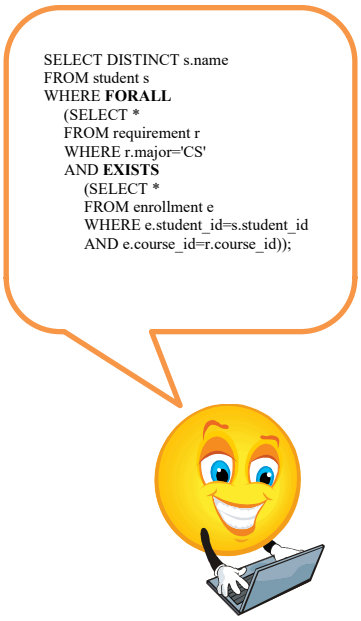
COMP 2121 DISCRETE MATHEMATICS | LAB 4

1. Determine the truth value of the following statements (T or F) and justify your answer. (hint: you can use counterexample to disprove the statement)

   The universe for x is numbers: 8, 6, 4, 2 and 0.
   The universe for y is numbers: –7, –5, –3, and –1.



   a) $\exists x \exists y \; such \; that \; -30 < x \cdot y < -5$

   b) $\forall x \forall y \; such \; that \; x \cdot y < x + y$

   c) $\forall x \exists y \; such \; that \; x + y = 1$

   d) $\forall y \exists x \; such \; that \; x + y = 1$

   e) $\exists x \forall y \; such \; that \; x \cdot y > -10$

2. Determine the truth value of the following statements (T or F) and justify your answer.

   Sets A, B and C are defined as follows:

   $A = \{1, 2, 3\}$ $B = \{-1, -2, -3\}$ $C = \{-1, -2, -4, -9\}$.

a) $\forall x \in A, \forall y \in B,$ then $x \cdot y \in C$

b) $\forall x \in A, \exists y \in B,$ then $x \cdot y \in C$

c) $\exists y \in B, \forall x \in A,$ then $x \cdot y \in C$

d) $\exists z \in C, \forall y \in B$ such that $z \cdot y \notin A$

e) $\exists u \in A, \exists v \in A$ such that $u \cdot v \in C$

3. Determine the truth value of the following statements (T or F) and justify your answer.

   The universe for x is {-4, -2, -1}.
   The universe for y is {-4, -2, 4, 6}

   (a) $\forall x, \forall y,\ 0 < |x - y| < 6$

   (b) $\exists x, \exists y,\ 0 < |x - y| < 6$

   (c) $\forall x, \exists y,\ 0 < |x - y| < 6$

   (d) $\exists x, \forall y,\ 0 < |x - y| < 6$

4. Determine the following:

a) $X \cup Y \cup Z$

b) $Y \cap Z$

c) $Y - (X \cup Z)$

X = {1, 2, 3, 4}

Y = {1, 3, 7}

Z = {4, 6} and

universe U = {1, 2, 3, 4, 5, 6, 7, 8}

d) $\overline{(X - Z)} \Delta Y$

Determine the truth value of the following statements (T or F) and justify your answer.

e) $\exists p \in U, \forall q \in X \Delta Y$, then $1 \leq |p - q| \leq 3$

X = {1, 2, 3, 4}

Y = {1, 3, 7}

Z = {4, 6} and

universe U = {1, 2, 3, 4, 5, 6, 7, 8}

f) $\forall t \in \overline{X \cup Y}, \exists w \in X - Z$, then $t - w \in \overline{X \cap Y} \Delta Z$

g) $\exists a \in X - Z, \forall b \in \overline{X \cap Y} \Delta Z$, then $-a + b \notin \overline{X \cap Y} \Delta Z$