# Mathematics 7 (9170) Course Overview Curriculum Document

## Course Description

As in grade 6, students start grade 7 by studying scale drawings, an engaging geometric topic that supports the subsequent work on proportional relationships in the second and fourth units. It also makes use of grade 6 arithmetic understanding and skill, without arithmetic becoming the major focus of attention at this point. Geometry and proportional relationships are also interwoven in the third unit on circles, where the important proportional relationship between a circle's circumference and its diameter is studied. By the time students reach the fifth unit on operations with rational numbers, both positive and negative, students have had time to brush up on and solidify their understanding and skill in grade 6 arithmetic. The work on operations on rational numbers, with its emphasis on the role of the properties of operations in determining the rules for operating with negative numbers, is a natural lead-in to the work on expressions and equations in the next unit. Students then put their arithmetical and algebraic skills to work in the last two units, on angles, triangles, and prisms, and on probability and sampling.

| Credits | Prerequisites |
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| N.A. | Mathematics 6 |
| **Board Approved** | **Revised** |
| June 2019, June 2023 | September 2013, May 2018, October 2021, June 2022, June 2023 |

## Required Assessments

District-wide, standards-based common summative assessments

## Textbooks/Resources

Illustrative Mathematics. (2020). *Middle School Math: Grade 7*. Kendall Hunt.
Book 1: Unit 1 - 3, Book 2: Unit 4 - 6, Book 3: Unit 7 - 9

## Course Essential Understandings

*As a result of successfully completing this course, students will understand that:*

- all rational numbers, with a strong emphasis on positives and negatives, are used to solve problems, and can be explained on a number line.
- the ratios of circle measurements can be rewritten into equations. Working simple equations forwards and backwards solve different problems.
- the graphs, tables, and equations of proportional relationships are all used to solve problems.
- numbers in a variety of forms, percentage, fractions, and decimals can be used to solve different problems.
- variable expressions can be written in different but equal ways to help make calculations faster. Equal sides of equations can be changed together to solve more complex equations and inequalities.
- angles, surface area, and volume can be measured and calculated in different ways.
- prediction and comparison is a purpose of probability and statistics by evaluating samples, averages, and probability ratios.

## Course Relevance Questions

*What thought-provoking questions will foster inquiry, meaning-making, and transfer?*

- How can the relationship between quantities, how one number compares to another, be used to solve problems?
- When are variables used to stand for numbers that can change or used to stand for a single unknown number?

## Unit Overviews

| Unit Name | Unit Description | Unit Relevance Question | Instructional Standards | Assessed Standards |
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| Unit 1: Scale Drawings | In this unit, students learn to understand and use the terms “scaled copy,” “to scale,” “scale factor,” “scale drawing,” and “scale,” and recognize when two pictures or plane figures are or are not scaled copies of each other. They use tables to reason about measurements in scaled copies, and recognize that angle measures are preserved in scaled copies, but lengths are scaled by a scale factor and areas by the square of the scale factor. They make, interpret, and reason about scale drawings. These include maps and floor plans that have scales with and without units. This provides geometric preparation for grade 7 work on proportional relationships as well as grade 8 work on dilations and similarity. Lessons included: scaled copies and scale drawings. | • What is a scaled copy and how do you create a scaled copy from an original? | M.7.G.A.1 | M.7.G.A.1 |
| Unit 2: Introducing Proportional Relationships | In this unit, students learn to understand and use the terms “proportional,” “constant of proportionality,” and “proportional relationship,” and recognize when a relationship is or is not proportional. They represent proportional relationships with tables, equations, and graphs. Students use these terms and representations in reasoning about situations that involve constant speed, unit pricing, and measurement conversions. Proportional relationships prepare the way for the study of linear functions in grade 8. Lessons included: representing proportional relationships with tables, representing proportional relationships with equations, comparing proportional and nonproportional relationships, and representing proportional relationships with graphs. | • What are equivalent ratios and how do you use it?<br>• How can a graph, equation, and table all say the same thing, but in a different way? | 7.G.A.1, 7.G.B.6, 7.RP.A, 7.RP.A.1 7.RP.A.2, 7.RP.A.2.a 7.RP.A.2.b, 7.RP.A.2.c, 7.RP.A.2.d | M.7.RP.A.2 |
| Unit 3: Measuring Circles | In this unit, students extend their grade 6 work with perimeters of polygons to circumferences of circles, and recognize that the circumference of a circle is proportional to its diameter, with constant of proportionality $\pi$. They encounter informal derivations of the relationship between area, circumference, and radius.Students learn to understand and use the term “circle” to mean the set of points that are equally distant from a point called the “center.” They gain an understanding of why the circumference of a circle is proportional to its diameter, with constant of proportionality $\pi$. They see informal derivations of the fact that the area of a circle is equal to $\pi$ times the square of its radius. Students use the relationships of circumference, radius, diameter, and area of a circle to find lengths and areas, | • How does the mysterious number pi work its way into ratios and equations? | M.7.RP.A.2 M.7.RP.A.3 | M.7.G.B.4 *M.7.RP.A.2* M.7.RP.A.3 |

