

Exercises to 3.6 Identity

(1) Symbolize the sentences.

- 1) There are at least three sages.
- 2) There are at most three sages.
- 3) There are exactly three sages.

(2) Symbolize the sentences using the notations.

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| 1) | No one loves anyone but himself (herself). | F – ...loves...; D – the set of humans |
| 2) | Everyone loves someone else. | as above |
| 3) | There is something that is more perfect than anything but itself. | F – ...is more perfect than... |
| 4) | Nothing is against God except God himself. | F – ...is against..., a – God |
| 5) | For each thing there is another thing, more perfect than it. | F – ...is more perfect than... |
| 6) | If something is more perfect than everything but itself, it is God. | F – ...is more perfect than..., a – God |
| 7) | No one who desires the good of everyone but himself is selfish. | F – ...desires the good of..., G – ...is selfish; D – the set of humans |
| 8) | No one respects someone who respects no one but himself. | F – ...respects...; D – the set of humans |
| 9) | If two things are different, then one has a property that the other does not. | F – ...is a property, G – ...has... |
| 10) | Peter respects only Mary and John. | F – ...respects..., a – Peter, b – Mary, c – John |

(3) Prove the validity of the inferences using the notations.

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| 1) | John swims faster than the team's coach.
No one swims faster than himself (herself).
<hr/> John is not the team's coach. | F – ...swims faster than..., a – John, b – the team's coach |
| 2) | No one has access to the security cameras except the manager and the head of security.
The documents were stolen by someone who has access to the security cameras.
<hr/> The manager or the head of security stole the documents. | F – ...has access to the security cameras, G – ...stole the documents, a – the manager, b – the head of security; D – the set of humans |

Exercises to 3.6 Identity

(4) Prove the following logical equivalences:

1) $\forall x(a=x \rightarrow Fx) \quad \Leftrightarrow \quad Fa$

2) $\exists x(Fx \wedge x=a) \quad \Leftrightarrow \quad Fa$

(5) Symbolize the sentences using the notations.

1) The wife of John loves flowers. F – ...is a wife of..., G – ...loves flowers, a – John

2) The father of Alice knows Bob. F – ...is a father of..., G – ...knows..., a – Alice, b – Bob; D – the set of humans

3) This town where I was born is probably boring for many. F – ...is a town, G – ...was born in..., H – ...is probably boring for many, a – me

4) The castle where Dracula was born is in Carpathians. F – ...is a castle, G – ...was born in..., H – ...is in..., a – Dracula, c – Carpathians

5) The chess player that no computer can beat is a Hungarian. F – ...is a chess player, G – ...is a computer, H – ...can beat..., I – ...is a Hungarian

6) If the author of *Waverley* is a Scotsman, then the author of *Ivanhoe* is a Scotsman. F – ...is an author of..., G – ...is a Scotsman, w – *Waverley*, i – *Ivanhoe*

(6) Prove the validity of the inferences using the notations.

1) The author of *Waverley* wrote *Ivanhoe*.
There is someone who wrote both *Ivanhoe* and *Waverley*. F – ...wrote..., w – *Waverley*, i – *Ivanhoe*

2) The soprano I listened to last night performed Queen of the night aria.
Everyone who performs this aria can reach F_6 .
Some sopranos can reach F_6 . F – ...is a soprano, G – I listened to...last night, H – ...performed Queen of the night aria, I – ...can reach F_6 ; D – the set of humans