YALE NATIONAL INITIATIVE
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If You Can See It, It's Not Nano: Working with Numbers at the Extremes

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by Nancy Rudolph

Using the field of Nanotechnology as a backdrop for the semester, 10 th - 12 th grade math students will learn the mathematics related to this emerging field. Within the context of Nanotechnology there are several areas of overlap where science and mathematics support each other; this unit will naturally integrate the two subjects to benefit student understanding. Students will begin the semester with an overview of science at the nanoscale (materials having at least one critical dimension between 1-100 billionth of a meter) including *intra*molecular and *inter*molecular bonding characteristics of atoms, properties of matter, and applications of Nanotechnology relevant to their lives. "Size and scale" is the unifying concept, in that students have minimal experience with materials smaller than what they can see. Students will describe absolute sizes using scientific notation, and study the significance of the increased surface area to volume ratio of nanomaterials on physical properties. The mathematical topics in this unit address common areas of weakness: Number Sense (relative size); Exponents (applying properties, negative exponents); and Geometry, (composite area and volume, effects of scaling). More advanced topics for upper level math classes include Logarithms and the Fibonacci sequence.

(Developed for Pre-Calculus, grades 11-12, and Integrated Math III, grade 10; recommended for Math, Algebra, Geometry, and Pre-Calculus, grades 10-12)