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| | expressing these in terms of $\pi$ or using appropriate approximations of to express them numerically. Lessons included: circumference of a circle and area of a circle. | | | |
| Unit 4: Proportional Relationships and Percentages | In this unit, students use ratios, scale factors, unit rates (also called constants of proportionality), and proportional relationships to solve multi-step, real-world problems that involve fractions and percentages. They use long division to write fractions presented in the form $\frac{a}{b}$ as decimals, e.g. $\frac{11}{32} = 0.36$. They learn to understand and use the terms "repeating decimal," "terminating decimal," "percent increase," "percent decrease," "percent error," and "measurement error." They represent amounts and corresponding percent rates with double number line diagrams and tables. They use these terms and representations in reasoning about situations involving sales taxes, tips, markdowns, markups, sales commissions, interest, depreciation, and scaling a picture. Students use equations to represent proportional relationships in which the constant of proportionality arises from a percentage, e.g., relationship between price paid and amount of sales tax paid. Lessons included: proportional relationships with fractions, percent increase and decrease, and applying percentages. | • Why is it helpful to represent numbers in different ways? | M.7.RP.A.1<br>M.7.RP.A.2<br>M.7.NS.A.2.d<br>M.7.RP.A.3 | M.7.RP.A.2<br>M.7.RP.A.3<br>M.7.EE.B.3 |
| Unit 5: Rational Number Arithmetic | In this unit, students extend the operations of addition, subtraction, multiplication, and division from fractions to all rational numbers, written as decimals or in the form $\frac{a}{b}$ . Students interpret signed numbers in contexts (e.g., temperature, elevation, deposit and withdrawal, position, direction, speed and velocity, percent change) together with their sums, differences, products, and quotients. Students extend their use of the "next to" notation (which they used in expressions such as $5x$ and $6(3 + 2)$ in grade 6) to include negative numbers and products of numbers, e.g., writing $-5x$ and $(-5)(-10)$ rather than $(-5) \cdot (x)$ and $(-5) \cdot (-10)$ . They extend their use of the fraction bar to include variables as well as numbers writing $-8.5 \div x$ as well as $\frac{-8.5}{x}$. Lessons included: interpreting negative numbers, adding and subtracting rational numbers, multiplying and dividing rational numbers, and solving equations when there are negative numbers. | • Why do we need both positive and negative numbers? | M.7.NS.A<br>M.7.NS.A.1<br>M.7.NS.A.1.a<br>M.7.NS.A.1.b<br>M.7.NS.A.1.c<br>M.7.NS.A.2.d<br>M.7.NS.A.3<br>M.7.NS.A.2.a<br>M.7.NS.A.2.b<br>M.7.NS.A.2.c<br>M.7.RP.A<br>M.7.RP.A.2<br>M.7.EE.B.3<br>M.7.EE.B.4<br>M.7.EE.B.4.a | M.7.NS.A.1<br>M.7.NS.A.2<br>M.7.NS.A.3<br>M.7.EE.B.4 |
| Unit 6: Expressions, Equations, and Inequalities | In this unit, students solve equations of the forms $px + q = r$and $p(x + q) = r$ , and solve related inequalities, e.g., those of the form $px + q > r$ and $px + q \geq r$ , where $p$, $q$, and $r$ are rational numbers. They draw, interpret, and write equations in one variable for balanced "hanger diagrams," and write expressions for sequences of instructions, e.g., "number puzzles." They use tape diagrams together with equations to represent situations with one unknown quantity. They