

IPM component 3



Term 1, week 6

On argumentation

Argumentation



Version 1

- An academic argument consists of
 - 1) an assertion or statement that something is true or false,
 - 2) a reason as to why we believe that statement to be true or false.

Argumentation



Version 1

- Gravity:
 - 1) “dropping an object from a given height will cause it to fall to the ground ...”
 - 2) “... because there is a force called gravity which acts on the object to attract it to the ground.”

Argumentation and truth



- Arguments need not be true. The following is false but is a correct form of argumentation:
 - 1) “The sun and planets revolve around a stationary Earth ...
 - 2) “... because when we look up at the sky the sun and the planets move across the sky.”

Argumentation



Version 2

- An academic argument is a form of *justification* or *explanation*
 - Statistics: “The value of g , the acceleration due to gravity, is approximately 9.8 m/s^2 . This is based on having performed a 95% confidence-interval test on experimental data.”

Argumentation



Version 2

- An academic argument is a form of *justification* or *explanation*
 - Mechanics: i) “Since friction is negligible, we will ignore it, and treat the surface of a table as smooth”;
 - ii) “The object is one-thousand times heavier than the rod. As a result, we treat the rod as being without weight”.

Argumentation



Watch out for language structure

- 1) "The value of g , the acceleration due to gravity, is approximately 9.8 m/s^2 . This is based on having performed a 95% confidence-interval test on experimental data."
- 2) "A 95% confidence-interval was performed on experimental data relating to the measurement of g , the acceleration due to gravity, and was found to show that g is approximately 9.8 m/s^2 ."

Argumentation



Watch out for language structure

- Notice that ex 2) of the previous slide also contains an assertion and a reason.
- Therefore, the aim when reading text is to find what counts as an underlying assertion and what counts as an underlying reason or justification.

Argumentation



Watch out for language structure

- Assertion in statistics are called hypotheses.

There are two types:

- The null hypothesis H_0 where nothing happens or changes when you conduct an experiment;
- The alternative hypothesis H_1 where something happens or changes when you conduct an experiment;

Argumentation



More examples

1) The discovery of Uranus:

- Newton's theory of gravity predicted that Uranus should be in a certain position at a certain time, but it wasn't.
- *Assertion:* "There is a planet beyond Uranus"
- *Reason:* "This new planet perturbs the orbit of Uranus which explains why Uranus is not where we calculated it to be"

Argumentation



More examples

- 1) The discovery of Uranus:
 - *Confirmation:* “Telescopic observation is conducted, and the planet is found in the location predicted by Newton’s theory of gravity.”
 - The planet was named Neptune.

Argumentation



More examples

2) About water

- It is an accepted fact that water boils at 100⁰C.
- *Assertion:* “Water can boil at higher or lower temperatures”
- *Reason:* “The boiling point of water depends on pressure and any substances added.”

Argumentation



More examples

2) About water

- *Reason:* “Higher altitudes lead to lower boiling points of water, and different substance lead to higher boiling points of water.”
- *Confirmation:* “Conduct an experiment at 1900 metres to find that water boils at $\sim 93^{\circ}\text{C}$.”

Argumentation



More examples

3) On the electron

- In the 19th century the atom was thought to be composed of smaller particles.
- *Assertion:* “There exists a negatively charged particle inside the atom.”

Argumentation



More examples

3) On the electron

- In the 19th century the atom was thought to be composed of smaller particles.
- *Reason:* “Any beam of particles which are negatively charged will be deflected away from positive charges.”

Argumentation



More examples

3) On the electron

- In the 19th century the atom was thought to be composed of smaller particles.
- *Confirmation:* “Experiments using a cathode ray tube, containing positively and negatively charged plates, deflect the cathode beam away from the positively charged plate.”

