Pg 28 (Handout)

#21b) $p \to q$ is false

$p \vee q$ — true

p true $\wedge$ q false

$p \wedge \neg q$

#21c) $q \to p$ — false

true by default

2a $(p \wedge q)$

2b $(p \vee q)$

} Negate

You have 3 baskets:

- one with apples only
- one with oranges only
- one with both

The labels on each basket are all wrong.

Pick one fruit from one basket and then correctly label all 3 baskets

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An airline has 100 passengers in line to board.

Passenger 1 has a ticket for seat 1

passenger 2 has a ticket for seat 2

etc...

But passenger 1 decides to ignore the rule and randomly picks a seat instead.

Every other passenger tries to go to their original seat; if it's occupied already they randomly pick another seat instead.

What's the probability that passenger 100 ends up in their original seat?

Arguments

statements are true or false
arguments are valid or invalid

dfn: Argument: A sequence of statements (propositions) that ends with a conclusion.

If Socrates is a man, then Socrates is mortal.
Socrates is a man.
∴ Socrates is mortal.

valid argument form:

$p \to q$
p
$\therefore q$

} valid argument form.

dfn: argument form: a sequence of statement forms

dfn: An argument form is VALID when and only when, no matter what particular statements are substituted for the statement variables in its premises:

IF the premises are ALL true, THEN the conclusion is true.

example:

$p \to q$
p
$\therefore q$

a valid argument form

premise
premise
premise
⋮
conclusion

p	q	p → q	
(T)	T	(T)	← critical row
T	F	F	
F	T	T	
F	F	T	
premise 2	conclusion	premise 1	

conclusion is true
∴ valid arg. form.

Q: Is this valid!

$p \vee (q \vee r)$ premise 1

$\sim r$ premise 2

$\therefore p \vee q$ conclusion

A)

p	q	r	~r	q∨r	p∨(q∨r)	p∨q
T	T	T	F	T	T	
T	T	F	(T)	T	(T)	CR T
T	F	T	F	T	T	
T	F	F	(T)	F	(T)	CR T
F	T	T	F	T	T	
F	T	F	(T)	T	(T)	CR T
F	F	T	F	T	T	
F	F	F	(P2)	F	(P1)	F
						CONCLUSION

looks valid so far keep going

looks valid still keep going

looks valid again keep going

all CR's have a true conclusion ∴ this is a valid arg. form.

ex.

① I am 10 ft or 20 ft or 30 ft tall

② I am not 10 ft tall

∴ I am 20 ft or 30 ft tall

This is valid reasoning

False conclusion

prosecutor tries to show they're dealing with a CR. Defense tries to show they're NOT.

Valid? Prove it.

$p \to q \vee \sim r$ i.e. $p \to (q \vee \sim r)$

$q \to p \wedge r$

$\therefore p \to r$

p	q	r	~r	q ∨ ~r	p → (q ∨ ~r)	p ∧ r	q → (p ∧ r)	p → r	? CR
T	T	T	F	T	T	T	T	T go on	✓
T	T	F	T	T	T	F	F		
T	F	T	F	F	F	T	T		
T	F	F	T	T	T	F	T	F ∴ stop	✓
F	T	T	F	T	T	F	F		
F	T	F	T	T	T	F	F		✓
F	F	T	F	F	T	F	T		✓
F	F	F	T	T	T	F	T		✓
					(P1)		(P2)		C

invalid

$p \to q$
p
$\therefore q$

p	q	$p \to q$	
(T)	T	(T)	✓ valid; only 1 CR
T	F	F	
F	T	T	
F	F	T	

(P1) (C) (P2)

2 premises

Some valid argument forms (rules of inference)

$p \to q$
p
$\therefore q$
} modus ponens

$p \to q$
$\sim q$
$\therefore \sim p$
} modus tollens

} know these

Valid?

If we are in Canada, then Mickey Mouse is prime minister.
We are in Canada

∴ Mickey Mouse is prime minister.

VALID; has the form of modus ponen

Valid?
If we are in Canada then we are bordered by the pacific + Atlantic ocean.

We are bordered by the pacific + Atlantic ocean.

∴ we are in canada.

CONVERSE ERROR

Invalid

Ask an American: True premise
True premise
False conclusion

True even if an American says it.

If Shaun is a cheater then Shaun sits in the back row.

Shaun sits in the back row
Shaun is a cheater

CONVERSE ERROR

If interest rates are going up
then stock market prices are going down.

Interest rates are not going up.

∴ Stock market prices are not going down.

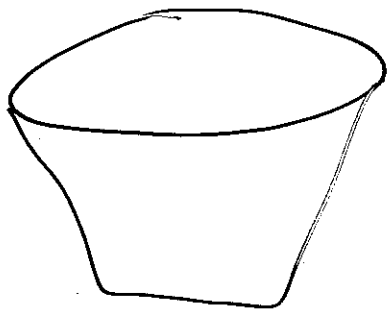
Invalid INVERSE ERROR

Q) Can you have a valid argument with a false conclusion?

$p \to q$
p
$\therefore q$

yes

p	q	p → q	
T	T	T	] CR VALID
T	F	F	
F	T	T	
F	F	T	
(P2)	(C)	(P1)	



All the balls in the bowl are red. TRUE

T or F?

