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# Statistics for Data Science-I

## Week 1: Statistics Graded Assignment Practice

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# Week 1: Statistics Graded Assignment Practice

- Keep a notebook and pen ready for solving problems
- How to join?
  - Audio/screenshare on webex - click on link sent to you
    - Doubts? Use webex chat. Do not answer questions on webex chat.
  - Join on pear deck - joinpd.com (enter code seen on top right)
    - Answer questions only here
- For every question - 5 to 15 minutes allotted
  - Question will be shown in a slide for solving
  - If you are done solving, enter your answer at joinpd.com
  - Presenter will provide a solution
  - Questions and discussion

# Example Screenshots

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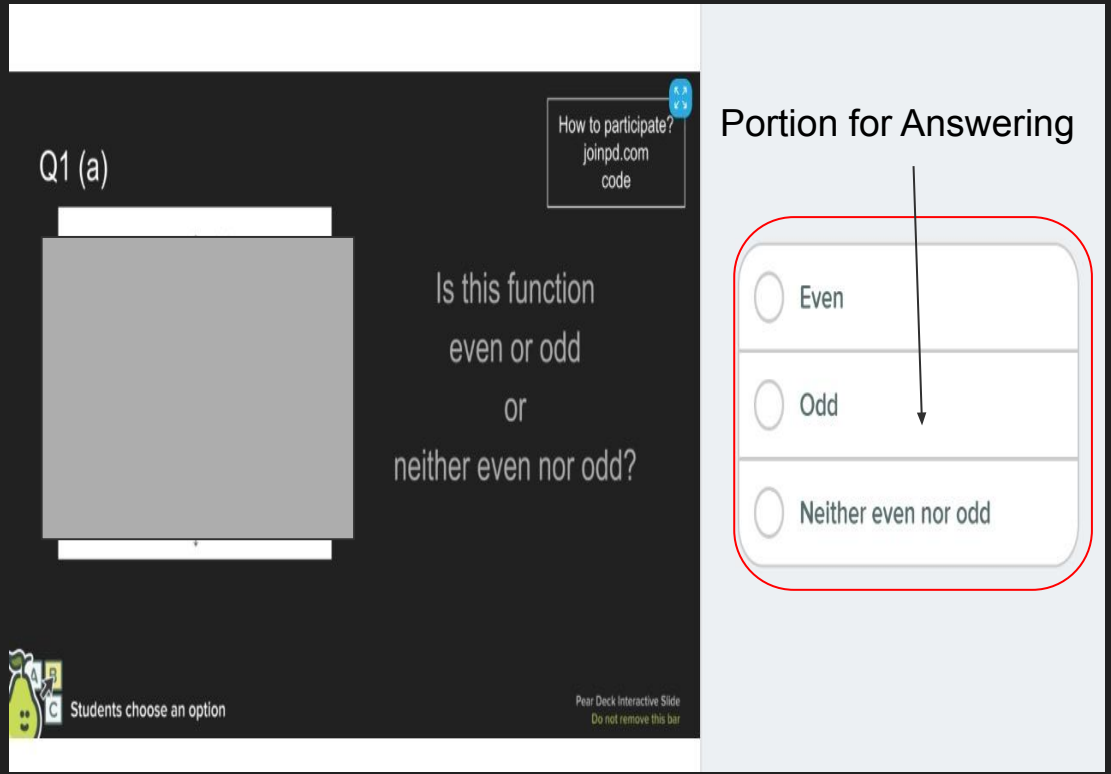
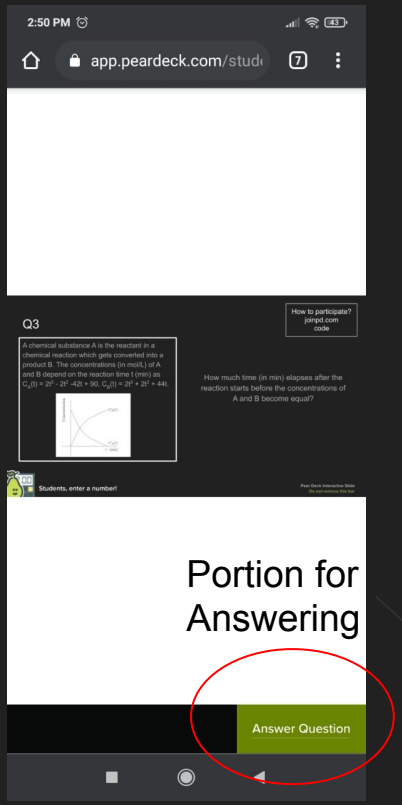
Laptop/Desktop




