

## Categorical Statements

In this chapter we will be looking at a special kind of statement called categorical. They are so called because sentences that express them can be interpreted as asserting a relation between two categories or classes of things.

Some examples of sentences expressing categorical statements are:

*All mice are rodents.*  
*Some basketball players are seven feet tall.*  
*A few scholars are good athletes.*  
*No sailors are bad swimmers.*  
*Most snakes are harmless.*

Each of these sentences expresses a relation between two categories or classes of things. The first asserts that all members of the class of mice are members of the class of rodents. The second asserts that some members of the class of basketball players are members of the class of things seven feet tall. The third asserts that some members of the class of scholars are members of the class of good athletes. The fourth asserts that no members of the class of sailors are members of the class of bad swimmers. The fifth asserts that most members of the class of snakes are members of the class of harmless things.

A class is any group of things that have some property in common. An individual is a member of a class if it has the property that defines the class. Each individual is a unique member of the class that includes only itself. Every individual is a member of the class of all individuals.

The terms in a categorical statement that identify the classes about which an assertion is made are called the subject term and the predicate term. Obviously these are related to the grammatical subject and the grammatical predicate of the sentences expressing the statement. More about this relation later.

Returning to the examples used above, in the first statement, the subject term was "mice" and the predicate term was "rodents." In the second statement, the subject term was "basketball players" and the predicate term was "things over seven feet tall." In the third statement, the subject term was "scholars" and the predicate term was "good athletes." In the fourth statement the subject term was "sailors" and the predicate term was "bad swimmers." In the fifth statement the subject term was "snakes" and the predicate term was "things that are harmless."

The verb that expresses the relation of inclusion or exclusion between the subject and predicate class is called the copula.

In addition to a logical subject, a logical predicate, and a copula, every categorical statement has a quantifier. The quantifier is the term in the statement that tells how many of the subject class are being related to the predicate class. In our examples above, the terms "all," "some," "a few," "no," and "most" are quantifiers.

As you have already learned, there are an indefinite variety of ways to express the

same statement. While this adds interest to reading and writing, it adds confusion to logic. In order to clearly analyze the categorical statements expressed by sentences, it is most convenient to write the sentences in a standard categorical form. In this way we can identify each logical component of the statement.

A categorical statement, then, consists of four parts. These are:

1. the quantifier;
2. the subject term;
3. the copula;
4. the predicate term.

The four parts of a standard form categorical statement always occur in the above order.

### **Exercise 9.1**

Identify each of the four parts of the categorical statements expressed by the following sentences.

1. All reptiles are cold-blooded animals.
2. No stars are planets.
3. Some planets are frozen bodies of ice.
4. Some planets are not bodies rich in carbon.
5. Many logic students are good writers.
6. A few good writers are professionals.
7. Good lawyers are not bad logicians.
8. Mammals are warm-blooded animals.
9. Prime numbers are divisible by seven.
10. Not all prime numbers have been discovered.

### **Quantity and Quality**

In addition to these four parts, there are two properties that all categorical propositions have that are important for classifying them. These properties are quantity and quality. Quantity has to do with how much, and the quantifier of the statement determines this property. A categorical statement is either about all of the subject class, or it is about part of the subject class. If it is about all of that class, then it is universal in quantity. If it is about part of the subject class, then it is particular in quantity.

The other important property that all categorical statements have is quality. The relation which categorical statements assert between the subject class and the predicate class is one either of inclusion or exclusion. The statement

*All mice are rodents.*

asserts that all members of the class of mice are included in the class of rodents. The statement

*No mice are rodents.*

asserts that all members of the class of mice are excluded from the class of rodents.

If the relation asserted between the subject and predicate classes of the statement is one of inclusion, then the statement's quality is affirmative. If the relation asserted between the subject and predicate classes of the statement is one of exclusion, then the statement's quality is negative.

Every categorical statement, then, has a quantity, which is either universal or particular. It also has a quality, which is either affirmative or negative. The combination of quantity and quality give us four different forms of categorical statements. These are identified by the four letters A, E, I, and O. The four forms are:

A: universal, affirmative;  
E: universal, negative;  
I: particular, affirmative;  
O: particular, negative.

### **Exercise 9.2**

Identify the form of the categorical statements expressed by the following sentences.

1. All heroes are brave people.
2. No brave people flee from danger.
3. Some people who face danger are brave.
4. Some who flee from danger are not brave.
5. A few logic students will become great philosophers.
6. Philosophers have all studied logic.
7. Many pre-law students study logic.
8. Not all logic students become philosophers.
9. At least one philosopher was emperor of Rome.
10. There haven't been any philosophers on the moon.

### **Exercise 9.3**

Some of the following sentences express categorical statements; some do not. If the sentence expresses a categorical statement, identify the form.

1. Some soldiers are not brave.

2. Patton was a brave soldier.
3. If Patton was a brave soldier, then so was York.
4. No Quakers are soldiers.
5. Either Nixon was not a Quaker, or he was not a soldier.
6. Tell the truth and keep your promises.
7. No truthful people are habitual liars.
8. All categorical statements express a relation between two classes.
9. Some categorical statements express a relation of inclusion.
10. All categorical statements are false.

