Critical Thinking
University of St Andrews March 2007

Critical thinking is about arguments: what are arguments, what types of arguments are there, why are some arguments better than others?

A. Arguments are made up of statements, which can be either true or false.
Which of the following are statements?

1. The Sun goes round the Earth.
2. I like chocolate.
3. Mmm, chocolate…
4. Watch out for pickpockets in this area.
5. Pickpockets are at work in this area.
6. Coffee can be bitter if you drink it without milk or sugar.
7. Windfarms are a necessary part of the solution to global warming.
8. We should build windfarms now.
9. What could be worse than having a windfarm outside your front door?
10. Windfarms now!

B. An argument has a structure, with premise(s) and a conclusion.
The premises are supposed to act as reasons to believe the conclusion. Which of the following are arguments, and which are just lists of statements? For each argument, what is the conclusion?

1. Before they start school, all children need to acquire many skills, for example, speaking, dressing, washing, identifying colours. Parents are perfectly capable of teaching these skills. Instead of spending money on nursery education, we should spend it on educating people to become good parents.

2. Red squirrels can eat yew berries, hawthorn berries and rosehips. Grey squirrels can eat none of these. However, grey squirrels eat acorns which red squirrels cannot eat.
3. Averting global warming is the most important problem facing humanity right now, and windfarms are an essential element in combating global warming. So the Executive should license as many windfarms as possible.

4. In recent years, the demand for computer-literate personnel has increased. More students are graduating in computing science than before. Some companies find that these graduates require further training before embarking on a career in computing.

5. The North American Wildlife Federation, which sponsors an annual watch for endangered species, reports that sightings of the bald eagle between 1978 and 1979 increased by 35 per cent. In 1979, 13,127 sightings were reported, 3,400 over the 1978 count. This indicates considerable growth in the bald eagle population.

6. To make an assessment of modern art is an impossible task. For one can assess a work of art only when there are accepted rules and conventions. Modern art has no rules and conventions.

7. Oddly enough, a reduction in the present penalty for drunk driving would have a beneficial effect. A mild penalty makes the jury more ready to convict.

An argument is often signalled by words like ‘so’, ‘therefore’, ‘thus’, ‘for’, ‘since’, but this is only a rule of thumb, and some arguments are not explicitly signalled.

C. Some arguments are valid and some are invalid.

When we judge validity, we judge the internal structure of the argument. We do not judge whether the premises are true. When we say that an argument is valid, we say that if the premises were true then the conclusion would have to be true. In other words, it’s impossible for the premises to be true and the conclusion false.
What are the conclusions of the following arguments, and which arguments are valid?

1. St Andrews is by far the biggest city in Scotland. The capital of a country is always its biggest city. So St Andrews is the capital of Scotland.

2. St Andrews is a medium-sized town on the east coast. Glasgow is the largest city in Scotland. So Glasgow is to the west of St Andrews.

3. To make an assessment of modern art is an impossible task. For one can assess a work of art only when there are accepted rules and conventions. Modern art has no rules and conventions.

4. If imprisonment worked as a deterrent to potential criminals, the more people we had in prison to serve as examples, the more would their lesson be conveyed to those outside prison. But clearly imprisonment is not an effective deterrent, for today we have record numbers of people in prison, and a crime rate which is growing, not decreasing.

Could there be a valid argument with:

1. all true premises and true conclusion?
2. some true premises, some false premises, and a true conclusion?
3. all false premises and a true conclusion?
4. all true premises and a false conclusion?
5. some true premises, some false premises and a false conclusion?
6. all false premises and a false conclusion?

What about an invalid argument?
D. Some arguments are sound, and some are not.

To be sound, an argument must be valid and have all true premises. Skills of reasoning can help us tell whether an argument is valid, but to detect soundness we must rely on our general knowledge of what’s true and what’s false.

Why are sound arguments particularly valuable?

E. Some arguments are deductive and some are inductive.

A deductive argument is one which aims to be valid, i.e. absolutely watertight. An inductive argument is one in which the premises are supposed to give you good grounds to accept the conclusion, but without guaranteeing that the conclusion is true.

Which of the following arguments are deductive, and which are inductive?

1. Jenny won’t be there on time, she’s almost always late.

2. Every student here today has a copy of the handout, Jenny is a student here today, so she has a copy of the handout.

3. Every student here today was given a copy of the handout this morning. Jenny is a student here today, so she has her handout with her now.

4. Tests have repeatedly indicated a correlation between watching TV amongst young children and obesity in later life. If we want to tackle obesity, we must tackle the menace of Cbeebies.

5. Watching TV in early childhood causes obesity in later life. If we want to tackle obesity, we must tackle the menace of Cbeebies.

Sound deductive arguments are the most reliable but interesting ones are difficult to find, and most scientific and everyday arguments are inductive.
F. How arguments fail

An argument can fail by having false premises, or by having premises which do not support the conclusion. Some common ways in which arguments can fail are called ‘fallacies’. Learning about fallacies can help us spot failing arguments – our own or other people’s.

Some fallacies give rise to false premises, e.g. ‘false dilemma’: either you support the war in Iraq or you support terrorism.

Other fallacies give rise to premises which do not support the conclusion. E.g.

‘Begging the question’:

1. We shouldn’t test cosmetics on animals, because that’s not the sort of practice we should be involved in.

2. Euthanasia is wrong because life is sacred.

‘Affirming the consequent’:

3. If she was secretly in love with me, she’d ignore me all the time. She ignores me all the time, so she must be secretly in love with me.

4. If dinosaurs used to roam the Earth, we would find their remains today. We find dinosaur remains today. So dinosaurs used to roam the Earth.

‘Denying the antecedent’:

5. If you’re in Glasgow right now, then you’re in Scotland. You’re not in Glasgow, so you’re not in Scotland.

6. If he really wants to be here, he’ll be here on time. He doesn’t really want to be here, so he won’t be on time.

‘Slippery slope’:

7. We wouldn’t want the whole of Scotland to be covered in windfarms, so we mustn’t allow any to be built.

8. If we let one student have the answers before the test, we’ll have to let them all. So we shouldn’t let anyone have the answers before the test.