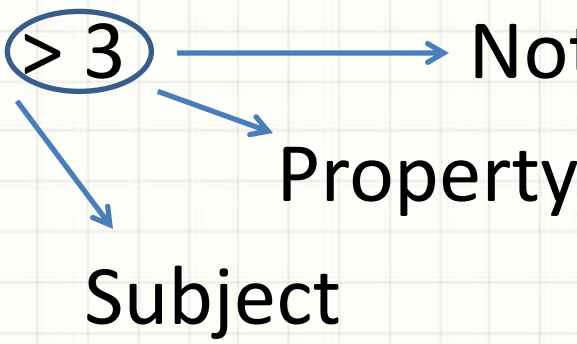
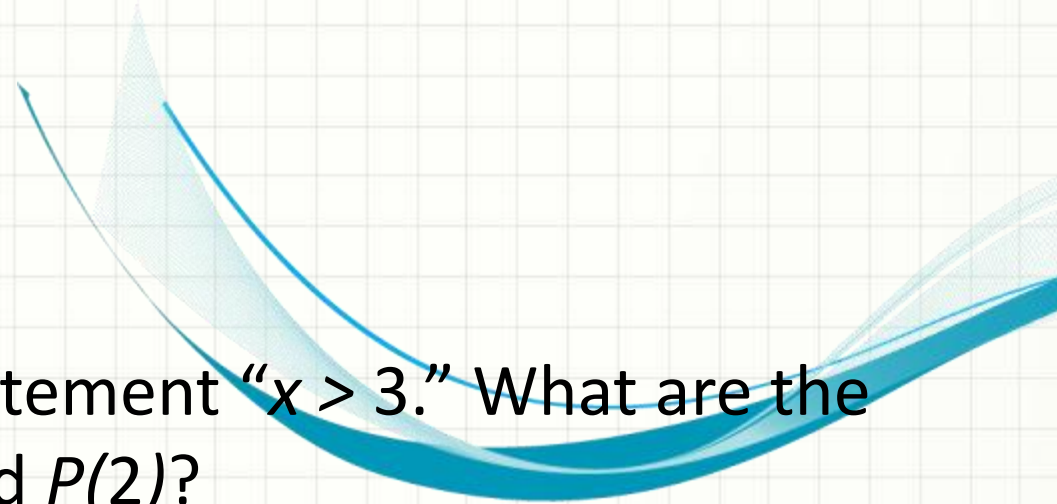




PREDICATES

Predicates

- $x > 3$  Not a Statement/Proposition
Subject
Property
- Property of Subject
- Expression that contains variables
- Denoted as $P(\text{variables})$, e.g. $P(x)$
- Propositional Function



Let $P(x)$ denote the statement “ $x > 3$.” What are the truth values of $P(4)$ and $P(2)$?

Solution: We obtain the statement $P(4)$ by setting $x = 4$ in the statement “ $x > 3$.” Hence, $P(4)$, which is the statement “ $4 > 3$,” is true. However, $P(2)$, which is the statement “ $2 > 3$,” is false.

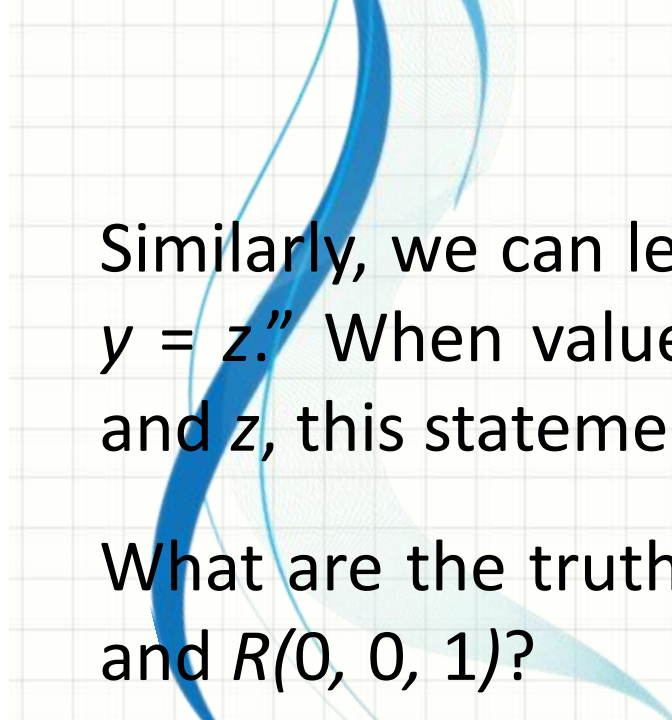
Let $A(x)$ denote the statement “Computer x is under attack by an intruder.” Suppose that of the computers on campus, only CS2 and MATH1 are currently under attack by intruders. What are truth values of $A(\text{CS1})$, $A(\text{CS2})$, and $A(\text{MATH1})$?

Solution: We obtain the statement $A(\text{CS1})$ by setting $x = \text{CS1}$ in the statement “Computer x is under attack by an intruder.” Because CS1 is not on the list of computers currently under attack, we conclude that $A(\text{CS1})$ is false. Similarly, because CS2 and MATH1 are on the list of computers under attack, we know that $A(\text{CS2})$ and $A(\text{MATH1})$ are true.



Let $Q(x, y)$ denote the statement “ $x = y + 3$.” What are the truth values of the propositions $Q(1, 2)$ and $Q(3, 0)$?

Solution: To obtain $Q(1, 2)$, set $x = 1$ and $y = 2$ in the statement $Q(x, y)$. Hence, $Q(1, 2)$ is the statement “ $1 = 2 + 3$,” which is false. The statement $Q(3, 0)$ is the proposition “ $3 = 0 + 3$,” which is true.



Similarly, we can let $R(x, y, z)$ denote the statement “ $x + y = z$.” When values are assigned to the variables x , y , and z , this statement has a truth value.

What are the truth values of the propositions $R(1, 2, 3)$ and $R(0, 0, 1)$?

Solution: The proposition $R(1, 2, 3)$ is obtained by setting $x = 1$, $y = 2$, and $z = 3$ in the statement $R(x, y, z)$. We see that $R(1, 2, 3)$ is the statement “ $1 + 2 = 3$,” which is true. Also note that $R(0, 0, 1)$, which is the statement “ $0 + 0 = 1$,” is false.