Mobile



# Sample Question

Dummy statement

Which of the following statements is true?


Students choose an option

# Concepts involved

What is Statistics?

# Concepts involved

## What is Statistics?

Statistics is the art of learning from data. It is concerned with the collection of data, their subsequent description, and their analysis, which often leads to the drawing of conclusions.

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The part of statistics concerned with the description and summarization of data is called descriptive statistics.

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What is Inferential Statistics?

# Concepts involved

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What is Descriptive statistics?

The part of statistics concerned with the description and summarization of data is called descriptive statistics.

What is Inferential Statistics?

The part of statistics concerned with the drawing of conclusions from data is called inferential statistics.

# Concepts involved

What is population?

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The total collection of all the elements that we are interested in is called a population.

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A: All the students of IIT Madras who enrolled in Statistics-1

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What is Sample?

A subgroup of the population that will be studied in detail is called a sample.

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A subgroup of the population that will be studied in detail is called a sample.

Sample should be representative and randomly selected for the conclusions to be correct.

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A subgroup of the population that will be studied in detail is called a sample.

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If I am interested in the marks of the students in IIT Madras who are enrolled in statistics-1 subject, what could be sample?

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## What is population?

The total collection of all the elements that we are interested in is called a population.

If I am interested in the marks of the students in IIT Madras who are enrolled in Statistics-1 subject, what is the population?

A: All the students of IIT Madras who enrolled in Statistics-1

What is Sample?

A subgroup of the population that will be studied in detail is called a sample.

Sample should be representative and randomly selected for the conclusions to be correct.

If I am interested in the marks of the students in IIT Madras who are enrolled in statistics-1 subject, what could be sample?

A: Any subset of the students of IIT Madras who enrolled in Statistics-1.

# Q1

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# Q1

A mobile manufacturing company received complaints from customers regarding defective mobiles. To confirm this, the company randomly selected 100 mobile phones from the total mobile phones manufactured and checked for the defectiveness of mobiles.

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# Q1

A mobile manufacturing company received complaints from customers regarding defective mobiles. To confirm this, the company randomly selected 100 mobile phones from the total mobile phones manufactured and checked for the defectiveness of mobiles.

A) Inferential Statistics can be done using this data.
B) Descriptive Statistics can be done using this data.
C) Randomly selected 100 mobile phones is a sample.
D) Randomly selected 100 mobile phones is the population.
E) All mobile phones manufactured in the company is the population.
F) All mobile phones manufactured in the company is a sample.

Enter all the correct options separated comma.

Students, write your response!

# Solution:

The population is all the mobile phones manufactured in company as it is all the elements of interest.

The sample is 100 mobile phones selected, as these are elements on which the study is being done.

Inferential statistics is done on this data as we are going to conclude about all mobile phones manufactured in the company using the sample of 100 mobile phones.

# Q2

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# Q2

For the conclusions made through inferential statistics to be correct, which of the following statements should be valid?

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# Q2

For the conclusions made through inferential statistics to be correct, which of the following statements should be valid?

A) Sample should not be randomly selected.
B) Sample should be randomly selected.
C) Sample should be a representative of the population.
D) Sample should not be a representative of the population.

