

# **The Logic of Aristotle**

**Principles from the Logic of Aristotle**

**And Questions**

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## 1. Terms

### Names



### I. Univocal, Equivocal, Analogical

Aristotle (384-322, Athens), *Categories*, Chapter 1, Line number 1 a 1.

Things are said to be named *equivocally* when, though they have a common name, the definition corresponding with the name differs for each. Thus, a real man and a figure in a picture can both lay claim to the name 'animal'; yet these are equivocally so named, for, though they have a common name, the definition corresponding with the name differs for each. For should any one define in what sense each is an animal, his definition in the one case will be appropriate to that case only.

On the other hand, things are said to be named *univocally* which have both the name and the definition answering to the name in common. A man and an ox are both 'animal', and these are univocally so named, inasmuch as not only the name, but also the definition, is the same in both cases: for if a man should state in what sense each is an animal, the statement in the one case would be identical with that in the other.

Things are said to be named *analogously*, which derive their name from some other name, but differ from it in termination. Thus the grammarian derives his name from the word 'grammar', and the courageous man from the word 'courage'.

#### a. Practice

Determine whether univocal (same), equivocal (different), or analogical (partly the same, partly different).

1. *Pitcher* as signifying a container of water and a baseball player.
2. *Antenna* as on a grasshopper and on a radio.
3. *Athlete* as signifying a swimmer and a wrestler.
4. *Metal* as signifying iron and copper.
5. *Nerve* as signifying a band of living tissue and courage.
6. *Pit* as signifying the hard stone of a fruit and a hole in the ground.
7. *Literature* as signifying prose and poetry.
8. *Date* as signifying a fruit and a point in time.
9. *Walk* as signifying a movement and a pathway.
10. *Peck* as signifying a fourth part of a bushel and a quick stroke of a beak.
11. *Passion* as signifying love and joy.
12. *Beautiful* as signifying a person and the physical complexion of a person.
13. *Poker* as signifying a metal rod for stirring a fire and a card game.

## 2. Terms

Forms of speech



### I. Simple, Composite

Aristotle, *Categories*, c. 2

Forms of speech are either simple or composite. Examples of the latter are such expressions as 'the man runs', 'the man wins'; of the former 'man', 'ox', 'runs', 'wins'.

#### a. Practice

Please determine whether simple or composite.

- |                      |                      |                    |                            |
|----------------------|----------------------|--------------------|----------------------------|
| 1. man               | 2. running man       | 3. rational animal | 4. kangaroo                |
| 5. marsupial mammal  | 6. car               | 7. chalet          | 8. remote herdsman's hut   |
| 9. vehicle on wheels | 10. metallic element | 11. lead           | 12. marsupial with a pouch |
| 13. the man runs     | 14. the man wins     | 15. man            | 16. wins                   |

#### b. More Practice

Please determine whether univocal, equivocal or analogical

1. *Boot* as signifying a shoe and the activity of kicking.
2. *Fall* as signifying a dropping down and a season.
3. *Loose* as signifying free from restraint and an immoral person.
4. *Bank* as signifying an establishment for holding money and the margin of a river.
5. *Tree* as signifying a pine and a redwood.
6. *Sensation* as said of hearing and smelling.
7. *Living* as said of a snail and of the universe.
8. *Granny* as signifying a knot and a grandmother.
9. *Spike* as signifying a large nail and a dose of alcohol in a drink.
10. *Rug* as signifying a floor covering and a man's hairpiece.
11. *Color* as signifying red and green.
12. *Pen* as signifying a writing instrument and a cage for animals.
13. *Number* as signifying odd and even.
14. *Story* as signifying an anecdote and a set of rooms on the same floor.

### 3. Terms

Four Relations



#### I. Predicated of, Present in

Aristotle, *Categories*, c. 2

Of things themselves (1) some are predicable of a subject, and are never present in a subject. Thus 'man' is predicable of the individual man, and is never present in a subject. By being 'present in a subject' I do not mean present as parts are present in a whole, but being incapable of existence apart from the said subject.

(2) Some things, again, are present in a subject, but are never predicable of a subject. For instance, a certain point of grammatical knowledge is present in the mind, but is not predicable of any subject; or again, a certain whiteness may be present in the body (for color requires a material basis), yet it is never predicable of anything.

(3) Other things, again, are both predicable of a subject and present in a subject. Thus while knowledge is present in the human mind, it is predicable of grammar.

(4) There is, lastly, a class of things which are neither present in a subject nor predicable of a subject, such as the individual man or the individual horse. But, to speak more generally, that which is individual and has the character of a unit is never predicable of a subject. Yet in some cases there is nothing to prevent such being present in a subject. Thus a certain point of grammatical knowledge is present in a subject.

#### II. Practice

Please determine whether the name is (1), (2), (3) or (4).

1. *Man* as said of an individual man. ('He is a man'.)
2. *Point of grammar* as said of a person's knowledge. ('He has knowledge of syntax which is a certain point of grammar'.)
3. *Knowledge* as said of a person ('He has knowledge') and as said of grammar ('Grammar is the knowledge of words').
4. *The individual man*.
5. *The individual horse*.
6. *Powerful hind legs* as said of the kangaroo. ('The kangaroo has powerful hind legs'.)
7. *The individual kangaroo*.
8. *Pouch* as said of a kangaroo ('The kangaroo has a pouch for holding kids'.)
9. *Mammal* as said of a kangaroo. ('A kangaroo is a mammal.')
10. *Red fur* as said of the kangaroo. ('The kangaroo has red fur'.)

#### 4. Terms

Predicates



##### I. Genus, Species

Aristotle, *Categories*, c. 3

When one thing is predicated of another, all that which is predicable of the predicate will be predicable also of the subject. Thus, 'man' is predicated of the individual man; but 'animal' is predicated of 'man'; it will, therefore, be predicable of the individual man also: for the individual man is both 'man' and 'animal'.

##### a. Practice

Please determine the conclusion.

- a. If Animal is predicable of Man, and Man is predicable of an Individual,  
*then...*
1. If Mammal is predicable of Marsupial, and Marsupial is predicable of Kangaroo,  
*then...*
2. If Vertebrate is predicable of Mammal, and Mammal is predicable of Marsupial,  
*then...*
3. If Chordate is predicable of Vertebrate, and Vertebrate is predicable of Mammal,  
*then...*
4. If Animal is predicable of Chordate, and Chordate is predicable of Vertebrate,  
*then...*
5. If Existing Thing is predicable of Natural Thing, and Natural Thing is predicable of Animal,  
*then...*
6. If Metal is predicable of Magnetic Thing, and Magnetic Thing is predicable of Cobalt,  
*then...*
7. If Gas is predicable of Respiratory Irritant, and Respiratory Irritant is predicable of Chlorine,  
*then...*
8. If Chemical is predicable of Mineral, and Mineral is predicable of Sodium,  
*then...*

## 5. Terms

### Features



### I. Nine Features

Aristotle, *Categories*, c. 4

Expressions which are in no way composite signify substance, quantity, quality, relation, place, time, position, state, action, or affection. To sketch my meaning roughly, examples of substance are 'man' or 'the horse'; of quantity, such terms as 'two cubits long' or 'three cubits long'; of quality, such attributes as 'white', 'grammatical'. 'Double', 'half', 'greater', fall under the category of relation; 'in the market place', 'in the Lyceum', under that of place; 'yesterday', 'last year', under that of time. 'Lying', 'sitting', are terms indicating position; 'shod', 'armed', indicate state; 'to lance', 'to cauterize', indicate action; 'to be lanced', 'to be cauterized', indicate affection.

#### a. Practice

Please determine the category of the following features.

- |                      |                         |
|----------------------|-------------------------|
| 1. two cubits long   | 11. three cubits long   |
| 2. white             | 12. grammatical         |
| 3. double            | 13. half                |
| 4. greater           | 14. in the market place |
| 5. in the Lyceum     | 15. yesterday           |
| 6. last year         | 16. lying               |
| 7. sitting           | 17. shod                |
| 8. armed             | 18. to lance            |
| 9. to cauterize      | 19. to be lanced        |
| 10. to be cauterized | 20. to be warmed        |

#### b. More Practice

Please determine the category of the following features.

- |                           |                      |
|---------------------------|----------------------|
| 1. being a parent         | 7. hasty             |
| 2. in Los Angeles         | 8. being a friend    |
| 3. in August              | 9. in the mall       |
| 4. driving to school      | 10. last year        |
| 5. being drenched by rain | 11. standing up      |
| 6. one hundred kilograms  | 12. wearing a jacket |

## 6. Terms

### Subjects



### I. Primary Substances

Aristotle, *Categories*, c. 5, no. 2 a 12

Substance, in the truest and primary and most definite sense of the word, is that which is neither predicable of a subject nor present in a subject; for instance, the individual man or horse. But in a secondary sense those things are called substances within which, as species, the primary substances are included; also those which, as genera, include the species. For instance, the individual man is included in the species 'man', and the genus to which the species belongs is 'animal'; these, therefore—that is to say, the species 'man' and the genus 'animal,—are termed secondary substances.

#### a. Review

There are four substances that exist in the natural environment (which we can see and hear) and two in the supernatural environment (which we cannot see but can try to prove).

1. Minerals
  - a. 103 Elements : Three basic groups — metals, semi-metals, nonmetals or solids, liquids, and gases
  - b. 10,000 Compounds : (a compound is a set of two or more elements) Two groups— edible and poisonous
2. Plants
  - a. 400,000 members : Five basic groups — algae, bacteria, protista, fungi, and seed-bearing plants
3. Animals
  - a. 1,000,000 members : Fourteen basic groups — protozoans, sponges, jellyfishes, worms, mollusks, millipedes, insects, crustaceans, spiders, starfishes, tunicates, lancelets, vertebrates
  - b. Vertebrates — amphibians, birds, fishes, mammals, reptiles
4. Human persons
  - a. 2 members : men and women
  - b. Other possible divisions — children, adults (quantity of time), poor, middle class, rich (quantity of wealth and useful things), inferiors, superiors (activity of work), novice, intermediate, expert (activity of skiing), healthy and sick (activity of visiting patients), thankful or envious (activity of thinking)
5. Superior intelligences
  - a. Unlimited number of members (since they have nothing material to divide them) : simple intelligences, separated substances, intellectual substances
6. First Being
  - a. 1 : Also known as First Mover, First Principle, Higher Agent, Deus (Latin), Θεός (Greek)

**b. Practice**

Please name species (least general class) and its genus (most general class) of the substance underlined.

