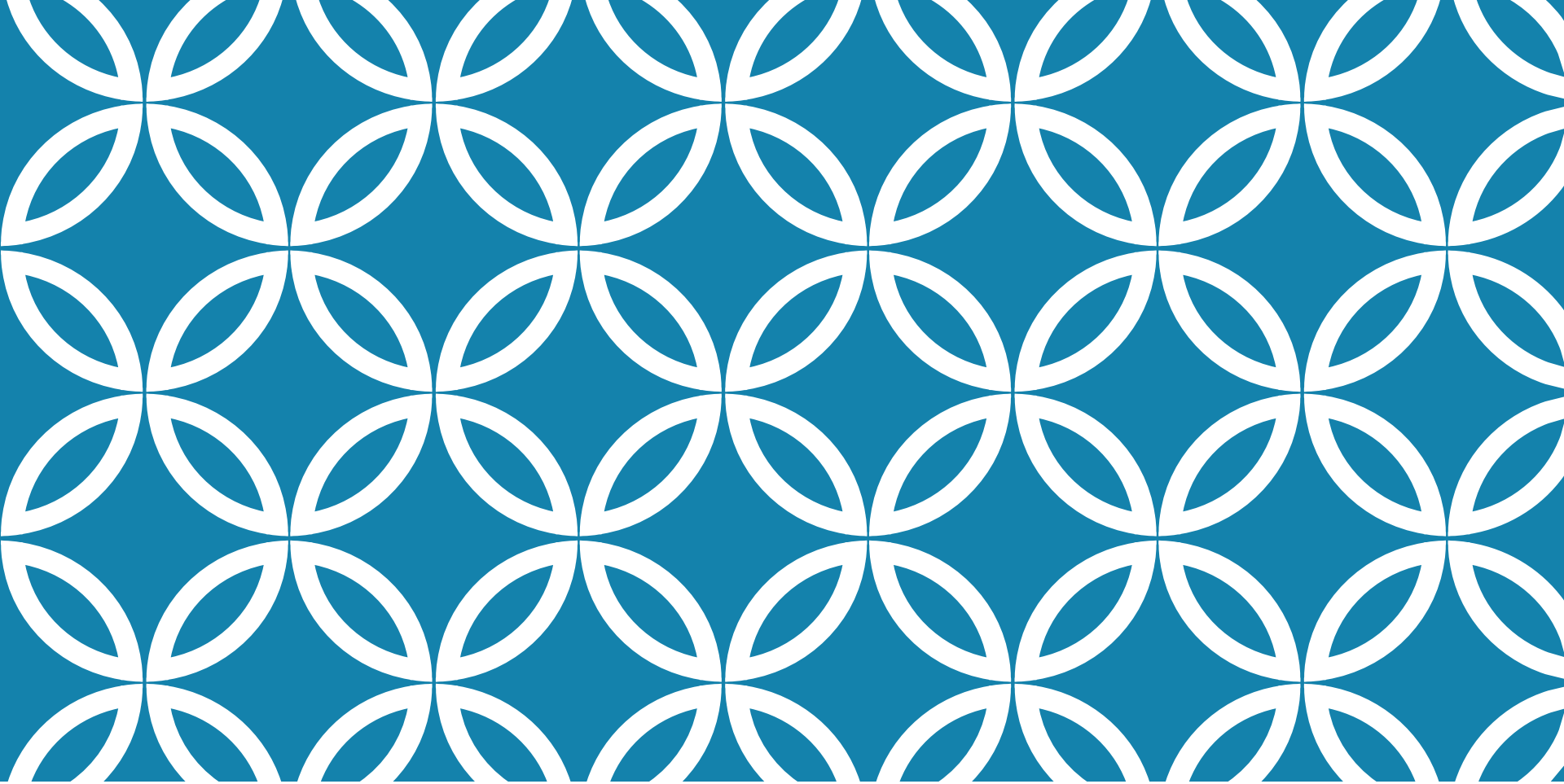


INTRODUCTION TO STATISTICS

Chapter 1

WHY STUDY STATISTICS

Data are collected everywhere and require statistical knowledge to make the information useful

Statistical techniques are used to make professional and personal decisions

A knowledge of statistics is needed to understand the world and be conversant in your career

In summary, statistics will help you make more effective personal and professional decisions

WHAT IS MEANT BY STATISTICS

What is statistics?

