Translating English Statements to Predicate Well-Formed Formula

Many English statements can be translated to predicate wffs; however, any particular English statement can be translated into multiple predicate wffs. Therefore, here are a few suggestions

- The key phrases and words such as "for all", "for every", "for any", "for each", "all" indicate the use of the universal quantifier.
- The key phrases and words such as "for some", "there exists", "some", "at least" indicate the use of the existential quantifier.
- Generalization implies the use of the universal quantifier.
- Proper nouns are usually constants.
- Adjectives and nouns usually form unary predicates.
- Relational verbs except for "to be" usually form binary predicates.
- Predicate wff that are universally quantified usually are implemented with the implication connective.
- Predicate wff that are existentially quantified usually are implemented with the conjunctive connective.
- The predicate following the word "only" is the consequent of the argument.
- Avoid making predicates represent negated statements.
- Transition phrases and words such as "hence", "therefore" implies implication.
- The correct translation usually follows the order of the words in the English statement.

Let us practice with the following examples.

1. Carnivores eat meat.
   Solution:
   In the statement, it is implied that "All carnvores eat all meat"; hence, we will be using the universal quantifier.

   $$(\forall x)(\ldots)$$

   From the statement, we can identify three predicates from carnivore and meat which are nouns, and to eat which is a relational verb. So, we have

   $$C(x) \Rightarrow x \text{ is a carnivore.}$$
   $$M(x) \Rightarrow x \text{ is meat.}$$
   $$E(x, y) \Rightarrow x \text{ eats } y.$$

   Now, since we are using the universal quantifier, we are most likely going to use the implication connective. To verify, rewrite the statement in a form that resembles a direct translation of a predicate wff to an English statement.

For all things, if it is a carnivore, then for all other things, if it is meat, then the first thing eats the second thing.

The rewritten statement still states the same idea as the original statement; therefore, the statement translated to a predicate wff is

$$(\forall x)\big[C(x) \to (\forall y)\big(M(y) \to E(x,y)\big)\big]$$

Notice, however, that the predicate wff can be simplified. In our statement, the only thing being eaten is meat, so the predicate $E(x,y)$ to be rewritten as $E(x)$ such that $E(x) \Rightarrow x$ eats meat. Doing this will allow us the eliminate the $M(x)$ predicate; hence, simplifying the predicate wff to

$$(\forall x)\big(C(x) \to E(x)\big)$$

2. Only decent politicians are morals.
Solution:
Since the statement is generalized, we know that we will use the universal quantifier. Likewise, since decent follows the word only, it will be the consequent of our wff. The predicates are

$$D(x) \Rightarrow x \text{ is decent.}$$
$$P(x) \Rightarrow x \text{ is a politician.}$$
$$M(x) \Rightarrow x \text{ is moral.}$$

Therefore, the predicate wff is

$$(\forall x)\big[P(x) \to \big(M(x) \to D(x)\big)\big]$$

3. Students like some music.
Solution:
Since student is general, we know that we will be using the universal quantifier. Because of the word some, we will also use the existential quantifier. The predicates are

$$S(x) \Rightarrow x \text{ is a student.}$$
$$L(x,y) \Rightarrow x \text{ likes } y.$$
$$M(x) \Rightarrow x \text{ is music.}$$

Therefore, the predicate wff is

$$(\forall x)\big[S(x) \to (\exists y)\big(L(x,y) \wedge M(y)\big)\big]$$