Scales of measurement (Answers)

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This lesson has been created by Effini in partnership with Data Education in Schools, The Data Lab and Data Skills for Work, with funding from the Scottish Government.

1. Scales of measurement

Reminder

Nominal - Has no meaningful order

Interval - Has no true zero (can be negative or positive)

Ordinal - Has an implicit order

Ratio - Has a true zero

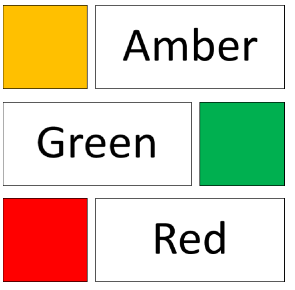
Section 1.1

1) For each of these qualitative data types, decide it they are nominal.

Data	Nominal?	Reason
Colour of hats in a shop	Yes	Can not be meaningfully ordered
Days of the week	No	Can be ordered (Mon/Tue/Wed)
Types of cheese	Yes	Can not be meaningfully ordered
Images of tartan patterns	Yes	Can not be meaningfully ordered
Year group in school (e.g. P4,P7,S2)	No	Can be ordered (P1,P2,P3 etc)

2) Place these ordinal data types into a meaningful order.

Seasons of the year
Winter
Spring
Summer
Autumn



Traffic light colours
Red
Amber
Green

1. Scales of measurement

Reminder
Nominal - Has no meaningful order
Ordinal - Has an implicit order
Interval - Has no true zero (can be negative or positive)
Ratio - Has a true zero

3) Can you decide if these data types are interval or ratio measurements?

Age of a person,
Time,
Temperature in Celsius,
Distance between Edinburgh and Glasgow

Interval	Ratio
Time	Age of a person
Temperature in Celsius	Distance between Edinburgh and Glasgow

Section 1.2

4) Are these qualitative data types, nominal or ordinal? Describe why?

Example	Data Type	Describe why?
Days of the week	Ordinal	Has implicit order (Mon, Tue etc)
Types of trees	Nominal	Unordered data
True/False answer to a question	Nominal	Unordered data
NATO phonetic alphabet	Ordinal	Has implicit order (Alfa, Bravo)

Section 1.3

5) Can you explain why length of a song (in seconds) is 'interval' whereas time in general is 'ratio'.

The length of a song has a true zero, the point where the song starts. However time does not have a meaningful true zero.

2. Extension

This extension section will cover,
Data categories and Scales of measurements

Section 2.1

1) Here is a list of possible survey questions for visitors to a museum for each question state whether the data type and the scale of measurement.

Question	Data Type (qualitative or quantitative)	Scale of measurement
Which day of the week did you visit the museum?	Qualitative	Ordinal
How many people were with you when you visited?	Quantitative	Ratio
Did you buy anything from the cafe during your visit? (yes/no)	Qualitative	Nominal
How likely are you to visit the museum again? (Likely/Unlikely)	Qualitative	Ordinal
Is there anything we could do improve your visit?	Qualitative	n/a

2) Now create your own question for this survey that fits with **at least one of these data types,**

Question	Data Type	Sub-Type	Scale of measurement
e.g. "How many times have you visited the museum before today?" Any example where the answer is a whole number that would be counted with a true zero	Quantitative	Discrete	Ratio
e.g. "Are there any types of food you would like in the café that weren't on offer today?" Any example where the question gives a raw text answer.	Qualitative	Raw text	n/a

2. Extension

This extension section will cover,
Data categories and Scales of measurements

3) A charity is looking to become more environmentally friendly. Can you think of 5 questions it could ask its staff or customers to help with its planning?

Possible answers to this question.

Question	**Data Type** (qualitative or quantitative)	**Sub-Type of quantitative data** (discrete or continuous)	**Scale of measurement**
Example: Do you own an electric car? (yes/no)	*Qualitative*	*n/a*	*Nominal*
What do you think the recycling facilities at the charity?	Qualitative	n/a	Ordinal
How long have you been involved with the charity? (in whole months)	Quantitative	Discrete	Ratio
Are you a customer or staff member?	Qualitative	n/a	Nominal
How often do you use public transport? (regularly, sometimes, often, never)	Qualitative	n/a	Ordinal
What do you think it's the biggest thing the charity could do?	Qualitative	n/a	n/a

4) Describe an issue that could arise when analysing shoe size data if you were not aware that it is discrete data type.

You could calculate the average shoe size which would be meaningless. E.g. shoe size 4.561 does not make sense.

5) Why is it important to understand the types of data you are analysing?

By understanding how your data is categorised it will help you handle it correctly.
It can help you spot errors in your data (e.g. words in a number column).
You can make sure any calculations performed make sense (e.g. calculating averages of discrete data where the answer doesn't make sense)

2. Extension

This extension section will cover,
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6) You are asking clothes manufacturers to provide you with the sizes of the clothes they produce, below are some examples of the data you receive back.
What do you need to think about in terms of the categories of data before you could start analysing the information?

4 small blue tops

Some 4-5yr old leggings

Small children's tops

6 XL coats

32" waist trousers

Two size 10 dresses

One size hat

XXL trousers (black)

You have received the data in a mixture of data types (qualitative or quantitative).
You might have a mixture of discrete and continuous data.
You might not know if "small" is the same size between different manufactures.

You will have to manipulate the data before analysing to make sure you can handling it correctly for the data type.

7) Design 3 questions that you could ask the clothes manufacturers to allow you overcome some of these issues from question 6? State the data type, sub-type and scale of measurement for each question.

Question	**Data Type** (qualitative or quantitative)	**Sub-Type of quantitative data** (discrete or continuous)	**Scale of measurement**
Example: How long (in cm) is your coat?	*Quantitative*	*Continuous*	*Ratio*
How many of "*the clothes item*" do you have?	*Quantitative*	*Discrete*	*Ratio*
What colour is *"the clothes item"?*	*Qualitative*	*Categorised*	*Nominal*
What is the waist measurement (in inches) of your trousers?	*Quantitative*	*Continuous*	*Ratio*

2. Extension

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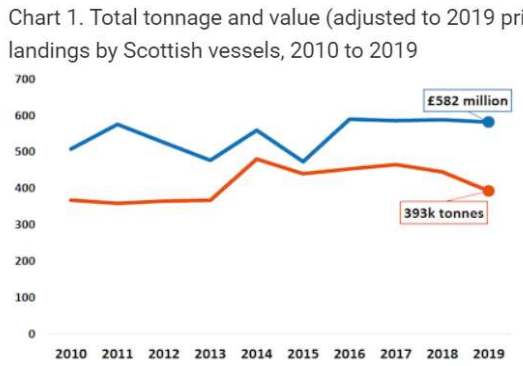
Section 2.2

8) Go online and find 2 graphs on a subjects you are interested in.
For each graph, decide if the data is quantitative or qualitative? What are the scales of measurements?

Example



The data is quantitative.

The value and amount in tonnes are ratio as they have a meaningful zero point.

https://www.gov.scot/publications/scottish-sea-fisheries-statistics-2019/pages/2/