DEPARTMENT: MATHEMATICS	COURSE TITLE: QUANTITATIVE REASONING COURSE NUMBER: 338
GRADE(S): 12	PRE-REQUISITES (IF ANY): ALGEBRA II

UNIT	LENGTH	CONTENT	SKILLS	METHODS OF ASSESSMENT	FRAMEWORK STRAND(S) & STANDARD(S)
Number Theory	6 weeks	• Unique Sums • Modular Arithmetic • Infinite Series • Alternatives to Base 10 (both whole numbers and fractions)	• Utilize QuickBasic programming, including loops and expressions involving modular arithmetic. • Express sums with sigma notation. • Develop a method to predict the upper bound of a converging geometric series. • Discuss whether or not .999… really equals one. • Use the Comparison Method to prove existence or non-existence of upper bounds. • Translate between base 10 decimals and base 3 “tressimals.”	• Portfolio • Homework assignments • Class participation	3, 29
Dynamical Systems	6 weeks	• Linear Recursion • Parameters versus variables • Logistic Model • Convergence • Periodicity • Web diagrams (graphical iteration) • Bifurcation diagram	• Use subscript notation to describe recursive sequences. • Use graphing calculator and QuickBasic programs to observe behavior of dynamical systems. • Solve for equilibrium algebraically. • Analyze web diagrams to explain behavior of dynamical systems. • Distinguish between converging systems, periodic systems, and chaotic systems. •	• Portfolio • Homework assignments • Class participation • Midyear exam	33

Chaos/Fractals	6 weeks	• Sensitivity versus stability • Arithmetic in the complex plane • Julia Sets • Mandelbrot Set • Self-similarity • Fractional Dimension	• Develop definition of chaos (sensitivity, mixing, density of periodic points). • Use computer to gather data to create handmade Julia Set. • Identify connection between the Mandelbrot Set and Julia Sets. • Follow recursive rules to create fractals. • Distinguish between topological dimension and self-similarity dimension. • Calculate self-similarity dimension of fractals	• Portfolio • Homework assignments • Class participation	1, 36
Chance	4 weeks	• Randomness • Polling simulations • Combinatorics	• Develop a definition of randomness. • Investigate importance of sample size. • Distinguish between margin of error and confidence level. • Use counting methods, including multiplication principle, factorial, trees, and "choose" to determine probabilities	• Portfolio • Homework assignments • Class participation • Final exam	26, 27, 28
Cardinality	2 weeks	• Very large numbers • Countable infinity • Uncountable infinity • Cantor set • Transfinite arithmetic • Continuum hypothesis	• Investigate how big a googol is. • Use estimation techniques for Fermi problems. • Use one-to-one correspondence to arrive at results in transfinite arithmetic. • Use Cantor's methods to establish countability of the rational numbers, and uncountability of the continuum	• Portfolio • Homework assignments • Class participation	