

Continuation of §13.4

Archimedes' Principle:

- a) A nonporous object that *sinks* displaces an amount of water that is equal to the **volume** of the submerged object
- b) A nonporous object that *floats* displaces an amount of water that is equal to the **weight** of the floating object. Scientific fact: 1 cm^3 of water weighs 1 gram.

3. An empty fish tank has a rectangular base of 60 cm by 25 cm and is 40 cm tall. When a statue of Jennifer Aniston is placed inside and 25,000 mL of water is poured in, the tank becomes 2/3 full. If the statue sinks to the bottom, use Archimedes's Principle to find the volume of the statue.

$$\text{Total Volume of fish tank: } (60 \text{ cm})(25 \text{ cm})(40 \text{ cm}) = 60,000 \text{ cm}^3 \\ = 60,000 \text{ mL.}$$

Known fact $1 \text{ cm}^3 = 1 \text{ mL}$

Have

$$\text{Statue} + 25,000 \text{ mL} = \frac{2}{3} (60,000 \text{ mL})$$

$$\begin{array}{r} \text{Statue} + 25,000 \text{ mL} = 40,000 \text{ mL} \\ - 25,000 \text{ mL} \quad - 25,000 \text{ mL} \\ \hline \text{Statue} = 15,000 \text{ mL} \end{array}$$

§15-1 Gathering Data and Using Sample.

Statistics is the Science of Collecting, organizing, and interpreting data in large quantities.

To perform Statistical Analysis the usual guideline is followed.

- ① Formulate Questions.
- ② Collect data.
- ③ Analyze data.
- ④ Interpret Results.

Data is Pieces of info. that is collected from experiments. Data can be numerical (ex. height, time, weight, ...) or Categorical (ex. Color, Shape, Yes or No, items, etc.).

There are two types of Statistical Studies.

- ① Observational Study: A study in which a researcher simply observes behavior in a systematic manner w/o influencing or interrupting the behavior.
- ② Experimental Study: A researcher measures a behavior before and after certain factors are deliberately introduced in order to see how the factor influence the behavior. Ex Vaccines and Placebos.

Population: The full set of people or things that a study is designed to observe.

Sample: Some members of the full Population.

Random Sample: A sample which every member of the Population has an equally likely chance of being chosen.

Example pg 679 #2.

Kaitlyn, a fifth-grader, asked five of her friends in class which book is their favorite. All of them said *Harry Potter and the Sorcerer's Stone*. Can Kaitlyn conclude that most of the children at her school would say *Harry Potter and the Sorcerer's Stone* is their favorite book? Why or why not?

No, Kaitlyn cannot conclude that "Harry Potter" is the school's favorite book, b/c her sample size is too small and she asked her friends which they might share common interest in the book which is bias.

Pg 680 #4.

An announcer of a TV program invited viewers to vote in an Internet poll, indicating whether or not they are better off economically this year than last year. Most of the people who participated in the poll indicated they are worse off this year than last year. Based on this information, can we conclude that most people are worse off this year than last year? If so, explain why. If not, explain why not.

Issues.

- People can lie.
- Different Sources.
- * NOT Every body has access to the internet.
- what do they mean by 'worse off'?
- Subject to each Person's Opinion.

Made
up

Describe how each of the following methods of obtaining a random sample can be flawed or can introduce bias into the survey: a) Target population: New Yorkers. You run ads on Facebook inviting members to register their opinion online. b) Target population: those who like to fish and camp out. You conduct a survey through *Outdoor Life* magazine. c) Target population: Staten Islanders. You conduct a lunchtime survey of people at the mall.

(a) New Yorkers.

run ads on Facebook inviting members to register their opinion online.

Issue: NOT EVERYBODY HAS F.B.

(b) Fishers and Campers.

A Survey w/ *Outdoor Life* Magazine.

Issue: Bias b/c not random samples taken.

(c) Staten Islanders.

Lunchtime Survey of people at the mall.

- People don't go to the mall.

- Bias at food court w/ people's favorite meal.

Pg 679 #3

A large bin is filled with 200 table-tennis balls. Some of the balls are white and some are orange. Tyler reaches into the bin and randomly pulls out 10 table-tennis balls. Three of the balls are orange and 7 are white. Based on Tyler's sample, what is the best estimate we can give for the number of orange table-tennis balls in the bin? Explain your reasoning.

Pick: 10 balls.

3 orange

7 white.

What is the Estimated # of orange balls in total?

$$\frac{3 \text{ orange}}{10 \text{ total}} = \frac{X \text{ orange}}{200 \text{ total}} \rightarrow$$

$$\frac{3}{10} \rightarrow \frac{X}{200}$$

* Cross multiply.

$$\frac{600}{10} = \frac{10X}{10}$$

$$X = \textcircled{60} \text{ orange balls.} \quad \left| \begin{array}{r} \text{White balls.} \\ 200 - 60 \\ \hline \textcircled{140} \end{array} \right.$$

Pg 679 #4

There is a large bin filled with table-tennis balls, but we don't know how many. There are 40 orange table-tennis balls in the bin; the rest are white. Amalia reaches into the bin and randomly picks out 20 table-tennis balls. Of the 20 she picked, 6 are orange. Based on Amalia's sample, what is the best estimate we can give for the number of table-tennis balls in the bin? Explain your reasoning.

Know: 40 orange.

Picked: 20 balls.
6 orange 14 white.

$$\frac{6 \text{ orange}}{20 \text{ total}} = \frac{40 \text{ orange}}{X \text{ total}}$$

$$\frac{6}{20} \times \frac{40}{X} \quad * \text{ cross multiply.}$$

$$\frac{6X}{6} = \frac{800}{6}$$

$$X = 133 \text{ balls. about.}$$