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ENVIRONMENTAL MANAGEMENT **0680/21**

Paper 2 Management in Context **October/November 2021**

1 hour 45 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

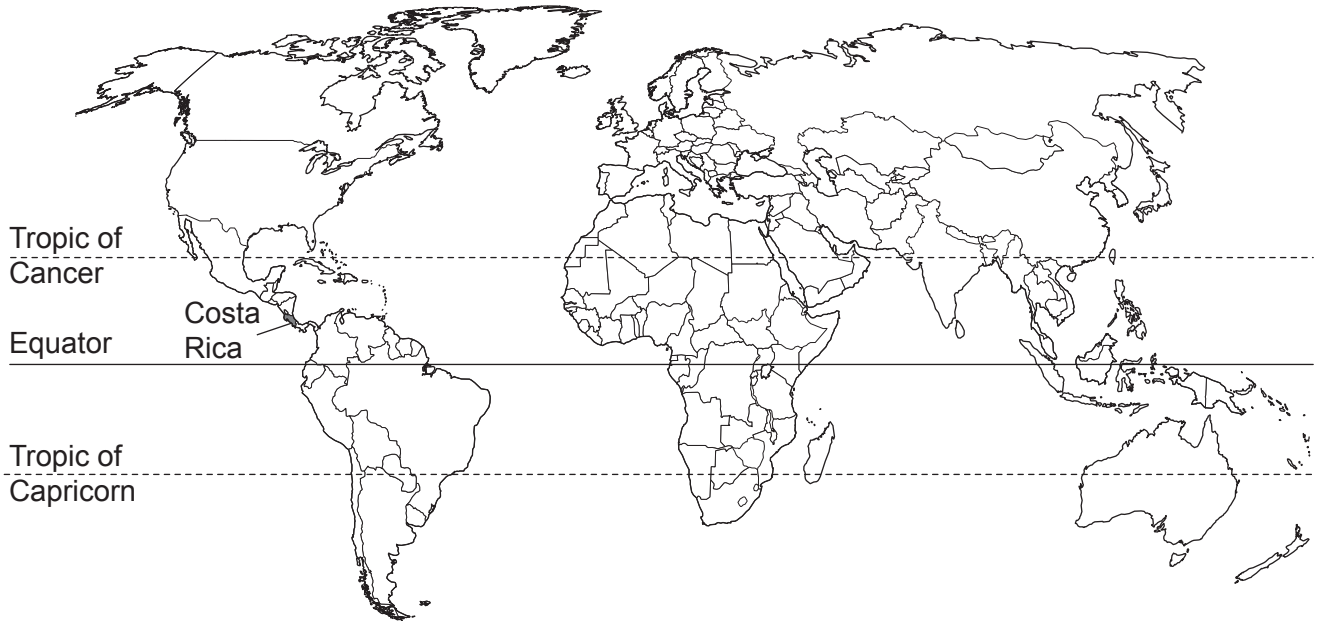
- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **24** pages. Any blank pages are indicated.

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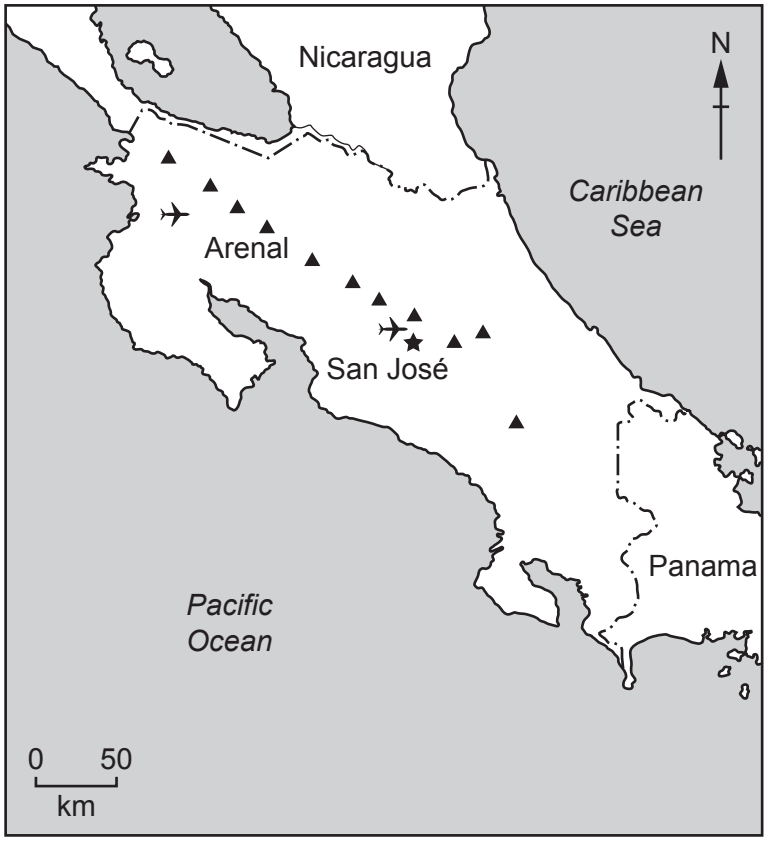
world map showing the location of Costa Rica



