
Mathematics As A Liberal Art

Math 105 Spring 2024

© 2024 Ron Buckmire

Fowler 309 MWF 3:00pm- 3:55pm

<http://sites.oxy.edu/ron/math/105/24/>

Class 2: Wednesday January 24

What is Mathematics?

Mathematics: the Science of Patterns

Keith Devlin (1947–), Professor of Mathematics at Stanford University and author of *Mathematics: the Science of Patterns*, says in the Prologue to that book (pp. 6-7):

Mathematics, the science of patterns, is a way of looking at the world, both the physical, biological and sociological world we inhabit, and the inner world of our minds and thoughts. Mathematics' greatest success has undoubtedly been in the physical domain, where the subject is rightly referred to as both the queen and the servant of the (natural) sciences. Yet, as an entirely human creation, the study of mathematics is ultimately a study of humanity itself. For none of the entities that form the substrate of mathematics, exist in the physical world; the numbers, the points, the lines and planes, the surfaces, the geometric figures, the functions, and so forth are pure abstractions that exist in humanity's collective mind. The absolute certainty of a mathematical proof and the indefinitely enduring nature of mathematical truth are reflections of the deep and fundamental status of the mathematician's patterns in both the human mind and the physical world.

Mathematics: the Language of the Book of Nature

Galileo Galilei (1564-1642) said:

The great book of nature can be read only by those who know the language in which it was written. And this language is mathematics.

Mathematics: the Queen of the Sciences

Carl Friedrich Gauss (1777-1855) said:

Mathematics is the queen of the sciences and number theory is the queen of mathematics.

Mathematics: the Poetry of Logic

Albert Einstein (1879-1955) said:

Pure mathematics is, in its way, the poetry of logical ideas.

Mathematics: A Liberal Art

In *Discovering the Art of Mathematics: Truth, Reasoning, Certainty and Proof*, the authors say in the Preface (available at <http://www.artofmathematics.org/books/>):

Mathematics plays a dual role as both a liberal art and as a science. As a powerful science, mathematics shapes our technological society and serves as an indispensable tool and language in many fields. But it is not our purpose to explore these roles of mathematics here. This has been done in many other fine, accessible books. Instead, our purpose here is to journey down a path that values mathematics from its long tradition as a cornerstone of the liberal arts.

Mathematics was the organizing principle of the Pythagorean society (ca. 500 B.C.). It was a central concern of the great Greek philosophers like Plato (Greek philosopher; 427 - 347 B.C.). During the Dark Ages, classical knowledge was rescued and preserved in monasteries. Knowledge was categorized into the classical liberal arts and mathematics made up several of the seven categories.

During the Renaissance and the Scientific Revolution the importance of mathematics as a science increased dramatically. Nonetheless, it also remained a central component of the liberal arts during these periods. Indeed, mathematics has never lost its place within the liberal arts - except in the contemporary classrooms and textbooks where the focus of attention has shifted solely to the training of qualified mathematical scientists. If you are a student of the liberal arts or if you simply want to study mathematics for its own sake, you should feel more at home on this exploration than in other mathematics classes.

[...]

Mathematics is broad, dynamic, and connected to every area of study in one way or another. There are places in mathematics for those in all areas of interest.

Mathematics: Universal Language

ChatGPT's response to the prompt "What is Mathematics?":

Mathematics is a branch of knowledge that deals with the study of numbers, quantity, structure, space, and change. It includes a wide range of topics such as arithmetic, algebra, geometry, calculus, statistics, and more. Mathematics is often considered a universal language because its principles and concepts are consistent and applicable across various disciplines. It provides a framework for logical reasoning, problem-solving, and understanding patterns in the world around us

GROUPWORK

Write down a few short sentences describing your response to the question “**What is Mathematics?**” Share your thoughts with some of your neighbors in the class.

EXTRA CREDIT

Expand your thoughts on the nature of mathematics to a 1-2 page paper (at least 300-500 words) submitted by the beginning of next class to receive extra credit equivalent to the value of *Problem of the Day # 1* (5 points).

DEBATE: Is Mathematics Created or Discovered?