

What is truth?

Part 2 - Mathematical Truth

In the previous article we saw that philosophical truth is unreliable because its source is the corrupt heart of man. At the opposite end of the reliability spectrum is mathematical truth. During our lives we have come to trust mathematics. We learned to count before we started elementary school and soon thereafter were taught arithmetic. We found arithmetic to be reliable because there was only one correct answer for each equation or problem. Later we learned algebra, trigonometry and perhaps calculus. With each of these we could be certain there was a uniquely correct answer because all the terms and operators (e.g., addition, division) were precisely defined by mathematicians. This type of mathematics is called “numeric” and is an example of deductive reasoning. In such reasoning one starts with known information, manipulates it by known rules and obtains a reliable and unique answer.

In high school we also encountered geometry, in which much of the material was quite different from the numeric manipulation to which we were accustomed. We frequently had to prove certain statements to be true where no numbers were involved. Instead we dealt with triangles and other figures for which we needed to show some relationship was true through a series of steps, each justified by some rule that was true for geometric figures. For example, we might have been asked to prove that the base angles of isosceles triangles are equal. Geometry introduced us to a new kind of mathematics, one in which some truism about the object of interest was sought rather than a numeric value. This mathematics is called “non-numeric.” Like numeric mathematics, its results are reliable, being the same no matter who does the problem-solving. This occurs because everything used in solving non-numeric problems is precisely defined and not subject to varying interpretations by different people.

Yet, as we are all aware, mathematical answers are not always correct. Even if one pushes all the right buttons on one’s calculator, the answer will be wrong if the information one started with is wrong. If one measures a door wrong (e.g., 7 feet 10 inches tall instead of 6 feet 10 inches) or reverses two digits when recording a number (e.g., 136 instead of 163), the mathematical calculation will be valid, but the answer will be wrong. Correct application of mathematics cannot compensate for bad input.

Long ago the Greek philosopher Aristotle concluded the same type of reasoning used in geometry could be used to evaluate other problems as well. He developed “syllogistic logic,” another form of deductive reasoning. This gave a way to reliably evaluate the validity of conclusions based on stated premises. Syllogistic reasoning was characterized by a major premise, a minor premise and a conclusion. For centuries students have learned: Major premise: “All men are mortal.” Minor premise: “Socrates was a man.” Conclusion: “Socrates was mortal.” Because the premises in this syllogism are true, the conclusion must be true. All syllogisms have a subject (e.g., Socrates), a predicate (e.g., mortal) and a middle term (e.g., man). Aristotle quickly realized, however, that syllogistic reasoning had its limitations. If the two premises were “Some frogs are green” and “Plants are green,” then the conclusion would be “Some frogs are plants.” Clearly, this conclusion is not true even though both of the premises are. To determine which of the many arrangements and types of subjects, predicates and middle terms gave valid syllogisms, Aristotle developed five rules which guided this form of logic for 2000 years. Syllogisms were the beginning of “formal logic,” which manipulates phrases with the same reliability that arithmetic manipulates numbers.

Within the last century formal logic has been expanded far beyond syllogisms to methods such as truth-functional logic and predicate calculus. In the former, informational statements are coded into a

matrix called a “truth table,” which allows all possible true and false values for each statement to be combined and evaluated. In the latter, the truth or falseness of any conclusion can be determined from any set of premises by a process which is similar to the proof used for a geometric axiom. By coding premises and conclusions into a symbolic representation, the emotional component so often present in philosophical reasoning is removed. It does not matter how one feels about the merit of an argument; its validity depends only on whether the conclusion can be shown to follow logically (i.e., through rule-based manipulations) from the premises. Formal logic therefore always gives us valid answers just as numerical mathematics always gives us valid answers.

Just as we saw with mathematical conclusions, however, formal logic can give valid conclusions that are not true (i.e. “sound”). For example, “All orange vegetables are poisonous.” “Carrots are orange vegetables.” Therefore, “Carrots are poisonous.” This is a valid conclusion, but the conclusion is not true because the first premise is false. Despite the validity of formal logic, it can be used to lead us astray if we are duped into accepting a false premise or assuming a premise is being used that was never actually stated. For example, if a product is labelled “reduced sodium” or “reduced fat,” we tend to assume as a premise that the reduction is significant, not just 1%. Our assumption may be wrong.

A real threat to our faith occurs when people state deceptive premises about religious issues and then they use valid logic to draw us into false beliefs. For example, consider this argument commonly studied in philosophy classes. Premise: “If a god exists, then he is omnipotent.” Premise: “Anyone who is omnipotent can do anything.” Conclusion: “God therefore can create a stone so heavy that he can’t lift it.” Contradiction: “But if god cannot lift the stone, he is not almighty. Therefore, the premise that there is a god must be false.” While this argument may sound convincing, it is the second premise, not the first, which is false. The correct premise is “If He is omnipotent, then He can do anything *consistent with His will*.” God’s attributes are perfectly unified and cannot conflict with each other. The existence of God does not depend on our ability to logically prove it.

Now consider a more common argument directed against hell. Premise: “God is love” (1 John 4:8). Premise: “Hell is a horrible place” (Matthew 13:42). Premise: “A loving being would not send someone to a horrible place.” Conclusion: “Therefore, God will not send anyone to hell.” In this case the third premise is false because it claims that God being love overrides His other attributes, including His justice. It also contradicts His direct statement (Matthew 25:46).

Thus, while formal logic is a major advance over philosophical reasoning in the search for truth, it suffers from two limitations. First, stating the premises and conclusions correctly and developing proofs takes significant study and effort. Many people shy away from it because of bad memories involving word problems and geometry. Second, false premises can lead to false conclusions even if the reasoning is correct. To avoid being deceived, one must be certain one’s premises are correct. The fourth part in this series will demonstrate that this requires not only reading the Bible, but studying its doctrines and examining the textual and the cultural context of Biblical quotations before accepting any theological premises (Matthew 4:5-7).