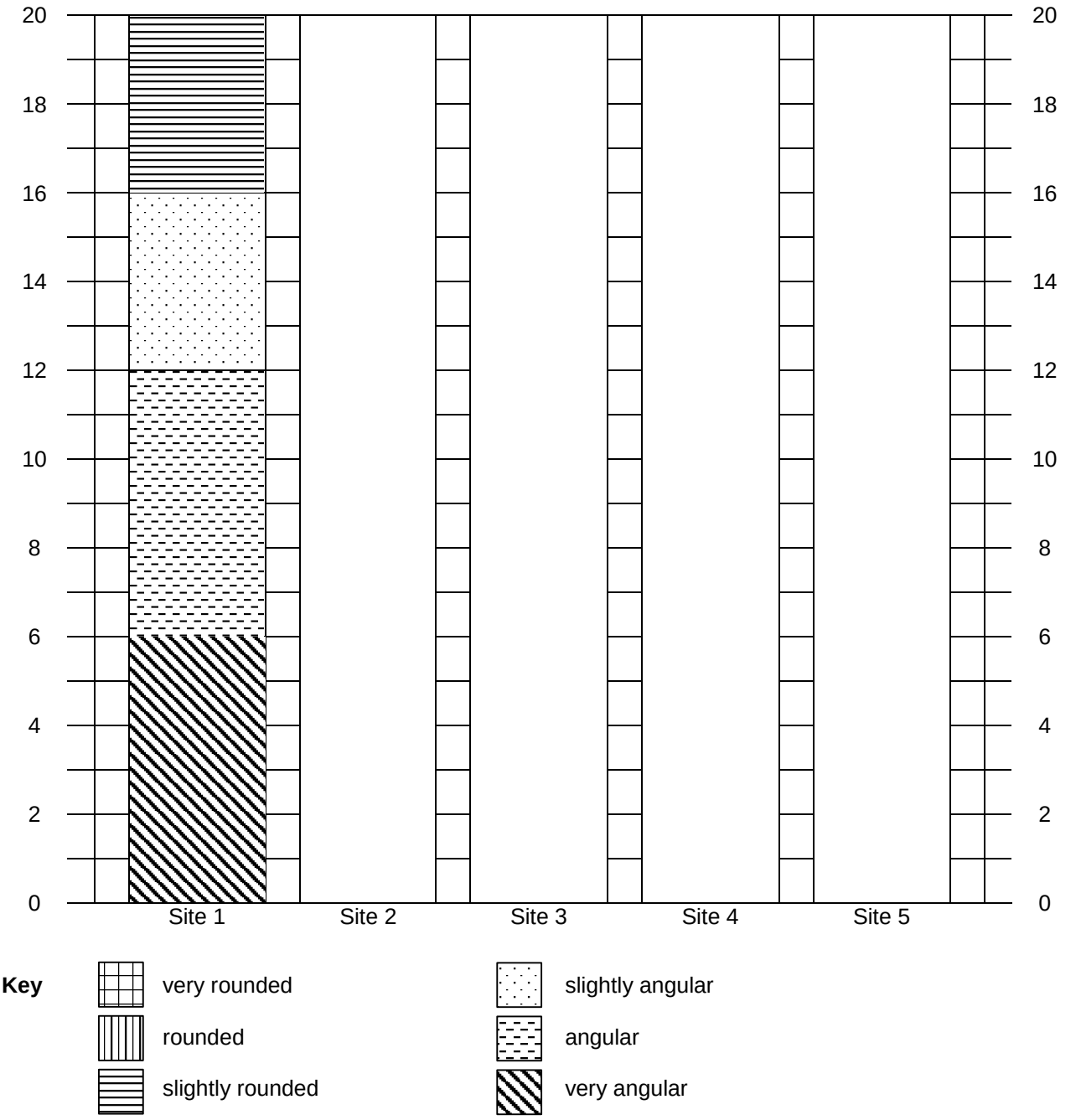
Worksheet D: Equipment and techniques

Equipment or technique	How it is used	Reliability
Pedestrian count	A site is selected and the number of people who pass by that point in a given time is logged.	Depending on the hypothesis, the sites will need to be carefully selected. The time of day when the count is carried out also has to be considered depending on the hypothesis. The length of the count is important – too short and not enough data will be collected, too long and it may become impractical. Three repetitions at each site will allow an average to be taken.
Traffic count		
Land use survey		
Questionnaire		

Worksheet E: Presenting data

Use the data table below to complete the divided bar chart showing pebble roundness from five sites along a river. Site 1 has been completed for you.

