

Student Name

Mathematics Stage 4

DATA CLASSIFICATION AND VISUALISATION

Book 1 Classify data as either numerical or
categorical variables.

Version: 260207

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OVERVIEW

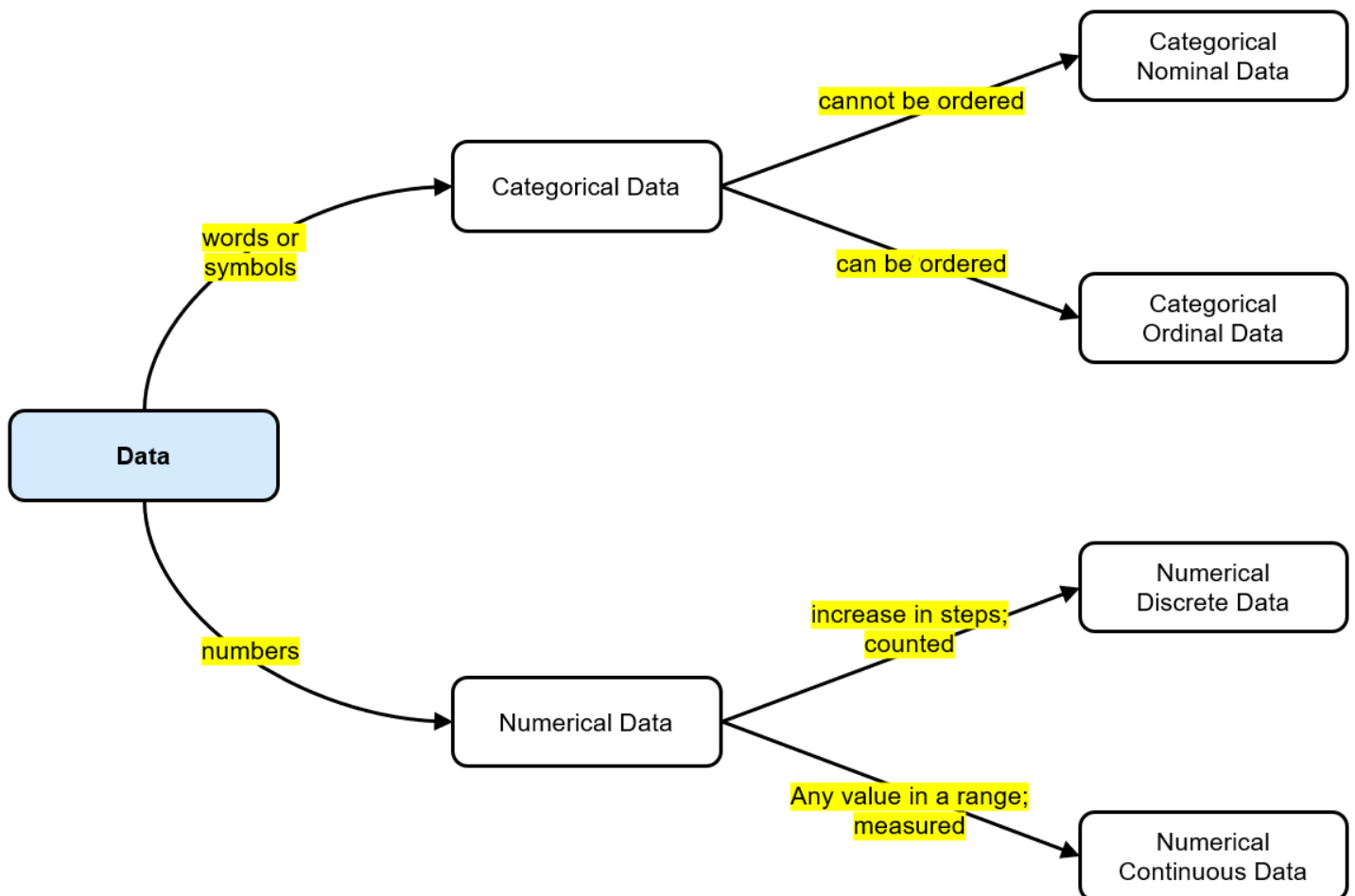
SYLLABUS CONTENT

MA4-DAT-C-01 classifies and displays data using a variety of graphical representations