Argumentation



More examples

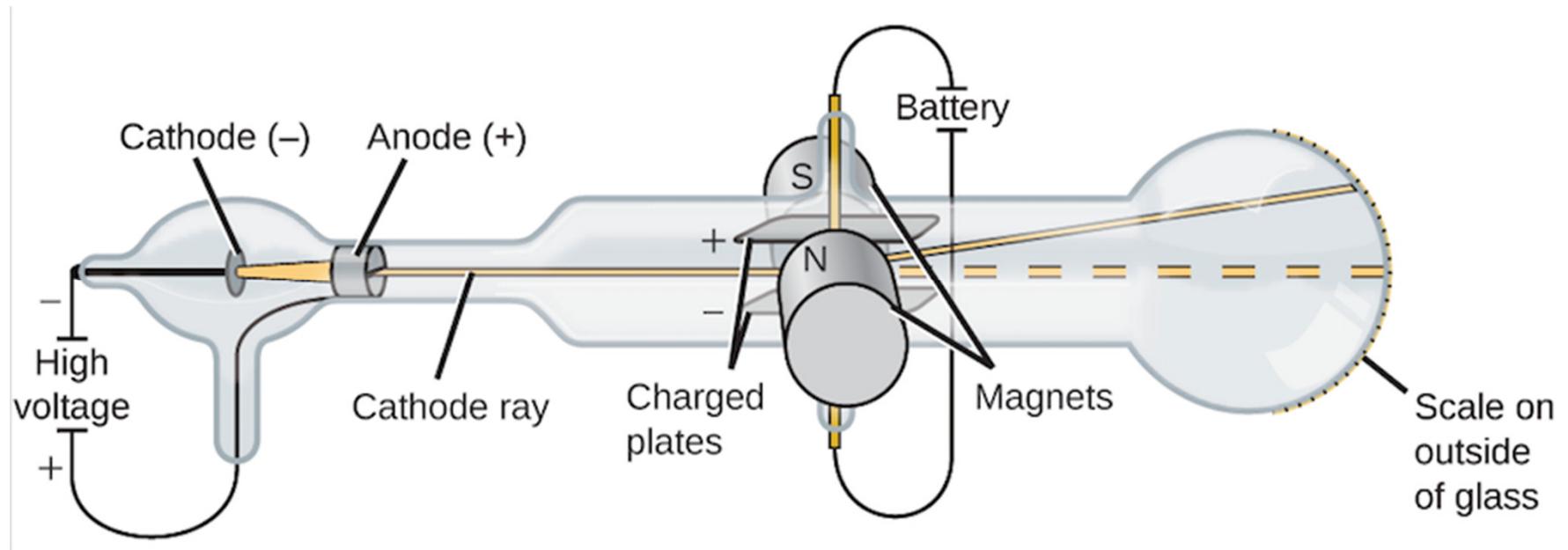
3) On the electron

- In the 19th century the atom was thought to be composed of smaller particles.
- *Confirmation:* “The cathode ray strikes the glass bulb not in the centre but towards the top, in a direction away from the negatively charged plate.” (see picture below)

Argumentation

More examples

3) On the electron



Observe the natural world and ask a question about it

I saw this happen. Why did it happen? How did it happen? Etc.

For a claim/hypothesis

This is the reason it happens ... This is how it happens ...

Conduct experiment (i.e. collect and analyse data)

Evidence 1

Information/data
used to support of
refute the claim

Evidence 2

Information/data
used to support of
refute the claim

Evidence 3

Information/data
used to support of
refute the claim

Reasoning/argumentation used

to explain why claim is true

to explain why claim is true

Reasoning/argumentation used

Argumentation



Exercise: Recall the example of dropping the ball under gravity. In what situation could the assertion and reasoning be incorrect?

1)

2)

Argumentation



Exercise

- What assertions, claims or theories were used in your discipline in the past that are now no longer used?
- What arguments were provided to support these claims?
- Why are these claims no longer accepted?

Approaches to argumentation



1) "A did X because of Y"

- See notes for examples and exercises.

2) "Since/If – Then – Because"

- See notes for examples and exercises.

Argumentation vs description



- Argumentation is a form of reasoning used to
 - justify the truth of a belief;
 - explain how things could have been different;
 - explain why one thing is better/worse than another thing;
 - justify how a particular conclusion was arrived at.

etc. These are just a few examples.

Argumentation vs description



- Description is a form of explanation used simply to
 - give information
 - state things as they are;
 - say that “this is like that”;
 - report on somethingetc. (summaries act as descriptions).

Argumentation vs description



- Description does not
 - compare or contrast anything;
 - argue for or against anything;
 - criticises or judge anything;
 - analyse the pros and cons of anything;etc.

The language of argumentation



- Argumentation involves certain types of vocabulary, phrasing and sentence building.
- See the table in the notes for examples of phrasing.
- These examples are designed to illustrate the underlying style of argumentation language.
- Example: See notes.

The language of argumentation

Because X is	<ul style="list-style-type: none"> is similar to □ is different from □ can be contrasted with ... 	Y in	<ul style="list-style-type: none"> several □ a number of □ □ ... 	<ul style="list-style-type: none"> ways □ means □ respects ... 	we	<ul style="list-style-type: none"> introduce alter add assume □ ...
Due to the	<ul style="list-style-type: none"> similarities differences changes deviations □ ... 	<ul style="list-style-type: none"> in ... from ... with respect to ... 	<ul style="list-style-type: none"> as a result of due to because of by reason of in order to account for ... 	we have	<ul style="list-style-type: none"> introduced altered added assumed □ ... 	
X is/has a	<ul style="list-style-type: none"> important □ significant □ major ... 	<ul style="list-style-type: none"> impact determinant tendency trend □ ... 	on/towards ... as a result of	<ul style="list-style-type: none"> alterations additions modifications changes adjustments ... 	made to ...	

Argumentation



- **A possible definition**

Argumentation is about using language which illustrate one's close, reflective reading of the text, where such language is seen via aspects of comparing and contrasting, discussing advantages and disadvantages, pros and cons, cause and effect, etc.