Exercise walk-through

3.3
Option: Extreme environments

International Baccalaureate · IB Diploma · Geography · SL

How the options are examined

- In Paper 1 each option has 20 marks.
- The first part is a set of short **structured questions** (10 marks), often about a map, graph or table.
- Then you choose one of two essays (10 marks).
- SL students answer two options in 1 hour 30 minutes; HL students answer three in 2 hours 15 minutes.

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Extreme environments

- **Extreme environments** are cold (high mountains, polar and glacial areas) or dry (hot deserts).
- Ice erodes valleys into a U shape and leaves piles of rock called **moraines** .
- In hot deserts, wind builds dunes and rare flash floods cut steep valleys called wadis.
- People see these places as both **opportunities** (minerals, tourism, solar energy, scientific research) and **challenges** (cold or heat, little water, poor access, a fragile environment).

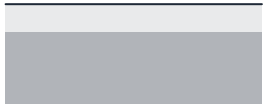
Fieldwork: geographic inquiry and sampling

- The fieldwork report is worth 25% at SL and 20% at HL.
- It is a report of up to 2,500 words, marked out of 25, on **primary data** that you collect yourself in the field.
- You cannot measure everything, so you take a sample:
- **Worked example.** Question: *Does the number of pedestrians fall with distance from the central square?* **Hypothesis**: pedestrian numbers fall as distance increases.

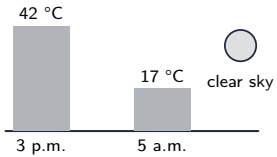
$$r_s = 1 - \frac{6\sum d^2}{n(n^2-1)} = 1 - \frac{6 \times 158}{8 \times 63} = 1 - \frac{948}{504} \approx -0.88$$

Exercises 2.1·2.2

2.1 Define **permafrost** and the **active layer**. [2]

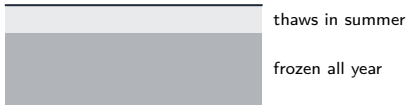


2.2 In a hot desert town, the temperature is 42 °C at 3 p.m. and 17 °C at 5 a.m. Calculate the daily range, and explain why it is so large. [3]



Exercises 2.1·2.2

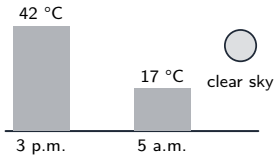
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2.1

permafrost: ground that stays frozen for at least two years in a row; active layer: the top layer above it that thaws in summer and freezes again in winter

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2.2

$42 - 17 = \mathbf{25}$ °C; clear skies and dry air let strong sunlight heat the ground by day; at night there are no clouds and little water vapour to hold the heat, so it escapes quickly

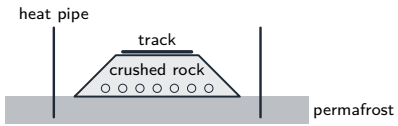
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Exercises 2.3·2.4

2.3 State **two** opportunities that extreme environments offer to people. [2]



2.4 Explain how engineers protected the Qinghai–Tibet Railway from thawing permafrost. [3]



Exercises 2.3·2.4

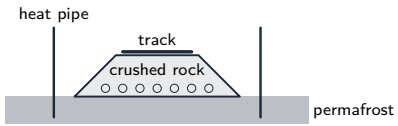
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2.3

any two: minerals, oil or gas; tourism, e.g. trekking or skiing; solar or wind energy; scientific research, e.g. in Antarctica

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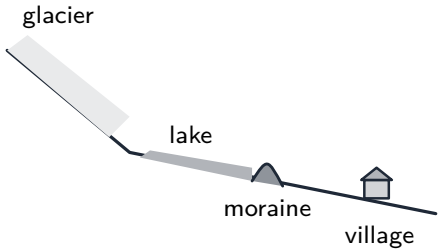
2.4

any three: bridges raise the track above the ground in the most sensitive areas; crushed-rock embankments let cold air sink and circulate between the stones, which cools the ground; heat pipes (thermosiphons) carry heat out of the ground in winter; so the permafrost stays frozen and the track does not sink

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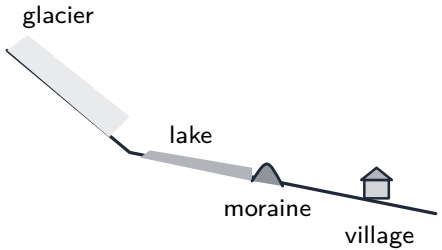
Exercise 2.5

2.5 Explain **two** ways in which shrinking mountain glaciers affect people living downstream. [4]



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2.5

any two, explained: at first more meltwater, but later less water in rivers in the dry season for farming, drinking and hydropower; lakes held by moraines grow and can burst, causing sudden floods that destroy villages and roads; less snow and ice for tourism, so local jobs are lost

Exercise 3.1 (a)

3.1 *(Paper 1 style.)* The table shows the length of a mountain glacier (illustrative data).

(a) Calculate the average rate of retreat, in metres per year, from 1985 to 2025. [2]

year	1985	1995	2005	2015	2025
length (km)	6.0	5.8	5.5	5.2	4.8

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(a) $6.0 - 4.8 = 1.2$ km $= 1{,}200$ m; $1{,}200 \div 40 =$ **30** m a year

Exercise 3.1 (b)

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(b) Describe **two** landforms the glacier left behind as it retreated, and how each formed. [4]

Exercise 3.1 (b)

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(b) Describe **two** landforms the glacier left behind as it retreated, and how each formed. [4]

(b) any two: a U-shaped valley: the glacier eroded the sides and floor by plucking and abrasion; a terminal or lateral moraine: rock carried by the ice was dropped at the snout or sides; a lake held behind a moraine: meltwater filled the hollow

Exercise 3.2

3.2 "The opportunities of extreme environments are greater than the challenges." Discuss this statement. [10]

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3.2

Mark with the markbands: [9-10] focused on the command term, detailed and accurate knowledge, well-developed explanation, specific named examples (places, dates, numbers), balanced evaluation and a supported conclusion; [7-8] mostly focused, good knowledge and examples, some evaluation; [5-6] relevant knowledge and examples, explanation partly developed, little evaluation; [3-4] general knowledge, few examples, mostly description; [1-2] little that is relevant. Points that may be included: opportunities: minerals and energy, e.g. oil and gas in the Arctic; tourism: the Qinghai–Tibet Railway brings tourists and trade to Tibet; solar energy in hot deserts with strong sunshine; research in Antarctica and high mountains; challenges: cold, heat and poor access make building costly, e.g. thawing permafrost under the railway; fragile environments recover slowly

from roads, mines and tourism; local and Indigenous cultures can be put under pressure; climate change adds new risks: thawing permafrost, glacial lake outburst floods; technology turns challenges into opportunities, but at high cost; conclusion: the opportunities are large, but mostly for outside companies and governments; for local people and ecosystems the challenges are often greater