Classify data as either numerical (discrete or continuous) or categorical (nominal or ordinal) variables

- Define a variable in the context of statistics as any characteristic, number or quantity that can be measured or counted
- Classify and describe variables as numerical or categorical
- Describe a numerical variable as either discrete or continuous
- Describe a categorical variable as nominal or ordinal
- Distinguish between and compare numerical (discrete or continuous) and categorical (nominal or ordinal) variables

SUMMARY



CLASSIFYING DATA

VARIABLES

- **Data** is collected information.
- Data has **variables** and **values**.
 - A **variable** is anything we can describe, measure, or count.
 - **Data values** are the measurements.

Variables	Data Values
Age	11, 12, 15 , 21, 86
Grade	A, B, C, D, E
Colour	Red, Green, Orange

NUMERICAL OR CATEGORICAL

- **Categorical** data is **qualitative**. It involves descriptions, categories, and names.
- **Numerical** data is **quantitative**. It involves numbers.

Example Classify variables as numerical or categorical.

The number of siblings you have. The data values 0, 1, 2, 3, are numbers. Numerical.	Year 8's favourite movie. The data values are movies. Categorical.
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Classify these variables as numerical or categorical.

a Number of sheep owned by farmers in Australia.	b Favourite video game console.
numerical	categorical
c Favourite makeup brand.	d Time taken to complete a test.
categorical	numerical

DISCRETE OR CONTINUOUS

- **Numerical** data can be **discrete** or **continuous**.
- **Discrete** data:
 - **increase in steps**.
usually come from **counting**.
- **Continuous** data:
 - can have **any value** in a range.
 - Comes from **measuring**.

Example Classify numerical variables as discrete or continuous.

Number of people at a concert. The number of people is counted. Numerical discrete.	Height of a year 9 student. Length is measured. Numerical continuous.
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Classify these variables as numerical discrete or numerical continuous.

a Number of sheep owned by farmers in Australia. Numerical discrete	b Time taken to complete a test. Numerical continuous
c Mass of students' schoolbags. Numerical continuous	d Number of students late to school today. Numerical discrete

NOMINAL OR ORDINAL

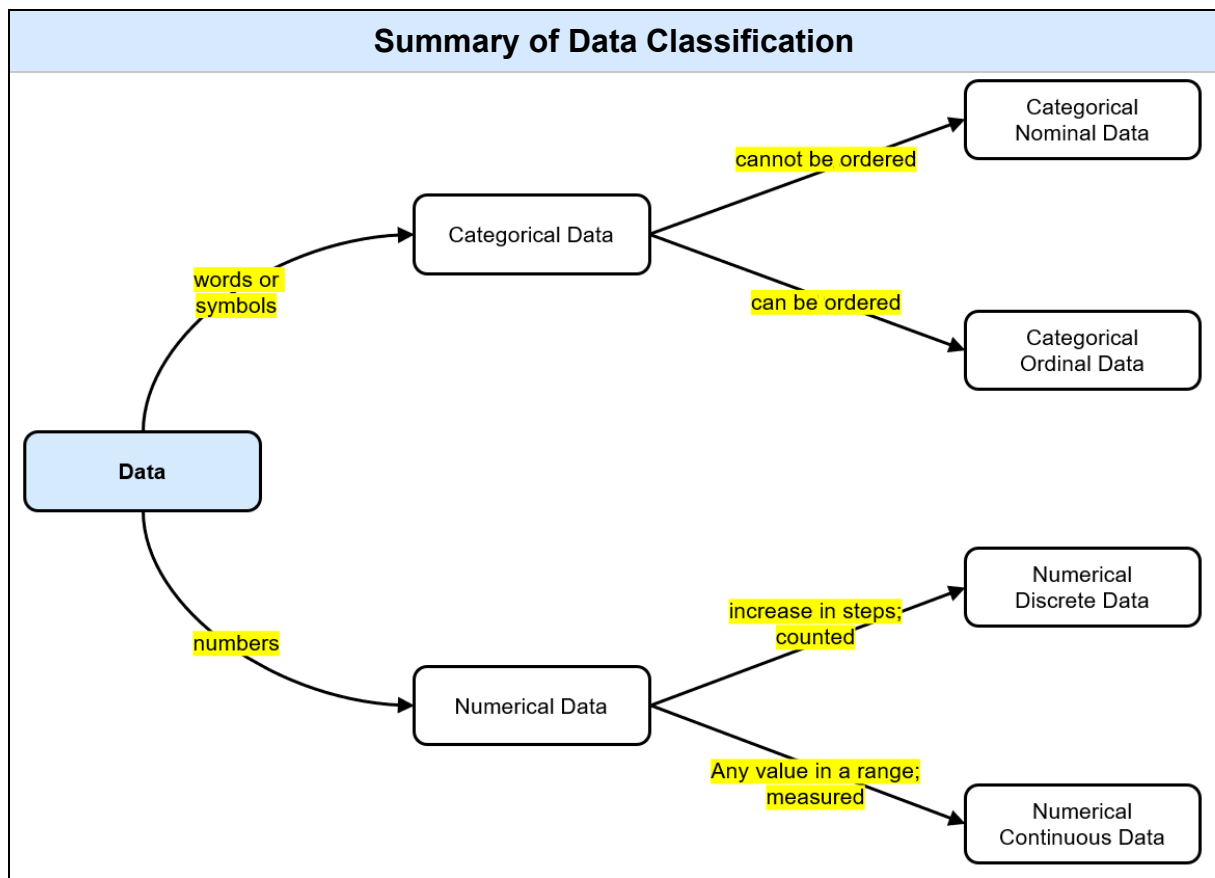
- **Categorical** variables can be **nominal** or **ordinal**.
- Nominal data has no natural order, e.g. colours, flavours, locations etc.
- Ordinal data has a natural order, e.g. sizes, level of education, etc.