Site	Number of pebbles					
	very angular	angular	slightly angular	slightly rounded	rounded	very rounded
1	6	6	4	4	0	0
2	9	4	6	1	0	0
3	0	2	3	12	2	1
4	0	0	3	8	7	2
5	0	2	4	9	5	0



Worksheet F: Example past paper questions

Identifying aims, hypotheses and guiding questions

1 A class of students in Cairo, Egypt were studying population migration. They decided to do a fieldwork investigation about migration in their country.

(a) Before they began their fieldwork they revised key terms to do with migration.

(i) Define the following terms:

internal migration .....

.....

international migration .....

.....[2]

(ii) Push and pull factors affect migration. Explain what is meant by a push factor **and** a pull factor.

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.....[2]

2 Students at a school in Northern Ireland visited a country park to investigate how relative humidity of the air and temperature might vary within a small area.

They decided to investigate the following hypotheses:

Hypothesis 1: *Relative humidity is higher in areas where the ground cover is vegetation.*

Hypothesis 2: *Temperatures are higher nearer to buildings.*

(a) Which one of the following is the correct definition of relative humidity?
Tick your choice below.

	Tick (✓)
The maximum amount of water vapour in the air in hot temperatures	
The percentage of water vapour in the air compared with the total water vapour it could hold at that temperature	
The amount of moisture in the air	
The amount of moisture in the air after a heavy rainstorm	

Worksheet G: Example past paper questions

Collecting data

3 Students from Auckland, New Zealand, were investigating different topics about their city. One group did fieldwork to investigate how the amount of traffic and number of pedestrians changed with increasing distance from the city centre.

(a) To test their hypotheses the students chose counting sites along four roads going from the city centre towards the edge of the city.

(i) The students did a 15-minute traffic count at 08:00, 13:00 and 18:00 hours. Describe how the students would carry out their traffic count at each site.

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..... [4]

4 Students were investigating tourism in a village around a national park. To do this they asked 100 people a questionnaire.

(a) The students decided to put their questionnaires to visitors returning to their cars before leaving the car park. Suggest why they made this decision and one possible disadvantage of their decision.

Why they made the decision .....

.....

Disadvantage .....

.....

.....[2]

Worksheet H: Example past paper questions

Presenting data

5 Students measured the depth of a river every 20 centimetres (0.2 metres) across the channel. They used their results to draw a cross section of the river channel at each site.

(a) The results of the students' fieldwork at site 5 are shown in the table below.
Use these results **to complete the cross section** of the river channel and then **shade in** the river channel at site 5 on Fig. 1 below. [3]

Distance across channel (m)	Depth of river (m)
5.0	0.56
5.2	0.52
5.4	0.56
5.6	0.40
5.8	0.48
6.0	0.43
6.2	0.39
6.4	0.34

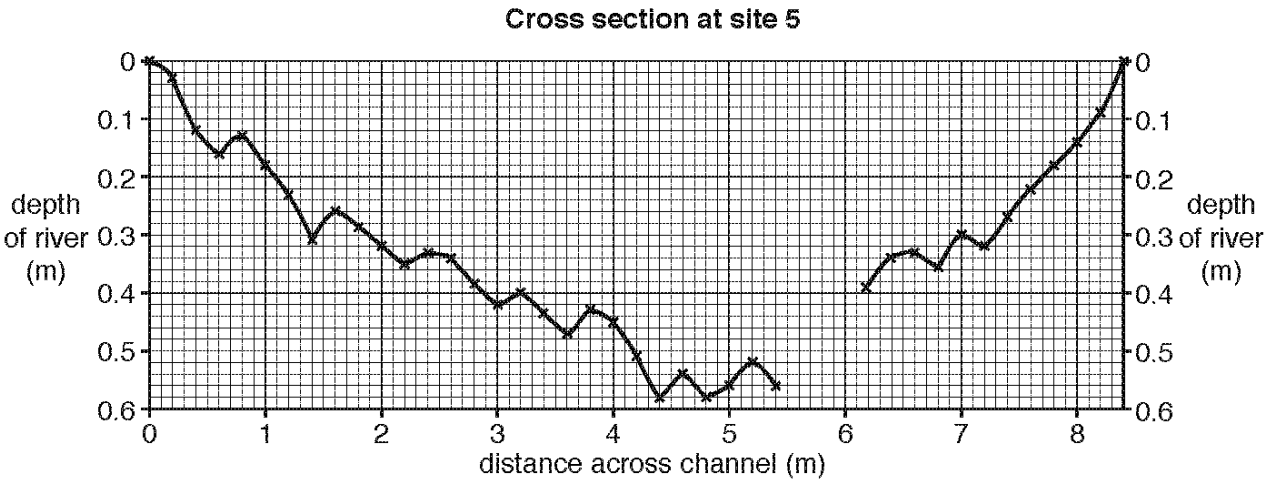

Fig. 1

Worksheet I: Example past paper questions

Analysing data

Some students decided to investigate the sphere of influence of Nova Friburgo.

