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NAAC ACCREDITED 'A' GRADE

Topic: Universal and Existential Quantifiers

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Universal and Existential Quantifiers.

Singular proposition affirms
↓
some individual things has a given predicate

→ There are ~~some~~ some propositional functions.

Example.

If —

M for mortal
B for beautiful
→ ~~Some~~ simple predicates that we have.
Mx and Bx
↓
assert humanity or beauty

x — Socrates
→ We can get singular propositions such as
'Socrates is mortal'
'Socrates is beautiful.

But there might be more than one individual.

→ 'Everything is mortal'
'Something is beautiful'.

'Everything is mortal.'
'Everything is beautiful'.
→ These expressions contain predicate terms.

↓

They are not singular propositions because they do not refer specifically to any particular individual
↓

General Propositions.

→ these general propositions may be expressed in ~~various~~ various ways that are logically equivalent.
↓

(1) All things are mortal.

OR

Given any individual thing whatever, it is mortal.

OR

Given any x, Mx. → Propositional function, not a proposition.

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The phrase 'Given any x' is customarily symbolized by '(x)'.

↓

universal quantifier.

So, the given proposition can be expressed by:—

(x) Mx. → Everything is mortal.

↓

This analysis shows that we can convert a propositional function into a proposition not only by substitution, but also by generalization or quantification.

(2) Something is beautiful.

↓

Can be expressed —

There is ~~an~~ at least one thing that is beautiful.

refers back to the word 'thing' ← relative ~~pronoun~~ pronoun

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~~Usi~~ Using individual variable x —

There is at least one x such that x is beautiful.

Using the notation —

There is at least one x such that Bx.

We have an expression that contains Bx that is a proposition.

← it is a propositional function.

The phrase 'there is at least one x such that'

↓

customarily symbolized by ($\exists x$)

↓

Existential quantifier.

So, the second general proposition completely symbolized as

$$(\exists x)\ Bx.$$

~~Therefore,~~
~~So, we see~~

Therefore, we see that propositions may be formed from propositional functions either by instantiation, that is, by substituting an individual constant for its individual variable, or by generalization, that is, by placing a universal or existential quantifier before it.

↓

i) The universal quantification of a propositional function, $(x)\ Mx$ is true if and only if all its substitution instances are true.

ii) The existential ~~quantifier~~ quantification of a propositional function, $(\exists x)\ Mx$, is true if and only if it has at least one true substitution instance.

↓

It is certain that, if the universal quantification of a propositional function is true, then the existential quantification of it must also be true.

But not all propositions are affirmative.

One may deny that 'Socrates is not mortal'.

↓

$\sim Ms$

↓

If Ms is a substitution instance of Mx, then $\sim Ms$ may be regarded as $\sim Mx$?

So, we begin some general propositions—

(1) Nothing is perfect.

↓ We can paraphrase as

Everything is imperfect.

↓ may be written as

Given any individual thing whatever, it is not perfect.

↓ can be rewrite

Given any x, x is not perfect

↓ So, if P symbolizes the attribute of being perfect

$(x) \sim Px$

There are some ~~importand~~ important connections between universal and existential ~~quat quantifiar~~ quantification.

i) The universal general proposition 'Everything is mortal' is denied by the existential general proposition 'Something is not mortal'.

We may say that $(x)Mx$ is denied by $(\exists x)\sim Mx$

$(x)Mx \overset{T}{\equiv} (\exists x)\sim Mx$ — biconditional is necessarily and logically true

ii) 'Everything is mortal' expresses exactly what is expressed by 'There is nothing that is not mortal'

$(x)Mx \equiv \sim(\exists x)\sim Mx$ → biconditional is also true.

iii) The universal general proposition, 'Nothing is mortal' is denied by the existential general proposition, 'Something is mortal.'

↓. ~~Symbolso~~

$(x) \sim Mx$ is denied by $(\exists x)\, Mx$.

$(x) \sim Mx \overset{T}{\equiv} (\exists x)\, Mx$. → biconditional is ~~a~~ logically and necessarily true

iv) 'Everything is mortal'. ~~is de...~~ is expressed by 'There is nothing that is mortal

$(x) \sim Mx \overset{T}{\equiv} \sim(\exists x)\, Mx$.

↓.

These four logically true biconditionals set forth the interrelations of universals and existential quantifiers.

We may replace any proposition with another logically equivalent proposition.

We can list these four biconditionals with the symbol ϕ (phi), which will stand for any simple predicate –

$$[(x)\,\phi x] \overset{T}{\equiv} [\sim(\exists x) \sim \phi x]$$

$$[(\exists x)\,\phi x] \overset{T}{\equiv} [\sim(x) \sim \phi x]$$

$$[(x) \sim \phi x] \overset{T}{\equiv} [\sim(\exists x)\,\phi x]$$

$$[(\exists x) \sim \phi x] \overset{T}{\equiv} [\sim(x)\,\phi x]$$

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