Solutions to Workbook Exercises

Unit 17:

Negated Categorical Propositions

Exercise "Negated Proposition A"

Symbolize the following propositions in two equivalent ways (as negations of a universal proposition and as an existential proposition). State the existential proposition in English.

U.D.: animals

Bx: x barks	Hx: x howls
Cx: x is a cat	Lx: x likes to walk
Dx: x is a dog	Mx: x meows
Fx: x likes canned food	Wx: x wags its tail

		$\sim\forall x\,(Sx \rightarrow Px)$	$\exists x\,(Sx \bullet \sim Px)$
(a)	Not all dogs howl.	$\sim\forall x\,(Dx \rightarrow Hx)$	$\exists x\,(Dx \bullet \sim Hx)$
	There is a dog that does not howl.		
(b)	Not every cat meows.	$\sim\forall x\,(Cx \rightarrow Mx)$	$\exists x\,(Cx \bullet \sim Mx)$
	There is a cat that does not meow.		
(c)	Not all dogs wag their tails.	$\sim\forall x\,(Dx \rightarrow Wx)$	$\exists x\,(Dx \bullet \sim Wx)$
	There is a dog that does not wag its tail.		
(d)	Not all cats like canned food.	$\sim\forall x\,(Cx \rightarrow Fx)$	$\exists x\,(Cx \bullet \sim Fx)$
	There is a cat that does not like canned food.		
(e)	Not every dog likes to walk.	$\sim\forall x\,(Dx \rightarrow Lx)$	$\exists x\,(Dx \bullet \sim Lx)$
	There is a dog that does not like to walk.		
(f)	Not all dogs bark.	$\sim\forall x\,(Dx \rightarrow Bx)$	$\exists x\,(Dx \bullet \sim Bx)$
	There is a dog that does not bark.		

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Exercise "Negated Proposition E"

Symbolize the following propositions in two equivalent ways (as negations of a universal proposition and as an existential proposition). State the existential proposition in English.

U.D.: animals

Ax: *x* likes to stay alone	*Fx*: *x* likes canned food
Cx: *x* is a cat	*Sx*: *x* likes to swim
Dx: *x* is a dog	*Wx*: *x* likes to walk

		$\sim\forall x\,(Sx \rightarrow \sim Px)$	$\exists x\,(Sx \bullet Px)$
(a)	It isn't the case that no cat likes to walk.	$\sim\forall x\,(Cx \rightarrow \sim Wx)$	$\exists x\,(Cx \bullet Wx)$
	There is a cat that likes to walk.		
(b)	It is false that no dogs like canned food.	$\sim\forall x\,(Dx \rightarrow \sim Fx)$	$\exists x\,(Dx \bullet Fx)$
	There is a dog that likes canned food.		
(c)	It is false that no dog likes to stay alone.	$\sim\forall x\,(Dx \rightarrow \sim Ax)$	$\exists x\,(Dx \bullet Ax)$
	There is a dog that likes to stay alone.		
(d)	It is false that no cats like canned food.	$\sim\forall x\,(Cx \rightarrow \sim Fx)$	$\exists x\,(Cx \bullet Fx)$
	There is a cat that likes canned food.		
(e)	The claim that no cat likes to swim is false	$\sim\forall x\,(Cx \rightarrow \sim Sx)$	$\exists x\,(Cx \bullet Sx)$
	There is a cat that likes to swim.		
(f)	It is false that no cat likes to stay alone.	$\sim\forall x\,(Cx \rightarrow \sim Ax)$	$\exists x\,(Cx \bullet Ax)$
	There is a cat that likes to stay alone.		

Exercise "Negated Proposition I"

Symbolize the following propositions in two equivalent ways (as negations of an existential proposition and as a universal proposition). State the negation of the existential proposition in English.

U.D.: animals

Ax: *x* likes to stay alone	*Fx*: *x* likes canned food
Cx: *x* is a cat	*Sx*: *x* likes to swim
Dx: *x* is a dog	*Wx*: *x* likes to walk

		$\sim\exists x\,(Sx \bullet Px)$	$\forall x\,(Sx \rightarrow \sim Px)$
(a)	No cats like to swim.	$\sim\exists x\,(Cx \bullet Sx)$	$\forall x\,(Cx \rightarrow \sim Sx)$
	It is not the case that: there is a cat that likes to swim.		
(b)	No dogs like canned food.	$\sim\exists x\,(Dx \bullet Fx)$	$\forall x\,(Dx \rightarrow \sim Fx)$
	It is not the case that: there is a dog that likes canned food.		
(c)	No dog likes to stay alone.	$\sim\exists x\,(Dx \bullet Ax)$	$\forall x\,(Dx \rightarrow \sim Ax)$
	It is not the case that: there is a dog that likes to stay alone.		
(d)	No cats like canned food.	$\sim\exists x\,(Cx \bullet Fx)$	$\forall x\,(Cx \rightarrow \sim Fx)$
	It is not the case that: there is a cat that likes canned food.		
(e)	No cat likes to walk.	$\sim\exists x\,(Cx \bullet Wx)$	$\forall x\,(Cx \rightarrow \sim Wx)$
	It is not the case that: there is a cat that likes to walk.		
(f)	No cat likes to stay alone.	$\sim\exists x\,(Cx \bullet Ax)$	$\forall x\,(Cx \rightarrow \sim Ax)$
	It is not the case that: there is a cat that likes to stay alone.		

