Unit 1: Measurement & Proportions

Content Area: **Mathematics**
Course(s): **Practical Math (as per IEP)**
Time Period: **1 marking period**
Length: **10 weeks**
Status: **Published**

Unit Overview

This course is designed to assist classified students with the necessary mathematical skills. It will lead into real life and consumer math skills by emphasizing a strong foundation of basic math skills.

This unit will cover...

- Measurement concepts including converting metric and customary units and using ratio reasoning to convert between systems
- Applying rational operations in real-world context (such as cooking)
- Defining area, perimeter, and volume and using those formulas to solve real-world application problems
- Using proportions to compare geometrical figures

Transfer

Students will be able to independently use their learning to...

- identify mathematics in everyday situations and solve problems using basic operations.
- relate informal language to mathematical language and symbols.
- solve real-world problems using problem-solving strategies.
- justify why an answer is reasonable.

Meaning

Understandings

Students will understand...

- How to convert among different-sized standard measurement units.
- Converting measurements within a single measurement system.

- Converting measurements from one system to another.
- How to set up and solve a proportion.
- Proportions to compare two units of measurement.
- Correct and appropriate labeling of units.
- Adding, subtracting, multiplying, and dividing fractions.
- The meaning of area, perimeter, and volume (with appropriate units).
- How to find area, perimeter, and volume of 2D and 3D figures.

Essential Questions

Students will keep considering...

- What measurement unit does the US use and how do we make it universal?
- Why do proportions make it easier to convert measurements?
- How do you set up a proportion?
- Why is labeling important when working with units?
- When do you look to find a common denominator with fraction operations?
- What is the different between area, perimeter and volume?
- How can you compare the volumes of different objects visually?
- When would you use a scale factor to compare objects?
- What do we call a number that is expressed with a numerator and a denominator?
- How can fractions and decimals be used to convert units of measurement?

Application of Knowledge and Skill

Students will know...

Students will know...

- how to perform fraction operations
- how to apply fraction operation to a recipe
- how to find the area and perimeter of a 2D object
- how to find the volume of an object
- how to use proportions to compare objects
- the units of measurement that are in the US customary system
- the units of measurement that are in the metric system
- how to convert measurement units from one system to the other

Students will be skilled at...

Students will be skilled at...

- labeling units
- converting units within a measurement system
- converting units between two different measurement systems
- multiplying, dividing, adding, and subtracting fractions
- finding a least common denominator when adding/subtracting fraction
- using measurement tools to determine length
- comparing objects using scale factors
- finding the area and perimeter of an object
- using the volume formula to compare objects

Academic Vocabulary

The Metric
System meter centimeter millimeter kilometer liter milliliter kilogram gram milligram conversion factor area convert foot inch length width height measurement unit measure perimeter area volume proportion scale factor least common denominator fraction numerator denominator US Customary System of
Measurement model formula simplify compare ounce pound ton weight cup tablespoon teaspoon quart gallon

Learning Goal 1 (Level of Difficulty 3: Analysis)

SWBAT solve real world application problems involving measurement and conversion of measurements.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.6.RP.A	Understand ratio concepts and use ratio reasoning to solve problems.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.5.MD.A	Convert like measurement units within a given measurement system.
MA.4.MD.A	Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.

Target 1 (Level of Difficulty 2: Comprehension)

SWBAT express measurements of a larger unit in terms of a smaller unit within a single measurement system.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.4.MD.A.1	Know relative sizes of measurement units within one system of units including km, m, cm, mm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two column table.

Target 2 (Level of Difficulty 2: Comprehension)

SWBAT convert among different-sized measurement units within a single measurement system.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.5.MD.A.1	Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.

Target 3 (Level of Difficulty 3: Analysis)

SWBAT use ratio reasoning to convert measurement units across measurement systems.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.6.RP.A.3	Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.

Learning Goal 2 (Level of Difficulty 4: Knowledge Utilization)

SWBAT solve real world application problems involving rational number measurements.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.7.NS.A	Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.
MA.7.NS.A.2	Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

MA.7.NS.A.3	Solve real-world and mathematical problems involving the four operations with rational numbers.