1. Nickel is an element, because nickel cannot be broken down into anything simpler.
2. Baking soda is a compound, because baking soda is composed of the elements sodium, hydrogen, carbon and hydrogen.
3. A toadstool has the capacity to grow without a conducting system. Hence, a toadstool is a fungus.
4. The conifers have their seeds pollinated by the wind.
5. The Aurelia is has an umbrella shape and composed of mesogloea which places the Aurelia in the jellyfish family.
6. A snake crawls on its belly and is covered with scales. Hence, a snake is a reptile.
7. A kangaroo is a mammal, because this kangaroo has fur and a four-chambered heart.
8. A nun is a woman who makes vows of poverty, chastity and obedience.
9. The man who is a father is the man who has conceived a child.
10. A spiritual substance does not need a body for intellectual activity. As a result, a spiritual substance is an intellectual substance. [Philosophy note: things without a body cannot be placed in a species.]

**II. Secondary Substances**

Aristotle, *Categories*, c. 5, no. 2 b 6

Of secondary substances, the species is more truly substance than the genus, being more nearly related to primary substance. For if any one should render an account of what a primary substance is, he would render a more instructive account, and one more proper to the subject, by stating the species than by stating the genus. Thus, he would give a more instructive account of an individual man by stating that he was man than by stating that he was animal, for the former description is peculiar to the individual in a greater degree, while the latter is too general. Again, the man who gives an account of the nature of an individual tree will give a more instructive account by mentioning the species 'tree' than by mentioning the genus 'plant'.

**a. Practice**

Please circle the "more instructive" description of the substance.

1. Nickel is an *element* and a *mineral*.
2. A conifer is a *seed-bearing tree* and a *plant*.
3. A snake is an *animal* and a *reptile*.
4. A kangaroo is an *animal* and a *mammal*.
5. A man is a *human person* and an *animal*.



### III. Species

Aristotle, *Categories*, c. 5, no. 2 b 23

Of species themselves, except in the case of such as are genera, no one is more truly substance than another. We should not give a more appropriate account of the individual man by stating the species to which he belonged, than we should of an individual horse by adopting the same method of definition. In the same way, of primary substances, no one is more truly substance than another; an individual man is not more truly substance than an individual ox.

#### a. Practice

Please determine whether (a) is more clear, (b) is more clear, or both (a) + (b) are equally clear.

1. (a) *Reptile* as said of a snake. (b) *Mammal* as said of a horse.
2. (a) *Element* as said of nickel. (b) *Compound* as said of baking soda.
3. (a) *Fungus* as said of toadstool. (b) *Seed-bearing tree* as said of a conifer.
4. (a) *Tunicate* as said of a sea-squirt. (b) *Vertebrate* as said of an amphibian.
5. (a) *Woman* as said of a nun. (b) *Man* as said of a father.

### IV. Primary and Secondary Substances

Aristotle, *Categories*, c. 5, no. 2 b 38.

Primary substances are most properly so called, because they underlie and are the subjects of everything else. Now the same relation that subsists between primary substance and everything else subsists also between the species and the genus to which the primary substance belongs, on the one hand, and every attribute which is not included within these, on the other. For these are the subjects of all such. If we call an individual man 'skilled in grammar', the predicate is applicable also to the species and to the genus to which he belongs. This law holds good in all cases.

#### a. Practice

Please determine whether (a) and (b) are true.

1. (a) A kangaroo may have red fur or gray fur. (b) A mammal may have red fur or gray fur.
2. (a) Nickel may be shaped into a tube. (b) An element may be shaped into a tube.
3. (a) Baking soda may be located in the fridge. (b) A compound may be located in the fridge.
4. (a) A toadstool may live in California or Nevada. (b) A fungus may live in California or Nevada.
5. (a) A conifer may be short or tall. (b) A tree may be short or tall.
6. (a) A snake may be cold or hot. (b) A reptile may be cold or hot.
7. (a) A nun may be reading or praying. (b) A woman may be reading or praying.
8. (a) A father may be purchasing ice cream. (b) A man may be purchasing ice cream.

## 7. Terms

### Features



### I. Quantity

Aristotle, *Categories*, c. 6, 4 b 20

Quantity is either discrete or continuous. Moreover, some quantities are such that each part of the whole has a relative position to the other parts: others have within them no such relation of part to part. Instances of discrete quantities are : number and speech; of continuous quantity : lines, surfaces, solids, also time and place.

#### a. Practice

Please determine whether the quantity is continuous or discrete.

1. The Christmas rose has 12 to 18 petals on each flower.
2. The Christmas rose is usually 10 to 15 inches tall.
3. The fruit of the Annonaceae plants may attain a diameter of 8 inches.
4. The Celtis australis tree may grow in Uganda to a height of 165 feet.
5. There are thousands of species of hybrid garden daffodils.

### II. Relation

Aristotle, *Categories*, c. 7, no. 6 a 37

Those things are called relative, which, being either said to be of something else or related to something else, are explained by reference to that other thing. For instance, the word 'superior' is explained by reference to something else, for it is superiority over something else that is meant. Similarly, the expression 'double' has this external reference, for it is the double of something else that is meant. So it is with everything else of this kind. There are, moreover, other relatives, e.g. habit, disposition, perception, knowledge, and attitude. The significance of all these is explained by a reference to something else and in no other way. Thus, a habit is a habit of something, knowledge is knowledge of something, attitude is the attitude of something.

#### a. Practice

Please determine the term to which the fundamental (underlined) is related.

1. This medicine is superior.
2. He ordered a double martini.
3. This person is greedy.
4. That person is thinking.
5. The young man is rude.
6. The log is producing smoke.
7. The car has a dent in the fender.

### III. Other Categories

Aristotle, *Categories*, c. 9, no. 11 b 1

Action and affection both admit of contraries and also of variation of degree. Heating is the contrary of cooling, being heated of being cooled, being glad of being vexed. Thus they admit of contraries. They also admit of variation of degree: for it is possible to heat in a greater or less degree; also to be heated in a greater or less degree. Thus action and affection also admit of variation of degree. So much, then, is stated with regard to these categories.

We spoke, moreover, of the category of position when we were dealing with that of relation, and stated that such terms derived their names from those of the corresponding attitudes.

As for the rest : time, place, state, since they are easily intelligible, I say no more about them than was said at the beginning, that in the category of state are included such states as 'shod', 'armed', in that of place 'in the Lyceum' and so on, as was explained before.

#### a. Practice

Please answer the following.

1. *Merriam-Webster's* dictionary defines an action as "the manner or method of performing."  
Agree or disagree? Why?
2. *Merriam-Webster's* dictionary defines an affection as "the state of being affected" and "to be given to".  
Agree or disagree? Why?
3. (i) An *action* is an activity that has a goal and (ii) a *passion* is an affection that has a trigger.  
Agree or disagree? Why?
4. Please determine whether action or affection.
  - a. The sun is heating the dolphin.
  - b. The thick clouds are cooling the ocean.
  - c. The dolphin is becoming heated by the sun.
  - d. The ocean water is becoming cooled by the thick clouds.
5. Whether the activities of driving and eating may have "variations of degrees"?  
Why?
6. Whether "time, place, state" are "easily intelligible"?  
Why?

## 8. Terms

### Opposition



### I. Correlative, Contrary, Contradictory, Privation

Aristotle, *Categories*, c. 10

We must next explain the various senses in which the term 'opposite' is used. Things are said to be opposed in four senses: (i) as correlatives to one another, (ii) as contraries to one another, (iii) as privatives to positives, (iv) as affirmatives to negatives...

(i) Pairs of opposites which fall under the category of relation are explained by a reference of the one to the other, the reference being indicated by the preposition 'of' or by some other preposition. Thus, double is a relative term, for that which is double is explained as the double of something... Such things, then, as are opposite the one to the other in the sense of being correlatives are explained by a reference of the one to the other.

(ii) Pairs of opposites which are contraries are not in any way interdependent, but are contrary the one to the other. The good is not spoken of as the good of the bad, but as the contrary of the bad, nor is white spoken of as the white of the black, but as the contrary of the black... (a) Those contraries which are such that the subjects in which they are naturally present, or of which they are predicated, must necessarily contain either the one or the other of them, have no intermediate... Thus disease and health are naturally present in the body of an animal, and it is necessary that either the one or the other should be present in the body of an animal. (b) On the other hand, in those contraries with regard to which no such necessity obtains, we find an intermediate. Blackness and whiteness are naturally present in the body, but it is not necessary that either the one or the other should be present in the body, inasmuch as it is not true to say that everybody must be white or black.

(iii) 'Privatives' and 'positives' have reference to the same subject. Thus, sight and blindness have reference to the eye. It is a universal rule that each of a pair of opposites of this type has reference to that to which the particular 'positive' is natural. We say that that is capable of some particular faculty or possession has suffered privation when the faculty or possession in question is in no way present in that in which, and at the time at which, it should naturally be present. We do not call that toothless which has not teeth, or that blind which has not sight, but rather that which has not teeth or sight at the time when by nature it should. For there are some creatures which from birth are without sight, or without teeth, but these are not called toothless or blind.

(iv) But in the case of affirmation and negation, whether the subject exists or not, one is always false and the other true. For manifestly, if Socrates exists, one of the two propositions 'Socrates is ill', 'Socrates is not ill', is true, and the other false. This is likewise the case if he does not exist; for if he does not exist, to say that he is ill is false, to say that he is not ill is true. Thus it is in the case of those opposites only, which are opposite in the sense in which the term is used with reference to affirmation and negation, that the rule holds good, that one of the pair must be true and the other false.

**a. Practice**

In summary, a correlative is a *corresponding* feature, a contrary is the *extreme* feature, a privation is a *missing* feature (and contains prefixes such as –dis, -un or suffixes such as –less), and a contradiction is the *denial* of a feature. Please give the following opposites.

**Correlative**

1. double – *single*
2. father
3. superior
4. vice-president
5. helper

**Contrary**

1. double – *half*
2. pleasant
3. wide
4. high
5. hidden
6. secure
7. reliable
8. lonely
9. powerful
10. solid

**Privative**

1. pleasant –
2. reliable
3. powerful
4. significant
5. common
6. restful
7. secure
8. responsive
9. stable
10. proven

**Contradiction**

1. The redwood tree is tall.
2. The father is reliable.
3. The street is wide.
4. The waves are high.
5. The candy is hidden.
6. Your money is secure.
7. My car is reliable.
8. That person is lonely.
9. She is powerful.
10. The table is solid.

## 9. Terms

### Mutation



### I. Generation, Corruption, Alteration

Aristotle, *Categories*, c. 14

Speaking generally, rest is the contrary of motion... Thus, destruction is the contrary of generation.