Exercise "Negated Proposition O"

Symbolize the following propositions in two equivalent ways (as negations of an existential proposition and as a universal proposition). State the universal proposition in English.

U.D.: animals

Bx: *x* barks	*Hx*: *x* howls
Cx: *x* is a cat	*Lx*: *x* likes to walk
Dx: *x* is a dog	*Mx*: *x* meows
Fx: *x* likes canned food	*Wx*: *x* wags its tail

		$\sim\exists x\,(Sx \bullet \sim Px)$	$\forall x\,(Sx \rightarrow Px)$
(a)	There are no cats that do not meow.	$\sim\exists x\,(Cx \bullet \sim Mx)$	$\forall x\,(Cx \rightarrow Mx)$
	All cats meow.		
(b)	There are no dogs that do not bark.	$\sim\exists x\,(Dx \bullet \sim Bx)$	$\forall x\,(Dx \rightarrow Bx)$
	All dogs bark		
(c)	There are no dogs that do not howl.	$\sim\exists x\,(Dx \bullet \sim Hx)$	$\forall x\,(Dx \rightarrow Hx)$
	All dogs howl		
(d)	There are no dogs that don't wag their tails.	$\sim\exists x\,(Dx \bullet \sim Wx)$	$\forall x\,(Dx \rightarrow Wx)$
	All dogs wag their tails.		
(e)	There are no dogs that do not like to walk.	$\sim\exists x\,(Dx \bullet \sim Lx)$	$\forall x\,(Dx \rightarrow Lx)$
	All dogs like to walk.		
(f)	There are no cats that dislike canned food.	$\sim\exists x\,(Cx \bullet \sim Fx)$	$\forall x\,(Cx \rightarrow Fx)$
	All cats like canned food.		

Exercise "Negated Categorical Propositions"

Symbolize the following opinions about politicians using the symbolization key provided. In each case, provide two equivalent symbolizations.

U.D.: politicians

Ax: *x* is ambitious	*Ix*: *x* is intelligent
Cx: *x* is corrupt	*Nx*: *x* is new to politics
Dx: *x* is diligent	*Px*: *x* is pretentious
Hx: *x* is honest	*Tx*: *x* is tired

(a)	No intelligent politicians are corrupt.	$\forall x\,(Ix \rightarrow \sim Cx)$	$\sim\exists x\,(Ix \bullet Cx)$
(b)	There are no intelligent politicians who are not honest.	$\sim\exists x\,(Ix \bullet \sim Hx)$	$\forall x\,(Ix \rightarrow Hx)$
(c)	Not all corrupt politicians are intelligent.	$\sim\forall x\,(Cx \rightarrow Ix)$	$\exists x\,(Cx \bullet \sim Ix)$
(d)	Not all diligent politicians are tired.	$\sim\forall x\,(Dx \rightarrow Tx)$	$\exists x\,(Dx \bullet \sim Tx)$
(e)	There are no ambitious politicians who are not honest.	$\sim\exists x\,(Ax \bullet \sim Hx)$	$\forall x\,(Ax \rightarrow Hx)$
(f)	No honest politician is corrupt.	$\forall x\,(Hx \rightarrow \sim Cx)$	$\sim\exists x\,(Hx \bullet Cx)$
(g)	It is not the case that no diligent politician is corrupt.	$\sim\forall x\,(Dx \rightarrow \sim Cx)$	$\exists x\,(Dx \bullet Cx)$
(h)	No corrupt politician is honest.	$\forall x\,(Cx \rightarrow \sim Hx)$	$\sim\exists x\,(Cx \bullet Hx)$
(i)	There are no pretentious politicians who are new to politics.	$\forall x\,(Px \rightarrow \sim Nx)$	$\sim\exists x\,(Px \bullet Nx)$
(j)	Not all honest politicians are tired.	$\sim\forall x\,(Hx \rightarrow Tx)$	$\exists x\,(Hx \bullet \sim Tx)$
(k)	It is not the case that no corrupt politician is tired.	$\sim\forall x\,(Cx \rightarrow \sim Tx)$	$\exists x\,(Cx \bullet Tx)$
(l)	No honest politician is pretentious.	$\forall x\,(Hx \rightarrow \sim Px)$	$\sim\exists x\,(Hx \bullet Px)$
(m)	Not only ambitious politicians are corrupt.	$\sim\forall x\,(Cx \rightarrow Ax)$	$\exists x\,(Cx \bullet \sim Ax)$