Philosophy 240: Symbolic Logic

Class #37 - Translation Using Identity I (§8.7)

### I. The identity predicate is a special predicate, with a special logic

Consider the following logical derivation:

<ol> <li>Superman can fly.</li> <li>Superman is Clark Kent.</li> <li>So, Clark Kent can fly.</li> </ol>	Fs
	???
	Fc

Identity, as in premise 2, is a relation among individuals. We could write it 'Esc'. But, identity has special logical properties, so we give it its own symbol, '='. Identity sentences thus look a little different from other dyadic relations.

Clark Kent is Superman	c=s
Mary Ann Evans is George Eliot	m=g

But, they are just two-place relations.

To deny an identity, we can write either '~a=b' or ' $a\neq b$ '. Negation applies to the identity predicate, and not to the objects related by that predicate.

We will discuss the special properties of the identity predicate on Monday. Today, we will learn a bit of translating, using a group exercise called a jigsaw.

### II. The jigsaw

Overview:

Organize your base groups and divide tasks. (10 minutes) Go to work groups and learn something. (10 minutes) Go back to base groups and teach what you learned in the work groups to the other members of your base group. (25 minutes, 5 minutes per topic)

Philosophy 240: Symbolic Logic

Hamilton College Russell Marcus

# Identity Theory Jigsaw Lesson Work Group: At Least

I. Translation key:

b: Berkeley; c: *The Critique of Pure Reason*; d: Descartes; f: Frege Cx: x is a coherentist; Ix: x is an idealist; Mx: x is a materialist; Px: x is a philosopher Mxy: x is read more widely than y; Rxy: x respects y; Sxy: x studies y; Wxy: x wrote y

II. Examine the translations below, which use the key in I.

1. At least one materialist respects Berkeley.

 $(\exists x)(Mx \bullet Rxb)$ 

2. At least two materialists respect Berkeley.

 $(\exists x)(\exists y)(Mx \bullet Rxb \bullet My \bullet Ryb \bullet x \neq y)$ 

3. There are at least three materialists who respect Berkeley.

 $(\exists x)(\exists y)(\exists z)(Mx \bullet Rxb \bullet My \bullet Ryb \bullet Mz \bullet Rzb \bullet x \neq y \bullet x \neq z \bullet y \neq z)$ 

4. At least two idealist philosophers respect each other.

 $(\exists x)(\exists y)(Ix \bullet Px \bullet Iy \bullet Py \bullet x \neq y \bullet Rxy \bullet Ryx)$ 

5. At least three coherentists respect some book by Descartes.

$$(\exists x)(\exists y)(\exists z)\{Cx \bullet Cy \bullet Cz \bullet x \neq y \bullet x \neq z \neq y \neq z \bullet (\exists w)[(Bw \bullet Wdw) \bullet Rxw] \bullet (\exists w)[(Bw \bullet Wdw) \bullet Ryw] \bullet (\exists w)[(Bw \bullet Wdw) \bullet Rzw] \}$$

III. Try these, using the key in I.

6. At least two philosophers are read more widely than Frege.

7. There are at least three philosophers who are read more widely than Frege.

8. At least four idealists study The Critique of Pure Reason.

Philosophy 240: Symbolic Logic

Hamilton College Russell Marcus

# Identity Theory Jigsaw Lesson Work Group: At Most

I. Translation key:

b: Berkeley; d: Descartes; h: Hume; k: Kant; n: Nietzsche
Ex: x is an empiricist; Ix: x is an idealist; Px: x is a philosopher; Rx: x is a rationalist
Lxy: x likes y; Mxy: x is read more widely than y; Pxy: x plays billiards with y; Rxy: x respects y; Wxy: x wrote y
Lxyz: x likes y better than z

II. Examine the translations below, which use the key in I. Note that 'at most' statements make no existential commitments.

1. Nietzsche respects at most one philosopher.

 $(\forall x)(\forall y)[(Px \bullet Rnx \bullet Py \bullet Rny) \supset x=y]$ 

2. Nietzsche respects at most two philosophers.

 $(\forall x)(\forall y)(\forall z)[(Px \bullet Rnx \bullet Py \bullet Rny \bullet Pz \bullet Rnz) \supset (x=y \lor x=z \lor y=z)]$ 

3. Kant likes at most two empiricists better than Hume.

 $(\forall x)(\forall y)(\forall z)[(Ex \bullet Lkxh \bullet Ey \bullet Lkyh \bullet Ez \bullet Lkzh) \supset (x=y \lor x=z \lor y=z)]$ 

4. At most one idealist plays billiards with some rationalist.

 $(\forall x)(\forall y)\{Ix \bullet (\exists z)(Rz \bullet Pxz) \bullet Iy \bullet (\exists z)(Rz \bullet Pyz)] \supset x=y\}$ 

5. At most two rationalists wrote a book more widely read than every book written by Hume.

 $\begin{aligned} (\forall x)(\forall y)(\forall z) \{ \{ Rx \bullet (\exists w)[Bw \bullet Wxw \bullet (\forall z)(Bz \bullet Whz) \supset Mwz] \bullet Ry \bullet (\exists w)[Bw \bullet Wyw \\ \bullet (\forall z)(Bz \bullet Whz) \supset Mwz] \bullet Rz \bullet (\exists w)[Bw \bullet Wzw \bullet (\forall z)(Bz \bullet Whz) \supset Mwz] \} \supset \\ (x=y \lor x=z \lor y=z) \} \end{aligned}$ 

III. Try these, using the key in I.

6. At most one philosopher is both an empiricist and a rationalist.

- 7. Berkeley respects at most two philosophers.
- 8. Some empiricists like Descartes but at most two.