### II. Mutation

St. Thomas Aquinas (1224-1274, Paris), *Commentary on Aristotle's Physics*, 1. 13 (1963: 55).

We must note that... there are three species of mutation, namely, generation and corruption and alteration. The difference among these is as follows. Alteration is from one positive state to another positive state, as from white to black. Generation, however, is from the negative to the positive, as from the non-white to the white, or from non-man to man. Corruption, on the other hand, is from the positive to the negative, as from the white to the non-white, or from man to non-man. Therefore, it is clear that in alteration two contraries and one subject are required. But in generation and corruption there is required the presence of one contrary and its absence, which is privation.

#### a. Practice

Please determine whether (i) generation, (ii) corruption or (iii) alteration.

1. Mutation from white to black and from one positive state to another positive state.
2. Mutation from non-white to white and from the negative to the positive.
3. Mutation from the positive to the negative and from white to non-white.
4. Mutation involving two contraries and a subject.
5. Mutation from a privation to a contrary.
6. Mutation from a contrary to a privation.
7. The principle from which is a contrary and the principle to which is a privation.
8. The principle from which is a privation and the principle to which is a contrary.
9. The principle from which is a contrary and the principle to which is a contrary.
10. Change from being to being.
11. Change from non-being to being.
12. Change from being to non-being.
13. Change from non-thorium to thorium.
14. Change from uranium to non-uranium.
15. Change from a large amount of uranium to a small amount of uranium.
16. Mutation from a young kid [baby kangaroo] toward an adult kangaroo.
17. Mutation and the birth of a young kid.
18. Mutation from an adult kangaroo toward a deceased kangaroo.

## 10. Terms Questions



### I. Whether, What, How, Why T. Faulders

There are four types of questions: whether, what, how and why. A “whether” question asks for a fact and a ‘yes’ or ‘no’ response, such as whether the subject has a curious feature. A “what” question asks for a definition. A “how” question asks for a process and for step 1, step 2, and step 3 that brought about the curious feature. A “why” question asks for the cause and for the reason why the subject has a curious feature. For example, a person may wonder about marsupials and ask the following: whether some mammals have a pouch? What is a pouch? How did some mammals get their pouches? And why do some mammals have a pouch?

#### a. Practice St. Valentine

ROME, FEB. 13, 2002 (Zenit.org) - Hundreds of couples engaged to be married will promise faithful love on Thursday in the basilica of the Italian city of Terni, home of the mortal remains of St. Valentine. This year the annual Celebration of Promise, which for centuries has gathered people from different countries and Italian cities, will be presided by Bishop Vincenzo Paglia of Terni. The city is about 100 kilometers (60 miles) from Rome. The couples will receive a parchment as a memento of their avowal of faithful love. Bishop Paglia also will give them a copy of St. Luke’s Gospel.

Valentine, a bishop of Terni, suffered martyrdom about the year 268. For many years, there was confusion in the calendar of saints’ days among Christians with the same name in times of the Roman Empire. Stories vary on why he was made the patron of couples in love. One legend says that Valentine opposed Emperor Claudius II’s prohibition against allowing Roman Legionnaires to marry, supposedly because single men were tougher in battle. Valentine disobeyed the order and presided over the marriage of a pagan legionary to a young Christian woman. From that day, says the legend, the bishop blessed the marriages of numerous soldiers.

#### b. Practice Please answer the following.

1. Whether St. Valentine is the patron of couples in love?
2. Who was St. Valentine?
3. What is a patron? [*Webster’s Collegiate Dictionary*: **patron** : a person chosen as a special guardian, protector or supporter]
4. How did St. Valentine become the patron of couples in love?
5. Why did St. Valentine become the patron of couples in love?

## 11. Terms

### Signs



### I. Natural, Artificial, Customary

T. Faulders; John Poincot, (1589-1644, Salamanca, Spain), *Treatise on Signs*, c. 9a

Experience teaches us that we know in basically two distinct ways. The first way is by sensation. We are familiar with the way of sensation since it involves the five senses: seeing, hearing, smelling, tasting and touching. This is the way of knowing observable features. The second way of knowing is by way of the intellect. Once contacting a feature, we can know the unobservable subject and unobservable cause of the feature in an abstract way.

Our intellectual knowledge of subject and causes is dependent on what we first know by sensation. In other words, what is known by the intellect is first known by the senses. But how does the singular, observable knowledge of the senses get translated into the general, unobservable knowledge of the intellect? The process is by means of signification. The sense knowledge acts as a sign from which the intellect can understand the world. We know the baseball players are having fun (cause), since we can hear them laughing (feature) and see them jumping up and down (feature).

As a result, the excellent logician, who is concerned with the art of thinking, is especially concerned with the process of signification. As John Poincot wrote in 1632:

A term, no less than a statement and a proposition, and any other logical instrument, is defined by means of signification. This is due to the fact that the understanding knows by means of the signification of concepts, and expresses what it knows by means of the signification of sounds, so that, without exception, all the instruments which we use for knowing and speaking are signs. Therefore, if the student of logic is to know his or her tools – namely, terms and statements – in an exact manner, it is necessary that he or she should also know what a sign is.

### II. Definition of a Sign

Poincot defines a sign in the following way:

“A sign is that which represents something other than itself to a knowing power.”

To better understand this definition, one needs to consider how this works in three ways. A sign can represent something other than itself to a knowing power in three ways: naturally, conventionally or customarily.

1. “A natural sign is one that represents from the nature of a thing, independently of any convention or custom whatever, and so it represents the same for all, as smoke signifies a burning fire.”
2. “A conventional sign is an artificial and man-made sign that represents something other than itself because of an imposition and choice of a community, like the linguistic expression ‘tree.’”
3. “A customary sign is one that represents something other than itself from use alone without any public imposition, as napkins upon the table signifying a meal.”



**a. Practice**

Please determine whether the following sign relationships are natural, artificial or customary.

1. A cool blue glow as signaling plutonium.
2. An irregular and rapid pulse as signaling cardiac dysrhythmias.
3. A fever as signifying an illness.
4. A menorah in front of a synagogue as signaling the Hanukkah festival.
5. A Christmas tree as signifying Christmas.
6. A paschal candle as signifying Easter.
7. A knife and fork which are laid parallel to each other across the right side of the plate as signaling the end of a meal.
8. A very last drink of orange juice as a signal from the French host for everyone to go home.
9. A half-full plate at a smorgasbord as a signal to the Swedish host that you plan to sample all the food.
10. An "air kiss" between men and women as signifying a greeting in Italy.
11. Blushing as signifying embarrassment.
12. The term "hello" as signifying a greeting.
13. The term "blue" as signifying a color.
14. A trademark as signifying a company.
15. A street sign as signaling the offramp of a freeway.

**b. More practice**

1. The term "lithium" which the Swedish chemist Arfvedson in 1817 used to signify an alkali metal.
2. The terms "NaCl" and "Na<sub>2</sub>CO<sub>3</sub>" as signifying sodium chloride and sodium carbonate.
3. A deep red spectral line as signifying rubidium.
4. A sky blue spectral line as signifying cesium.
5. A fizzing and a violet flame as signifying the mixture of water and sodium.
6. A metal floating on water as signifying an alkaloid metal.
7. Waiting to be told where to sit at a gathering as signifying respect in Thailand.
8. Covering one's mouth when speaking as signifying humility in Vietnam.
9. Not touching the top of a child's head as signifying respect in Burma.
10. Never refusing an offer of food and drink and taking small portions as signifying respect in Laos.

## 12. Propositions

### Parts and Features



### I. Nouns and Verbs

Aristotle, *On Interpretation*, c. 1, no. 16 a 1.

First we must define the terms 'noun' and 'verb', then the terms 'denial' and 'affirmation', then 'proposition' and 'sentence.' Spoken words are the signs of mental experience and written words are the signs of spoken words. Just as all men have not the same writing, so all men have not the same speech sounds, but the mental experiences, which these directly signify, are the same for all.

#### a. Practice

Please answer the following.

1. What six things will Aristotle discuss in his second book of logic?
2. Aristotle writes that "not all men" have the "same writing," but "the mental experiences" are "the same for all" men.

Agree or disagree? Why?

### II. Nouns, Verbs

Aristotle, *On Interpretation*, c. 2, no. 16 a 19.

By a noun we mean a sound significant by convention, which has no reference to time, and of which no part is significant apart from the rest. In the noun 'Fairsteed,' the part 'steed' has no significance in and by itself, as in the phrase 'fair steed'... A verb is that which, in addition to its proper meaning, carries with it the notion of time. No part of it has any independent meaning, and it is a sign of something said of something else. I will explain what I mean by saying that it carries with it the notion of time. 'Health' is a noun, but 'is healthy' is a verb; for besides its proper meaning it signifies the present existence of the state in question.

1. Whether a *noun* and a *verb* are different?
2. What distinguishes a noun and a verb?
  - a. Please underline the verbs.
    - i. Late last year our neighbors bought a goat.
    - ii. Portia White was an opera singer.
    - iii. The bus inspector looked at all the passengers' passes.
    - iv. According to Plutarch, the library at Alexandria was destroyed in 48 B.C.
    - v. Philosophy is of little comfort to the starving.
3. Whether every proposition has two parts?
4. What are the two parts of every proposition? Answer: subject and predicate
  - a. Whether the *subject* is that about which something is said?

- b. Whether the *predicate* is that which is said about something?
- c. Please circle the subject and underline the predicate.
  - i. All minerals are natural things in the physical environment.
  - ii. Some plants are seed-bearing plants.
  - iii. Some animals are not arthropods and do not have a segmented body.
  - iv. No human persons attend school on the moon.
  - v. Socrates was a person who was placed in jail.

### III. Sentences, Propositions

Aristotle, *On Interpretation*, c. 4, no. 16 b 28.

A sentence is a significant portion of speech, some parts of which have an independent meaning, that is to say, as an utterance, though not as the expression of any positive judgment. Let me explain. The word 'human' has meaning, but does not constitute a proposition, either positive or negative. It is only when other words are added that the whole will form an affirmation or denial. But if we separate one syllable of the word 'human' from the other, it has no meaning; similarly in the word 'mouse', the part 'ouse' has no meaning in itself, but is merely a sound. Every sentence has meaning, not as being the natural means by which a physical faculty is realized, but, as we have said, by convention. Yet every sentence is not a proposition; only such are propositions as have in them either truth or falsity. Thus a prayer is a sentence, but is neither true nor false. Let us therefore dismiss all other types of sentences but the proposition, for this last concerns our present inquiry, whereas the investigation of the others belongs rather to the study of rhetoric or of poetry.