learn algebraic methods for solving equations. Students solve linear inequalities in one variable and represent their solutions on the number line. They understand and use the terms "less than or equal to" and "greater than or equal to," and the corresponding symbols. They generate expressions that are equivalent to a given numerical or linear expression. Students formulate and solve linear equations and inequalities that represent real-world situations. Lessons included: representing situations of the form $px + q = r$ and $p(x + q) = r$, solving equations of the form $px + q = r$ and $p(x + q) = r$ and problems that lead to those equations, inequalities, and writing equivalent expressions. | • Equivalent fractions and ratios are used to solve problems, what about equivalent expressions, equations, and inequalities? | M.7.EE.B.3<br>M.7.EE.B.4<br>M.7.EE.B.4.a<br>M.7.EE.A.2<br>M.7.EE.B.4.b<br>M.7.EE.A.1<br>M.7.NS.A.1<br>M.7.NS.A.1.c | M.7.EE.B.4<br>M.7.EE.A.1 |
| Unit 7: Angles, Triangles, and Prisms | In this unit, students investigate whether sets of angle and side length measurements determine unique triangles or multiple triangles, or fail to determine triangles. Students also study and apply angle relationships, learning to understand and use the terms "complementary," "supplementary," "vertical angles," and "unique." The work gives them practice working with rational numbers and equations for angle relationships. Students analyze and describe cross-sections of prisms, pyramids, and polyhedra. They understand and use the formula for the volume of a right rectangular prism, and solve problems involving area, surface area, and volume. Lessons included: angle relationships, drawing polygons with given conditions, and solid geometry. | • How does *what* we measure affect *how* we measure? | M.7.G.A<br>M.7.G.B<br>M.7.G.B.5<br>M.7.EE.A<br>M.7.EE.B.4<br>M.7.G.A.2<br>M.7.NS.A.1<br>M.7.G.A.3<br>M.7.G.B.6<br>M.7.RP.A | M.7.G.B.5<br>M.7.G.B.6<br>M.7.G.A.2<br>M.7.G.A.3 |
| Unit 8: Probability and Sampling | In this unit, students design and use simulations to estimate probabilities of outcomes of chance experiments and understand the probability of an outcome as its long-run relative frequency. They represent sample spaces (that is, all possible outcomes of a chance experiment) in tables and tree diagrams and as lists. They calculate the number of outcomes in a given sample space to find the probability of a given event. They consider the strengths and weaknesses of different methods for obtaining a representative sample from a given population. They generate samples from a given population, e.g., by drawing numbered papers from a bag and recording the numbers, and examine the distributions of the samples, comparing these to the distribution of the population. They compare two populations by comparing samples from each population. Lessons included: | • How can we predict, compare, and influence with data? | M.7.SP.C<br>M.7.SP.C.5<br>M.7.SP.C.6<br>M.7.SP.C.7<br>M.7.SP.C.7.a<br>M.7.SP.C.7.b<br>M.7.RP.A<br>M.7.SP.C.8.c<br>M.7.SP.C.8.a<br>M.7.SP.C.8.b<br>M.7.SP.B<br>M.7.SP.B.3<br>M.7.SP.A<br>M.7.SP.A.1 | M.7.SP.C.5<br>M.7.SP.C.6<br>M.7.SP.C.7<br>M.7.SP.C.8<br>M.7.SP.A.1<br>M.7.SP.A.2<br>M.7.SP.B.4 |

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| | probabilities of single step events, probabilities of multi-step events, sampling, and using samples. | | M.7.SP.A.2<br>M.7.SP.C.7<br>M.7.SP.B.4<br>M.7.NS.A.2.d | |