

**Unit Title: “Comparing and Scaling”**

**Course: Middle School Mathematics**

**Subject Area: Mathematics**

**Time Frame: 20 days**

**Standards**

Middle School Mathematics Standards	Sunshine State Standards Benchmarks	NCEE New Standards
<p>The student will:</p> <p>11.1 Demonstrate the use of the term ‘ratio’, ‘proportion’, and ‘percent’ to ask comparison questions.</p> <p>11.2 Find equivalent ratios.</p> <p>11.3 Represent data in tables and graphs.</p> <p>11.4 Set up and solve proportions that arise in applications.</p> <p>11.5 Look for patterns in tables that will allow predictions to be made beyond the tables.</p>	<p>MA.A. 1.3.2 The student understands the relative size of integers, fractions, and decimals; numbers expressed as percents; numbers with exponents; numbers in scientific notation; radicals; absolute value; and ratio.</p> <p><i>Expectations</i> The student:</p> <ul style="list-style-type: none"><li>• Compares and orders fractions, decimals, numbers with exponents, and numbers expressed as percents or in scientific notation, including ordering on a number line.</li></ul> <p>MA.A.1.3.4 The student understands that numbers can be represented in a variety of equivalent forms, including integers, fractions, decimals, percents, scientific notation, exponents, radicals, and absolute value.</p>	<p>The student:</p> <p>M1b Uses and understands the inverse relationships between addition and subtraction, multiplication and division, and exponentiation and root-extraction; uses the inverse operation to determine unknown quantities in equations.</p> <p>M1c Consistently and accurately applies and converts the different kinds and forms of rational numbers.</p> <p>M1e Interprets percent as part of 100 and as a means of comparing quantities of different sizes or changing sizes.</p> <p>M1f Uses ratio and rates to express “part-to-part” and “whole-to-whole” relationships, and reasons proportionally to solve problems involving equivalent fractions, equal ratios, or constant rates, recognizing the multiplicative nature of these problems in the constant factor of change.</p> <p>M1g Orders numbers with the &gt; and &lt; relationships and by location on a</p>

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	<p><i>Expectations</i> The student:</p> <ul style="list-style-type: none"> <li>• Knows the relationships among fractions, decimals, and percents.</li> <li>• Expresses a given quantity in a variety of ways (for example, integers, fractions, decimals, numbers expressed as a percent, numbers expressed in scientific notation, ratios).</li> <li>• Knows whether numbers expressed in different forms are equal.</li> <li>• Converts a number expressed in one form to its equivalent in another form.</li> </ul> <p>MA.A.3.3.1 The student understands and explains the effects of addition, subtraction, multiplication, and division on whole numbers, fractions, including mixed numbers, and decimals, including the inverse relationships of positive and negative numbers.</p> <p><i>Expectations</i> The student</p> <ul style="list-style-type: none"> <li>• Knows the effects of the four basic operations on whole numbers, fractions, mixed numbers, and decimals.</li> <li>• Uses models or pictures to show the effects of addition, subtraction, multiplication, and division, on whole numbers, decimals, fractions, and mixed numbers.</li> <li>• Applies the properties of rational numbers</li> </ul>	<p>number line; estimates and compares rational numbers using sense of magnitudes and relative magnitudes of numbers and of base-ten place values.</p> <p>M6a Computes accurately with arithmetic operations on rational numbers.</p> <p>M6b Knows and uses the correct order of operations for arithmetic computations.</p>

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	<p>to solve problems (commutative, associative, distributive, identity, equality, inverse).</p> <ul style="list-style-type: none"> <li>• Knows the inverse relationship of positive and negative numbers.</li> </ul> <p>MA.A.3.3.2 The student selects the appropriate operation to solve problems involving addition, subtraction, multiplication, and division of rational numbers, ratios, proportions, and percents, including the appropriate application of the algebraic order of operations.</p> <p><i>Expectations</i> The student:</p> <ul style="list-style-type: none"> <li>• Knows the appropriate operations to solve real-world problems involving fractions, decimals, and integers.</li> <li>• Solves real-world problems using one or two-step problems.</li> <li>• Applies order of operations when solving problems.</li> <li>• Solves real-world problems involving percents.</li> <li>• Applies order of operations to solve problems.</li> <li>• Knows proportional relationships and uses tables, graphs, or “constant ratio” relationship to solve and explain problems.</li> </ul> <p>MA.A.3.3.3 The student adds, subtracts, multiplies and</p>	