6 The answers from their questionnaire showed that the main ways of travelling to the CBD were by bus and car. One student drew the main roads leading to the CBD on her map. She also added upland areas on the map. Her completed map is shown below (Fig. 2).

(a) Use evidence from Figs. 2 and 3 to explain why the sphere of influence of Nova Friburgo is NOT equal in all directions.

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..... [3]

Fig. 2
Area around Nova Friburgo

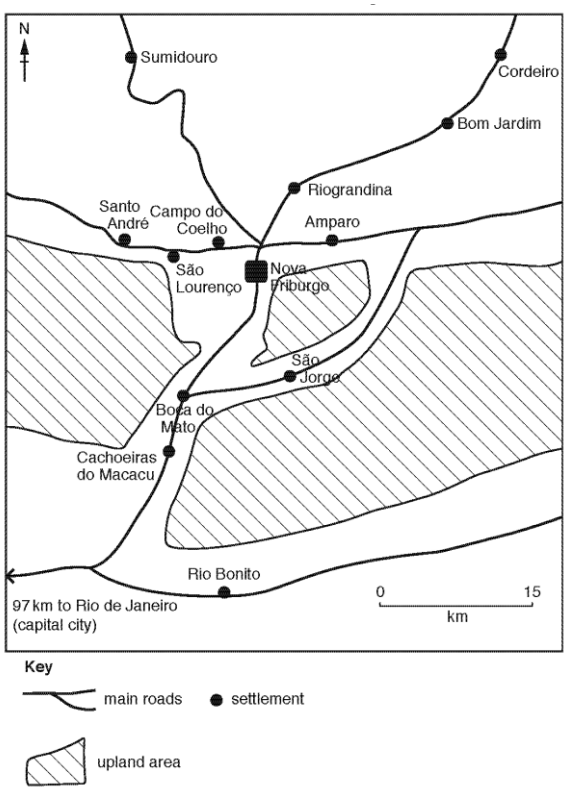
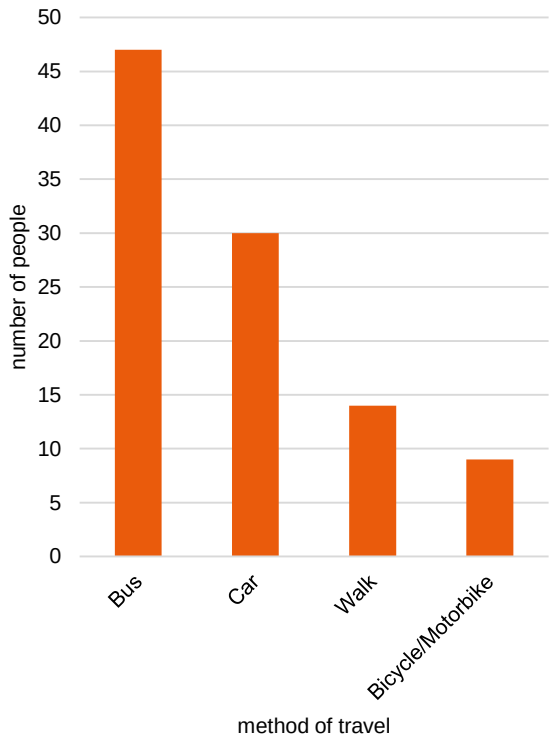


Fig. 3
Chart showing how people travelled to the CBD



Worksheet J: Example past paper questions

Making conclusions

7 Students at a school in south west England (UK) did fieldwork on a river which flows from Dartmoor National Park (an upland area).

(a) The students decided that **Hypothesis 2**: *The bedload becomes more rounded downstream* was partly true. Use evidence from Fig. 3 to explain why they reached this conclusion.