Example Classify categorical variables as nominal or ordinal.

Responses to a survey: disagree, neutral, agree There is a natural order to the responses. Categorical ordinal.	Favourite colour of year 5 students. Colour does not have a natural order. Categorical nominal.
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Classify these variables as nominal or ordinal.

a Survey of favourite ice cream flavours. Categorical nominal	b Highest level of education achieved (high school, diploma, university, PhD) Categorical ordinal
c Favourite travel destinations. Categorical nominal	d Clothing sizes (small medium large) Categorical ordinal



Match each word to its definition.

- | | | |
|-------------|---|--|
| Numerical | • | • Categorical data that has no order |
| Continuous | • | • Data that are numbers |
| Discrete | • | • Numerical data that take on a limited number of values |
| Categorical | • | • Data that is not numbers. |
| Ordinal | • | • Numerical data that take any value in a given range |
| Nominal | • | • Categorical data that can be ordered |

Key ideas

1. Data is collected pieces of
2. A is anything that can be described, measured, or counted.
3. There are two broad types of data: and
4. Numerical data can be or
5. Categorical data can be or

1 Classify these variables as numerical (N) or categorical (C).

a	Mass of student in kg	N C	b	Brand of computers	N C
		N			C
c	Price of ice cream in \$	N C	d	Number of TV sets owned by a family	N C
		N			N
e	Amount of rainfall in mm	N C	f	Cause of tooth decay	N C
		N			C
g	Sets won in a tennis match	N C	h	Speed of truck in km/h	N C
		N			N

2 Classify these numerical variables as discrete (D) or continuous (C).

a	Number of homes with solar power	D C	b	Amount of cough medicine taken by child	D C
		D			C
c	Size of the crowd at a rock concert	D C	d	Number of road accidents in Grafton	D C
		D			D
e	Times taken for athlete to run 100 metres	D C	f	Patients' body temperature	D C
		C			C
g	School population	D C	h	Seats on a bus	D C
		D			D
i	Mass of an athlete	D C	j	Height of a building	D C
		C			C

3 Classify these categorical variables as nominal (N) or ordinal (O).

a	Method of travel to work	N O	b	Report grade	N O
		N			O
c	Suburb of home	N O	d	Fan setting on air conditioner (low med high)	N O
		N			O
e	Brand of car	N O	f	Level of satisfaction with the government	N O
		N			O
g	Olympic medal	N O	h	Gender	N O
		O			N
i	Size of drink (small med large)	N O	j	Favourite football team	N O
		O			N