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# Q2

For the conclusions made through inferential statistics to be correct, which of the following statements should be valid?

A) Sample should not be randomly selected.
B) Sample should be randomly selected.
C) Sample should be a representative of the population.
D) Sample should not be a representative of the population.

Enter all the correct option(s) separated by comma.

Students, write your response!

# Solution:

As we have discussed,

Sample should be randomly selected so that conclusions made on population will be correct and not biased.

Sample should be representative of the population, that is, it should be unbiased and should represent all the distinct properties of population.

Like if population is Indian states, then sample should contain elements from almost all the states of India.

# Concepts involved to solve the questions

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When data is scattered about with no structure, the information is of very little use. It is unstructured data. We cannot directly do analysis on the unstructured data.

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# Concepts involved to solve the questions

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Data are the facts and figures collected, analyzed, and summarized for presentation and interpretation.

What is Unstructured data?

When data is scattered about with no structure, the information is of very little use. It is unstructured data. We cannot directly do analysis on unstructured data.

What is structured data?

When data is not scattered and has structure, the information is useful for analysis.

# Concepts involved to solve the questions

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What is case?

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## What is case?

A: A unit from which data are collected.

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## What is case?

A: A unit from which data are collected.

What is variable?

# Concepts involved to solve the questions

## What is case?

A: A unit from which data are collected.

What is variable?

A: A characteristic or attribute that varies across all units.

# Q3

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A biomedical company generated a new vaccine for Covid-19 and tested it on the few people. After a few days, medical checkup was done on them and the report is given in Table. In Table, BP stands for Blood Pressure, HP stands for High Pressure, and LP stands for Low Pressure. In the Gender column, M stands for Male and F stands for Female.

# Q3

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What are the case(s) and variable(s) for this data?

# Q3

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A biomedical company generated a new vaccine for Covid-19 and tested it on the few people. After a few days, medical checkup was done on them and the report is given in Table. In Table, BP stands for Blood Pressure, HP stands for High Pressure, and LP stands for Low Pressure. In the Gender column, M stands for Male and F stands for Female.

Which of the following is the case for this data?

| Name | Gender | Weight (Kg) | BP (HP/LP) | Temperature ($^0$F) | Headache | Vomiting |
|---|---|---|---|---|---|---|
| Venkatesh | M | 65 | 118/80 | 94 | No | No |
| Hitesh | M | 58 | 120/85 | 100 | Mild | No |
| Keerthi | F | 56 | 120/80 | 95 | No | No |
| Manish | M | 67 | 120/80 | 96 | Severe | Yes |
| Dharma | M | 55 | 130/90 | 100 | Mild | Yes |
| Joseph | M | 65 | 122/82 | 94 | No | No |
| Farah | F | 61 | 119/80 | 93 | Mild | No |
| Ramakrishna | M | 60 | 125/94 | 97 | No | No |

Table 1.G.1: Patients report


Students choose an option

# Solution:

Since the data is collected from each person the biomedical company tested vaccine, each of the person’s name will be cases.

So, Venkatesh, Hitesh, Keerthi… will be the cases.

# Concepts involved

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Also called quantitative variables, numerical variables have numerical properties of cases. They can have the measurement units.

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Numerical variables are classified into continuous and discrete numerical variables.

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Also called quantitative variables, numerical variables have numerical properties of cases. They can have the measurement units.

Numerical variables are classified into continuous and discrete numerical variables.

Example: Weight (Kg) is continuous, while number of item sold is discrete numerical variable.

# Concepts involved

What is time series data?

A: Data is recorded over time.

Can you give examples of time series data?

What is cross-sectional data?

A: Data observed at the same time or at an instant of time.

Can you give examples of cross-sectional data?

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Can you give examples of cross-sectional data?

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# Q4

Choose the correct statement(s) from the following:

A) Revenue generated by India from 10 different countries through tea exports in year 2010 is a time-series data.

