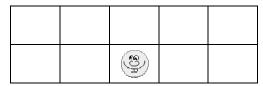
### **Solutions to Workbook Exercises**

#### **Unit 15:**

## **Quantifiers and Negation**

### **Existentialization of a negation:**

- [2]  $\exists x \sim Bx$
- $\{2\}$  There is an x such that x is not beautiful.
- (2) Somebody is not beautiful.



### Universalization of a negation:

- [4]  $\forall x \sim Bx$
- {4} For every *x*, *x* is not beautiful. [Everybody is not beautiful.]
- (4) Nobody is beautiful.



# Exercise "Canonical Reading"

(2) U.D.: people Px: x is happy (3) U.D.: dogs Px: x barks (4) U.D.: husbands Px: x cheats on his wife (5) U.D.: things Px: x is round  (1) There is an x, such that x is not wise. Someone is not wise.  (2) There is an x, such that x is not happy. Someone is not happy.  (3) There is an x, such that x does not bark. Some dogs do not bark.  (4) There is an x, such that x does not cheat on his wife. Some husbands do not cheat on their wives.  (5) There is an x, such that x is not round. Something is not round.  (1) There is no x, such that x is wise. Nobody is wise.  (2) There is no x, such that x is happy. Nobody is happy.  (3) There is no x, such that x barks. No dogs bark.  (4) There is no x, such that x barks. No dogs bark.  (5) There is no x, such that x cheats on his wife. No husband cheats on his wife.  (5) There is no x, such that x is round. Nothing is round.			(1)	U.D.: people	Px: x is wise	
<ul> <li>(4) U.D.: husbands Px: x cheats on his wife</li> <li>(5) U.D.: things Px: x is round</li> <li>(1) There is an x, such that x is not wise.</li></ul>			(2)	U.D.: people	Px: x is happy	
(5) U.D.: things  Px: x is round  (1) There is an x, such that x is not wise.   Someone is not wise.  (2) There is an x, such that x is not happy.   Someone is not happy.  (3) There is an x, such that x does not bark.   Some dogs do not bark.  (4) There is an x, such that x does not cheat on his wife.   Some husbands do not cheat on their wives.  (5) There is an x, such that x is not round.   Something is not round.  (1) There is no x, such that x is wise.   Nobody is wise.  (2) There is no x, such that x is happy.   Nobody is happy.  (3) There is no x, such that x barks.   No dogs bark.  (4) There is no x, such that x cheats on his wife.   No husband cheats on his wife.  (5) There is no x, such that x is round.			(3)	U.D.: dogs	Px: x barks	
(1) There is an <i>x</i> , such that <i>x</i> is not wise.  Someone is not wise.  (2) There is an <i>x</i> , such that <i>x</i> is not happy.  Someone is not happy.  (3) There is an <i>x</i> , such that <i>x</i> does not bark.  Some dogs do not bark.  (4) There is an <i>x</i> , such that <i>x</i> does not cheat on his wife.  Some husbands do not cheat on their wives.  (5) There is an <i>x</i> , such that <i>x</i> is not round.  Something is not round.  (1) There is no <i>x</i> , such that <i>x</i> is wise.  Nobody is wise.  (2) There is no <i>x</i> , such that <i>x</i> is happy.  Nobody is happy.  (3) There is no <i>x</i> , such that <i>x</i> barks.  No dogs bark.  (4) There is no <i>x</i> , such that <i>x</i> cheats on his wife.  No husband cheats on his wife.  (5) There is no <i>x</i> , such that <i>x</i> is round.			(4)	U.D.: husbands	Px: x cheats on his wife	
Someone is not wise.  (2) There is an $x$ , such that $x$ is not happy. Someone is not happy.  (3) There is an $x$ , such that $x$ does not bark. Some dogs do not bark.  (4) There is an $x$ , such that $x$ does not cheat on his wife. Some husbands do not cheat on their wives.  (5) There is an $x$ , such that $x$ is not round. Something is not round.  (1) There is no $x$ , such that $x$ is wise. Nobody is wise.  (2) There is no $x$ , such that $x$ is happy. Nobody is happy.  (3) There is no $x$ , such that $x$ barks. No dogs bark.  (4) There is no $x$ , such that $x$ cheats on his wife. No husband cheats on his wife.  (5) There is no $x$ , such that $x$ is round.			(5)	U.D.: things	Px: x is round	
(2) There is an x, such that x is not happy. Someone is not happy.  (3) There is an x, such that x does not bark. Some dogs do not bark.  (4) There is an x, such that x does not cheat on his wife. Some husbands do not cheat on their wives.  (5) There is an x, such that x is not round. Something is not round.  (1) There is no x, such that x is wise. Nobody is wise.  (2) There is no x, such that x is happy. Nobody is happy.  (3) There is no x, such that x barks. No dogs bark.  (4) There is no x, such that x cheats on his wife. No husband cheats on his wife.  (5) There is no x, such that x is round.	(a)	$\exists x \sim Px$	(1)	There is an x, such that x is not wise.		
Someone is not happy.  (a) $\exists x \sim Px$ (3) There is an $x$ , such that $x$ does not bark. Some dogs do not bark.  (4) There is an $x$ , such that $x$ does not cheat on his wife. Some husbands do not cheat on their wives.  (5) There is an $x$ , such that $x$ is not round. Something is not round.  (1) There is no $x$ , such that $x$ is wise. Nobody is wise.  (2) There is no $x$ , such that $x$ is happy. Nobody is happy.  (3) There is no $x$ , such that $x$ barks. No dogs bark.  (4) There is no $x$ , such that $x$ cheats on his wife. No husband cheats on his wife.  (5) There is no $x$ , such that $x$ is round.				Someone is not wise.		
Some dogs do not bark.  (4) There is an $x$ , such that $x$ does not cheat on his wife. Some husbands do not cheat on their wives.  (5) There is an $x$ , such that $x$ is not round. Something is not round.  (1) There is no $x$ , such that $x$ is wise. Nobody is wise.  (2) There is no $x$ , such that $x$ is happy. Nobody is happy.  (3) There is no $x$ , such that $x$ barks. No dogs bark.  (4) There is no $x$ , such that $x$ cheats on his wife. No husband cheats on his wife.  (5) There is no $x$ , such that $x$ is round.			(2)	***		
<ul> <li>(4) There is an x, such that x does not cheat on his wife. Some husbands do not cheat on their wives.</li> <li>(5) There is an x, such that x is not round. Something is not round.</li> <li>(1) There is no x, such that x is wise. Nobody is wise.</li> <li>(2) There is no x, such that x is happy. Nobody is happy.</li> <li>(3) There is no x, such that x barks. No dogs bark.</li> <li>(4) There is no x, such that x cheats on his wife. No husband cheats on his wife.</li> <li>(5) There is no x, such that x is round.</li> </ul>			(3)	There is an $x$ , such that $x$ does not bark.		
Something is not round.  (1) There is no x, such that x is wise.  Nobody is wise.  (2) There is no x, such that x is happy.  Nobody is happy.  (3) There is no x, such that x barks.  No dogs bark.  (4) There is no x, such that x cheats on his wife.  No husband cheats on his wife.  (5) There is no x, such that x is round.			(4)	There is an $x$ , such that $x$ does not cheat on his wife.		
Nobody is wise.  (2) There is no <i>x</i> , such that <i>x</i> is happy.  Nobody is happy.  (3) There is no <i>x</i> , such that <i>x</i> barks.  No dogs bark.  (4) There is no <i>x</i> , such that <i>x</i> cheats on his wife.  No husband cheats on his wife.  (5) There is no <i>x</i> , such that <i>x</i> is round.			(5)			
Nobody is happy.  (3) There is no <i>x</i> , such that <i>x</i> barks.  No dogs bark.  (4) There is no <i>x</i> , such that <i>x</i> cheats on his wife.  No husband cheats on his wife.  (5) There is no <i>x</i> , such that <i>x</i> is round.	(b)	$\sim \exists x Px$	(1)			
<ul> <li>(b) No dogs bark.</li> <li>(4) There is no x, such that x cheats on his wife. No husband cheats on his wife.</li> <li>(5) There is no x, such that x is round.</li> </ul>			(2)	·		
No dogs bark.  (4) There is no x, such that x cheats on his wife.  No husband cheats on his wife.  (5) There is no x, such that x is round.			(3)	There is no $x$ , such	that x barks.	
No husband cheats on his wife.  (5) There is no <i>x</i> , such that <i>x</i> is round.				No dogs bark.		
(5) There is no $x$ , such that $x$ is round.			(4)	There is no $x$ , such	that x cheats on his wife.	
				No husband cheats on his wife.		
Nothing is round.			(5)	There is no $x$ , such	that x is round.	
				Nothing is round.		