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	<p>divides whole numbers, decimals, and fractions, including mixed numbers, to solve real-world problems, using appropriate methods of computing, such as mental mathematics, paper and pencil, and calculators.</p> <p><i>Expectations</i> The student:</p> <ul style="list-style-type: none"> <li>• Solves one- or two-step real-world problems involving whole numbers, fractions, or decimals using appropriate methods of computation, such as mental computation, paper and pencil.</li> </ul> <p>MA.B.1.3.3 The student understands and describes how the change of a figure in such dimensions as length, width, height, or radius affects its other measurements such as perimeter, area, surface area, and volume.</p> <p><i>Expectations</i> The student:</p> <ul style="list-style-type: none"> <li>• Given a two-dimensional figure, creates a new figure by increasing or decreasing the original dimensions.</li> <li>• Knows the relationship between the area or perimeter of an original figure and that of a newly created figure.</li> </ul>	

### Desired Results

Enduring Understanding	Essential Questions	Knowledge and Skills
<p>Students will understand</p> <ul style="list-style-type: none"> <li>The difference in the information provided by comparisons made by finding the difference between two quantities and comparisons made by forming ratios between two quantities.</li> <li>Proportions can be used to find unknown quantities or inaccessible measurements.</li> <li>Patterns in tables will allow predictions to be made beyond the tables.</li> </ul>	<ul style="list-style-type: none"> <li>When quantities have different measurements, how can they be compared?</li> <li>When can a comparison be made by subtraction? How can division be used?</li> <li>Why is ratio a good comparison?</li> <li>How does rounding affect the numbers used in a ratio?</li> <li>What is the relationship between ratios and similar figures?</li> <li>Where can proportions be used in daily life to find unknown quantities or inaccessible measurements?</li> </ul>	<p>Students will know</p> <ul style="list-style-type: none"> <li>Key terms (e.g., population density, rate, ratio, scale, scaling, unit rate)</li> <li>The informal language used to ask comparison questions.</li> </ul> <p>Students will be able to</p> <ul style="list-style-type: none"> <li>Decide when the most informative comparison is to find the difference between two quantities and when it is to form ratios between pairs of quantities.</li> <li>Scale a ratio or fraction up or down to make a larger or smaller object or population with the same relative characteristics as the original.</li> <li>Represent data in tables and graphs.</li> <li>Set up and solve proportions that arise in applications.</li> </ul>

### Acceptable Evidence

Performance Tasks	Quizzes, Test, and Work Samples	Observations and Dialogues
<ul style="list-style-type: none"> <li><b>Making Comparisons</b> Students encounter the language of comparison and ratios in the context of advertising. Students informally explore strategies for presenting quantitative comparison information, particularly forming ratios.</li> </ul>	<p>Check-Up 1 Quiz A Check-Up 2 Quiz B Unit Test</p>	<p>Teacher observations of students during work on performance tasks. Accountable talk during work on performance tasks.</p>

Performance Tasks	Quizzes, Test, and Work Samples	Observations and Dialogues
<ul style="list-style-type: none"> <li>• <b>Comparing by Find Percents</b> Students analyze data from a national survey on sports participation and find ways to describe or make comparisons among males and females and different age groups. The exploration of comparisons focus on percents and the use of division for finding decimal or percent rates.</li> <li>• <b>Comparing by Using Ratios</b> Students explore typical recipe scaling problems and allocation problems to develop strategies for scaling ratios to make comparisons or to find missing parts of equivalent ratios. Students are comparing quantities that refer to different kinds of measures, like tomatoes and money.</li> <li>• <b>Comparing by Finding Rates</b> Students look at situations in which making tables to explore rates is an efficient strategy for making comparisons. Patterns in the rate tables help students predict other numbers in the table. The unit rate is essentially the slope of the graph of a linear equation, which connects proportional reasoning and unit rates to students' earlier work with variables, patterns, and algebraic rules.</li> <li>• <b>Estimating Populations and Population Densities</b> Students are introduced to real-world situations in which they use techniques for reasoning about ratios and proportions.</li> </ul>	Unit Project – Paper Pool	