- 1. Whether sentences and propositions are different?
- 2. What is the difference between a sentence and a proposition?

### IV. Simple, Composite

Aristotle, *On Interpretation*, c. 5, no. 17 a 15.

We call those propositions single which indicate a single fact, or the conjunction of the parts of which results in unity: those propositions, on the other hand, are separate and many in number, which indicate many facts, or whose parts have no conjunction... [O]f propositions one kind is simple, i.e. that which asserts or denies something of something, the other composite, i.e. that which is compounded of simple propositions. A simple proposition is a statement, with meaning, as to the presence of something in a subject or its absence, in the present, past, or future, according to the divisions of time.

- 1. Whether a *simple proposition* has one subject and one predicate?
- 2. Whether a *composite proposition* has more than one subject or more than one predicate or more of both?
  - a. Every kangaroo is a marsupial. (Simple or composite.)
  - b. Every kangaroo is a marsupial and a mammal. (Simple or composite.)
  - c. Every kangaroo and wallaby is a marsupial. (Simple or composite.)
  - d. Every kangaroo is a marsupial, and every wallaby is a marsupial. (Simple or composite.)

## V. Affirmative, Negative

Aristotle, *On Interpretation*, c. 6, no. 17 a 25.

An affirmation is a positive assertion of something about something, a denial a negative assertion. Now it is possible both to affirm and to deny the presence of something which is present or of something which is not, and since these same affirmations and denials are possible with reference to those times which lie outside the present, it would be possible to contradict any affirmation or denial. Thus it is plain that every affirmation has an opposite denial, and similarly every denial an opposite affirmation. We will call such a pair of propositions a pair of contradictories. Those positive and negative propositions are said to be contradictory which have the same subject and predicate. The identity of subject and of predicate must not be 'equivocal'. Indeed there are definitive qualifications besides this, which we make to meet the casuistries of sophists.

1. Whether every *affirmative proposition* connects a subject with a feature?
2. Whether every *negative proposition* separates a subject with a feature?
  - a. Every mammal has a spinal column. (Affirmative or negative.)
  - b. Some mammals have pouches to carry the young. (Affirmative or negative.)
  - c. Some mammals do not have pouches to carry the young. (Affirmative or negative.)
  - d. No mammals have cold blood. (Affirmative or negative.)

## VI. General, Singular

*On Interpretation*, c. 7, no. 17 a 38.

Some things are general, others individual. By the term 'general' I mean that which is of such a nature as to be predicated of many subjects, by 'individual' that which is not thus predicated. Thus 'man' is a universal, 'Callias' an individual. Our propositions necessarily sometimes concern a general subject, sometimes an individual.

1. Whether a *singular proposition* signifies a subject existing in time and place?
2. Whether a *general proposition* signifies a subject in an abstract way?
  - a. A kangaroo has a pouch to carry its young. (Singular or general?)
  - b. This kangaroo has a pouch to carry its young. (Singular or general?)
  - c. Those three kangaroos at the zoo have pouches to carry their kids. (Singular or general?)
  - d. Kangaroos have a pouch to carry the young. (Singular or general?)

## VII. Universal, Particular

Richard J. Connell, *Logical Analysis*, c. 15.

A "class name" signifies (1) a common nature or attribute first and directly, and (2) it signifies individuals who have the attribute secondarily and indirectly. Consequently, when predicates are affirmed of general subjects, they can be said of them in two basic ways: as belonging either to the whole class or to only a part of the class. Subjects taken according to their entire class membership are signified by special words such as "every," "all," "any," "each," "whatever," "whoever," etc. Here are some examples of a universal proposition where an attribute is predicated of the whole class: "Every pulsar

rotates rapidly," "All elands conserve water," "Whatever is a metal is conductive." Now here are some examples of a particular proposition where an attribute is predicated of some members of a class: "Some stars are pulsars," "Many Americans are restless in their prosperity," "Some cells are spherical." Thus, a universal statement predicates something of the subject unrestrictedly, whereas a particular statement predicates something of the subject restrictedly. In sum, varying the multitude of class members gives rise to different propositions. Of course, negative as well as affirmative propositions can be distinguished according to universal and particular quantities.

1. Whether a *particular proposition* signifies an attribute that belongs to a part of a class?
2. Whether a *universal proposition* signifies an attribute that belongs to the whole a class?
  - a. All kangaroos have red fur. (Universal or particular.)
  - b. Some kangaroos have red fur. (Universal or particular.)
  - c. Some kangaroos do not have red fur. (Universal or particular.)
  - d. No kangaroo has blue fur. (Universal or particular.)

### **VIII. True, False**

St. Thomas Aquinas (Paris, 1250), *On Truth*, question 1, no. 1

Truth or the true has been defined in [two] ways. First, it is defined according to that which precedes truth and is the basis of truth. This is why Augustine writes, "The true is that which is" (*PL* 32, 889). Truth is also defined in another way – according to that in which its intelligible determination is formally completed. Thus, Isaac writes, "Truth is the conformity of thing and intellect" (*MK* 332), and Aristotle says that in defining truth we say that truth is had when one affirms that "to be which is, and that not to be which is not" (*Metaphysics* 1011 b 27).

1. Whether a *true proposition* agrees with reality and signifies that which can be observed or proved?
2. Whether a *false proposition* does not agree with reality?
  - a. All kangaroos are mammals. (True or false.)
  - b. All kangaroos are underwater creatures. (True or false.)
  - c. Some kangaroos are truck drivers. (True or false.)
  - d. Some kangaroos are animals. (True or false.)
  - e. Some dolphins are not in the San Diego zoo. (True or false.)
  - f. Some dolphins are not sea creatures. (True or false.)
  - g. No dolphins are dump trucks. (True or false.)
  - h. No dolphins are animals. (True or false.)

### 13. Propositions



## Categorical Propositions

## I. Categorical Propositions

Aristotle, *On Interpretation*, c. 7

The denial proper to the affirmation "every man is white" is "not every man is white;" that proper to the affirmation "some men are white" is "no man is white."

### a. Practice

Please answer the following.

1. What are the four kinds of categorical propositions listed above?
  - a.
  - b.
  - c.
  - d.

## II. Categorical Propositions

Richard Connell, *Logical Analysis*, c. 16.

If we combine the possible variations in the quantity of propositions (“all” or “some”) with the possible variations in quality (“affirmative” or “negative”), we end up with four types of general statements. Each kind of statement can be represented by a letter symbol as follows: universal affirmative, A; universal negative, E; particular affirmative, I; particular negative, O. The symbols come from the Latin words *affirmo* and *nego*. *Affirmo* means “I affirm” and its vowels are A and I, which signify the two affirmative propositions. *Nego* means “I deny,” and its vowels are E and O, the symbols for the two negative propositions. Thus, we have four types of general propositions: A, E, I and O.

### a. Practice

Please write all four general propositions: A, E, I and O. The work is tedious but worth the effort.

1. electrons move in circular orbits
- A
- E
- I
- O



## 14. Propositions

### Opposition



### I. Subalternation Opposition

Richard Connell, *Logical Analysis*, c. 16.

When we look at two propositions containing the same terms and having the same quality (affirmative or negative), one of which is universal and the other particular, we see that they are related as whole to part. By definition universal propositions join their predicates to all the members of a class or to none of the members of a class. And because there is a whole/part relation between a universal affirmative statement and a particular affirmative statement, a certain kind of inference from one to the other is possible. Since the universal contains the particular, it follows that if the former is true, then the latter is true, too. If “every unicellular organism is a viscous substance” is true, then “some unicellular organisms are viscous substances” is true, also. Similarly, if “no ice fish has red corpuscles” is true, then “some ice fish do not have red corpuscles” must be true.

#### a. Practice

First rule of opposition: subalternation where the universal is true.

1. If the universal proposition is true, then the particular proposition is necessarily true.
  - a. If “every cellular thing is viscous” is true, then “some cellular things are viscous” is \_\_\_\_\_
  - b. If “no ice fish has red corpuscles” is true, then “some ice fishes do not have red corpuscles” is \_\_\_\_\_
  - c. If A is true, then I is \_\_\_\_\_
  - d. If E is true, then O is \_\_\_\_\_

### II. Subalternation Opposition

Connell, *Logical Analysis*, c. 16.

But since the particular can be true without the whole being true, the truth of the particular does not allow us to infer the truth of the universal. If “some men are right handed” is true, we are not entitled to infer that “Every man is right handed” is true. And if “some men are not chemists” is true, we may not infer that “No men are chemists” is true.

#### a. Practice

Second rule of opposition: subalternation where the particular is true.

2. If the particular proposition is true, then the universal may be true or false and is unknown.
  - a. If “some men are right handed” is true, then “all men are right handed” is \_\_\_\_\_
  - b. If “some men are not chemists” is true, then “no men are chemists” is \_\_\_\_\_
  - c. If I is true, then A is \_\_\_\_\_
  - d. If O is true, then E is \_\_\_\_\_



### III. Subalternation Opposition

Connell, *Logical Analysis*, c. 16.

The relation between universal and particular under a condition of falsity is the reverse of the above. If a part is false, then the whole is destroyed. Thus, if the particular is false, then the universal is known to be false, also. For example, if it is false that "some antelopes drink water," then it must be false to say that "all antelopes drink water."

#### a. Practice

Third rule of opposition: subalternation where the particular is false.

3. If the particular proposition is false, then the universal proposition must be false.
  - a. If "some antelopes drink water" is false, then "all antelopes drink water" is \_\_\_\_\_
  - b. If "some students are not surfers" is false, then "no students are surfers" is \_\_\_\_\_
  - c. If I is false, then A is \_\_\_\_\_
  - d. If O is false, then E is \_\_\_\_\_

### IV. Subalternation Opposition

Connell, *Logical Analysis*, c. 16.

Finally, if the universal is false, then nothing may be said about the particular, for a predicate that is denied of one member of a class may be affirmed of another member of the same class. For example, if it is false that "All small animals herd together," then it is not necessarily false that "some small animals herd together."

#### a. Practice

Fourth rule of opposition: subalternation where universal is false.

4. If the universal proposition is false, then the particular may be true or false and remains unknown.
  - a. If "all small animals herd together" is false, then "some small animals herd together" is \_\_\_\_\_
  - b. If "no students are airline pilots" is false, then "some students are not airline pilots" is \_\_\_\_\_
  - c. If A is false, then I is \_\_\_\_\_
  - d. If E is false, then O is \_\_\_\_\_

### V. Contrary Opposition

Aristotle, *On Interpretation*, c. 7, no. 17 b 2 and c. 7, no.

