

1) Let $P(x)$ be the statement "will fail this class". Where the universe of discourse consists of all students in class. Express $\forall x, \neg P(x)$ in English (1.3-5)

"No student will fail this class"

2) Let $P(x)$ denote "x is my friend". Let $Q(x)$ denote "x is perfect". Translate "Not everyone of my friends is perfect" into a logical expression using quantifiers and connectives.

$\exists x P(x) \wedge \neg Q(x)$, or equivalently $\neg(\forall x P(x) \rightarrow Q(x))$

3) Mark how the following Processing program should be modified so that it can be used to verify whether $\forall i \exists j : (i \neq j) \wedge (T[i]=T[j])$ where the domain is [1,6].

```
int n=6;
int T[] = new int [n];
T[0]=10; T[1]=12; T[2]=10; T[3]=12; T[4]=10; T[5]=12;
boolean trueValue=true;
for (int i=0; i<n; i++) {
    int foundMatch= 0;
    for (int j=0; j<n; j++) {
        if ((i!=j)&&(T[i]==T[j])) {foundMatch++ };
    };
    if (foundMatch != 1 ) {trueValue=false;};
};
println("truevalue="+trueValue);
```

4) $M(x,y)$ means "x has called y". $T(x,y)$ means "x has emailed y". Use quantifiers to express: "There are at least two students who, between them have e-mailed or called everyone else in the class." (13n)

$\exists x \exists y (x \neq y \wedge \forall z ((z \neq x) \wedge (z \neq y)) \rightarrow (T(x,z) \vee T(y,z) \vee M(x,z) \vee M(y,z)))$

5) Consider the following argument

Premise 1: If you did all the assigned exercises you will get an A in the class

Premise 2: You got an A in the class

Conclusion: You did all the assigned exercises

Is it valid? **No** . If not, what is such an argument called? **Fallacy**

Explain why it is not valid (assuming that P stands for "you did the assigned exercises" and Q stands for "you got an A")? **The argument $((P \rightarrow Q) \wedge Q) \rightarrow P$ is not a tautology. Assume that P is false and Q is true. Then, $(P \rightarrow Q)$ is true, but P is false. Hence $((P \rightarrow Q) \wedge Q) \rightarrow P$ is false.**