Philosophy 240: Symbolic Logic

Hamilton College Russell Marcus

### Identity Theory Jigsaw Lesson Work Group: Superlatives

I. Translation key:

c: *The Critique of Pure Reason*; e: *The Ethics*; h: Hume; k: Kant; l: Locke; q: *The Inquiry Concerning Human Understanding*; s: Spinoza
Bx: x is a book; Ex: x is an empiricist; Px: x is a philosopher; Rx: x is a rationalist
Bxy: x is bigger than y; Dxy: x is more difficult to read than y; Mxy: x is read more widely than y; Oxy: x is more original than y; Wxy: x wrote y

II. Examine the translations below, which use the key in I.

1. The Ethics is more difficult to read than The Enquiry Concerning Human Understanding.

Deq

2. Hume is the biggest philosopher.

 $Ph \bullet (\forall x) [(Px \bullet x \neq h) \supset Bhx]$ 

3. Hume is not the most difficult empiricist to read.

Eh • ~ $(\forall x)[(Ex • x \neq h) \supset Dhx]$ 

4. *The Ethics* is the most difficult book by Spinoza to read.

Be • Wse •  $(\forall x)[(Bx • Wsx • x \neq e) \supset Dex]$ 

5. Either The Critique of Pure Reason or The Ethics is the most difficult book to read.

Bc • Be •  $(\forall x)[(Bx • x \neq c • x \neq e) \supset (Dcx \lor Dex)]$ 

III. Try these, using the key in I.

6. Spinoza is the most original philosopher.

7. The Critique of Pure Reason is the most well-read book written by Kant.

8. Some book is the biggest book written by an empiricist.

Philosophy 240: Symbolic Logic

Hamilton College Russell Marcus

# Identity Theory Jigsaw Lesson Work Group: Except

I. Translation key:

a: Aristotle; b: Berkeley; d: Descartes; g: Heidegger; i: Leibniz; l: Locke; n: Nietzsche; p: Plato; r: Arendt; s: Spinoza; t: Socrates
Bx: x is a book; Mx: x is a materialist; Px: x is a philosopher
Lxy: x likes y; Rxy: x respects y; Sxy: x studies y; Wxy: x wrote y

II. Examine the translations below, which use the key in I.

1. Every philosopher respects Locke.

 $(\forall x)(Px \supset Rxl)$ 

2. Every philosopher except Berkeley respects Locke

 $Pb \bullet \sim Rbl \bullet (\forall x)[(Px \bullet x \neq b) \supset Rxl]$ 

3. Nietzsche does not respect any philosopher except Spinoza.

 $Ps \bullet Rns \bullet (\forall x)[(Px \bullet x \neq s) \supset \sim Rnx]$ 

4. Some philosopher likes all philosophers except Plato and Aristotle.

 $Pp \bullet Pa \bullet (\exists x) \{ Px \bullet (\forall y) [(Py \bullet y \neq p \bullet y \neq a) \supset Lxy] \}$ 

5. Every philosopher but Socrates wrote a book.

 $Pt \bullet \sim (\exists x)(Bx \bullet Wtx) \bullet (\forall x)[(Px \bullet x \neq t) \supset (\exists y)(By \bullet Wxy)]$ 

III. Try these, using the key in I.

6. All philosophers are materialists except Leibniz and Berkeley.

7. No philosopher but Arendt respects Heidegger.

8. Some books are studied by every philosopher except Nietzsche.

Philosophy 240: Symbolic Logic

Hamilton College Russell Marcus

# Identity Theory Jigsaw Lesson Work Group: Only

#### I. Translation key

b: Berkeley; d: Descartes; h: Hume; k: Kant; l: Locke; n: Nietzsche; s: Spinoza; Ex: x is an empiricist; Px: x is a philosopher; Rx: x is a rationalist Lxy: x likes y; Mxy: x is read more widely than y; Pxy: x plays billiards with y; Rxy: x respects y

II. Examine the translations below, which use the key in I.

1. Nietzsche respects Spinoza

Rns

2. Nietzsche respects only Spinoza

Rns •  $(\forall x)(Rnx \supset x=s)$ 

3. Only Nietzsche doesn't like Nietzsche.

 $\sim$ Lnn • ( $\forall$ x)( $\sim$ Lxn  $\supset$  x=n)

4. Only Locke plays billiards with some rationalist who is read more widely than Descartes.

 $(\exists x)(Rx \bullet Mxd \bullet Plx) \bullet (\forall x)[(Rx \bullet Mxd) \supset (\forall y)(Pyx \supset y=l)]$ 

5. Only Kant is read more widely than Descartes and Hume.

 $Mkd \bullet Mkh \bullet (\forall x)[(Mxd \lor Mxh) \supset x=k]$ 

III. Try these, using the key in I.

6. Nietzsche is the only philosopher read more widely than Descartes.

- 7. Kant is the only empiricist who is also a rationalist.
- 8. Only Locke and Berkeley are empiricist philosophers respected by some rationalist philosopher.