If, then, a man states a positive and a negative proposition of universal character with regard to a universal, these two propositions are "contrary." By the expression "a proposition of universal character with regard to a universal," such propositions as "every man is white," "no man is white" are meant... [P]ropositions are opposed as contraries when both the affirmation and the denial are universal, as in the sentences "every man is white," "no man is white," "every man is just," "no man is just."

**a. Practice**

Fifth rule of opposition: contraries.

5. If one side of a contrary (A or E) is true, then the other side must be false.  
If one side of a contrary (A or E) is false, then the other side must be unknown.
  - a. If "every man is white" is true, then "no man is white" is \_\_\_\_
  - b. If "every man is just" is false, then "no man is just" is \_\_\_\_
  - c. If A is true, then E is \_\_\_\_
  - d. If A is false, then E is \_\_\_\_
  - e. If E is true, then A is \_\_\_\_
  - f. If E is false, then A is \_\_\_\_

**VI. Contradictory Opposition**

Aristotle, *On Interpretation*, c. 7, no. 17 b 15 and c. 7, no. 18 a 4.

An affirmation is opposed to a denial in the sense which I denote by the term "contradictory," when, while the subject remains the same, the affirmation is of universal character and the denial is not. The affirmation "every man is white" is the contradictory of the denial "not every man is white," or again, the proposition "no man is white" is the contradictory of the proposition "some men are white." ...The denial proper to the affirmation "every man is white" is "not every man is white;" that proper to the affirmation "some men are white" is "no man is white."

**a. Practice**

Sixth rule of opposition: contradictories

6. If one side of a contradiction is true (A or E), then the other side must be false.  
If one side of a contradiction is false (A or E), then the other side must be true.
  - a. If "every man is white" is true, then "some men are not white" is \_\_\_\_
  - b. If "no man is white" is true, then "some men are white" is \_\_\_\_
  - c. If A is true, then O is \_\_\_\_
  - d. If A is false, then O is \_\_\_\_
  - e. If E is true, then I is \_\_\_\_
  - f. If E is false, then I is \_\_\_\_

**VII. Subcontrary Opposition**

*On Interpretation*, C. 7, no. 17 b 28.

When, on the other hand, the reference is to universals, but the propositions are not universal, it is not always the case that one is true and the other false, for it is possible to state truly that "man is white" and that "man is not white" and that "man is beautiful" and that "man is not beautiful;" for if a man is deformed he is the reverse of beautiful, also if he is progressing towards beauty he is not yet beautiful. This statement might seem at first sight to carry with it a contradiction, owing to the fact that the proposition "man is not white" appears to be equivalent to the proposition "no man is white." This, however, is not the case, nor are they necessarily at the same time true or false.

**a. Practice**

Seventh rule of opposition: subcontraries.

7. If one side of a subcontrary is true (I or O), then the other side remains unknown.  
If one side of a subcontrary is false (I or O), then the other side must be true.
  - a. If "some men are white" is true, then "some men are not white" is \_\_\_\_\_
  - b. If "some men are beautiful" is false, then "some men are not beautiful" is \_\_\_\_\_
  - c. If I is true, then O is \_\_\_\_\_
  - d. If I is false, then O is \_\_\_\_\_
  - e. If O is true, then I is \_\_\_\_\_
  - f. If O is false, then I is \_\_\_\_\_

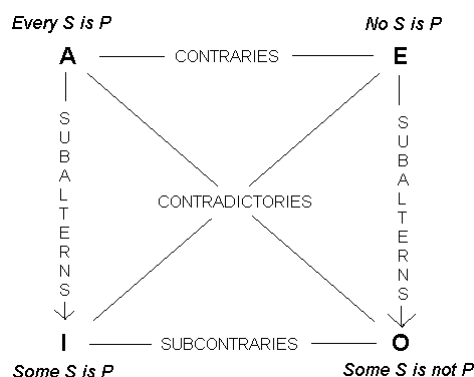
**b. Review**

Please answer the following.

1. All jet airplanes have jet propulsion. (True.)  
Some jet airplanes have jet propulsion. (True, false or unknown.)
2. Some jet airplanes are manufactured in California. (True.)  
All jet airplanes are manufactured in California. (True, false or unknown.)
3. Some jet airplanes are manufactured in Burma. (False.)  
All jet airplanes are manufactured in Burma. (True, false or unknown.)
4. All jet airplanes are manufactured in Italy. (False.)  
Some jet airplanes are manufactured in Italy. (True, false or unknown.)
5. All club mosses are plants. (True.)  
No club mosses are plants. (True, false or unknown.)
6. All bristlecone pines are trees. (True.)  
Some bristlecone pines are not trees. (True, false or unknown.)
7. Some angiosperms are seed-bearing plants. (True.)  
Some angiosperms are not seed-bearing plants. (True, false or unknown.)

**c. Square of Opposition**

<http://plato.stanford.edu/entries/square/>



## 15. Propositions

### Modals



### I. Modal Propositions

Aristotle, *On Interpretation*, c. 12

As these distinctions have been made, we must consider the mutual relation of those affirmations and denials which assert or deny possibility or contingency, impossibility or necessity: for the subject is not without difficulty.

### II. Theory

Celestine Bittle, O.F.M., *The Science of Correct Thinking* (1960: 122)

The modal proposition is a single sentence in which the linking verb is so modified as to express the manner and “mode” in which the predicate belongs to the subject... The copula itself states whether the objective connection between subject and predicate is necessary, impossible, possible or contingent. There are four such modes, each of which produces a different kind of proposition.

The necessary modal proposition states that the predicate belong to the subject and *must* belong to it. For example, a circle must be round. The impossible proposition states that the predicate does not and *cannot* belong to the subject, as it is impossible that a mineral is intelligent. The possible proposition enunciates the fact that the predicate is not actually found in the subject, but it *might be*, such as a car which can attain a speed of 75 miles an hour. The contingent proposition states that the predicate actually belongs to the subject, but it *need not*, as it is contingent that the eagle is flying.

The peculiarity of the modal proposition lies precisely in its “mode,” the truth of the judgment depends mainly on the truth of this mode. Like other composite propositions, the modal proposition presupposes a former judgment. For example, the statement that a circle must be round presupposed the statement that circles are round.

### a. Practice

Please determine whether necessary, impossible, possible or contingent.

1. Water is a mineral and a compound. *must be; necessary*  
 Water is a plant and a tree. *cannot be; impossible*  
 Water is able to put out a fire. *capable, might; possible*  
 Water is being poured into a glass. *presently, temporarily; contingent*
  
2. A conifer is a plant and a tree.  
 A conifer is an element.  
 A conifer is running.  
 A conifer is able to sway in the wind.  
 A conifer is covered in snow.

3. A kangaroo is a marsupial mammal.  
A kangaroo is a tree and a plant.  
A kangaroo can drive a taxi.  
A kangaroo is able to weigh 200 pounds.  
A kangaroo is sleeping.
4. A child is a human person.  
A child is a mineral and a compound.  
A child can swim one hundred miles.  
A child is able to learn a language.  
A child is eating ice cream.
5. Iron is a metal.  
Iron is a plant.  
Iron is capable of being hammered into thin sheets.  
Iron is used to make golf clubs.
6. A plant needs light in order to grow.  
A plant may be categorized as a metal.  
A plant may run like an animal.  
A plant exists on the window sill.  
A plant may bend toward the light.
7. A leopard belongs to the class of mammals and cats.  
A leopard is perhaps the most athletic of the big cats.  
A leopard is capable of running and swimming.  
A leopard may be classified as a mineral.  
A leopard is hunting a bird.
8. A tiger is categorized as a mammal.  
The length of a tiger may be up to nine feet.  
A tiger may be classified as a plant.  
A tiger is fishing with its paws.  
A tiger may be observed in Burma and Thailand.
9. In order to speak a human person needs to have a larynx.  
A person is speaking to his neighbor.  
The sound of a person's voice may be seen.  
The sound of a person's voice may be loud or quiet.

## 16. Propositions

### Premises



### I. Demonstrative and Dialectical

Aristotle, *Prior Analytics*, c. 1

We must first state the subject of our inquiry and the faculty to which it belongs: its subject is demonstration and the faculty that carries it out demonstrative science. We must next define a premise, a term, and a syllogism...

A premise then is a sentence affirming or denying one thing of another. This is either universal or particular or indefinite. By universal I mean the statement that something belongs to all or none of something else; by particular that it belongs to some or not to some or not to all; by indefinite that it does or does not belong, without any mark to show whether it is universal or particular, e.g. 'contraries are subjects of the same science', or 'pleasure is not good'.

The demonstrative premise differs from the dialectical, because the demonstrative premise is the assertion of one of two contradictory statements (the demonstrator does not ask for his premise, but lays it down), whereas the dialectical premise depends on the adversary's choice between two contradictories. But this will make no difference to the production of a syllogism in either case; for both the demonstrator and the dialectician argue syllogistically after stating that something does or does not belong to something else. Therefore a syllogistic premise without qualification will be an affirmation or denial of something concerning something else in the way we have described; it will be demonstrative, if it is true and obtained through the first principles of its science... The nature then of a premise and the difference between syllogistic, demonstrative, and dialectical premises, may be taken as sufficiently defined by us in relation to our present need, but will be stated accurately in the sequel.

I call that a term into which the premise is resolved, i.e. both the predicate and that of which it is predicated, 'being' being added and 'not being' removed, or vice versa.

A syllogism is discourse in which, certain things being stated, something other than what is stated follows of necessity from their being so. I mean by the last phrase that they produce the consequence, and by this, that no further term is required from without in order to make the consequence necessary.

### a. Practice i

Please answer the following.

1. Whether Aristotle opens his third book on logic, *Prior Analytics*, with an introduction?
2. What are the subject and the faculty that uses the subject in Aristotle's "inquiry"?
  - a. The subject:
  - b. The faculty [and cause of the subject]:
3. What three things will Aristotle define in the *Prior Analytics*?

4. Whether a demonstrative premise and a dialectical premise are different?
5. What is the difference between a demonstrative premise and a dialectical premise?
  - a. Demonstrative premise:
  - b. Dialectical premise:
6. A syllogism uses (a) a demonstrative premise or (b) a dialectical premise.

