**Scientific Method - Controls and Variables**

***Definition of Key Terms***

* ***Control*** - A part of the experiment that is not being tested and is used for comparison.
* ***Variable*** - Any part of an experiment that can change.
* ***Independent Variable*** - The part of the experiment that is changed by the scientists or person performing the experiment.
* ***Dependent Variable*** - The part of the experiment that is affected by the independent variable.

***Krusty Krabs Breath Mints***

Mr. Krabs created a secret ingredient for a breath mint that he thinks will “cure” the bad breath people get from eating crabby patties at the Krusty Krab. He asked 100 customers with a history of bad breath to try his new breath mint. He had fifty customers (Group A) eat a breath mint after they finished eating a crabby patty. The other fifty (Group B) also received a breath mint after they finished the sandwich; however, it was just a regular breath mint and did not have the secret ingredient. Both groups were told that they were getting the breath mint that would cure their bad breath. Two hours after eating the crabby patties, thirty customers in Group A and ten customers in Group B reported having better breath than they normally had after eating crabby patties.

**\_\_\_\_\_1. Which people are in the control group?**

 a. Group A b. Group B

**\_\_\_\_\_2. What is the variable?**

 a. The actual breath mint. c. The secret ingredient in the breath mint.

 b. The crabby patties. d. How many crabby patties eaten.

**\_\_\_\_\_\_3. What should Mr. Krabs’ conclusion be?**

 a. The breath mint with the secret ingredient does reduce breath odor.

 b. The breath mint with the secret ingredient reduces breath odor over 50% of

 the time.

 c. The breath works, but it is not 100% effective.

 d. All of the above.

***SpongeBob Clean Pants***

SpongeBob noticed that his favorite pants were not as clean as they used to be. His friend Sandy told him that he should try using Clean-O detergent, a new laundry soap she found at Sail-Mart.

SpongeBob made sure to wash one pair of pants in plain water and another pair in water with the Clean-O detergent. After washing both pairs of pants a total of three times, the pants washed in the Clean-O detergent did not appear to be any cleaner than the pants washed in plain water.

**\_\_\_\_\_\_4. What was the problem SpongeBob wanted to investigate?**

 a. Is Clean-O detergent effective?

b. Is the length of time the pants are washed important?

c. How does water temperature affect cleaning pants?

 d. Does how often I wash my pants affect how clean they are?

**\_\_\_\_\_\_5. What is the variable?**

 a. Water temperature. c. Laundry soap

 b. Length of wash time. d. Size of washing tub.

**\_\_\_\_\_\_6. What should Sponge Bob’s conclusion be?**

 a. Clean-O best cleans his pants.

 b. Plain water best cleans his pants.

 c. Cold water best cleans his pants.

 d. Clean-O is not effective cleaning his pants.

***Squidward’s Symphony***

Squidward loves playing his clarinet and believes it attracts more jellyfish than any other instrument he has played. In order to test his hypothesis, Squidward played a song on his clarinet for a total of 5 minutes and counted the number of jellyfish he saw in his front yard. He played the song a total of three times on his clarinet and repeated the experiment using a flute and a guitar. He also recorded the number of jellyfish he observed when he was not playing an instrument. The results are shown in the chart.

|  |
| --- |
| ***Number of Jellyfish/Instrument*** |
| ***Trial*** | ***No Music*** | ***Clarinet*** | ***Flute*** | ***Guitar*** |
| 1 | 5 | 15 | 5 | 12 |
| 2 | 3 | 10 | 8 | 18 |
| 3 | 2 | 12 | 9 | 7 |

**\_\_\_\_\_7. What is the variable?**

 a. Number of jellyfish. c. Length the music was played.

 b. Instrument. d. The song he played.

**\_\_\_\_\_8. What should Squidward’s conclusion be?**

 a. The clarinet and guitar attracted the same number of jellyfish.

 b. The flute attracted more fish than the control (no music).

 c. Music attracts more jellyfish than does no music.

 d. All of the above.

**Qualitative Observations vs. Quantitative Observations**

Determine which of the following statements are quantitative and which are qualitative.

|  |  |
| --- | --- |
| \_\_\_\_\_9. The cup had a mass of 454 grams.\_\_\_\_\_10. The temperature outside is 250o C.\_\_\_\_\_11. It is warm outside.\_\_\_\_\_12. The tree is 30 feet tall.\_\_\_\_\_13. The building has 25 stories.\_\_\_\_\_14. The building is taller than the tree.\_\_\_\_\_15. The sidewalk is long.\_\_\_\_\_16. The sidewalk is 100 meters long.\_\_\_\_\_17. The race was over quickly.\_\_\_\_\_18. The race was over in 10 minutes. | A. QualitativeB. Quantitative |