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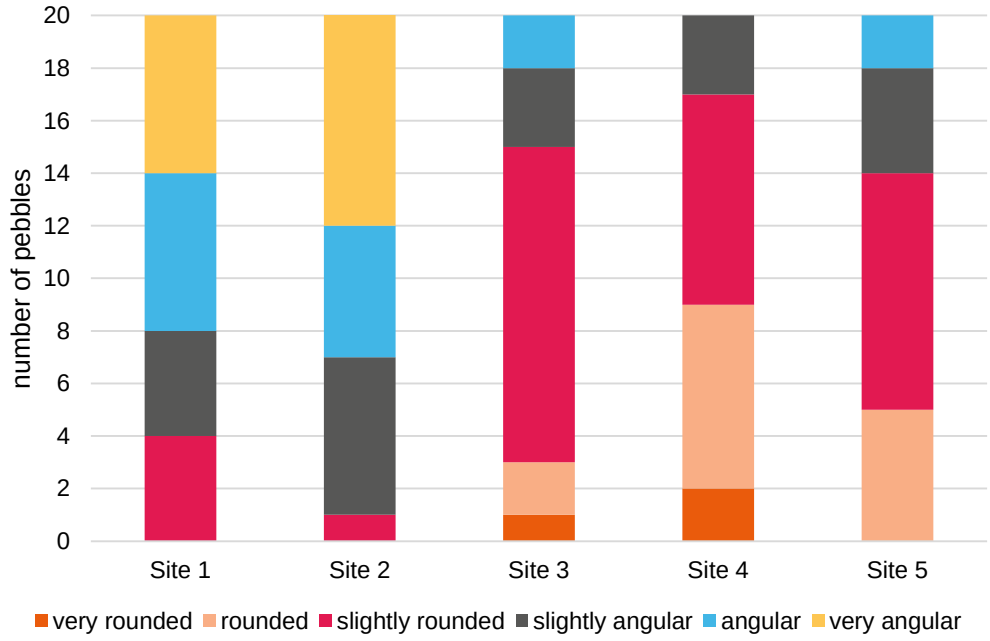
..... [2]

Fig. 3
Pebble roundness



Mark scheme

Question	Answer	Marks
1 (a) (i)	Internal migration: movement of people within a country (1) International migration: movement of people from one country to another / between countries (1) (1+1)	2
1 (a) (ii)	One mark each for definition of Push and Pull: NOT examples of push / pull factors **Push**: people want to leave / want to move out / go from OR Force people to leave OR Negative factors. **Pull:** attract / bring people to / to move into / attract OR Make people want to live in OR Positive factors (1+1)	2
2 (a)	The percentage of water vapour in the air compared with the total water vapour it could hold at that temperature	1
3 (a) (i)	Organise themselves – e.g. one student on each side of the road / different groups go to different sites One student shouts out data and another student records it / one student counts one way and the other student counts the other Use equipment such as stopwatch / counter / clicker / timer Synchronise timing / start and finish at same time Use tally method / record on tally sheet	4
4 (a)	**Why:** People would be better equipped to talk about what they had done / have views about the day's activities Waited until people have finished the day's activities / will not disturb people whilst doing activities (1 mark maximum) [2] **Disadvantage:** People are tired at end of a busy day / cannot be bothered to answer questions People in a rush to set off for home May not get enough answers and too late to do anything about it Only visitors travelling by car will be surveyed / ignores visitors coming by train or bus or walking (1 mark maximum) [2]	2

Mark scheme: *Continued*

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>5 (a)</td><td>Plotting points on cross-section 2 marks:
<table>
<tr><td>Distance across channel(m)</td><td>Depth (m)</td><td></td></tr>
<tr><td>5.6</td><td>0.40</td><td>✓</td></tr>
<tr><td>5.8</td><td>0.48</td><td>✓</td></tr>
<tr><td>6.0</td><td>0.43</td><td></td></tr>
</table>
Shade in cross-sectional area 1 mark</td><td>3</td></tr>
<tr><td>6 (a)</td><td>Most settlements are in north / uneven distribution of settlements
No settlements in the uplands / settlements in lowlands / uplands are
unevenly distributed / relief varies/ no uplands in north / uplands in south / east
Access to roads varies / easier access from north / more roads from north / roads are unevenly distributed / 4 roads from north and 1 road from south / more accessible by road
Rio de Janeiro will restrict sphere of influence (to the south)</td><td>3</td></tr>
<tr><td>7 (a)</td><td>evidence very angular / angular or slightly angular changes downstream supporting hypothesis (1)
OR
evidence very rounded / rounded or slightly rounded changes downstream supporting hypothesis (1)

evidence very angular / angular or slightly angular changes downstream showing an anomaly (1)
OR
evidence very rounded / rounded or slightly rounded changes downstream showing an anomaly (1)</td><td>2</td></tr>
</table>

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