**b. Practice ii**

Please answer the following

1. Whether a premise is a proposition and a sentence?
2. What are the two parts of a proposition?
3. What is a true proposition?
4. Determine whether the proposition is *singular* or *general*.
  - a. This mule deer is a mammal.
  - b. All mule deers are mammals.
  - c. Some mule deers are mammals.
  - d. Some mule deers are not fawns.
5. Determine whether the proposition is *simple* or *compound*.
  - a. All mules deers are mammals and vertebrates.
  - b. Some mule deers are fawns.
  - c. Some mule deers and some coyotes are not located in Yosemite.
  - d. No mule deer is a tunicate and a lancelet.
6. Determine whether the proposition is *particular*, *universal* or *indefinite*.
  - a. All mules deers are mammals.
  - b. Some mule deers are mammals.
  - c. Some mule deers are not fawns.
  - d. No mule deers are reptiles.
  - e. Mule deers are long-eared deer of Western North America.
  - f. A mule deer is more heavily built than the common whitetail deer.
7. Determine whether the proposition is *affirmative* or *negative*.
  - a. All mules deers are mammals.
  - b. Some mule deers are mammals.
  - c. Some mule deers are not fawns.
  - d. No mule deers are reptiles.
8. Determine whether the proposition is *true* or *false*.
  - a. All mule deers are animals.
  - b. Some mule deers are dump trucks.
  - c. Some dump trucks are not reptiles.
  - d. No reptiles are animals.

## 17. Propositions

### Conversion



### I. Conversion

Aristotle, *Prior Analytics*, c. 2

Every premise states that something either is or must be or may be the attribute of something else; of premises of these three kinds some are affirmative, others negative, in respect of each of the three modes of attribution; again some affirmative and negative premises are universal, others particular, others indefinite. It is necessary then that in universal attribution the terms of the negative premise should be convertible, e.g. if no pleasure is good, then no good will be pleasure; the terms of the affirmative must be convertible, not however, universally, but in part, e.g. if every pleasure is good, some good must be pleasure; the particular affirmative must convert in part (for if some pleasure is good, then some good will be pleasure); but the particular negative need not convert, for if some animal is not man, it does not follow that some man is not animal.

First then take a universal negative with the terms A and B. If no B is A, neither can any A be B. For if some A (say C) were B, it would not be true that no B is A; for C is a B. But if every B is A then some A is B. For if no A were B, then no B could be A. But we assumed that every B is A. Similarly too, if the premise is particular. For if some B is A, then some of the As must be B. For if none were, then no B would be A. But if some B is not A, there is no necessity that some of the As should not be B; e.g. let B stand for animal and A for man. Not every animal is a man; but every man is an animal.

### II. Conversion ii

An analysis of the above.

- a. First then take a universal negative with the terms A and B.
  1. If no B is A, neither can any A be B.
    - a. For if some A (say C) were B, it would not be true that no B is A; for C is a B.
  2. But if every B is A, then some A is B.
    - a. For if no A were B, then no B could be A. But we assumed that every B is A.
  3. Similarly too, if the premise is particular. For if some B is A, then some of the As must be B.
    - a. For if none were, then no B would be A.
  4. But if some B is not A, there is no necessity that some of the As should not be B;
    - a. For let B stand for animal and A for man. Not every animal is a man; but every man is an animal.



**a. Practice i**

Please answer the following.

1. If “no animals are dump trucks” is true, then the statement that “no dump trucks are animals” is true, false or unknown.

Why? For if...

2. If “all dolphins are whales” is true, then the judgment that “some whales are dolphins” is true, false or unknown.

Why? For if...

3. If “some whales are warm-water animals” is true, then the inference that “some warm-water animals are whales” is true, false or unknown.

Why? For if...

4. If “some animals are not warm blooded” is true, then the proposition “some warm blooded things are not animals” is true, false or unknown.

Why? For if...

**b. Practice ii**

Please convert the following propositions.

1. No kangaroos are dump trucks.
2. No dolphins are minerals.
3. All dolphins are whales.
4. All dump trucks are machines.
5. Some whales are dolphins.
6. Some mammals are kangaroos.
7. Some warm-blooded animals are not wallabies.
8. Some machines are not dump trucks.
9. All chordates are animals.
10. Some animals are vertebrates.
11. Some marsupials are not kangaroos.
12. No reptiles are marsupials.

### III. Obversion

Manuel Piñon, *Fundamental Logic*, c. 17, no. 124

Obversion is one of the logical procedures for forming equivalent propositions. The original proposition is called the obvertend, and the resultant proposition is called the obverse. Obversion changes the quality of the proposition (affirmative becomes negative and negative becomes affirmative) without changing its meaning. The quantity of the proposition (universal or particular) is not changed, so that the obverse is the exact equivalent of the original. To form an equivalent proposition by way of obversion: (i) change the quality of the proposition, (ii) keep the quantity and (iii) substitute in place of the predicate its contradictory term. For example, “all men are wise” obverts to “no men are non-wise;” “no men are wise” becomes “all men are non-wise;” “some men are white” becomes “some men are not non-white;” and “some men are not beautiful” becomes “some men are non-beautiful.”

#### a. Practice

Please answer the following.

1. If “all dolphins are mammals,” then the inference that “no dolphins are non-mammals” is true, false or unknown.
2. If “no mammals are reptiles” is true, then “all mammals are non-reptiles” is true, false or unknown.
3. If “some reptiles are snakes” is true, then “some reptiles are not non-snakes” is true, false or unknown.
4. If “some snakes are not poisonous” is true, then “some snakes are non-poisonous” is true, false or unknown.
5. If it is true that “all bricks are non-flammable,” then the inference that “no bricks are non-non-flammable” is true, false or unknown.

### IV. Contrapositive

Miguel Piñon, *Fundamental Logic*, c. 17, no. 126

Conversion by contraposition is a procedure that makes use first of obversion, then converts according to the norms already given. An affirmative proposition thereupon becomes a negative converse, and vice-versa. For example, “all men are mortal” obverts to “no men are non-mortal” and converts to “no non-mortal beings are men.” To give another example, “some men are not virtuous” obverts to “some men are non-virtuous” and converts to “some non-virtuous beings are men.”

#### a. Practice

Please answer the following.

1. If “all kangaroos are mammals” is true,  
then the obversion “no kangaroos are non-mammals” is true, false or unknown?  
and the conversion “no non-mammals are kangaroos” is true, false or unknown?

**and the obversion “all non-mammals are non-kangaroos” is true, false or unknown?**

## 18. Arguments

### Theory of Syllogisms



#### I. Investigation

T. Faulders, "The theory and nature of a syllogism"

The question is whether a syllogism is good? I accept, allow, approve and welcome this question since Aristotle focused on the syllogism in his logical works and his works are very influential in the history of science.

The final cause and goal of a syllogism is to bring about new knowledge from old knowledge. For example, we all know that "a dolphin is a whale" and that "a whale is a mammal." What is new and interesting, however, is to realize that "a dolphin is mammal."

The material cause and stuff of a syllogism are three simple propositions. There are three formal causes and unique features that belong to every syllogism: (1) a universal proposition is the major premise on top, (2) an affirmative proposition is the minor premise in the middle, and (3) the figure is figure one.

The principal agent and person responsible for a syllogism is every logic student who tries to arrange three simple propositions into figure one. The preparing agent is that which prepares a logic student to use a syllogism which includes his previous work with subjects, predicates, simple and compound propositions, universal and particular propositions, affirmative and negative propositions, conversion, obversion and figures. A person who wishes to use a syllogism in order to bring new knowledge from old knowledge may be assisted by a logic teacher who has made many mistakes with syllogisms in the past and knows how to correct those mistakes. The syllogism itself is an instrumental agent and tool that allows a person to create scientific demonstrations and strong conclusions.

What does a person see when using a syllogism? A person who works with a syllogism will see a universal proposition on top, an affirmative proposition in the middle, and the middle terms in figure one.

The history of a syllogism starts with Aristotle (384-322 B.C.) who discovered the three features of a syllogism while studying logic at Plato's school "The Academy" in Athens. Because of his discovery of the syllogism as well as other tools in logic, Aristotle is described as "The man who built the foundation of a civilization" (B. Laughlin, *The Story of Aristotle*, 1995: 1). According to a contemporary historian of logic, "Aristotle's views on the syllogism and the structure of an axiomatic system has remained a part of every methodology of deduction right to our own day" (I. Bochenski, *History of Formal Logic*, 1961: 74).

A syllogism is analogous to a blender. A blender is a tool in the kitchen that is capable of making a healthy new drink from old ingredients, such as ice cream, eggs, chocolate powder and milk. Similarly, a syllogism is a tool in a person's memory that is capable of making healthy new knowledge from old knowledge, such as "dolphin," "whale" and "mammal." A sign that a syllogism is good and worthy of our attention is the fact that syllogisms bring peace, makes sense, sound logical and work smoothly.

The motive for using a syllogism is reasonable, since it is reasonable to use a logical tool in order to have new knowledge. The motive for using a syllogism might be natural, since a syllogism naturally

works. However, the motives for using a syllogism do not involve chance, compulsion, or anger, since a syllogism requires confidence and patience. The passions that are triggered when using a syllogism are several. A logic student may feel *fear* in relation to such things as “simple propositions,” “figures,” and “conversion.” Or a logic student might feel *anger* since a syllogism seems so easy in theory but difficult when actually using one. Or a student might feel *courage* since he knows that logic class is one of the most difficult classes on a college campus and welcomes the challenge. Lastly, a logic student might feel *joy*, because a syllogism is a logical instrument that brings about new knowledge. The percentage of logicians and scientists who use syllogisms is 100%.

After reviewing the above deliberation process, I will now choose (i) the analogy and (ii) the passions as my favorite reasons for accepting the conclusion that “a syllogism is good.” My two choices allow me to make the following command. A syllogism is good, because a syllogism (i) brings healthy new knowledge like a blender and (ii) triggers the feeling of joy. I shall now make the following argument:

Every thing that (i) brings healthy new knowledge and (ii) triggers the feeling of joy is good.

A syllogism is a thing that (i) brings healthy new knowledge and (ii) triggers the feeling of joy.

Therefore, a syllogism is good.

A historian may object that Aristotle’s syllogism was valuable during the Medieval (800-1200) and Renaissance (1200-1600) but is useless today, since the predicate calculus of Gottlob Frege (1848-1925) is a superior version of deduction that serves computer programs in a way that is much better than syllogisms. Jan Lukasiewicz, the famous mathematical logician from Crakow, Poland, responds to this objection and writes, “The syllogistic of Aristotle is a system the exactness of which surpasses even the exactness of a mathematical theory, and this is its everlasting merit.” (*Aristotle’s Syllogistic from the Standpoint of Modern Formal Logic*, 1951: 131).