It's more than presenting numerical facts

STATISTICS The science of collecting, organizing, presenting, analyzing, and interpreting data to assist in making more effective decisions.

Example: The inflation rate for the calendar year was 0.7%. By applying statistics we could compare this year's inflation rate to past observations of inflation. Is it higher, lower, or about the same. Is there a trend of increasing or decreasing inflation?

TYPES OF STATISTICS

There are two types of statistics, descriptive and inferential

Descriptive statistics can be used to organize data into a meaningful form You can summarize data and provide information that is easy to understand

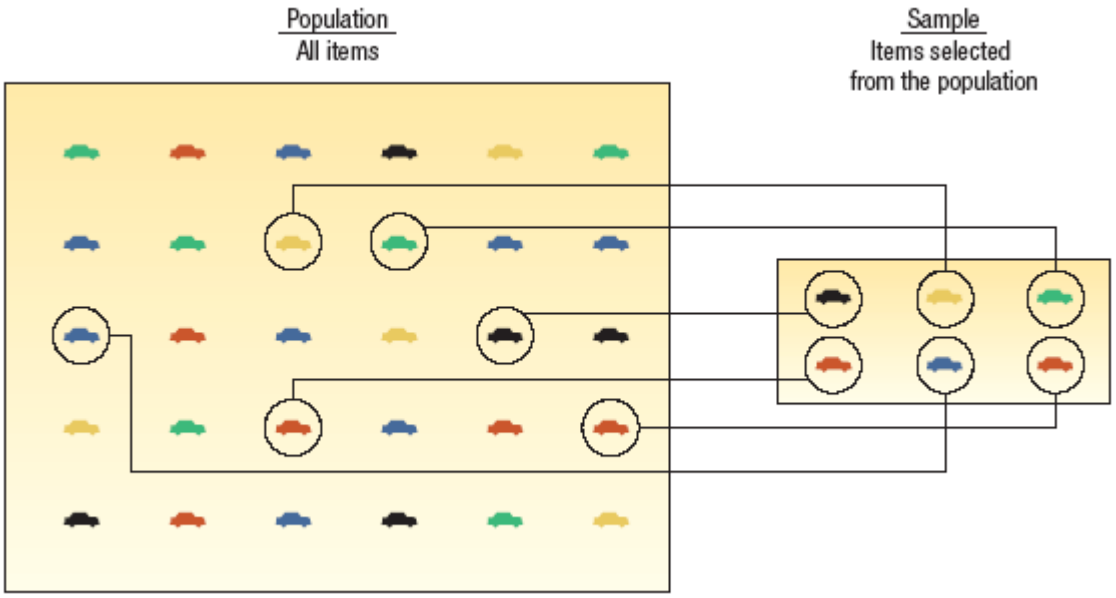
DESCRIPTIVE STATISTICS Methods of organizing, summarizing, and presenting data in an informative way.

Example: preparation of tables, charts,graphs,averages,etc.

TYPES OF STATISTICS

POPULATION The entire set of individuals or objects of interest or the measurements obtained from all individuals or objects of interest.

SAMPLE A portion or part of the population of interest.



TYPES OF STATISTICS

Inferential statistics can be used to estimate properties of a population

You can make decisions based on a limited set of data

INFERENTIAL STATISTICS The methods used to estimate a property of a population on the basis of a sample.

Example: Scientists test a new medicine on 200 patients. They use inferential data to decide if the drug will safely help all people with that disease.

TYPES OF VARIABLES

There are two basic types of variables

QUALITATIVE VARIABLE : An object or individual is observed and recorded as a non-numeric characteristic.

Examples: gender, state of birth, eye color

QUANTITATIVE VARIABLE : A variable that is reported numerically.

Examples: balance in your checking account, the life of a car battery, the number of people employed by a company

TYPES OF VARIABLES

Quantitative variables can be discrete or continuous

Discrete variables are typically the result of counting

- Values have “gaps” between the values
- Examples: the number of bedrooms in a house, the number of students in a statistics course

Continuous variables are usually the result of measuring something Can assume any value within a specific range

- Examples: weight, heights, temperatures, and time.

