Section 9.3
Using Samples & Populations to Collect Dat

To estimate the number of salmon in a river, biologist use a strategy called mark and recapture. At one place in the river, biologist capture some fish. Each fish is marked with a tag, then released into the river. At a different place in the river, biologist recapture fish. The track the numbers of marked and unmarked fish caught. They can then estimate the salmon population.

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7. **a)** On a warm August evening, the fans may not immediately see the point of building an indoor stadium, so many may respond negatively.

b) On a very cold November evening, Trinity may receive many more responses in favour of an indoor stadium.

9. **a)** No

b) Rebecca should have asked if her friends had any problems with their service provider, what service providers they had in the past, and whether they are satisfied with their current service providers.

10. **a)** Ethics: The survey designers didn't tell Sasha that promotional emails might be sent to the email address he provided. This reflects poorly on the brands advertised on the website.

b) Tell people their email addresses may be used for future correspondence and allow people then to indicate whether they wish to receive such emails.

8. **a)** **i)** The use of the words "violent criminal"; bias toward using DNA tests

ii) The use of the words "gas guzzling"; negative description of SUVs

iii) The question emphasizes the positive aspect of spell checks.

b) **i)** Do you think that DNA evidence should be allowed in courts?

ii) Are you in favour of banning SUVs?

iii) Do you think students should be allowed to use spell check?

13. **a)** Privacy: People may not want to admit how much or how little they spend on clothes. Timing: Depending on the month in which Bridget interviews people, there may be clothing sales because a new season begins or for a holiday season shopping. Ethics: People may want to know *why* Bridget is asking them.

b) Privacy: Bridget could ask people to write a number on a slip of paper and leave it on her desk later. Timing: Bridget could ask at different months in the year. Ethics: Bridget could tell people why she is doing this survey.

These moose were fitted with a GPS Radio Collar in Northern Ontario. The GPS collars give accurate locational data, and can be programmed to collect data over 24 hours throughout the year. The collars store data and the data can be downloaded onto a laptop computer via a modem connection. This particular study was undertaken to learn the effects of different types of logging on moose condition, home range and habitat use.

Do you think they put collars on all moose?

When Collecting Data...

✔ **Population** - *is the group about which you are getting information*

✔ **Census** - *is conducted when data are collected from each member of the population*

Ex) Suppose you test brake systems in cars that are made in a factory for defects, then ALL the cars made in that particular factory are the population. If you test each car's brakes , then you conducted a census.

✔ Can we think of problems associated with Census?

✔ - cost
- time consuming
-difficult to complete

When do we conduct a census?

-when an issue is important or population is small

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Census - Everything
or
Everyone

- **Sample** - *Is when small portion of the population is used to collect data*
  - ✔ One draws conclusions about the population based on data collected from a sample

Testing a sample of water from a well

✔When the sample chosen is REPRESENTATIVE of the population, the data collection provides **VALID CONCLUSIONS**

Ex) Testing the breaks on 20 out of 100 car's made each day for defected breaks is a sample. If those car's tested represent the typical quality of the car's breaks made in the factory, the conclusion of the data collection will be valid.

Sampling (i.e. selecting a sub-set of a whole population) is often done for reasons of ***cost*** (it's less expensive to sample 1,000 television viewers than 100 million TV viewers) and ***practicality*** (e.g. performing a crash test on every automobile produced is impractical).

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Sample - a portion of the population

Topic:
Favorite TV show of grade 9 MVHS students

Population? Who do you want to ask?

