

Kerry Ojakian's CSI 30 Class
Class Assignment #2

1. Let $P(x)$ be the predicate: $x < 7$. What are these truth values?

(a) $P(4)$

(c) $P(-7)$

(b) $P(58)$

(d) $P(7)$

2. Let $C(x, y)$ be the statement: "City x is the capital of state y ". What are the truth values of the following? (if you have no shame, look on your phone ...)

(a) $C(\text{Manhattan, New York})$

(c) $C(\text{Trenton, New Jersey})$

(b) $C(\text{Little Rock, Arkansas})$

(d) $C(\text{Los Angeles, California})$

3. Let $Q(x, y)$ denote the statement: " $x^2 < y$ or $y = 0$ ". What are the truth values of the following?

(a) $Q(2, 7)$

(c) $Q(-3, 0)$

(b) $Q(7, 2)$

(d) $Q(0, 5)$

4. Suppose the domain is all *positive* integers. Translate to each to English. Is each true or false? (remember the domain: positive integers)

(a) $\forall x \, x > 0$

(c) $\exists y \, y \leq 100$

(b) $\forall y \, y \leq 100$

(d) $\exists x \, x + x = 3 \cdot x$

5. Let $B(x)$ be the predicate: “ x is a student at BCC”.
Let $C(x)$ be the predicate: “ x lives in The Bronx”.
Express each of the following statements in terms of $B(x)$ and $C(x)$, quantifiers, and logical connectives. Let the domain consist of residents of NYC.
- (a) Someone lives in The Bronx, and is also a student at BCC.
 - (b) There is a student at BCC who does not live in The Bronx.
 - (c) Every student at BCC lives in The Bronx.
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6. Determine the truth value of each of these statements if the domain consists of all integers.

(a) $\exists x \ x^2 = 2x$

(b) $\forall x \ 3x \geq x$

7. Determine the truth value of each of these statements if the domain consists of all real numbers.

(a) $\exists x \ x - 2 > x$

(b) $\forall x \ x^4 \geq 0$

8. Determine the truth value of each of these statements if the domain consists of all rational numbers. In both cases, what if we changed the domain to be just the integers?

(a) $\forall x \exists y \ x \cdot y = 1$

(b) $\forall x (x > 0 \rightarrow (x - 3) > 0)$

9. Determine the truth value of each of these statements if the domain consists of all integers

(a) $\forall x \exists y \ x^2 < y$

(b) $\forall v \exists w \ v + w = 17$

10. Determine the truth value of each of these statements if the domain consists of all integers

(a) $\forall x \exists u \exists w \ u < x < w$

(b) $\exists u \exists w \forall x \ u < x < w$