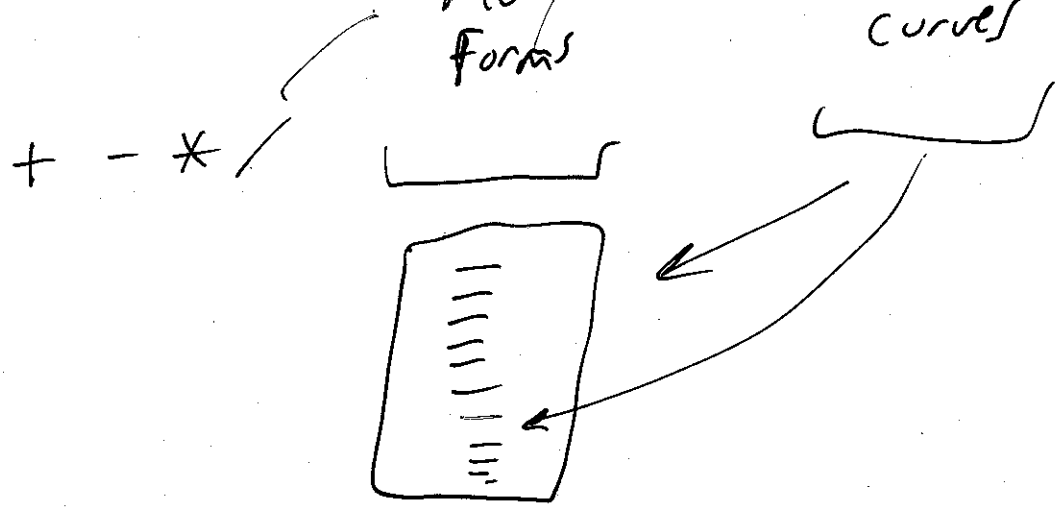
Taryana Shemura

Andrew Wiles

Nova PBS

Fermat's Last Thm

400



Valid?

$p \to q$
$q \to r$
$\therefore p \to r$

VALID?

Law of transitivity

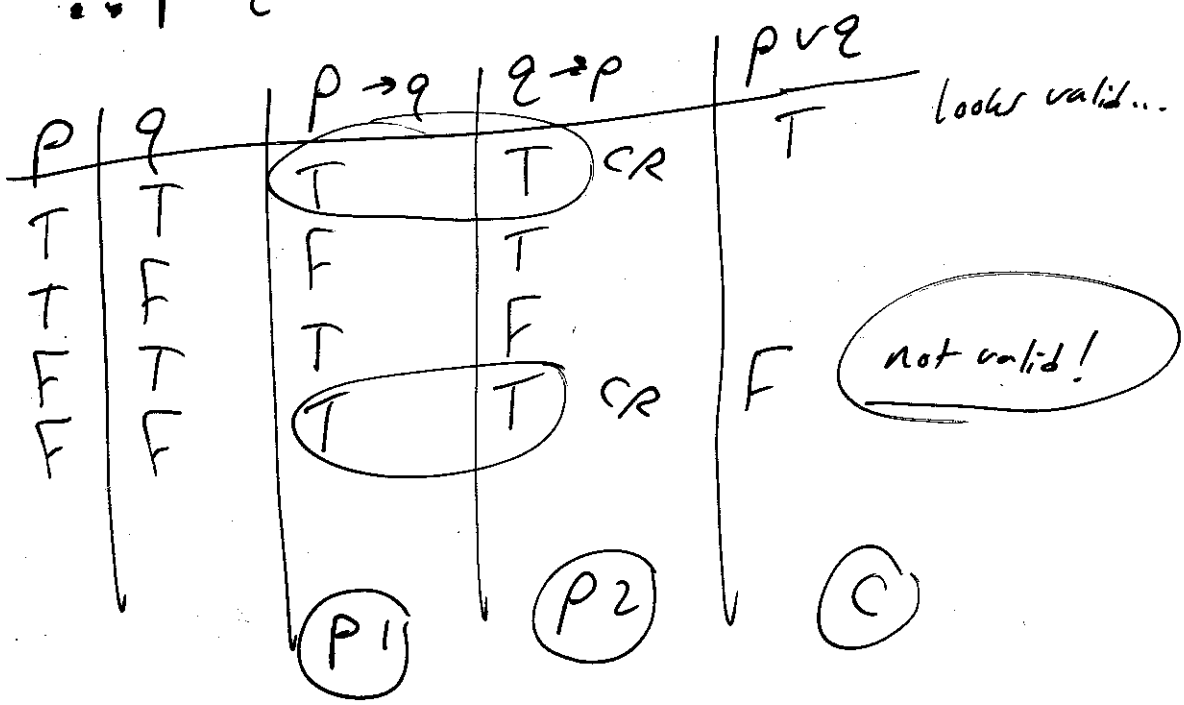
p	q	r	(P1) $p \to q$	(P2) $q \to r$	(C) $p \to r$	CR?
T	T	T	T	T CR	T ✓	✓
T	T	F	T	F	F False	
T	F	T	F	T	T True	
T	F	F	F	T	F	
F	T	T	T CR	T CR	T ✓	
F	T	F	T	F	T	
F	F	T	T CR	T CR	T ✓	
F	F	F	T CR	T CR	T ✓	

VALID

Handout: Rd pg 33-40 especially fallacies
1.3

-11-
-11-

Valid? $p \to q$
$q \to p$
$\therefore p \vee q$



Homework: Handout: 1.3 page 41 # 4 10 11 13b 23 28 32 38 40

NOTE: assignment questions: No need to simplify

$p \to q$
$\sim p$
$\therefore \sim q$
} inverse error