map of Costa Rica

Key

★ capital city
✈ airport
▲ volcano
–·–·– international boundary



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Area of Costa Rica: 51 100 km^2

Population of Costa Rica: 4.99 million (in 2019)

Children per woman: 1.89 (in 2019)

Life expectancy: 78.9 years

Currency: Costa Rican colón (610 CRC = 1 USD in 2019)

Language: Spanish and English

Climate of Costa Rica: tropical with a dry season and a wet season; cooler in the highlands

Terrain of Costa Rica: coastal lowlands separated by central mountains, including several active volcanoes, large areas of forest and rainforest

Main economic activities of Costa Rica: ecotourism and agricultural production including bananas, coffee, sugar and beef

Costa Rica's rich biodiversity attracts many ecotourists. The government has invested in education, healthcare, electricity, clean water and sanitation. Life expectancy has sharply increased over the last 60 years. However, 24 362 people do not have electricity and 21.7% of the population live in poverty. The population of the capital city, San José, is 339 581. In Costa Rica, 78% of the population lived in urban areas in 2019.

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[Turn over

1 **(a)** The graph shows the population of Costa Rica from 1950 to 2019.

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(i) Describe the trend shown in the graph.

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..... [2]

(ii) Suggest reasons for the changes in population shown in the graph.

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..... [2]

(iii) In Costa Rica, 78% of the population lived in urban areas in 2019.

Calculate the number of people in Costa Rica living in urban areas in 2019.

..... [1]

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(b) Some of Costa Rica's poorest people live in informal urban settlements. These are places where people have built homes illegally on land they do not own.

The photograph shows an informal urban settlement.



(i) Suggest reasons why infectious bacterial diseases can spread quickly in informal urban settlements.

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..... [2]

(ii) State the name of **one** infectious bacterial disease.

..... [1]

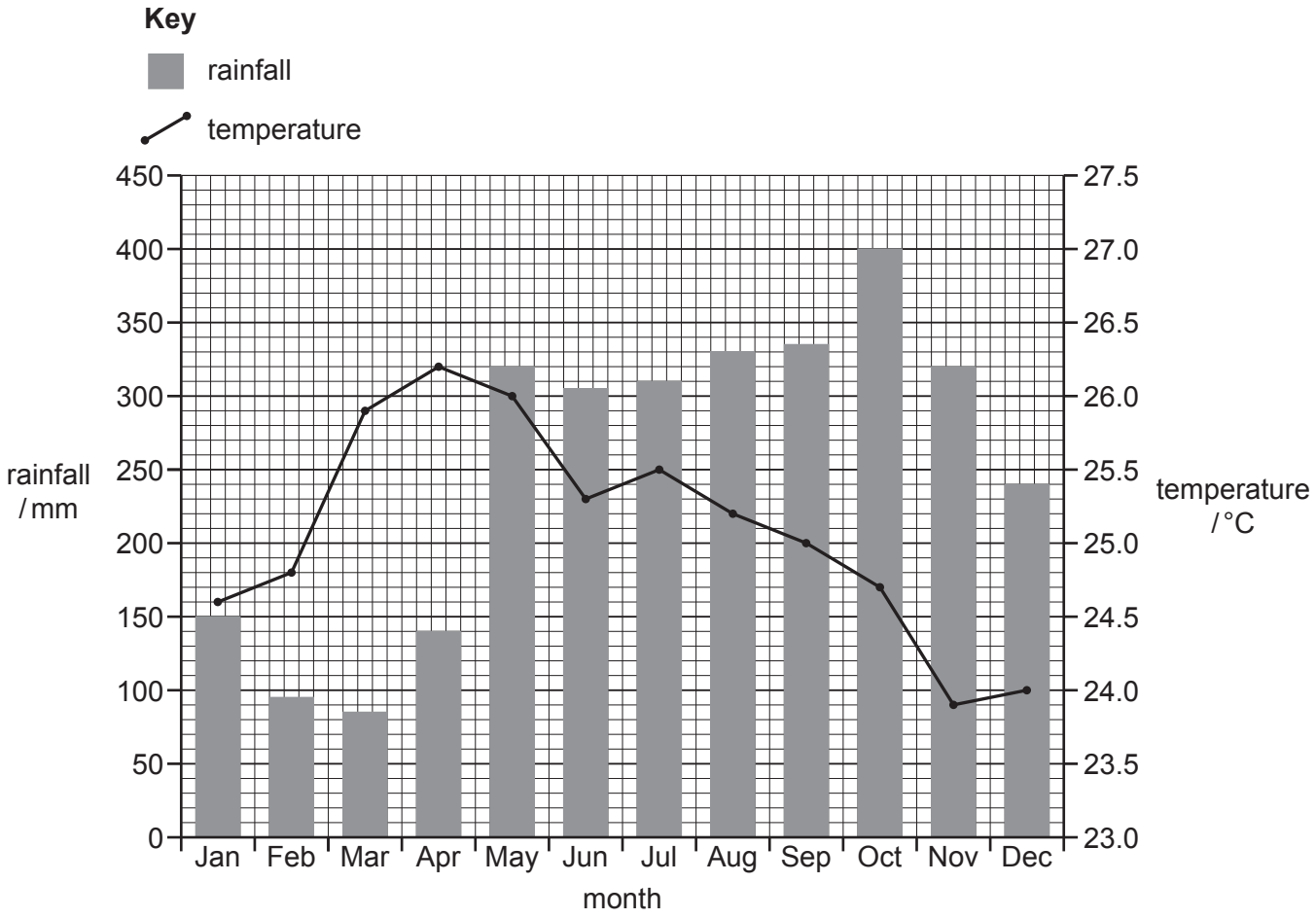
(iii) State **two** reasons why people migrate to urban areas from rural areas.

