Case Study on Volcano Mice

Background: A group of men and women scientists received a grant to study the evolution of mice in the desert of New Mexico for one year. Their task was to collect data on the populations of light and dark mice following a recent volcano eruption. The data they collected is provided below for the publishing magazine, *Scientific American.*

Month	Population of Light Mice	Population of Dark Mice
January	68	8
February	65	10
March	84	11
April	67	7
May	89	3
June	78	10
July	80	23
August	65	33
September	48	48
October	35	56
November	23	62
December	15	78

Calculations: Calculate the mean number of **light mice** over the 12 month period. Show correct set up and answer, including units.

Analysis Questions: Answer using complete sentences.

1. According to the data, predict when the lava eruption most likely happened. What is your evidence for this?

2. Determine the trend in the data of dark mice. Be sure to use the data in your answer and use words like increase/decrease/stable.

3. Predict what would happen to the dark mice in the future. Why do you think this will occur?

4. Why do you think the number of light mice changed over the year?

5. How might the changes in mice populations affect their predators, the coyote? Explain.

Case Study on East Coast Lionfish

Background: A group of men and women scientists received a grant to study the evolution of lionfish and cuttlefish on the United States East coast. Their task was to collect data on the population of cuttlefish once the lionfish was introduced into the population. The data they collected is provided below for the publishing magazine, *Scientific American.*

Year	Population of Cuttlefish	Population of Lionfish
1969	168	2
1970	193	8
1971	131	25
1972	148	35
1973	174	72
1974	156	150
1975	132	132
1976	122	189
1977	100	157
1978	98	192
1979	74	191
1980	98	200

Calculations: Calculate the mean number of **lionfish** over the 12 year period. Show correct set up and answer, including units.

Analysis Questions: Answer using complete sentences.

1. According to the data, predict when the lionfish was introduced into the East Coast. How could you tell (evidence)?

2. Do you think that the lionfish reached their carrying capacity? Explain.

3. Predict what would happen to the cuttlefish in the future. Why do you think this will occur?

4. Why do you think the number of cuttlefish changed over the year?

5. How might the changes in lionfish populations affect their predators, the white tipped reef shark? Explain.

Case Study on *Bordetella pertussis* Strains

Background: A group of scientists working for the National Institute of Health (NIH) recently developed a new antibiotic to fight against the growing epidemic of *Bordetella pertussis*, commonly known as Whooping Cough. Scientists introduced the antibiotic at some point between the years 2000-2010. The scientists quickly realized, however, that the antibiotic was not working. The data on Whooping Cough bacteria is provided below according to their published paper.

Year	Population of *Bordetella pertussis* Strain 1	Population of *Bordetella pertussis* Strain 2
2000	17,000,000	2,000
2001	19,000,000	4,000
2002	14,000,000	3,000
2003	18,000,000	2,000
2004	16,000,000	1,000
2005	4,000,000	500,000
2006	2,000,000	2,000,000
2007	100,100	5,000,000
2008	50,000	10,000,000
2009	25,000	20,000,000
2010	10,000	27,000,000

Calculations: Calculate the mean number of ***Bordetella pertussis* Strain 2** over the 11 year period. Show correct set up and answer, including units.

Analysis Questions: Answer using complete sentences.

1. According to the data, predict when the antibiotic was introduced to the public. What is your evidence for this?

2. Which strain of *Bordetella pertussis* is more dangerous? Use the data to support your answer.

3. Predict what would happen to *Bordetella pertussis* Strain 1 in the future. Why do you think this will occur?

4. Why do you think the number of *Bordetella pertussis* Strain 2 changed over the year?

5. In your own words, explain why the antibiotic was not working as effectively as the scientists had hoped.

Case Study on Taiga Plants

Background: A group of scientists were commissioned by the US government to study the seasonal disappearance of the Pereskia plant in the Canadian taiga. The scientists collected the following data about the Rhodocactus and Pereskia. The rainy season of the year in the Canadian taiga are April – September.

Month	Population of Pereskia Species 1	Population of Pereskia Species 2
January	30	10
February	32	8
March	78	12
April	50	24
May	30	30
June	15	70
July	5	80
August	7	75
September	9	72
October	11	30
November	25	28
December	30	10

Calculations: Calculate the mean number of **Pereskia Species 1** over the 12 month period. Show correct set up and answer, including units.

<u>Analysis Questions: Answer using complete sentences.</u>

1. According to the data, explain which months is the Pereskia more likely to survive and why. What is your evidence?

2. In your own words, explain how this data shows the evolution/change of Pereskia species in the Canadian Taiga.

3. How would the population of Pereskia plants change over time, if it rained all year long in the taiga?

4. Did Pereskia Species 1 reach a carrying capacity? If so, at what population size?

5. Predict what would happen to *Pereskia* Species 1 in the future. Why do you think this will occur?

Case Study on Green Swamp Moss

Background: A group of men and women scientists received a grant to study the evolution of swamp moss in the Florida Everglades. Their task was to collect data on the populations of different swamp mosses as more and more acidic solvents are dumped into the swamp by local mines. The data they collected is provided below for the publishing magazine, *Scientific American*.

Month	Population of Green Swamp Moss	Population of Red Swamp Moss
January	90	20
February	92	23
March	78	27
April	67	30
May	60	35
June	55	40
July	54	48
August	43	50
September	30	55
October	22	50
November	21	55
December	15	60

Calculations: Calculate the mean number of **Green Swamp Moss** over the 12 month period. Show correct set up and answer, including units.

Analysis Questions: Answer using complete sentences.

1. According to the data, predict and explain which species of moss is more resistant to changing acidity levels. What is your evidence?

2. In your own words, explain how this data demonstrates the evolution of swamp moss.

3. If the green and red swamp moss coexisted in an acidic environment, which species would survive? Why? Use the data to support your answer.

4. Did the red swamp moss reach a carrying capacity? If so, at what population size? How can you tell?

5. Predict what would happen to green swamp moss in the future. Why do you think this will occur?

Case Study on Palm Trees in Hawaiian Forest

Background: A group of men and women scientists received a grant to study the evolution of palm trees on a remote Hawaiian island. Their task was to collect data on the populations of long stem and short stem palm trees. The data they collected is provided below for the publishing magazine, *Scientific American.*

Year	Population of Long Stem Palms	Population of Short Stem Palms
2002	180,000	150,000
2003	200,000	140,000
2004	250,000	130,000
2005	300,000	135,000
2006	280,000	140,000
2007	270,000	145,000
2008	290,000	130,000
2009	300,000	125,000
2010	280,000	130,000
2011	320,000	140,000
2012	330,000	125,000
2013	300,000	127,000
2014	290,000	132,000

Calculations: Calculate the mean number of **Long Stem Palms** over the 13 year period. Show correct set up and answer, including units.

Analysis Questions: Answer using complete sentences.

1. According to the data, predict and explain which species of palm trees receives more sunlight. What is your evidence?

2. In your own words, explain what you would expect to happen to the population of short stem palm trees if less sunlight was available.

3. What is the carrying capacity for both the long stem and short stem palms? A range is an acceptable answer.

4. Predict what would happen to the short stem palms in the future. Why do you think this will occur?

5. Do you think that long stem and short stem palms can coexist forever? Explain using evidence.