- 4** Which one of the following survey questions would generate numerical data?
A What is your favourite colour?
B What type of car does your family own?
C How long does it take for you to travel to school?
D What type of dog do you own?
C
- 5** Which one of the following survey questions would generate categorical data?
A How many times do you eat at your favourite fast-food place in a typical week?
B How much do you usually spend buying your favourite fast food?
C How many items did you buy last time you went to your favourite fast-food place?
D Which is your favourite fast food?
D
- 6** Classify the following as categorical or numerical, nominal, ordinal, discrete or continuous.
- | | |
|---|----------------------|
| a The heights of members of a football team. | Numerical continuous |
| b The distance to drive to the train station. | Numerical continuous |
| c The different types of ice creams. | Categorical nominal |
| d The quality of food in a restaurant. | Categorical ordinal |
| e The eye colour of a group of people. | Categorical nominal |
| f Size of a drink at McDonald's. | Categorical ordinal |
| g The number of pets in a household. | Numerical discrete |
| h The time to swim 50 metres. | Numerical continuous |
| i The number of goals scored in a season. | Numerical discrete |
| j Today's most fashionable style of dress. | Categorical nominal |
| k The number of computers in the building. | Numerical discrete |
| l Replies given to a questionnaire (Yes, Maybe, No). | Categorical ordinal |
| m The perimeter of a block of land. | Numerical continuous |
| n The width of the Anzac Bridge. | Numerical continuous |
| o The number of people killed on the roads. | Numerical discrete |
| p The distance travelled by a car in 30 minutes. | Numerical continuous |
| q The most popular brand of car. | Categorical nominal |
| r Daily temperature of a lake. | Numerical continuous |
| s Time taken to solve a Rubik's Cube. | Numerical continuous |
| t Log of how many push ups done in a day. | Numerical discrete |

- 7 A marketing poll was conducted that asked about a person's employment status:
unemployed, receiving education, part-time job or full-time job
Classify the type of data that would result from this poll

Categorical ordinal

- 8 Emma is planning to build a new restaurant. She conducted a survey of the community. One of the questions asked was 'How far in kilometres would you be prepared to travel to get to a good restaurant?' The options given were:
5 km, 10 km, 15 km, 20 km
Classify the type of data that would result from this poll

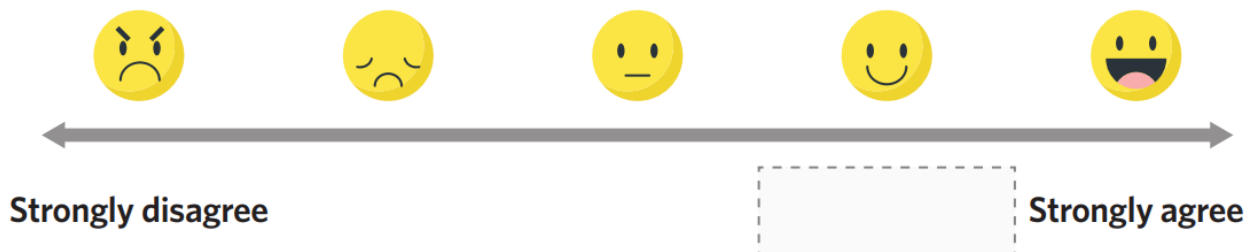
Numerical discrete

- 9 Freddy says that number plates represent categorical ordinal data because numbers and letters have a natural order. Explain why he is incorrect.



Letters and numbers have a natural order, but license plates are random, so there is no random order. Categorical nominal.

- 10 A Likert scale is often used to measure attitudes and opinions. A version of it is shown below visually, as well as on a spectrum.



- a What type of data does a Likert Scale collect?

Categorical ordinal

- b What would be the most appropriate to fill in the blank space?

A. Disagree

B. Neutral

C. Agree

D. Likely

agree

- 11 a Area is recorded in square metres. Classify this data.

Numerical continuous

- b Area is recorded in whole number of football fields. Classify this data.