### **Standard Form**

The four parts of a standard form categorical statement always occur in the order:

1. the quantifier;
2. the subject term;
3. the copula;
4. the predicate term.

The first term is the quantifier. It will always be "all" or "no" for universal statements.

Particular statements present a problem. As we have seen, English has many quantifying terms which are particular. These include "a," "some," "a few," "many," and "most." How many is a few of something? Most of something? There is, of course, no precise answer and logic demands precision. For this reason, we stipulate that the particular quantifier will always be "some," and that "some" is interpreted as meaning "at least one."

The subject and predicate terms of a categorical statement refer to classes of individuals, never to the individuals as such. This is true even in the case of a sentence whose grammatical subject or predicate is an individual. Since the terms refer to classes of individuals, the subject and predicate terms of standard form categorical statements must always be plural nouns or noun phrases.

For the same reason, the copula must always be plural. Also, categorical logic has no way of dealing with tenses. So the copula must always be the present tense of the verb "to be." In A, E, and I statements, the copula must be "are." In O form statements, it must be "are not."

We can now present the schemata for the four forms of categorical statements. They are:

- A: All S are P.
- E: No S are P.
- I: Some S are P.
- O: Some S are not P.

In each of the above schemata, the "S" is a place holder or variable for the subject term of a categorical statement and the "P" is a variable for the predicate term.

The first step in analyzing the categorical statement expressed by a sentence is to translate the sentence into standard categorical form. This sometimes requires a bit of ingenuity, but like most other things becomes easier with practice.

The sentence:

*All girl scouts help little old men.*

is close to being in standard form. It has the universal quantifier "all" and the subject term is a plural noun phrase. However, it has the transitive verb "help" which must be put into the predicate term, and the copula must be added. Doing this gives us the sentence:

*All girl scouts are people who help little old men.*

We now have the universal quantifier "all," the subject term "girl scouts," the copula "are," and the predicate term "people who help little old men." This is a standard form A categorical statement.

In the sentence:

*All girl scouts are dutiful.*

everything is in standard form except the predicate term. Instead of a noun phrase, we have a predicate adjective. This we would rewrite as:

*All girl scouts are dutiful people.*

We now have a standard form categorical statement.

A more round-about method must be used for statements which refer to individuals.

The sentence:

*Abdul-Jabar is over seven feet tall*

does not express the same statement as:

*All Abdul-Jabars are people over seven feet tall*

or as:

*Some Abdul-Jabars are people over seven feet tall.*

"Abdul-Jabar" is not the name of a class of individuals; it is the name of a single individual. Categorical logic requires that we have a class term as the subject. We get around the problem by referring to a class that has only Abdul-Jabar as its member.

*All people identical to Abdul-Jabar are people over seven feet tall.*

The statement is universal since we are referring to all members of the subject class.

Definite descriptions, terms using the definite article, "the," to identify one and only one individual, are treated the same as proper names. Thus

*The Baptist church on Pine Street is a red brick building*

becomes

*All buildings identical to the Baptist church on Pine Street are red brick buildings.*

While this is not a very elegant way of expressing the statement, it does make explicit the requirements of a categorical analysis.

Another troubling group of sentences are those which use the expressions "only" and "none but." The sentence,

*None but the humorous get laughs*

is translated,

*All persons who get laughs are humorous persons.*

It asserts that all persons who get laughs are members of the class of humorous persons. It leaves open the possibility that there are humorous persons who do not get laughs.

The sentence,

*Only freshmen are required to take the exam*

is similar. It is translated,

*All who are required to take the exam are freshmen.*

It does not assert that all freshmen are required to take the exam. That possibility is left open.

English does not require that a quantifier be used in a sentence expressing a categorical statement. From a logical point of view, that is unfortunate. The sentence,

*Firefighters are brave*

is ambiguous. We cannot tell whether it asserts the statement, "All firefighters are brave," or the statement, "Some firefighters are brave." In some cases there is no ambiguity. We know the sentence,

*Whales are mammals*

can be interpreted to assert that all whales are mammals. Where there is ambiguity, the safest approach is to interpret the sentence as asserting a particular statement.

**Exercise 9.4**

Translate the following sentences into standard categorical form.

1. All military officers wear their hats straight.
2. No cab drivers wear their hats straight.
3. Baseball players wear soft hats.
4. Basketball players do not wear hats.
5. Some physicists write philosophy.
6. No novelists write physics.
7. All physicists are not philosophers.
8. Few philosophers are professional athletes.
9. Several professional athletes are wealthy.
10. Not many philosophers are wealthy.
11. Many logicians are philosophers.
12. Not all logicians are philosophers.
13. Logicians are serious about truth.
14. No logician is habitually careless.
15. Professor Quine is a logician.
16. Professor Quine is not a poet.
17. Only logic students can recognize statements.
18. Statements are either true or false.
19. Questions are neither true nor false.
20. Anything that is true is a statement.