

5.6.1. Quantifier Construction Problems

A. For each of the **English sentences** (in the left list) **write** (in its accompanying blank) the number of its corresponding **formal sentence** (from the right list).

English Sentences:

a. Something is physical, but something isn't.

Matching Form:_____

b. Something is physical, but not everything is.

Matching Form:_____

c. Something is both physical and non-physical.

Matching Form:_____

d. Though something is physical, everything is non-physical.

Matching Form:_____

Formal Sentences:

1. $(\exists x Gx \wedge \forall x \sim Gx)$

2. $\exists x(Gx \wedge \sim Gx)$

3. $(\exists x Gx \wedge \exists x \sim Gx)$

4. $(\exists x Gx \wedge \sim \forall x Gx)$

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B. For each of the strings of symbols below, decide whether it a **formula** of the formal language according to the construction rules listed here.

Construction Rules (*Final Version*)

Terms

- T1. Name letters are terms
- T2. Variables are terms

Atomic Formulas:

- A1. Sentence letters are atomic formulas
- A2. A predicate letter followed by a term is an atomic formula.

Formulas:

- 1. Atomic formulas are formulas.
- 2. If \bullet is a formula, then $\sim\bullet$ is a formula.
- 3. If \bullet and \blacktriangle are formulas, then $(\bullet \wedge \blacktriangle)$ is a formula.
- 4. If \bullet and \blacktriangle are formulas, then $(\bullet \vee \blacktriangle)$ is a formula.
- 5. If \bullet and \blacktriangle are formulas, then $(\bullet \rightarrow \blacktriangle)$ is a formula.
- 6. If \bullet and \blacktriangle are formulas, then $(\bullet \leftrightarrow \blacktriangle)$ is a formula.
- 7a. If \star is a variable and \bullet is a formula, then $\exists\star \bullet$ is a formula.
- 7b. If \star is a variable and \bullet is a formula, then $\forall\star \bullet$ is a formula.

- 1. $(\forall x Gx \wedge \forall x Hx)$
- 3. $\forall x (Gx \wedge Hx)$
- 5. $(A \wedge P)$
- 7. $(\forall x GA \wedge HB)$
- 9. $\forall A (GA \wedge HA)$
- 11. $\forall x P$

- 2. HAB
- 4. $(\forall x Gx \wedge Hx)$
- 6. $(P \rightarrow MC)$
- 8. $\forall x (GA \wedge Hx)$
- 10. $(\forall x) (GA \wedge Hx)$
- 12. $(\forall x Q \wedge \forall x Hy)$

C. For each of the genuine formulas in A (repeated below), state whether it is a **sentence** or a **quasi-sentence**.

- | | |
|---|---|
| 1. $(\forall x Gx \wedge \forall x Hx)$ | 2. HAB |
| 3. $\forall x (Gx \wedge Hx)$ | 4. $(\forall x Gx \wedge Hx)$ |
| 5. $(A \wedge P)$ | 6. $(P \rightarrow MC)$ |
| 7. $(\forall x GA \wedge HB)$ | 8. $\forall x (GA \wedge Hx)$ |
| 9. $\forall A (GA \wedge HA)$ | 10. $(\forall x)(GA \wedge Hx)$ |
| 11. $\forall x P$ | 12. $(\forall x Q \wedge \forall x Hy)$ |

D. For each of the formulas in the above list featuring a quantifier, state whether or not its quantifier is **vacuous**.