TYPES OF VARIABLES SUMMARY

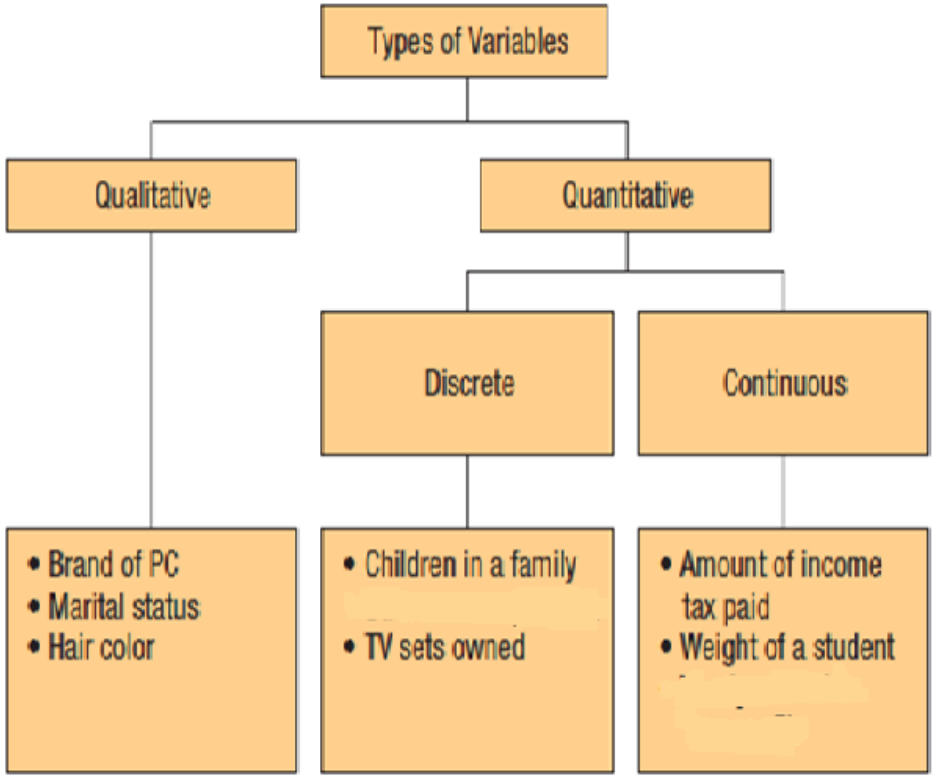


CHART 1–2 Summary of the Types of Variables

ETHICS AND STATISTICS

Practice statistics with integrity and honesty when collecting, organizing, summarizing, analyzing, and interpreting numerical information

