

# Worksheet 3 Review

March 20, 2020

## Question 1

- a.  $Correct(my\_prog) \wedge Python(my\_prog)$
- b.  $\exists x \in P, \neg Correct(x) \Rightarrow Python(x)$
- c.  $\forall x \in P, Python(x) \Rightarrow \neg Correct(x)$
- d.  $\forall x \in P, \neg Correct(x) \Rightarrow Python(x)$
- e. There is a program that is written in Python and is correct.
- f. Every program is not written in Python and is correct.
- g. There is a program that is correct but is not written in Python.
- h. All running programs not written in Python are correct, and all correctly running programs are not written in Python.

## Question 2

- a. All programs written in Python is correct, or all program written in python is not correct.
- b.  $(\exists x \in P, Python(x) \Rightarrow Correct(x)) \Rightarrow (\forall y \in P, Python(y) \Rightarrow Correct(y))$

**Correct Solution:**

$$(\exists x \in P, Python(x) \wedge Correct(x)) \Rightarrow (\forall y \in P, Python(y) \Rightarrow Correct(y))$$

- c.  $x_1$  and  $x_2$  in first statement could have different values. Where as the  $x$  in second statement has the same value.

The first statement is true, but the second is false. Assume  $x$  is divisible by 7. Then, 165 must be divisible by 7, but this is false.

### Question 3

- a.  $\forall n \in \mathbb{N}, \text{Odd}(n) \Rightarrow \exists k \in \mathbb{Z}, n = 2k + 1$

**Correct Solution:**

$\text{Odd}(n) : \exists k \in \mathbb{Z}, n = 2k + 1$ , where  $n \in \mathbb{Z}$

- b.  $\forall n, m \in \mathbb{N}, \text{Odd}(n) \wedge \text{Odd}(m) \Rightarrow \text{Odd}(nm)$   
c.  $\forall n, m \in \mathbb{N}, \exists k, l \in \mathbb{Z}, n = 2k - 1 \wedge m = 2l - 1 \Rightarrow \exists o \in \mathbb{Z}, nm = 2o - 1$   
d.  $\forall n, m \in \mathbb{N}, \exists o \in \mathbb{Z}, nm = 2o - 1 \Rightarrow \exists k, l \in \mathbb{Z}, n = 2k - 1 \wedge m = 2l - 1$

### Question 4

- a.  $((\neg a \vee \neg b) \wedge c) \vee ((a \wedge b) \wedge \neg c)$   
b.  $\exists x, y \in S, \forall z \in S, \neg P(x, y) \vee \neg Q(x, z)$

### Question 5