HG2002: Solution to Tutorial 10
Formal Semantics

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1. Are the following quantifiers (i) symmetrical or asymmetrical; (ii) upward or downward entailing in the left (iib) or right (iic) argument?

(1) *most*

- i *Most students are youths* $\not\models$ *Most youths are students* so asymmetrical
  **There are most students over there*
- iib *Most students are youths* $\not\models$ *Most people are youths* (Upward, left)
  Most students are youths $\not\models$ *Most linguistic students are youths* (Downward, left)
- iic *Most students study formal semantics* $\not\models$ *Most students study semantics* (Upward, right)
  Most students study semantics $\not\models$ *Most students study formal semantics* (Downward, right)

Neither upward or downward entailing on the left or right

(2) *many* (*cardinal*) "a large number"

- i *Many students are youths* $\models$ *Many youths are students* so symmetrical
  There are many students over there
- iib *Many students are youths* $\models$ *Many people are youths*
  Many students are youths $\not\models$ *Many linguistic students are youths*
- iic *Many students study formal semantics* $\models$ *Many students study semantics*
  Many students study semantics $\not\models$ *Many students study formal semantics*

Upward entailing on the left and right

(3) *few* (*cardinal*) "a small number" (in comparison with another number stated or implied)

- i *Few students are youths* $\models$ *Few youths are students* so asymmetrical
  There are few students over there
- iib *Few students are youths* $\not\models$ *Few people are youths*
  Few students are youths $\not\models$ *Few linguistic students are youths*
- iic *Few students study semantics* $\models$ *Few students study formal semantics*
  Few students study formal semantics $\not\models$ *Few students study semantics*

Downward entailing on the right

(4) *every*

- i *Every student is a youth* $\not\models$ *Every youth is student* so asymmetrical
  **There is every student over there*
- iib *Every student is a youth* $\not\models$ *Every person is a youth*
  Every student is a youth $\models$ *Every linguistic student is a youth*
- iic *Every student studies formal semantics* $\models$ *Every student studies semantics*
  Every student studies semantics $\not\models$ *Every student studies formal semantics*

Downward entailing on the left; Upward on the right

(5) [*at least*] *two*

- i *At least two students are youths* $\models$ *At least two youths are students* so symmetrical
  There are at least two students over there
- iib *At least two students are youths* $\models$ *At least two people are youths*
  At least two students are youths $\not\models$ *At least two linguistic students are youths*
- iic *At least two students study semantics* $\not\models$ *At least two students study formal semantics*
  At least two students study formal semantics $\models$ *At least two students study semantics*

Upward entailing on the left and right

(6) [*exactly*] *two* (no more or less)

i *Exactly two students are youths* $\models$ *Exactly two youths are students* so symmetrical
There are exactly two students over there

iib *Exactly two students are youths* $\not\models$ *Exactly two people are youths*
Exactly two students are youths $\not\models$ *Exactly two linguistic students are youths*

iic *Exactly two students study formal semantics* $\not\models$ *Exactly two students study semantics*
Exactly two students study semantics $\not\models$ *Exactly two students study formal semantics*

Neither upward or downward entailing on the left or right

2. Using the formulae of meaning postulates, represent the semantic relations between the following word pairs:
Also give the Theta-grid for the predicates.

(7) *couch/sofa*

- $\forall$x((COUCH(x) $\rightarrow$ SOFA(x)) $\wedge$ $\forall$x ((SOFA(x) $\rightarrow$COUCH(x))

(8) *accepted/rejected*

- $\forall$x(ACCEPTED(x) $\rightarrow$ $\neg$REJECTED(x));

\+ $\forall$x(REJECTED(x) $\rightarrow$ $\neg$ACCEPTED(x))

X be accepted ⟨THEME⟩
X be rejected ⟨THEME⟩

(9) *student/person*

- $\forall$x((STUDENT(x) $\rightarrow$ PERSON(x))

(10) *on/off* (*of a switch*)

- $\forall$x(ON(x) $\rightarrow$ $\neg$ON(x));

\+ $\forall$x(OFF(x) $\rightarrow$ $\neg$OFF(x))

X be on ⟨THEME⟩
X be off ⟨THEME⟩

(11) *buy/sell*

- $\forall$x$\forall$y(BUY(x,z,y) $\rightarrow$ SELL(y,z,x));
  $\forall$x$\forall$y(BUY(x,z,y) $\rightarrow$ $\neg$ SELL(x,z,y))
- $\forall$x$\forall$y(SELL(y,z,x) $\rightarrow$ BUY(x,z,y))
  $\forall$x$\forall$y(SELL(y,z,x) $\rightarrow$ $\neg$ BUY(y,z,x))

X buy Z from Y ⟨AGENT, THEME, SOURCE⟩
X sell Z to Y ⟨AGENT, THEME, GOAL⟩

(12) *computer/laptop*

- $\forall$x((LAPTOP(x) $\rightarrow$ COMPUTER(x))

(13) *give/receive*

- $\forall$x$\forall$y(GIVE(x,z,y) $\rightarrow$ RECEIVE(y,z,x));
  $\forall$x$\forall$y(GIVE(x,z,y) $\rightarrow$ $\neg$ RECEIVE(x,z,y))
- $\forall$x$\forall$y(RECEIVE(y,z,x) $\rightarrow$ GIVE(x,z,y))
  $\forall$x$\forall$y(RECEIVE(y,z,x) $\rightarrow$ $\neg$ GIVE(y,z,x))

X give Z to Y ⟨AGENT, THEME, GOAL⟩
X receive Z from Y ⟨AGENT, THEME, SOURCE⟩

(14) *Monday/Tuesday/Wednesday/Thursday/Friday*

- $\forall$x(MONDAY(x) $\rightarrow$ ($\neg$TUESDAY(x) $\vee$ $\neg$WEDNESDAY(x) $\vee$ $\neg$THURSDAY(x) $\vee$ $\neg$FRIDAY(x));

\+ $\forall$x(TUESDAY(x) $\rightarrow$ ($\neg$MONDAY(x) $\vee$ $\neg$WEDNESDAY(x) $\vee$ $\neg$THURSDAY(x) $\vee$ $\neg$FRIDAY(x));

\+ ...

3. Using set notation, define few(A,B) (cardinal) and few_of(A,B) (proportional).

    - few(A,B) = 1 iff $|A \cap B| < n$
      where n is a contextually defined number that denotes a small number without relating it to the size of A or B.
    - few_of(A,B) = 1 iff $|A \cap B| < |A|/n$
      n is a contextually defined number >1 that denotes the proportion in relation to A's size.

Acknowledgments These questions are partially based on exercises from Saeed (2003).