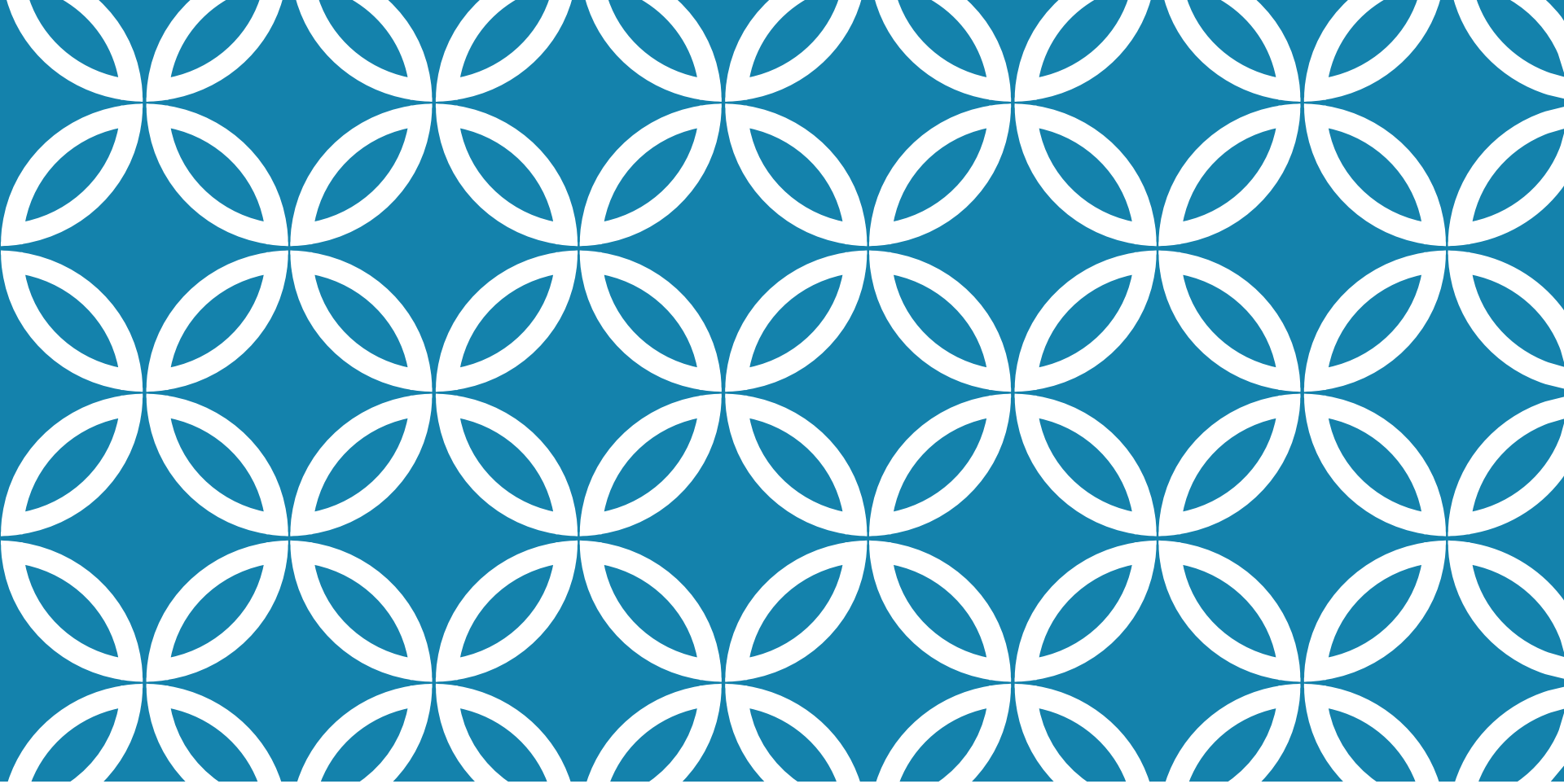
Maintain an independent and principled point of view when analyzing and reporting finding and results

Question reports that are based on data that

- do not fairly represent the population
- does not include all relevant statistics

ترجمة

ممارسة الإحصاء بنزاهة وأمانة عند جمع المعلومات الرقمية، وتنظيمها، وتلخيصها، وتحليلها، وتفسيرها. الحفاظ على وجهة نظر مستقلة ومبدئية عند تحليل النتائج والتقرير عنها. التشكيك في التقارير المبنية على بيانات لا تمثل المجتمع الإحصائي تمثيلاً عادلاً، أو لا تتضمن جميع الإحصاءات ذات الصلة.



A SURVEY OF PROBABILITY CONCEPTS

Chapter 2

PROBABILITY

PROBABILITY A value between 0 and 1 inclusive that represents the likelihood a particular event happens.

- 0 (or 0%): The event is impossible and will not happen.
- Near 0 : The event is highly unlikely to occur.
- 0.5 (or 50%): The event has an equal chance of happening or not happening (like a fair coin toss).
- Near 1: The event is highly likely or almost certain to occur.1 (or 100%): The event is certain to happen.

PROBABILITY

EXPERIMENT A process that leads to the occurrence of one and only one of several possible results.

OUTCOME A particular result of an experiment.

EVENT A collection of one or more outcomes of an experiment.

THE SAMPLE ESPACE: The set of all possible outcomes of a probability experiment

Example: consider the experiment of rolling a six-sided die and getting at least 4. Determine the number of outcomes ?

Solution: Event x has three outcomes: rolling a 4, 5, or 6.

$$x = \{4,5,6\}$$

EMPIRICAL PROBABILITY

The empirical definition occurs when the number of times an event happens is divided by the number of outcomes

EMPIRICAL PROBABILITY The probability of an event happening is the fraction of the time similar events happened in the past.

LAW OF LARGE NUMBERS Over a large number of trials, the empirical probability of an event will approach its true probability.

