Introduction to science: data analysis

Science

Exercise 1 - Data Interpretation

Table 1: Water quality vs. fish population										
Dissolved Oxygen	0	2	4	6	8	10	12	14	16	18
Number of Fish Observed	0	1	3	10	12	13	15	10	12	13

1. What patterns do you observe based on the information in Table 1? - The more dissolved oxygen in the water, the more fish are observed in that area of water.
2. Develop a hypothesis relating to the amount of dissolved oxygen measured in the water sample and the number of fish observed in the body of water. -If there is more dissolved oxygen in the water, there will be more fish present in the area the water sample is taking from.
3. What would your experimental approach be to test this hypothesis? -I would test the dissolved oxygen in different areas of water, keep track of the fish in those areas, and compare the results.
4. What are the independent and dependent variables? -Independent- Dissolved Oxygen -Dependent- Fish
5. What would be your control? -No Control
6. What type of graph would be appropriate for this data set? Why? -A line graph will be appropriate because it supports the hypothesis and provides clear results.
7. Graph the data from Table 1: Water Quality vs. Fish Population (found at the beginning of this exercise). You may use Excel, then “ Insert”

the graph, or use another drawing program. You may also draw it neatly by hand and scan your drawing. If you choose this option, you must insert the scanned jpg image here.

8. Interpret the data from the graph made in Question 7. -The graph above shows the fish population on the Y (axis) and the dissolved oxygen on the X (axis). The fish population increases in the above graph due to more dissolved oxygen that is found in the body of water. For example: There is 0 dissolved oxygen (ppm) in the water, so there are 0 fish observed.

Exercise 2 - Testable Observations

Determine which of the following observations (A-J) could lead to a testable hypothesis. For those that are testable: Write a hypothesis and null hypothesis What would be your experimental approach? What are the dependent and independent variables? What is your control? How will you collect your data? How will you present your data (charts, graphs, types)? How will you analyze your data?

1. When a plant is placed on a window sill, it grows three inches faster per day than when it is placed on a coffee table in the middle of the living room.
2. The teller at the bank with brown hair and brown eyes and is taller than the other tellers.
3. When Sally eats healthy foods and exercises regularly, her blood pressure is 10 points lower than when she does not exercise and eats unhealthy foods.

4. The Italian restaurant across the street closes at 9 pm but the one-two blocks away close at 10 pm.
5. For the past two days the clouds have come out at 3 pm and it has started raining at 3: 15 pm.
6. George did not sleep at all the night following the start of daylight savings.

Exercise 3 - Conversion

For each of the following, convert each value into the designated units.

1. 46, 756, 790 mg = 46, 756, 790 kg
2. 5. 6 hours = 20, 160 seconds
3. 13. 5 cm = 5. 31 inches
4. 47 °C = 116. 6 °F

Exercise 4 - Accuracy and Precision

1. During gym class, four students decided to see if they could beat the norm of 45 sit-ups in a minute. The first student did 64 sit-ups, the second did 69, the third did 65, and the fourth did 67. 2. The average score for the 5th-grade math test is 89. 5. The top 4th graders took the test and scored 89, 93, 91 and 87.
2. Yesterday the temperature was 89 °F, tomorrow it’s supposed to be 88°F and the next day it’s supposed to be 90°F, even though the average for September is only 75°F degrees!
3. Four friends decided to go out and play horseshoes. They took a picture of their results shown to the right:
4. A local grocery store was holding a contest to see who could most closely guess the number of pennies that they had inside a large jar.

The first six people guessed the numbers 735, 209, 390, 300, 1005, and 689. The grocery clerk said the jar actually contains 568 pennies.

Exercise 5 - Significant Digits and Scientific Notation

Part 1: Determine the number of significant digits in each number and write out the specific significant digits.

1. 405000 6 or 3
2. 0. 0098 2
3. 39. 999999 8
4. 13. 00 4
5. 80, 000, 089 8
6. 55, 430. 00 7
7. 0. 000033 2
8. 620. 03080 8

Part 2: Write the numbers below in scientific notation, incorporating what you know about significant digits.

1. 70, 000, 000, 000 7 x 1010
2. 0. 000000048 4. 8 x10-8
3. 67, 890, 000 6. 789 x107
4. 70, 500 7. 05 x 104
5. 450, 900, 800 4. 509008 x 108
6. 0. 009045 9. 0450 x 10-3
7. 0. 023 2. 3 x 10-2