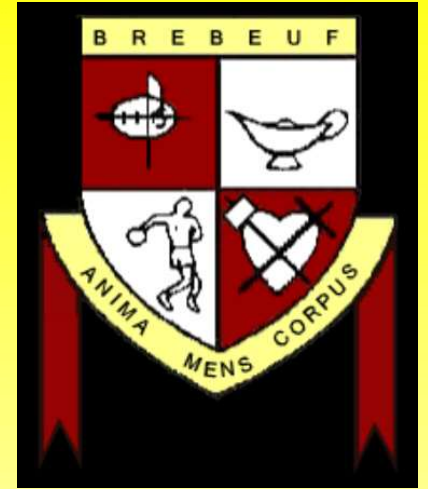
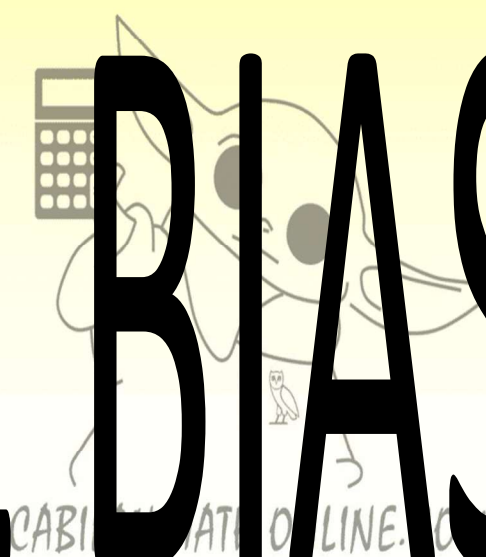


**ST. JEAN DE BREBEUF
MATHEMATICS**



CHAPTER 4.4

STATISTICAL BIAS



CHAPTER 4.4

STATISTICAL BIAS

KEY CONCEPTS

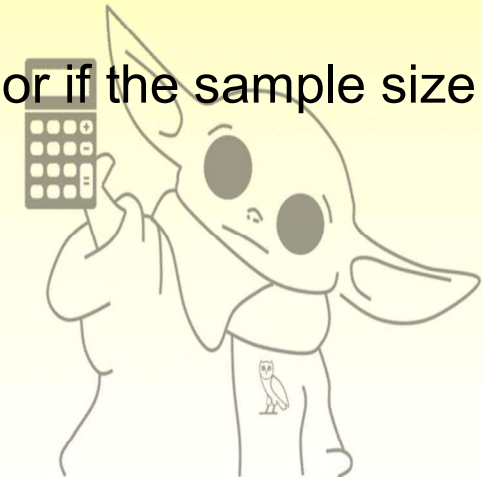
A **statistical bias** is when a *systemic* error contributes to the statistics for a sample being different from those of the population

→ *external* factors affect the accuracy of statistics

→ errors cannot be corrected even after repeating an experiment many times

Sampling bias occurs when the sample does not accurately reflect the general population

→ usually occurs when there is *non*-random sampling or if the sample size is *too small*



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CHAPTER 4.4

STATISTICAL BIAS

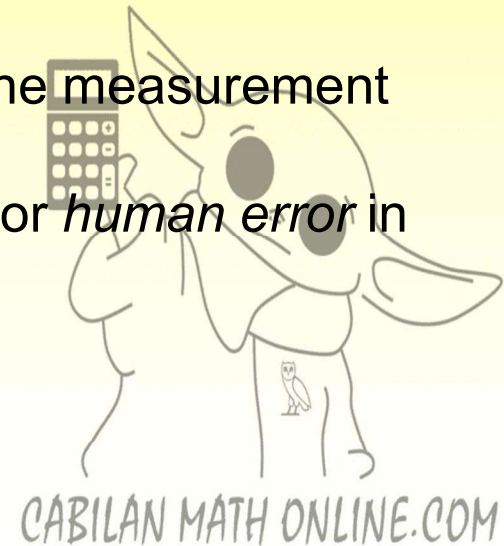
KEY CONCEPTS

Non-response bias occurs when certain groups in the population are *under-represented* due to *low* rates of participation (ie. rural or countryside populations may be under-represented and results may be more representative of populations from the city)

- also occurs if there is a *low overall* response rate (less than 80%)
- *Mail-in surveys* tend to have a high level of non-response compared to telephone surveys

Measurement bias occurs when there are errors in the measurement technique

- usually occurs when there is *misuse of equipment* or *human error* in reading and recording measurements