A logician may complain that the syllogism is a small part of Aristotle’s teachings on formal logic and that there are many other topics in logic that deserve more attention, such as modal propositions and relationships. This complaint is weak, as Bochenski points out, since “Aristotle’s masterpiece in formal logic is his syllogistic” (I. Bochenski, *History of Formal Logic*, 1961: 98).

A young logician may wonder if the time devoted to the study of syllogisms will prevent him or her from studying more exciting problems in contemporary philosophy. My response is to say that one of the topics in cognitive science today is called “Logical Reasoning Systems.” David McAllester, a contemporary philosopher at Toyota Technological Institute in Chicago, writes, “Logical reasoning systems derive sound conclusions from formal declarative knowledge... and have a rich history, starting with Greek syllogisms and continuing through the work of many prominent mathematicians such as Descartes, Leibniz, Boole, Frege, Hilbert, Godel and Cohen” (“Logical Reasoning Systems,” *The MIT Encyclopedia of the Cognitive Sciences*, 1999: 491). Thus, devoting time toward the understanding of syllogisms will open doors to current problems in philosophy. In summary, understanding and appreciating a syllogism is good, since a syllogism is a tool of logic that brings new knowledge, feelings of joy, the exactness of mathematical logic, and introduces a student to contemporary problems in philosophy. Similarly, the syllogism is the “masterpiece” of Aristotle’s logic.

## 19. Arguments

### Practice with Syllogisms



### I. Analytical Propositions

An “analytical proposition” is one that is or can be known immediately without additional premises.

1. Like things have like causes.  
Accept or reject?
2. Two things equal to a third thing are equal to each other.  
Accept or reject?
3. Whatever is affirmed universally of a group is affirmed of the members in the group.  
Accept or reject?
4. Whatever is denied universally of a group is denied of the members of the group.  
Accept or reject?
5. What might exist also might not exist.  
Accept or reject?
6. Every thing that is greater than a second thing is greater than any other thing that is less than the second thing.  
Accept or reject?
7. What is not now will never have to be.  
Accept or reject?
8. Whatever is received is received according to the nature or mode of being of the recipient.  
Accept or reject?

### II. Definition of a Syllogism

Aristotle, *Prior Analytics*, c. 1, no. 24 b 22

A syllogism is a discourse in which, certain things being stated, something other than what is stated follows of necessity from their being so. I mean by the last phrase that they produce the consequence, and by this, that no further term is required from without in order to make the consequence necessary.”

Accept or reject?

### III. Two Examples of a Syllogism

Aristotle, *Prior Analytics*, C. 4, no. 25 b 33

Whenever three terms are so related to one another that the last is contained in the middle as in a whole, and the middle is either contained in, or excluded from, the first as in or from a whole, the extremes must be related by a perfect syllogism. I call that term middle which is itself contained in

another and contains another in itself: in position also this comes in the middle. By extremes I mean both that term which is itself contained in another and that in which another is contained. If A is predicated of all B, and B of all C, A must be predicated of all C. Similarly also, if A is predicated of no B, and B of all C, it is necessary that no C will be A.

Accept or reject?

#### IV. Kinds of Syllogisms

Connell, *Logical Analysis*, pp. 145-146.

1. Every arrangement of propositions in which the first term is affirmed universally of a second term, and the second term is affirmed universally of a third term, produces another proposition necessarily in which the first term is affirmed universally of the third term.

Accept or reject?

2. Every arrangement of propositions in which the first term is denied universally of a second term and the second term is affirmed universally of a third term, produces another proposition necessarily in which the first term is denied universally of the third term.

Accept or reject?

3. Every arrangement of propositions in which the first term is affirmed universally of a second term, and the second term is affirmed particularly of a third term, produces another proposition necessarily in which the first term is affirmed particularly of the third term.

Accept or reject?

4. Every arrangement of propositions in which the first term is denied universally of a second term, and the second term is affirmed particularly of a third term, produces another proposition necessarily in which the first term is denied particularly of the third term.

Accept or reject?

#### IV. Questions about Syllogism

Please answer the following.

1. Whether every "argument" has a premise and a conclusion?
2. Whether every "syllogism" is an argument with two premises and one conclusion?
3. Whether the "major premise" is the first sentence and the first premise of a syllogism?
4. What feature is shared by all the major premises in the syllogisms above?
5. Whether the "minor premise" is the second sentence and the second premise of a syllogism?
6. What feature is shared by all the minor premises above?
7. How does a logician discover the similarity in the minor premises above?
8. Review:
  - a. Whether the major premises above (III. 1-4) have a similar feature?
  - b. Whether the minor premises above have a similar feature?
  - c. Whether the four syllogisms above might have another similar feature?

## 20. Arguments

### Reduction



### I. Matter and Form of a Syllogism

John Poinsett, *Formal Logic*, Madrid, 1630, Bk. III, chs. 4-5.

Syllogisms can be divided either according to matter or according to form. According to matter we have the demonstrative premises [A, E, I or O] which produce science and necessary conclusions... According to form syllogisms have three figures. The *first* figure is where the middle term is the subject in the major premise and the predicate in the minor premise. The *second* figure is where the middle term is the predicate in both premises. And the *third* figure is where the middle term is the subject in both premises. Also according to form a syllogism has a mood. A mood is the arrangement of premises or propositions with the right quantity and quality: at least one premise must be affirmative which is the quality and at least one premise must be universal which is the quantity.

- a. Whether a syllogism has a figure and a mood?
- b. What is the figure of a syllogism?
- c. What is the mood of a syllogism?
- d. Please determine the mood of the following syllogisms. Label them A, E, I, or O.
  - i. 

<i>Figure I:</i>	<i>Figure II:</i>	<i>Figure III:</i>
All M is P.	No P is M.	All M is P
All S is M.	Some S is M.	Some M is not S.

### II. Reduction in Theory

John Poinsett, *Formal Logic*, Madrid, 1630, Book 3, chapters 7 and 10 (1955: 115, 122)

The property of reduction of imperfect syllogisms to perfect syllogism consists in this: those syllogisms in which the *dictum de omni* and *dictum de nullo* principles do not appear evidently and clearly are reduced and tested by means of those syllogisms where the above principles are evident and clear. Now the most clear and perfect syllogisms are the four valid syllogisms of the first figure: *Barbara*, *Celarent*, *Darii*, and *Ferio*... Reduction employs two principles: (i) the conversion [and obversion] of propositions and (ii) the interchanging of the minor and major premises...

The whole syllogistic procedure is grounded on three principles which are known immediately. The first principle is: "Whatever things are identical with one third thing are identical with each other." On this principle the force of discursive proof rests... The second principle is: "*Dictum de omni*," that is, "Whatever is affirmed universally of a subject is said of everything that is contained under such a subject." For example, if it is affirmed of a man universally that he is risible [and capable of laughing], it ought to be affirmed of any individual instance of man... The third principle is: "*Dictum de nullo*," that is, "Whatever is denied universally of some subject is denied also of everything contained under such a subject." For example, if one denies of many universally that he is a stone, one ought to deny it of every individual instance under man.

- a. Whether "three principles" and rules guide the activity of forming syllogisms?

- b. What are the three principles that guide the activity of forming syllogisms?
  - i. Whatever things...
  - ii. *Dictum de omni* (Said of all) :
  - iii. *Dictum de nullo* (Said of none) :
- c. How does a person change an invalid and weak syllogism into a valid and strong syllogism? What is the name of the process?
- d. What are the two principles and tricks that a logician uses when reducing weak syllogisms to strong syllogisms?

**a. Reduction, Step One**

Please circle the middle terms. The middle terms appear twice in the premises.

- |                                |                               |
|--------------------------------|-------------------------------|
| 1. All M is P.<br>Some S is M. | 3. No L is R.<br>All Q is L.  |
| 2. All M is P.<br>Some S is M. | 4. No L is R.<br>Some Q is L. |

**b. Step Two**

Please put the universal proposition on top.

- |                                |                                    |
|--------------------------------|------------------------------------|
| 1. Some S is M.<br>All M is P. | 3. Some Q is L.<br>No R is L.      |
| 2. Some S is M.<br>No M is P.  | 4. Some Q is not L.<br>All R is L. |

**c. Step Three**

Please put the affirmative proposition on the bottom.

- |                               |                                    |
|-------------------------------|------------------------------------|
| 1. All S is M.<br>No M is P.  | 3. All L is Q.<br>No L is R.       |
| 2. Some S is M.<br>No M is P. | 4. Some Q is not L.<br>All R is L. |

**d. Step Four**

Please put the middle terms into Figure I.

*Figure I:*

All M is P.  
All S is M.

*Figure II:*

No P is M.  
All S is M.

*Figure III:*

All M is P  
Some M is S.

- |                               |                                |
|-------------------------------|--------------------------------|
| 1. No P is M.<br>Some M is S. | 3. All L is R.<br>Some L is Q. |
| 2. No P is M.<br>All M is S.  | 4. All L is R.<br>Some L is S. |



### III. Syllogisms in Figure One

Reduction rules: (1) Put the universal proposition on top. (2) Put an affirmative proposition on the bottom. (3) Put the middle term as the subject on top and as the predicate on the bottom. (4) Then label the syllogism “valid” (strong and necessary) or “invalid” (weak and impossible). You are welcome to use abbreviations.

1. All Marsupials are Vertebrates.  
All Kangaroos are Marsupials.
2. All Marsupials are Vertebrates.  
No Stones are Marsupials.
3. All Marsupials are Chordates.  
Some Animals are Marsupials.
4. All Marsupials are Chordates.  
Some Living forms are not Marsupials.
5. No Butterflies are Minerals.  
All Swallowtails are Butterflies.
6. No Butterflies are Minerals.  
No Elements are Butterflies.
7. No Butterflies are Chemicals.  
Some Animals are Butterflies.
8. No Butterflies are Chemicals.  
Some Living things are not Butterflies.
9. Some Mammals are Kangaroos.  
All Furry things are Mammals.
10. Some Mammals are Kangaroos  
No Stones are Mammals.
11. Some Reptiles are Snakes.  
Some Creatures are Reptiles.
12. Some Reptiles are Snakes.  
Some Creatures are not Reptiles.
13. Some Insects are not Monarchs. (try obversion)  
All Butterflies are Insects.
14. Some Insects are not Monarchs.  
No Compounds are Insects.
15. Some Mammals are not Kangaroos.  
Some Animals are Mammals.
16. Some Mammals are not Kangaroos.  
Some Creatures are not Mammals.

#### IV. Valid Syllogism in Figure One

Please determine the conclusion.

