Valid Arguments

Clicker Question

What cannot occur in a valid argument?

A. A false conclusion
B. False premises
C. All true premises and a false conclusion
D. False premises and a true conclusion

Clicker Question

An argument with a false conclusion is

A. Not sound
B. Not valid
C. Valid but not sound
D. Cannot tell

Clicker Question

In the statement "If there is a problem, I will fix it"

A. "There is a problem" is a premise
B. "There is a problem" is a antecendent
C. "I will fix it" is the conclusion
D. The argument is not valid

Clicker Question

The statement:
Unless Congress acts, taxes will increase
is equivalent to

A. If Congress acts, taxes will increase
B. If Congress acts, taxes will not increase
C. If Congress does not act, taxes will increase
D. If Congress does not act, taxes will not increase

Clicker Question

Which statement is not equivalent to the others?

There are no fires unless there are Santa Ana winds
If there are Santa Ana winds, there are fires
If there are fires, there are Santa Ana winds
There are fires only if there are Santa Ana winds

Clicker Question

In the statement:

Only if the ducks quack will the ice freeze

A. The ducks quack is a sufficient condition for ice freezing
B. Ice freezing is a necessary condition for ducks quacking
C. Ducks quacking is a necessary condition for ice freezing
D. Ducks quacking is a necessary and a sufficient condition for ice freezing

Clicker Question

Assume:

Sales are increasing **= T** ***Our sales force is less effective*** **= F**
We need to build a new plant **= F** ***We have excess production capacity*** **= T**

What is the truth value of the following statement?

Whenever sales are increasing, we need to build a new plant

A. True
B. False

Clicker Question

Assume:

Sales are increasing **= T** ***Our sales force is less effective*** **= F**
We need to build a new plant **= F** ***We have excess production capacity*** **= T**

What is the truth value of the following statement?

Only if sales are increasing do we need to build a new plant

A. True
B. False

Clicker Question

Assume:

***Sales are increasing* = T** ***Our sales force is less effective* = F**
***We need to build a new plant* = F** ***We have excess production capacity* = T**

What is the truth value of the following statement?

Unless we have excess production capacity, we need to build a new plant

A. True
B. False

Using conditionals in inference

There are two ways to use a conditional statement in a **valid** inference, one obvious, one less so:

The obvious way:
From *IF A, THEN B*, affirm A
From this it follows that B

Why?
If *B* weren't true, and A is true
If A, then B would be rendered false

So, the following form is VALID:
If A, then B
A
∴B ***Modus ponens***

Using conditionals in inference - 2

The second, less obvious way
From IF A, THEN B, deny B
From this is follows that A is false

If B is false and A is true, then what is the truth value of IF A, THEN B?

It is false. Thus A cannot be true when the whole conditional is true. Accordingly:

If A, then B
Not B
∴Not A
is VALID Modus tollens

Uses of conditional arguments in scientific reasoning

Modus ponens is most commonly invoked to make predictions from a hypothesis

If malaria is transmitted by mosquitoes and we eliminate the mosquitoes, malaria will decline
Malaria is transmitted by mosquitoes and we are eliminating the mosquitoes
∴Malaria will decline

Modus tollens is most commonly invoked to confirm or falsify a hypothesis based on the truth of falsity of a prediction

Invalid conditional arguments

Not all arguments that start with conditional statements are valid

What can you conclude about B (validly) from:

If A, then B
Not A
?

Denying the Antecedent
INVALID

Remember, to be valid, it must be that *if the premises were true, the conclusion would also have to be true*

What conclusion about B has to be true in this case?
Both *B* and *not B* are compatible with the premises
There is no valid argument here!

Invalid conditional arguments - 2

What about if we start with:

If A, then B
B
?

Affirming the consequent
INVALID

What conclusion about A has to be true in this case?
Both *A* and *Not A* are compatible with these premises
There is no valid argument here either!

Overview

- **Valid argument forms:**

  If A, then B
  A
  ∴B
  - *Modus ponens*

  If A, then B
  Not B
  ∴Not A
  – *Modus tollens*

- **Invalid argument forms**

  If A, then B
  Not A
  ∴Not B
  – Denying the antecedent

  If A, then B
  B
  ∴A
  – Affirming the consequent

Clicker Question

- What form is this argument?
  - I know I passed since I took the test, and if I took the test, I passed.

A. Modus ponens
B. Affirming the consequent
C. Modus tollens
D. Denying the antecedent

Clicker Question

- What form is this argument?
  - Whenever the computer is broken, I have to calculate the result by hand. Today I had to calculate the result by hand. Thus, the computer must have been broken.

A. Modus ponens
B. Affirming the consequent
C. Modus tollens
D. Denying the antecedent

Clicker Question

- Why is the following argument not valid
  - I read all the material on the Inquiry Website, therefore I will ace the exam

A. You didn't really read ALL the material
B. The premise could be true and the conclusion false
C. The argument doesn't have the form modus ponies
D. I will not ace the exam

Clicker Question

- What form is this argument?
  - Only if the dog is white is the ball blue. Indeed, the dog is white. So, the ball is blue.

A. Modus ponens
B. Affirming the consequent
C. Modus tollens
D. Denying the antecedent