

**MATH1021: Insights into the Nature of Mathematics  
Course Syllabus**

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*"Reason is immortal, all else mortal."*

-Pythagoras

**Course Details**

This course is part of the PBS TeacherLine suite of self-paced courses.

**Course  
Description**

Prime numbers are called the "atoms of arithmetic" and the use of primes is the foundation of cryptography. Combinatorics, the mathematics of counting complicated configurations, is essential to such tasks as mapping the human genome, while the concept of infinity puzzles us since we are finite and live in a finite world. In this course, reach beyond formulas and computations to explore the mathematics behind patterns, relationships, and real-world problems. Along the way, meet some of the fascinating people who are studying today's emerging questions about mathematics, and learn about the historical significance of typical mathematical concepts. Through Annenberg Learner videos, interactive activities, and problem solving, examine the "why" and not just the "how" of mathematical questions.

**Course  
Goals**

This course will help learners understand how prime numbers, combinatorics, and the ideas surrounding infinity relate to the everyday world around us. This course will also enable learners to implement digital media in the classroom to convey these concepts to high school students. During this course, learners will build their understanding of the following concepts:

- Primes are the fundamental building blocks of arithmetic.
- Combinatorics is about organization and plays a crucial role in modern scientific endeavors such as DNA sequencing.
- As a mathematical concept, infinity is at the heart of calculus, the notion of irrational numbers, and measurement.

**Course  
Design**

This 3 hour professional learning opportunity is a self-paced experience. Learners can explore the course content, watch videos, complete interactive activities, and take self-assessments at their own pace.

**Target  
Audience**

This course is intended for pre-service and in-service teachers of grades 9-12 and mathematics coaches and specialists.



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- Standards** This course addresses the following standards:
- ISTE NETS\*T 1 (a, b, c, d); 2 (a, b); & 5 (a, c)
  - NCTM Process Standards
  - Common Core State Standards: Mathematics (Grades 9-12)
- Schedule** This course is estimated to take approximately 3 hours to complete. However, it is a self-paced experience and learners may work at their own pace and according to their individual schedules. Learners will have access to the course for 1 year after the purchase date.
- Certificate** Learners will receive a printable certificate upon completion of all coursework, activities, and “Check for Understanding” multiple-choice quizzes, which will be tracked and graded by our automated system. All learners must score 100% on quizzes (with multiple attempts permitted) in order to receive the completion certificate.

### **Course Content and Assignments**

During this self-paced course, learners explore three key mathematical concepts that form the basis of many other topics in mathematics and have practical applications to everyday life. Throughout the course, learners are asked to analyze and interpret on-screen subject matter and graphics; reflect on their ideas and experiences; watch videos; explore interactive activities; and complete self-assessments. In order to receive a course certificate, learners must complete all course activities, with scores of 100% on multiple-choice quizzes (multiple attempts permitted).

<b>Topic</b>	<b>Learning Objective</b>	<b>Coursework/Activities</b>
The Primes	Analyze why prime numbers are the building blocks of encryption and determine their practical application in today's digital world	<ul style="list-style-type: none"><li>• Interpret on-screen content and figures</li><li>• Reflect on ideas and experiences</li><li>• Watch the “The Primes” video and answer the questions in the Viewing Guide</li><li>• Complete the interactive “Figurate Numbers”</li><li>• Answer Check for Understanding quiz</li></ul>

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Combinatorics Counts	Analyze how the ideas from combinatorics are used in modern methods of DNA sequencing	<ul style="list-style-type: none"> <li>• Interpret on-screen content and figures</li> <li>• Reflect on ideas and experiences</li> <li>• Watch the “Combinatorics Counts” video and answer the questions in the Viewing Guide</li> <li>• Complete the interactive “Shotgun Sequencing”</li> <li>• Answer Check for Understanding quiz</li> </ul>
How Big is Infinity?	Analyze how the concept of infinity challenges the basics of mathematical thinking and how this concept developed over the ages	<ul style="list-style-type: none"> <li>• Interpret on-screen content and figures</li> <li>• Reflect on ideas and experiences</li> <li>• Watch the “How Big is Infinity?” video and answer the questions in the Viewing Guide</li> <li>• Complete Activity “The Arithmetic of Infinity”</li> <li>• Answer Check for Understanding quiz</li> </ul>