Numerical discrete

12 2015 HSC Standard 2 Band 4

On a school report, a student's record of completing homework is graded using the following codes.

C = consistently

U = usually

S = sometimes

R = rarely

N = never

What type of data is this?

Categorical ordinal

13 2018 HSC Standard 2 Band 4

A survey asked the following question. 'How many brothers do you have?'

How would the responses be classified?

Numerical discrete

14 2021 HSC Standard 2 Band 5

Which of the following would provide data that are both categorical and nominal?

A. Hair colour

B. Height in centimetres

C. Number of people at a concert

D. Size of coffee cup classified as small, medium, large

A

15 2016 HSC Standard 2 Band 6

Which set of data is classified as categorical and nominal?

A. Blue, green, yellow

B. Small, medium, large

C. cm, 6 cm, 7.21 cm

D. 4 people, 5 people, 6 people

A

- 16 Collections of data can be described as numerical or categorical depending on the responses. Classify the data as categorical or numerical collected from these responses:

a Question: "What size is your shoe?"
Responses: Small, Medium, Large

Categorical ordinal

b Question: "What size is your shoe?"
Responses: 20 cm, 21 cm, 22 cm ...

Numerical discrete

c Question: "How much homework do you do per week?"
Responses: *none to lots*

Categorical ordinal

d Question: "How much homework do you do per week?"
Responses: whole number of hours

Numerical discrete

- 17 Zach says, "Age is an example of discrete data." Ed says, "Age is continuous data." Suggest why each person thinks what they do.

Discrete if we just say the year, continuous if we measure to the day, hour, second, millisecond, etc.

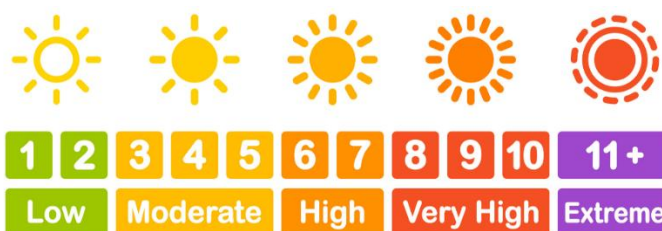
- 18 Consider the UV index:

When would the UV index be numerical?

When using the top number scale

When would the UV index be categorical?

When using the bottom descriptive scale



- 19 Mr Ding is quite fond of the FM radio station 101.7. He decides to collect data on the favourite radio station of the other teachers. He says: "I am collecting numerical data, since radio stations are numbers." Explain why his incorrect.

Radio stations are not counted or measured, so it is categorical

- 20 Many people argue that if something is not counted nor measured, it is categorical data. Shoe size (8, 9, 10, etc.) would then be classified as categorical ordinal data, rather than numerical discrete.

Classify the following data as categorical or numerical, using this new definition.

- a The number rolled on a die.
- b Restaurant star rating.
- c Electrical appliance energy star rating.
- d UV index.

All categorical ordinal

CHECK YOUR UNDERSTANDING

Classifying data

1	Which of these variables is continuous?						
a	Number of siblings	b	Hand span	c	Shoe size	d	Favourite colour
2	Which of these variables is discrete?						
a	Time to run 100 m	b	Distance of home from school	c	Shoe size	d	Height
3	Jeremy collects data on the number of siblings each member of a class has. What type of variable is this?						
a	Numerical Discrete	b	Numerical Continuous	c	Categorical Ordinal	d	Categorical Nominal
4	Ava collects data on the waist measurement, in cm, of her peers. What type of variable is this?						
a	Numerical Discrete	b	Numerical Continuous	c	Categorical Ordinal	d	Categorical Nominal
5	Leanne collects data on where her friends went on holiday last year. What type of variable is this?						
a	Numerical Discrete	b	Numerical Continuous	c	Categorical Ordinal	d	Categorical Nominal
6	Chris asks his colleagues how they think working conditions can be improved. What type of variable is this?						
a	Numerical Discrete	b	Numerical Continuous	c	Categorical Ordinal	d	Categorical Nominal
7	A café worker records the size of coffee ordered (small, medium, large) What type of variable is this?						
a	Numerical Discrete	b	Numerical Continuous	c	Categorical Ordinal	d	Categorical Nominal