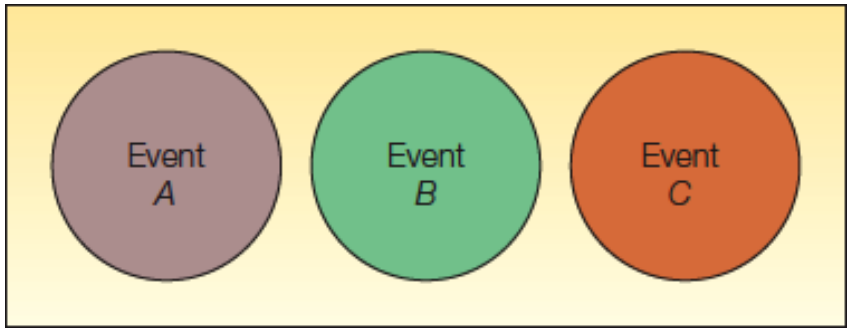
Example: You flip a coin 50 times. It lands on heads 48 times. What is the empirical probability of getting heads ?
Number of times heads occurred =48
Totale number of trials = 50
P(heads)= 48/50 = 0,96 =96%

RULES OF ADDITION

The rules of addition refer to the probability that any two or more events can occur

The special rule of addition is used when the events are mutually exclusive

SPECIAL RULE OF ADDITION $P(A \text{ or } B) = P(A) + P(B)$



COMPLEMENT RULE

The complement rule is used to determine the probability of an event happening by subtracting the probability of an event not happening

COMPLEMENT RULE $P(A) = 1 - P(\sim A)$

Exemple: If the weather report says there is an **80% (0.80) chance of rain today,** what is the chance that it does **not** rain?

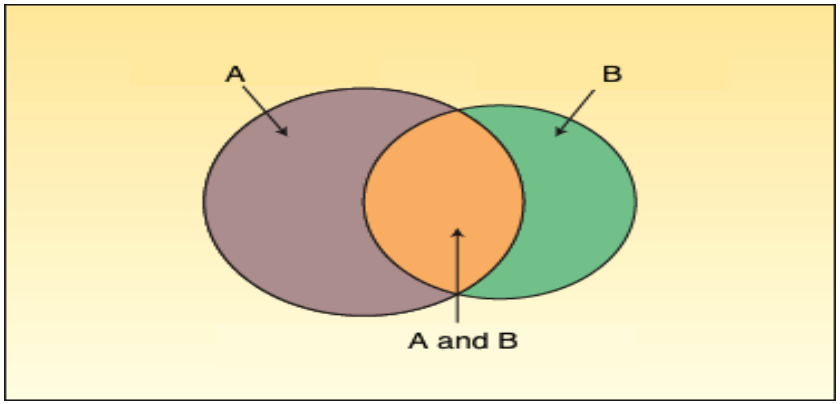
P(not raining)= 1-p(A) = 1-0,8 = 0,2 = 20%

GENERAL RULE OF ADDITION

GENERAL RULE OF ADDITION $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

The general rule of addition is used when the events are not mutually exclusive

JOINT PROBABILITY A probability that measures the likelihood two or more events will happen concurrently.



THE PERMUTATION FORMULA

PERMUTATION Any arrangement of r objects selected from a single group of n possible objects.

Another counting formula used to determine a total number of outcomes

PERMUTATION FORMULA

$$ {}_nP_r = \frac{n!}{(n-r)!} $$

where:

n is the total number of objects.
r is the number of objects selected.

There are three electronic parts to be assembled, so n=3. Because all three are to be inserted into the plug-in component, r=3.

$$ {}_3P_3 = \frac{3!}{(3-3)!} = \frac{3!}{0!} = \frac{3!}{1} = 6 $$

Label the parts A, B, and C ABC BAC CAB ACB BCA CBA

THE COMBINATION FORMULA

Another counting formula useful in determining the total number of outcomes

A combination is an arrangement where the order of the objects selected is not important

COMBINATION FORMULA

$$ {}_nC_r = \frac{n!}{r!(n-r)!} $$

where:

n is the total number of objects.

r is the number of objects selected.

The Grand 16 movie theater uses teams of three employees to work the concession stand each evening. There are seven employees available to work. How many different teams can be scheduled?

$$ {}_7C_3 = \frac{n!}{r!(n-r)!} = \frac{7!}{3!(7-3)!} = \frac{7!}{3!4!} = 35 $$