Target 1 (Level of Difficulty 4: Knowledge Utilization)

SWBAT apply rational number operations in real life context (i.e. cooking with a recipe).

- incorporate LGBTQ+ relationships in scenarios (i.e. word problems, etc.)
- https://www.stonewall.org.uk/system/files/inclusive_curriculum_guide.pdf
- https://foodism.xyz/lgbtq-chefs-in-the-world/

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.7.NS.A.1	Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.
MA.7.NS.A.2	Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.
MA.7.NS.A.2c	Apply properties of operations as strategies to multiply and divide rational numbers.
MA.7.NS.A.3	Solve real-world and mathematical problems involving the four operations with rational numbers.

Learning Goal 3 (Level of Difficulty 3: Analysis)

SWBAT apply the area, perimeter, and volume formulas in real world application problems.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.K-12.8	Look for and express regularity in repeated reasoning.
MA.7.G.B	Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.
MA.G-GMD.A	Explain volume formulas and use them to solve problems

Target 1 (Level of Difficulty 1: Retrieval)

SWBAT define area, perimeter, and volume.

MA.K-12.4	Model with mathematics.
MA.K-12.6	Attend to precision.
MA.5.NF.B.4b	Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.
MA.5.MD.C.5a	Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication.

Target 2 (Level of Difficulty 2: Comprehension)

SWBAT find the area and perimeter of two dimensional figures.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.7.G.B	Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.
MA.7.G.B.4	Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.
MA.7.G.B.6	Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

Target 3 (Level of Difficulty 2: Comprehension)

SWBAT use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.G-GMD.A.3	Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.

Target 4 (Level of Difficulty 3: Analysis)

SWBAT use proportions to compare geometrical figures.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.4	Model with mathematics.

MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.7.G.A.1	Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

Target 5 (Level of Difficulty 4: Knowledge Utilization)

SWBAT make predictions about the area, perimeter, or volume of figures and then test the prediction using formulas or models.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.K-12.8	Look for and express regularity in repeated reasoning.
MA.7.G.B.6	Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.
MA.G-GMD.A.3	Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.

Formative Assessment and Performance Opportunities

Class participation, classwork/homework, class openers and closures, group work, presentations, projects, student-teacher discussions

Summative Assessment

Tests, quizzes, end of unit assessment, projects

21st Century Life and Careers

CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.

CRP.K-12.CRP11 Use technology to enhance productivity.

Accommodations and Modifications

- Follow IEPs and 504 Plans
- Use of multiplication charts and calculators
- Differentiate instruction (number of problems, difficulty of problems, etc)
- Connect lessons to real-world situations as much as possible
- Incorporate hands-on lessons (ex: use a cooking recipe to show doubling of fractions)
- Use of math manipulatives (ex: 2D and 3D shapes when finding area/perimeter/volume)

Unit Resources

Learning Goal 1: SWBAT solve real world application problems involving measurement and conversion of measurements.

- https://www.khanacademy.org/math/cc-fifth-grade-math/imp-measurement-and-data-3

Learning Goal 2: SWBAT solve real world application problems involving rational number measurements.

- https://www.khanacademy.org/math/pre-algebra/pre-algebra-fractions
- https://www.albert.io/learn/prealgebra/fractions/topic-summary

Learning Goal 3: SWBAT apply the area, perimeter, and volume formulas in real world application problems.

- https://www.khanacademy.org/math/basic-geo/basic-geo-area-and-perimeter
- https://www.albert.io/learn/geometry/area-and-perimeter/topic-summary
- https://www.khanacademy.org/math/basic-geo/basic-geo-volume-sa
- https://www.albert.io/learn/geometry/3d-figures-surface-area-and-volume/topic-summary

Interdisciplinary Connections

Learning Goal 1: SWBAT solve real world application problems involving measurement and conversion of measurements.

Project Idea: Give measurements in non-standard form and have students make the correct conversions.

Learning Goal 2: SWBAT solve real world application problems involving rational number measurements.

Project Idea: Adjust a given recipe for more people (i.e. doubling or tripling the ingredient amounts).

FAM.9-12.9.3.5	Analyze recipe/formula proportions and modifications for food production.
5-PS1-3.3.1	Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.