B) Revenue generated by India during the period 2000-2010 on yearly basis is a time-series data.

Enter all the correct options separated by comma.

Students, write your response!

# Solution:

Option A:

Revenue generated by India from 10 different countries through tea exports in year 2010 is a time-series data.

The data is collected from different countries to whom the tea exports is done in year 2010. Year 2010 is a specific point of time in years. So, it is cross-sectional data.

# Solution:

Option B:

Revenue generated by India during the period 2000-2010 on yearly basis is a time-series data.

The data is collected from 2000 to 2010 about the revenue generated by India on yearly basis. Year 2000 to 2010 is a span of time. Here time is varying. So, it is time-series data.

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# Q5

Which of the following is/are numerical variable(s)?

A) Height (m)
B) Aadhar card number
C) Pan card number
D) Passenger Name Reservation (PNR) number
E) Stop-watch time (in seconds)

Enter all the correct options separated by comma.

Students, write your response!

# Solution:

Height (m) is a numerical variable as it can numbers and has numerical properties and specific units (metres).

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Aadhar card number, even though takes numbers, doesn’t have numeric properties. That is addition and subtraction operations are not possible for two aadhar card numbers and >,<,== operations are not valid.

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Pan card number too similarly is not a numerical variable. It is categorical variable.

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Passenger Name Reservation (PNR) number too is not a numerical variable since it represents the particular ticket which is reserved. One PNR number is not greater or lesser than another.

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Passenger Name Reservation (PNR) number too is not a numerical variable since it represents the particular ticket which is reserved. One PNR number is not greater or lesser than another.

# Solution:

Stop-watch time (in seconds) is a numerical variable, as the values it takes are numbers and have numerical properties, that is addition and subtraction operations can be performed on them.

It has definite units (seconds).

# Concepts involved

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What is scale of measurement of a variable?

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What is ordinal scale of measurement?

Data exhibits properties of nominal data and the order or rank of data is meaningful, the scale of measurement is considered a ordinal scale.

# Concepts involved

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Categorical variable has nominal or ordinal scale of measurement.

# Concepts involved

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What is interval scale of measurement?

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What is interval scale of measurement?

A: If the data have all the properties of ordinal data and the interval between values is expressed in terms of a fixed unit of measure, then the scale of measurement is interval scale.

# Concepts involved

What is interval scale of measurement?

A: If the data have all the properties of ordinal data and the interval between values is expressed in terms of a fixed unit of measure, then the scale of measurement is interval scale.

Interval data are always numeric. Can find out difference between two values. Ratios of values have no meaning here because the value of zero is arbitrary.

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What is ratio scale of measurement?

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What is ratio scale of measurement?

If the data have all the properties of interval data and the ratio of two values is meaningful, then the scale of measurement is ratio scale.

# Concepts involved

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What is ratio scale of measurement?

If the data have all the properties of interval data and the ratio of two values is meaningful, then the scale of measurement is ratio scale.

Numerical variable has interval or ratio scale of measurement.

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# Q6

Which of the following variables have nominal scale of measurement?

A) Shirt size (XS, S, M, L, XL, and XXL)
B) Aadhar card number
C) PAN card number
D) Passenger Name Reservation (PNR) number
E) Names of the vegetables

Enter all the correct options separated by comma.

Students, write your response!

# Solution:

Shirt Size (XS, S, M, L, XL, XXL)

# Solution:

Shirt Size (XS, S, M, L, XL, XXL) is a categorical variable because there is a particular order of the sizes. XS<S<M<L<XL<XXL. So, it has ordinal scale of measurement.

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Aadhar card number

# Solution:

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Aadhar card number is a categorical variable, there is no particular order in the aadhar card numbers. One aadhar card is not greater than or lesser than another number. So, it has nominal scale of measurement.