1 .....

2 .....

[2]

(c) The graph shows climate data from a weather station in Costa Rica for one year.



(i) Use the climate data to suggest which months are in the dry season in Costa Rica.

from ..... to ..... [1]

(ii) The annual temperature range is the difference between the maximum and minimum temperature values.

Calculate the annual temperature range at this weather station.

..... [2]

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(iii) The photograph shows part of a road in Costa Rica that crosses over a river.



Use the climate data to explain how this road is affected at different times of year.

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..... [3]

(iv) Use the climate data to explain why crops can be grown all year in Costa Rica.

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..... [3]

(d) The photograph shows deforested land in Costa Rica that is now used for grazing livestock.



(i) Describe the environmental impacts of deforestation.

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..... [3]

(ii) In 1940, 75% of Costa Rica's land was forested. Fifty years later, this had decreased to 29%.

Calculate the percentage decrease in forested land.

..... % [1]

(iii) Information relevant to land use in Costa Rica between 1900 and 2000 is shown.

- other countries gave farmers in Costa Rica bank loans to produce beef for export
- coffee became a popular drink worldwide
- bananas were exported
- demand for wood increased
- tourists started to visit Costa Rica

Use the information to explain the causes of deforestation in Costa Rica.

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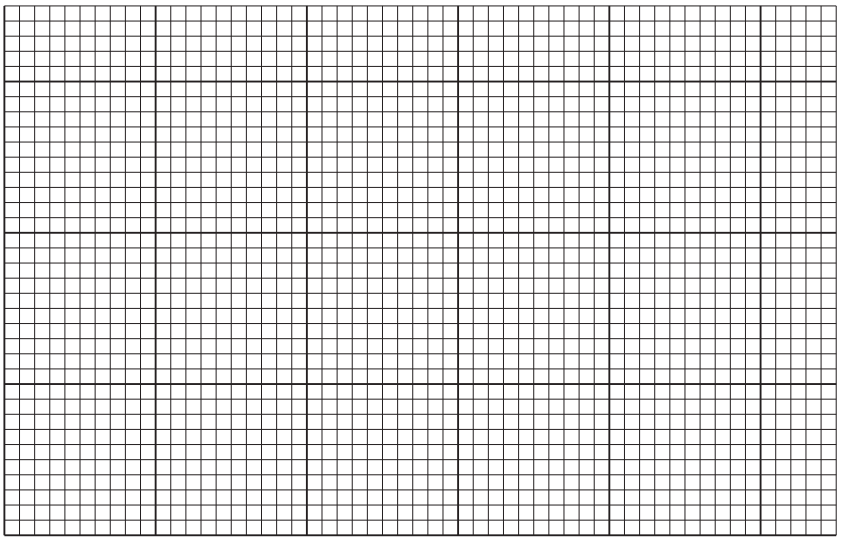
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..... [4]

(iv) The table shows data for the percentage rate of deforestation in Costa Rica between 1900 and 2000.

time period	percentage rate of deforestation
1900–1963	1.2
1964–1979	2.6
1980–1986	2.7
1987–1997	0.9
1998–2000	0.1

On the grid, plot a bar chart of the percentage rate of deforestation for the five time periods.