(1) U.D.: people Px: x is wise (2) U.D.: people Px: x is happy (3) U.D.: dogs Px: x barks Px: x cheats on his wife (4) U.D.: husbands (5) U.D.: things Px: x is round (1) Not: For every x, x is wise. Not everybody is wise. (2) Not: For every x, x is happy. Not everybody is happy. (3) Not: For every x, x barks. (c)  $\sim \forall x Px$ Not every dog barks. (4) Not: For every x, x cheats on his wife. Not every husband cheats on his wife. (5) Not: For every x, x is round. Not everything is round. (1) For every x, x is not wise. Nobody is wise. (2) For every x, x is not happy. Nobody is happy. (3) For every x, x does not bark. (d)  $\forall x \sim Px$ No dogs bark. (4) For every x, x does not cheat on his wife. No husband cheats on his wife. (5) For every x, x is not round. Nothing is round.

## **Exercise "Negated Quantifiers"**

Symbolize the following propositions in two equivalent ways:

U.D.: people		Hx: x is honest	Tx: x is trustworthy	
(a)	Not everybody is hones	st.	$\sim \forall x  Hx$	$\exists x \sim Hx$
(b)	Nobody is honest.		~∃ <i>x Hx</i>	$\forall x \sim Hx$
(c)	Somebody is dishonest		$\exists x \sim Hx$	$\sim \forall x  Hx$
(d)	Everybody is dishonest		$\forall x \sim Hx$	~∃ <i>x Hx</i>
(e)	Not everybody is trusty	vorthy.	$\sim \forall x \ Tx$	$\exists x \sim Tx$
(f)	Nobody is trustworthy.		~∃ <i>x Tx</i>	$\forall x \sim Tx$
(g)	Somebody is untrustwo	orthy.	$\exists x \sim Tx$	$\sim \forall x \ Tx$
(h)	Everybody is untrustwo	orthy.	$\forall x \sim Tx$	~∃ <i>x Tx</i>
(i)	Not everybody is untru	stworthy.	~∀ <i>x</i> ~ <i>Tx</i>	$\exists x \sim Tx$
(j)	Somebody is not dishort	nest.	$\exists x \sim Hx$	$\sim \forall x \sim Hx$