

# Logic & Arguments

## What is Logic?

# Logic & Arguments

**Logic is the study of arguments.**

# Logic & Arguments

**What is an argument?**

# Logic & Arguments

**Arguments** have structure:

- **Conclusion:** a sentence (or 'proposition') argued for.
- **Premises:** sentences (or 'propositions') intended to give reasons for thinking conclusion is true.

# Logic & Arguments

The Labour Party will win the next UK General Election. When real wages are falling, the opposition party tends to win. Moreover, real wages *are* falling and Labour is the opposition party.

Is this an **argument**?

If so, what is the **conclusion**? What are the **premises**?

# Logic & Arguments

The Labour Party will win the next UK General Election. When real wages are falling, the opposition party tends to win. Moreover, real wages *are* falling and Labour is the opposition party.

# Logic & Arguments

## Argument 1:

**P1:** When real wages are falling, the opposition party tends to win (the following General Election).

**P2:** Real wages *are* falling and Labour is the opposition party.

**C:** The Labour Party will win the next UK General Election.

# Logic & Arguments

Is the following a **good** argument? Why or why not?

## Argument 2:

**P1:** All bachelors are unmarried.

**P2:** Prince Harry is a bachelor.

**C:** Prince Harry is unmarried.



# Logic & Arguments

How about this one?

## Argument 3:

**P1:** All men are unmarried.

**P2:** Prince Harry is a man.

**C:** Prince Harry is unmarried.

# Logic & Arguments

And this one?

## Argument 4:

**P1:** All bachelors are unmarried.

**P2:** Prince Harry is a bachelor.

**C:** Prince Harry has red hair.

# Logic & Arguments

Finally, what about this one?

## Argument 5:

**P1:** All men are unmarried.

**P2:** Prince Harry is a man. **C:**

Prince Harry has red hair.

# Logic & Arguments

**What makes an argument good?**

# Logic & Arguments

Two main criteria:

1. All of the premises are true.
2. The premises support the conclusion.

As logicians, we tend to be more interested in 2 than 1.

# Logic & Arguments

## Argument 1:

**P1:** When real wages are falling, the opposition party tends to win (the following General Election).

**P2:** Real wages *are* falling and Labour is the opposition party.

**C:** The Labour Party will win the next UK General Election.

Truth of premises are matters that economists & political scientists (or Google!) are best qualified to answer.

Logicians better qualified to evaluate whether premises support conclusion.

# Logic & Arguments

## Caveat:

Truth/falsity of a premise (or conclusion) sometimes a purely **logical**, rather than **empirical**, matter.

E.g. **All bachelors are unmarried.**

True in virtue of meaning of 'bachelor' & 'married'.

# Validity

## Validity

- An argument is **valid** iff it's impossible for all of the premises to be true & the conclusion to be false (at the same time).
- Where this is so, the premises **logically entail** the conclusion.



# Validity

Is this argument valid?

## Argument 1:

**P1:** When real wages are falling, the opposition party tends to win (the following General Election).

**P2:** Real wages *are* falling and Labour is the opposition party.

**C:** The Labour Party will win the next UK General Election.

# Validity

What about this one?

## Argument 2:

**P1:** All bachelors are unmarried.

**P2:** Prince Harry is a bachelor.

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# Validity

How about this one?

## Argument 3:

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# Validity

And this one?

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# Validity

Finally, what about this one?

## Argument 5:

**P1:** All men are unmarried.

**P2:** Prince Harry is a man. **C:**

Prince Harry has red hair.

# Validity

Can an argument be good if it's not valid?

Why or why not?

# Validity

## Argument 1:

**P1:** When real wages are falling, the opposition party tends to win (the following General Election).

**P2:** Real wages *are* falling and Labour is the opposition party.

**C:** The Labour Party will win the next UK General Election.

# Validity

Premises **inductively support** conclusion when premises make conclusion **likely**, but it's possible for premises to all be true & conclusion false.

Such an argument is **inductively cogent**, but **not valid**.



# Validity

Can an argument be bad if it is valid?

Why or why not?

# Validity

**Is this a good argument?**

**Argument 3:**

**P1:** All men are unmarried.

**P2:** Prince Harry is a man.

**C:** Prince Harry is unmarried.

# Validity

## Soundness

An argument is **sound** iff it is **valid** & **all of its premises are true.**

# Validity

**Is this argument sound?**

**Argument 2:**

**P1:** All bachelors are unmarried.

**P2:** Prince Harry is a bachelor.

**C:** Prince Harry is unmarried.

# Validity

**How about this one?**

**Argument 3:**

**P1:** All men are unmarried.

**P2:** Prince Harry is a man.

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# Validity

**How about this one?**

**Argument 4:**

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# Validity

**Finally, what about this one?**

**Argument 5:**

**P1:** All men are unmarried.

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# Summary

<b>Relation of Premises to Conclusion</b>	<b>Premises</b>	<b>Valid/Cogent?</b>	<b>Argument Sound?</b>	<b>Argument Good?</b>	<b>Example</b>
<i>Impossible for premises to be true while conclusion false</i>	All true	Deductively valid	Yes	Yes	Argument 2
<i>Impossible for premises to be true while conclusion false</i>	Some false	Deductively valid	No	No	Argument 3
<i>Premises make conclusion likely, but it's still possible for premises to be true while conclusion false</i>	All true	Inductively cogent, but not deductively valid	No	Yes	Argument 1?
<i>Premises make conclusion likely, but it's still possible for premises to be true while conclusion false</i>	Some false	Inductively cogent, but not deductively valid	No	No	Argument 1?
<i>Premises don't even make conclusion likely</i>	All true	Neither deductively valid nor inductively cogent	No	No	Argument 4
<i>Premises don't even make conclusion likely</i>	Some false	Neither deductively valid nor inductively cogent	No	No	Argument 5



# Summary

We will only be concerned with whether an argument is **deductively valid** or **invalid**.

This is a course in **deductive logic**.

There is a branch of logic – **inductive logic** – concerned with inductive cogency of arguments.