Discussion: Plato and Aristotle's Philosophies of Mathematics

Purpose: Upon completing this assignment, students should be able to

- Describe differences between Plato and Aristotle's respective theories of the forms,

- Explain which phenomena the two theories are used to explain,

- Summarize criteria that can be used to judge which theory provides better explanations, and

- Defend their opinions that one theory or the other is better.

Directions: In previous classes, we discussed Plato's theory of forms. We first enumerated several phenomena that Plato's theory is intended to explain, namely, (1) the truth of mathematical theorems and ethical statements, (2) how learning (via recollection) is possible, (3) how effective communication is possible, and (4) how certain knowledge is possible. We then discussed properties of Plato's forms, namely, that they are insensible, mind-independent, eternal, and unchanging.

In this assignment, you will compare Plato's theory of forms with one of two interpretations of Aristotle's theory of forms; the two interpretations are discussed in chapter three of [Shapiro, 2000]. To do so, you should answer the questions below. These questions are **open-ended**. That is, although some answers are better than others (in the sense that they are better supported by textual evidence), most of the questions do not have a single correct answer that can unambiguously inferred from the chapter. The questions are also difficult. Give them your best shot.

1. Which properties, if any, do Plato's forms share with Aristotle's forms? What properties do they fail to share?

2. Use Aristotle's theory of forms to explain the truth conditions for the theorem "The angles at the base of an isosceles triangle are equal." The phrase "truth conditions" refers to the circumstances under which a statement is true. For example, under one popular theory of truth, the sentence "snow is white" is true precisely if snow (i.e., the object

denoted by the word "snow") is in fact white (i.e., has the property denoted by the adjective "white."). Plato explains the truth of mathematical theorems similarly. The theorem "The angles at the base of an isosceles triangle are equal" is true precisely because the form of an isosceles triangle (i.e., the object denoted by the noun-phrase "isosceles triangle") possesses the property of having equal angles at its base. Would Aristotle agree about the truth conditions of a mathematical theorem? Why or why not?

3. Use Aristotle's theory of forms to explain how learning geometric truths is possible. Recall that, for Plato, the existence of insensible forms explains how one's non-physical soul could acquire mathematical concepts prior to birth. Can Aristotle's theory of forms be used to explain how we acquire mathematical concepts and knowledge?

4. Geometric theorems during Euclid's time remain true today. Plato might explain this intuition by appealing to the fact that the forms do not change. Can Aristotle provide a similar explanation? Why or why not?

5. One issue that we have not discussed at length yet is the *applicability of mathematics*. How might Plato explain why mathematics is so useful in science? What about Aristotle?

6. Evaluate the explanations you gave in the previous four questions, and determine which of Plato or Aristotle's theory provides a better explanation of why mathematical theorems are true, how mathematical concepts might be learned, why mathematical truths seem not to change, and why mathematics is applicable in the sciences. You may conclude that Plato's theory is better in some regards and worse in others. Regardless, provide reasons for your opinion.

References

Stewart Shapiro. *Thinking about mathematics: The philosophy of mathematics.* Oxford University Press, 2000.