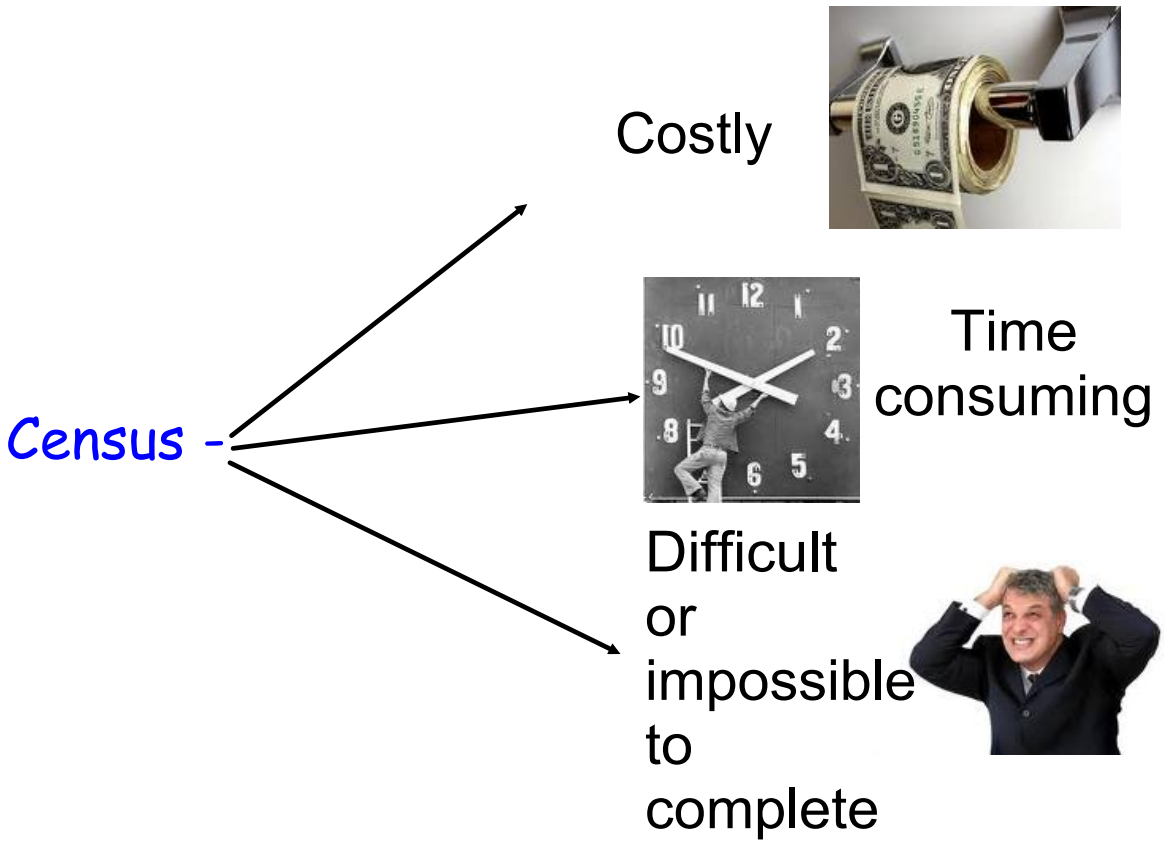
Census:

Sample:

Examples of Population and Sample

SITUATION	POPULATION	SAMPLE
Election poll	electorate	Polster's sample
Cooking	Soup kettle	tablespoon of soup
Medical study	People of N. America	Some subjects
Cost of living index	The citizenry	A logs kept be some families
Is my well water safe?	Water in well	Vial to lab
Crop comparisons	All farmland in N.B.	A few plots
Random number generator	The complete sequence	Some subsequences
Factory inventory	Partly worked material	A random sample
Measurement error	Possible measurements	Those that were made
Unemployment figures	The labor force	Stratified sample
Sex Ratio of births	The world's births	Some hospital records

Image: UNB Math Site KNIGHT



A sample represents the population.

Sample -

There is an advertisement...
(making hot sauce.. advance to 3:58)

Example 1) **

Explaining Why Data Are Collected from Populations

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In each case explain why populations is surveyed instead of a sample

a) To determine the average number of siblings of his classmates, Carlos surveyed each person in the class.

Solution:

- Surveying the entire population produces EXACT results (Not estimates)

- Would not take long

- Does not cost him anything

"A baby brother? — I'm not ready to make a *commitment* like that!"

b) Every 5 years, Statistics Canada conducts a census. One question in the survey is used to determine the ages of the people in each household

Solution:

A census was completed because of the importance of the question. The government requires data about the ages of Canadians so that it can budget for services such as day-care centres, schools, and senior citizens' homes.

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Example 2)

Reasoning Why & When Samples Should Be Used

The student council is planning a school dance. To attract more grade 9 students to the dance, the council decided to collect data about the preferred music of the grade 9 students. The council members set up in the hallway to collect data. By the end of the day it had surveyed 73% of the grade 9 students.

a) Why do you think the data were collected from a sample instead of the entire population?

Solution

- There was probably not enough time available to ask all grade 9 students
- It would take a lot of time and effort to find all grade 9, especially with absences.

b) Will the opinions of the sample reflect those of the population? Explain

Solution

Since the majority of students, 73%, were asked, it is likely that their opinions will reflect those of the entire population.

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Example 3)

Identifying & Critiquing the Use of Samples

Identify if the data was collected from a sample or a population. Explain if you think the conclusion would be valid.

a) A province considers banning cell phones in all of its schools. To determine the opinions of students on this issue, you poll each student in your school.

Sample: The population is all students of all schools in the province. By asking only the students in your school, your results are based on a sample. If the students in your school do not represent typical students in the province, the conclusion will NOT be valid. For example, if all students in your school own cell phones, your conclusion would probably be not to ban cell phones. However, not every student in the province owns a cell phone. So, your results would not be representative of the population.

b) To determine which politician is expected to win the municipal election, every person over 18 and who is eligible to vote in the election is polled.

Population: All possible voters are polled

c) To determine the average lifetime of a type of light bulb, 150 light bulbs were selected randomly from production line and tested.

Sample: Since not all bulbs were tested, the results are based on a sample

-It would not make sense for the whole population to be tested, since all bulbs would be destroyed in the process. There would be no light bulbs left to sell.

- Since a large number of bulbs were tested, the results will likely give a good estimate of the lifetime of a light bulb. So the conclusion about the lifetime of a light bulb is likely valid.

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Homework

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Methods of Collecting Data…

There are many methods used to collect or obtain data for statistical analysis. Three of the most popular methods are:

- Direct Observation
- Experiments, and
- Surveys.