Mathematics
Unit 4: Number Sense

Essential Understandings	▪ Various forms of real numbers are appropriate in different situations. ▪ Proportional relationships are important in a variety of problem solving situations.
Essential Questions	▪ How does one convert back and forth between fraction and decimal form? ▪ How does one compare and order fractions, decimals, and percents? ▪ How does one determine when decimal form is more appropriate than fraction from and vice-versa? ▪ How does one illustrate the relationships between the sets of real numbers? ▪ How does one identify whether a Real number is a rational number or an irrational number? ▪ How does one find the square roots of perfect squares? ▪ How does one estimate the square roots of non-perfect square? ▪ What types of relationships are proportional? ▪ How does one set-up and solve proportions? ▪ How does one set-up a proportion which involves percents? ▪ What steps does one take to estimate with percents? ▪ How does one use proportions to solve percent of change problems? ▪ How does one explain the meaning of negative exponents when used with a base of 10? ▪ How does one convert between numbers in standard form and numbers in scientific notation? ▪ How does one compare and order numbers written in scientific notation?

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Essential Knowledge	- There are some common fraction-decimal-percent conversions which should be memorized. - All Real numbers are either rational numbers or irrational numbers. - Some examples of irrational numbers include pi and square roots of non-perfect squares. - Square root values can be compared and ordered using estimation skills. - Number lines are useful in comparing and ordering all Real numbers. - A variety of Real numbers can be used in expressions and equations. - A proportion is an equation made by two equal ratios and can be solved by finding scale factors or by using cross products. - Proportions are used in a variety of applications including those with percents. - Estimating with percents is a critical real-life skill. - The important components of an exponential expression are the base and the exponent. - A base ten value raised to a negative exponent is equivalent to one divided by the base ten value raised to the corresponding positive exponent. - Converting between numbers in standard form and numbers in scientific notation requires an understanding of positive and negative exponents.
Vocabulary	- Terms: - Bases, cubes, cube roots, exponential notation, integers, irrational numbers, natural counting numbers, perfect squares, percent of change, powers, radical, rational numbers, real numbers, square roots, standard notation

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Essential Skills	- Accurately compute with fractions, decimals, and integers. (A) - Evaluate numerical expressions (including those with exponents) using positive rational numbers and integers by following the Order of Operations. (A) - Apply the associative, commutative, and distributive properties to mental math arithmetic. (A) - Set-up and solve two step word problems using all operations and involving all types of rational numbers (excluding negative decimals and fractions.) (R, A) - Solve proportions by finding scale factors or by using cross products. (A) - Identify proportional relationships in practical situations. (R) - Set up and solve proportions in word problems including discount, tax, and tip problems. (A) - Calculate and apply percentages of change. (R, A) - Identify whether real numbers are rational or irrational. (I, R) - Know some common examples of irrational numbers including pi or those arising from square roots. (I, R) - Compare and estimate the size of square root values. (I, R) - Estimate with rational and irrational numbers in decimal form. (I, R) - Place a variety of real numbers on the number line including those written as fractions (with and without exponents), decimals, percents, and square roots. (I, R) - Solve problems with proportional reasoning and squares/square roots, cubes/cube roots. (I) - Convert between standard notation and exponential notation using powers of ten with positive (R, A) and negative exponents (I, R). - Convert between standard and scientific notation. (R, A) - Compare the size of numbers written in scientific notation form. (R, A)

Related Maine Learning Results	A. Number
	A1.Students understand the set of real numbers as containing the rational numbers and the irrational numbers.
	    a. Know that there are real numbers that are not rational numbers.
	    b. Know some common examples or irrational numbers including pi or those arising from square roots.
	    c. Use square roots.
	    d. Be able to estimate the value of square roots of whole numbers and place them on the number line.

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NECAP	NECAP
	    Numbers and Operations
	        M (N & O) 8-1
	        Demonstrate conceptual understanding of rational numbers with respect to percents as a way of describing % of change.
	      M (N & O) 8-2
	        Demonstrates an understanding of the relative magnitude…with common irrationals, fraction bases with whole exponents.