1. If Vertebrate is affirmed universally of Marsupial, and Marsupial is affirmed universally of Kangaroo,  
*then...*
2. If Chordate is affirmed universally of Marsupial, and Marsupial is affirmed particularly of Animal,  
*then...*
3. If Mineral is denied universally of Butterfly, and Butterfly is affirmed universally of Swallowtail,  
*then...*
4. If Chemical is denied universally of Butterfly, and Butterfly is affirmed particularly of Animal,  
*then...*

#### V. Syllogisms in Figure Two

Reduction rules: (1) Put the universal proposition on top. (2) Put an affirmative proposition on the bottom. (3) Put the middle term as the subject on top and as the predicate on the bottom. (4) Then label the syllogism "valid" (strong and necessary) or "invalid" (weak and impossible).

1. All Mammals-with-a-pouch are Marsupials.  
All Kangaroos are Marsupials.
2. All Mammals-with-a-pouch are Marsupials.  
No Stones are Marsupials.
3. All Mammals-with-a-pouch are Marsupials.  
Some Animals are Marsupials.
4. All Kangaroos are Marsupials. (Try obversion.)  
Some Animals are not Marsupials. (Try obversion.)
5. No Minerals are Butterflies.  
All Swallowtails are Butterflies.
6. No Minerals are Butterflies.  
No Elements are Butterflies.
7. No Minerals are Butterflies.  
Some Animals are Butterflies.
8. No Minerals are Butterflies.  
Some Living things are not Butterflies.
9. Some Kangaroos are Mammals.  
All Furry things are Mammals.
10. Some Kangaroos are Mammals.  
No Stones are Mammals.
11. Some Kangaroos are Mammals.  
Some Creatures are Mammals.
12. Some Kangaroos are Mammals.  
Some Creatures are not Mammals.

13. Some Animals are not Insects. (try obversion)  
All Butterflies are Insects.
14. Some Animals are not Insects.  
No Compounds are Insects.
15. Some Animals are not Insects.  
Some Creatures are Insects.
16. Some Animals are not Insects.  
Some Living things are not Insects.

## **VI. Valid Syllogisms in Figure Two**

Please determine the conclusion.

1. If Stone is denied universally of Marsupial, and Marsupial is affirmed universally of Mammal with a pouch,  
*then...*
2. If Mineral is denied universally of Butterfly, and Butterfly is affirmed universally of Swallowtail,  
*then...*
3. If Mineral is denied universally of Butterfly, and Butterfly is affirmed particularly of Animal,  
*then...*
4. If Kangaroo is denied universally of Non-Marsupial, and Non-Marsupial is affirmed particularly of Animal,  
*then...*

## **VII. Mood**

Richard Connell, *Logical Analysis*, Ch. 22, p. 157.

In symbolizing moods, we ignore the order of the terms and take account only of the kinds of propositions (A, E, I or O). The Medieval logicians invented some names they thought useful for helping to remember the valid moods of Figure I. The vowels of the names signify the propositions of the moods, and taken in order, the names are: Barbara, Celarent, Darii and Ferio.

The names the Medievals supplied for the moods in Figure II are: Cesare, Camestres, Festino and Baroco. The vowels tell the mood [EAE, AEE, EIO and AOO]. The capital letters tell the mood of Figure I to which the mood of Figure II is reduced [Cesare in Figure II turns into "C"elarent in Figure I, etc.]. The "s" in Cesare, Camestres, and Festino tell us that the E propositions which the s's follows covert to other E propositions. The "m" in Camestres tells us that the order of the premises must be changed and "mutated". The "c" in Baroco indicates that in this mood the reduction is by contradiction rather than by conversion. But the reader need remember these names only if he feels they will help."

- a. Again, "the reader need remember these names only if he feels they will help."

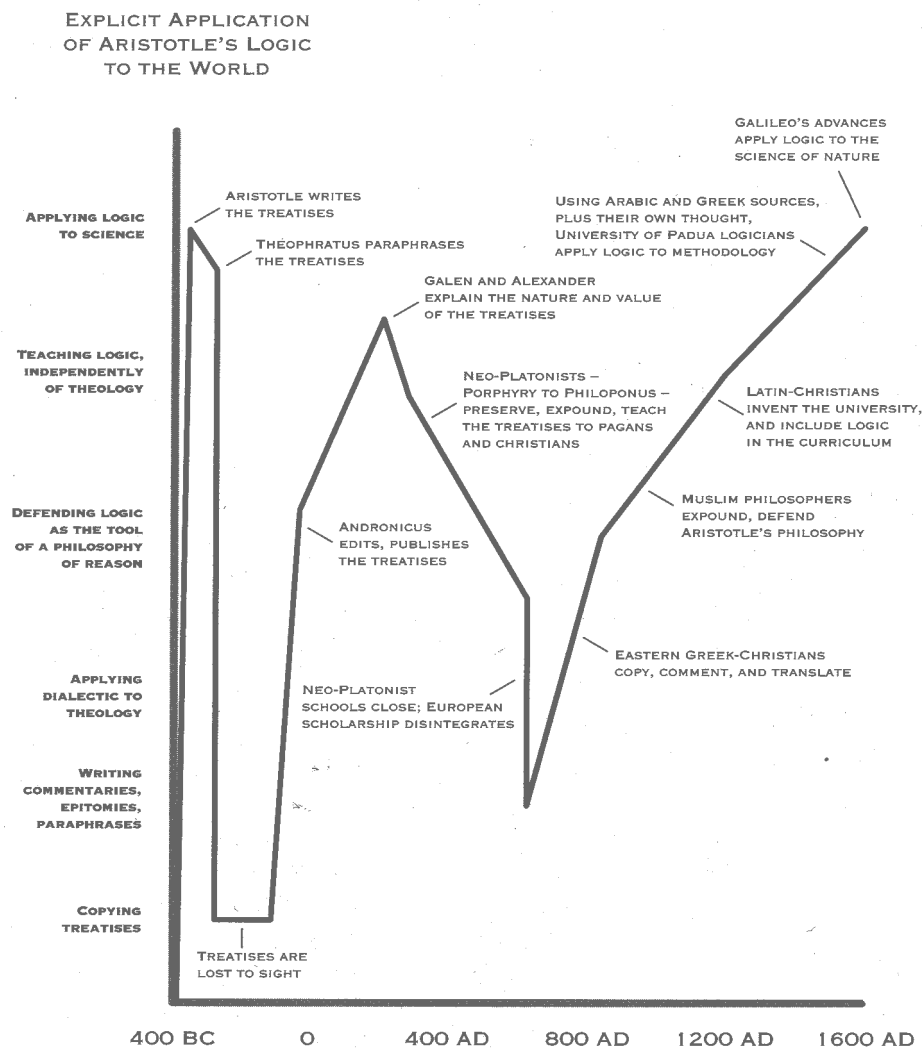
## 22. History

### Transmission of Aristotle's Logic

#### I. Timeline

Burgess Laughlin, *The Aristotle Adventure* (Flagstaff, AZ, 1995), p. 242.

#### 4. THE FATE OF ARISTOTLE'S LOGIC, IN THE MEDITERRANEAN COMMUNITY – TO 1600 AD



## II. Scholars in History

Burgess Laughlin, *The Aristotle Adventure* (Flagstaff, AZ, 1995), p. 180.

TABLE 29-1. THE ARISTOTLE ADVENTURE SCHOLARS ACTIVE IN THE SEVEN MAIN CENTERS.\*

City of Activity	Scholar	Place of Origin	Modern Country	Approx. Date
Athens	Aristotle	Stageira	Greece	330 BC
	Theophrastus	Eresos	Turkey	300 BC
	Straton	Lampsacus	Turkey	275 BC
	Syrianus	Alexandria	Egypt	425 AD
	Proclus	Lycia	Turkey	475 AD
Rome	Simplicius	Cilicia	Turkey	530 AD
	Cicero	Arpinum	Italy	50 BC
	Tyrannio (Elder)	Amisus	Turkey	50 BC
	Varro	Reate	Italy	50 BC
	Andronicus	Rhodes	Turkey	25 BC
	Eudorus	Alexandria	Egypt	25 BC
	Dionysius	Halicarnassus	Turkey	25 BC
	Boethus	Sidon	Lebanon	25 AD
	Adrastus	Aphrodisias	Turkey	100 AD
	Aspasius	Athens	Greece	125 AD
	Galen	Pergamum	Turkey	175 AD
	Alexander	Aphrodisias	Turkey	225 AD
	Plotinus	Lycopolis	Egypt	250 AD
	Porphyry	Tyre	Lebanon	275 AD
	Victorinus	Carthage	Libya	375 AD
	Praetextatus	Rome	Italy	380 AD
	Boethius	Rome	Italy	520 AD
Alexandria	Ptolemy (Unk.)	Alexandria	Egypt	325 AD
	Ammonius	Alexandria	Egypt	525 AD
	John Philoponus	Alexandria	Egypt	550 AD
	David	Alexandria	Egypt	570 AD
Constantinople	Eutochius	Ascalon	Palestine	575 AD
	Themistius	Paphlagonia	Turkey	375 AD
	Leontius	Byzantium	Turkey	540 AD
	J. L. Lydus	Lydia	Turkey	560 AD
	Stephanus	Alexandria	Egypt	620 AD
	Photius	Constantinople	Turkey	880 AD
	John Italus	Norman Italy	Italy	1100 AD
Baghdad	Al-Kindi	Basra	Iraq	850 AD
	Ishaq i. Hunain	Baghdad	Iraq	900 AD
	Thabit i. Qurra	Harran	Syria	900 AD
	Al-Farabi	Damascus	Syria	940 AD
Paris	Peter Abelard	Le Pallet	France	1130 AD
	John	Salisbury	England	1170 AD
	Alexander	Hales	England	1240 AD
	Albertus	Swabia	Germany	1260 AD
	Thomas	Aquino	Italy	1270 AD
	Siger	Brabant	Belgium	1275 AD
Padua	Peter	Abano	Italy	1300 AD
	Hugo	Siena	Italy	1400 AD
	Nipho	-	Italy	1510 AD
	Zabarella	-	Italy	1580 AD
	Galileo	Pisa	Italy	1620 AD

\* This list includes most scholars described in this book. Only a few others (such as Ibn Rushd) were not active in one of these cities. The exceptions appeared mostly when there were no central educational attractions, within a certain culture—e.g., during the period of the Syriac translators (c. 450-c. 750 AD) and in Latin Europe before the rise of universities (c. 550-c. 1150). The list does not include the *many* relatively minor individuals such as the technical logicians at Paris and Baghdad and additional physician-logicians at Padua.