[4]

(v) Suggest a limitation of this data set.

.....

..... [1]

(vi) The government of Costa Rica introduced two strategies to stop deforestation:

strategy 1: Landowners were paid to manage forests sustainably.

strategy 2: Cutting down mature forests was banned.

Suggest how each of these strategies can stop deforestation.

strategy 1 .....

.....

strategy 2 .....

.....

[2]

(vii) State **two** other strategies to conserve forests.

1 .....

2 .....

[2]

(e) State **three** agricultural techniques for increasing crop yields.

1 .....

2 .....

3 .....

[3]

[Total: 39]

2 The fact sheet shows information on the Resplendent Quetzal bird.

The Resplendent Quetzal



Resplendent Quetzal birds live in the forests of Costa Rica. Many tourists visit the forests to see these colourful birds.

The population of the Resplendent Quetzal birds is decreasing. Deforestation and climate change are two possible causes of this population decrease.

Wild avocado trees are the main food source for these birds. They also eat small lizards.

Resplendent Quetzal birds build nests in old trees and breed between February and July. However, 78% of the eggs do not hatch.

The long-tailed weasel is the main predator of the chicks and eggs. Adult birds are hunted by hawks and owls.

(a) (i) Deforestation and climate change are two possible causes of the population decrease of the Resplendent Quetzal birds.

Suggest **two** other possible causes of the population decrease of the Resplendent Quetzal birds.

1 .....

2 .....
[2]

(ii) Explain ways that climate change could cause the population of the Resplendent Quetzal birds to decrease.

.....

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..... [3]

(iii) Use the fact sheet to write a food chain for the Resplendent Quetzal birds that includes a **producer**.

..... [2]

(b) A conservationist wants to estimate the population of Resplendent Quetzal birds in a forest using a transect method.

(i) Describe how the conservationist can use a transect method to record the number of Resplendent Quetzal birds.

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..... [4]

(ii) The conservationist estimates there are four Resplendent Quetzal birds per km^2.

Suggest how the conservationist can calculate the total number of Resplendent Quetzal birds in the forests of Costa Rica.

.....

..... [1]

(iii) Sound recordings from microphones placed in the forest can also be used to estimate the population of the Resplendent Quetzal birds.

A computer programme recognises the recorded song of the Resplendent Quetzal bird. It also calculates how close a bird is to a microphone.

Suggest **two** advantages of using this method compared to methods that rely on observing the Resplendent Quetzal birds.

1 .....

.....

2 .....

.....
[2]

(iv) The conservationist wants to investigate the food of the Resplendent Quetzal bird.

The conservationist considers two different methods:

method 1:

- photograph a Resplendent Quetzal bird taking food into a nest
- repeat for other Resplendent Quetzal birds

method 2:

- collect the droppings (waste material) produced by a Resplendent Quetzal bird
- analyse the contents of the droppings
- repeat for other Resplendent Quetzal birds.

Suggest **one** advantage and **one** disadvantage for each method.
You must suggest different advantages and disadvantages for each method.

method 1:
advantage .....

.....

disadvantage .....

.....

method 2:
advantage .....

.....

disadvantage .....

.....

[4]

[Total: 18]

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3 **(a)** Costa Rica plans to be carbon neutral in the future.

Carbon neutral means that carbon dioxide emissions are balanced by carbon dioxide removal.

(i) One strategy is to gradually stop using fossil fuels by charging factories and companies 10 USD for each tonne of carbon dioxide they emit.

Explain how this strategy can help Costa Rica become carbon neutral.

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..... [2]

(ii) Another strategy is *carbon capture and storage*.

Outline how carbon capture and storage can be used to reduce carbon dioxide emissions.

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..... [2]

(b) For 300 days in 2018, 100% of the electricity generated in Costa Rica came from renewable resources.