CHAPTER 4.4

STATISTICAL BIAS

KEY CONCEPTS

Response bias occurs when respondents *purposely* give inaccurate or false answers

→ can occur when respondents *lie* to avoid embarrassment or if they want to influence the results

→ can also occur when there are leading questions (wording in the question elicits a desired response)



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CHAPTER 4.4

STATISTICAL BIAS

KEY CONCEPTS

Sampling bias occurs when the sample does not accurately reflect the general population

→ usually occurs when there is *non-random* sampling or if the sample size is *too small*

EXAMPLE 1 *Sampling Bias*

Identify the **sampling bias** in each situation

(a) To determine how people feel about a new product, 20 people were interviewed through a random selection of telephone numbers.

Small sample size

→ *Not reflective of the entire population*

(b) A pollster in an *upscale* shopping mall randomly selected people to fill out a survey on shopping preferences

Only shoppers of an upscale mall were surveyed

→ ***Better to survey all types of malls***

CHAPTER 4.4

STATISTICAL BIAS

KEY CONCEPTS

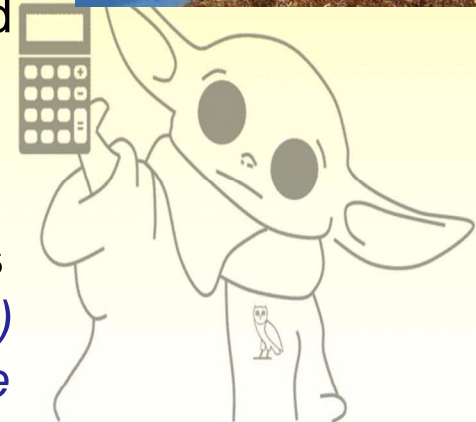
Non-response bias occurs when certain groups in the population are *under-represented* due to *low rates* of participation

EXAMPLE 2 *Non-Response Bias*

A neighbourhood survey about children's playground equipment in a local park was sent to randomly selected households. Approximately **30%** of the people responded and, in particular, people in condominiums tended not to respond.

Explain how this situation represents **non-response bias**

- *Very low response rate (30% of neighbourhood)*
- *probably not an important issue for most people in the neighbourhood*



CHAPTER 4.4

STATISTICAL BIAS

KEY CONCEPTS

Measurement bias occurs when there are errors in the measurement technique

→ usually occurs when there is *misuse of equipment* or *human error* in reading and recording measurements



EXAMPLE 3 Measurement Bias

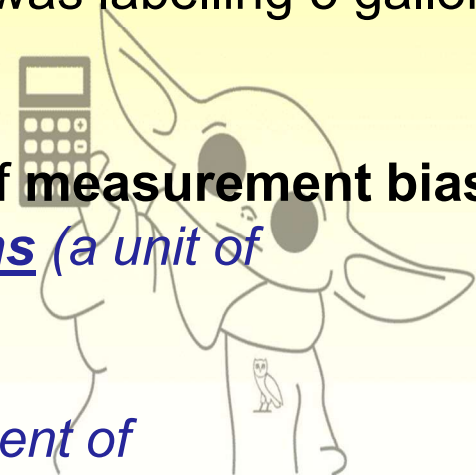
A high school chemistry student was labelling 5 gallon containers as **5 g**.

Explain why this is an example of **measurement bias**.

*“5 g” indicated **five grams** (a unit of mass/weight)*

*“Gallons” is a measurement of **volume/capacity***

*→ Should be labelled as **“5 gal”***



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CHAPTER 4.4

STATISTICAL BIAS

KEY CONCEPTS

Response bias occurs when respondents *purposely* give inaccurate or false answers

EXAMPLE 4 *Response Bias*

Explain the possible **response bias** in each situation. Suggest how to *eliminate* bias.

	POSSIBLE RESPONSE BIAS	WAYS TO ELIMINATE BIAS
A class of Grade 9 boys was asked by their gym teacher to put up their hands if they have had a date with a girl	Very personal question that most student feel <i>uncomfortable</i> answering in public	Ask students to write down answers and submit it <i>anonymously</i>
A survey question asks, "That shiny and new red sports car is beautiful, isn't it?"	Leading question → " shiny " and " new " are words which illicit a desired response	Re-phrase the question to " What do you think of the (sports) car? "

CHAPTER 4.4 STATISTICAL BIAS

HOMework / SEATWORK

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