# Solution:

Shirt Size (XS, S, M, L, XL, XXL) is a categorical variable because there is a particular order of the sizes. XS<S<M<L<XL<XXL. So, it has ordinal scale of measurement.

Aadhar card number is a categorical variable, there is no particular order in the aadhar card numbers. One aadhar card is not greater than or lesser than another number. So, it has nominal scale of measurement.

PAN card number, PNR numbers

# Solution:

Shirt Size (XS, S, M, L, XL, XXL) is a categorical variable because there is a particular order of the sizes. XS<S<M<L<XL<XXL. So, it has ordinal scale of measurement.

Aadhar card number is a categorical variable, there is no particular order in the aadhar card numbers. One aadhar card is not greater than or lesser than another number. So, it has nominal scale of measurement.

PAN card number, PNR numbers too are categorical variables, there is not particular order among PAN card numbers. So, they have nominal scale.

# Solution:

Shirt Size (XS, S, M, L, XL, XXL) is a categorical variable because there is a particular order of the sizes. XS<S<M<L<XL<XXL. So, it has ordinal scale of measurement.

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Names of the vegetables:

# Solution:

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Aadhar card number is a categorical variable, there is no particular order in the aadhar card numbers. One aadhar card is not greater than or lesser than another number. So, it has nominal scale of measurement.

PAN card number, PNR numbers too are categorical variables, there is not particular order among PAN card numbers. So, they have nominal scale.

Names of the vegetables:
There is not particular order in vegetables. Potatoes are not greater than tomatoes. Or chilli is not greater than onions. So, names of vegetables has nominal scale of measurement.

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# Q7

In a supermarket, the bill for each customer is given in an ordered tabular form. The bill for the customer Pavithra, dated on 1 Mar 2021, is given in Table 1.G.2. Assume cost per unit is a continuous numerical variable. Also, assume that all items are as packs. Total cost is calculated using the following formula.

Total cost = Cost per * Units. Which of the following options is correct?

| S.No. | Item name | Category | Brand | Cost per unit | Units | Total cost |
|---|---|---|---|---|---|---|
| 1. | Cadbury Dairy Milk Silk | Snacks | Cadbury | 100 | 1 | 100 |
| 2. | Lays American | Snacks | Lays | 50 | 2 | 100 |
| 3. | Cello Fine Grip | Stationery | Cello | 5.5 | 4 | 22 |
| 4. | Classmate Long Notebook | Stationery | Classmate | 30 | 4 | 120 |
| 5. | Shimla Apples | Fruits | Shimla Apples | 40 | 5 | 200 |
| 6. | Basmati Rice 1kg | Grains | Daawat | 60 | 2 | 120 |

Table 1.G.2: Supermarket bill


Students choose an option

# Solution:

Given data is time-series or cross-sectional?

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Given data is time-series or cross-sectional?

The data is taken from a customer, Pavithra, who purchased items at a particular instant of time. So, it is cross-sectional data.

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# Solution:

Given data is time-series or cross-sectional?

The data is taken from a customer, Pavithra, who purchased items at a particular instant of time. So, it is cross-sectional data.

Given assume cost per unit is a continuous variable.

Number of units can take values 0, 1, 2, 3,.... So, it can take only discrete values. It is a discrete variable.

# Solution:

Given data is time-series or cross-sectional?

The data is taken from a customer, Pavithra, who purchased items at a particular instant of time. So, it is cross-sectional data.

Given assume cost per unit is a continuous variable.

Number of units can take values 0, 1, 2, 3,.... So, it can take only discrete values. It is a discrete variable.

Total cost would be continuous variable as it cost per unit * number of units.

# Solution:

What are the cases for the given data?

# Solution:

What are the cases for the given data?

Each item bought by customer would be cases.

# Solution:

What are the cases for the given data?

Each item bought by customer would be cases.

So, cadbury dairy milk silk, cello fine grip, shimla apples… are cases.

# Thank You