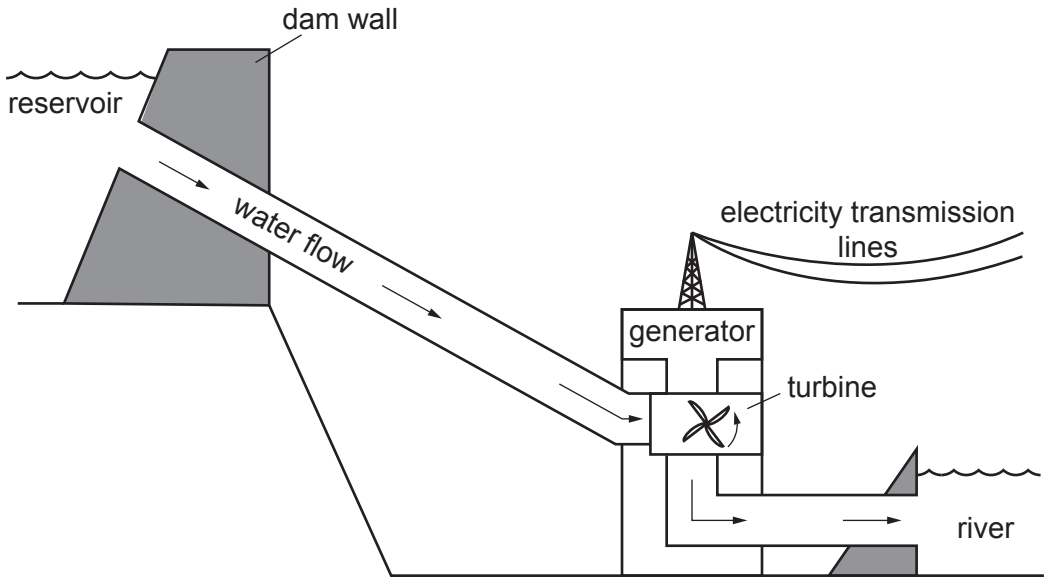
(i) Hydroelectric power is a renewable energy resource.

State **two** other renewable energy resources used for generating electricity.

1 .....

2 .....
[2]

(ii) The diagram shows the Reventazón dam, a hydroelectric power station in Costa Rica.



Use the diagram to describe how a hydroelectric power station generates electricity.

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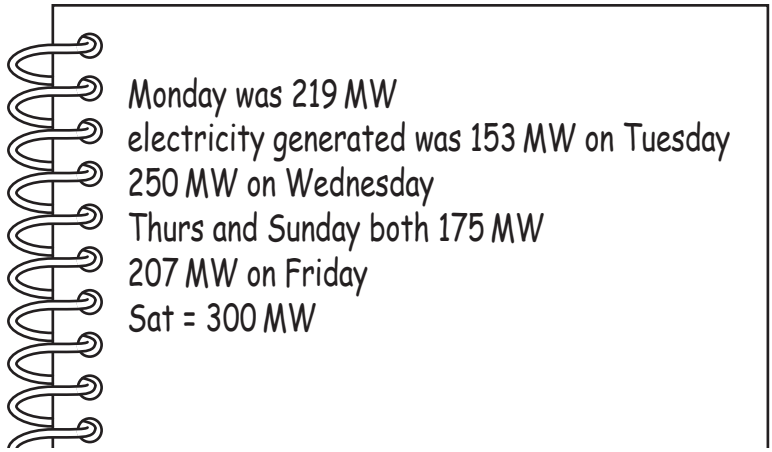
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..... [4]

(iii) An engineering student recorded in a notebook the electricity generated in megawatts (MW) from the Reventazón dam over a one-week period.



Present the data from the notebook in a suitable table.

[3]

(iv) The Reventazón dam provides electricity to 525 000 homes in Costa Rica.

Suggest other ways the Reventazón dam benefits the people of Costa Rica.

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..... [2]

(v) When the Reventazón dam was built, a large area of land was flooded to make the reservoir.

Some people were concerned that vegetation covered by water would decompose and release methane.

Explain why people are concerned about the release of methane into the atmosphere.

.....

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..... [2]

(c) The jaguar is the largest species of cat in Central and South America. Jaguar numbers are decreasing.

The map shows jaguar populations. These are areas where jaguars live.

The jaguars move between populations through areas called corridors.

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The corridors cover an area of 6 000 000 km^2 and link different jaguar populations from northern Mexico to Argentina.

(i) A scientist used a tracking device to record the movement of a jaguar over one year.

The jaguar moved from location **X** to location **Y**.

Calculate the distance between **X** and **Y**.

..... km [2]

(ii) The Reventazón dam was built in one of the jaguar corridors.

Explain why some people were concerned about the Reventazón dam having a negative impact on jaguar populations.

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..... [4]

[Total: 23]

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