Accelerated 7 Mathematics

Full Syllabus

Illustrative Mathematics® 6-8 Accelerated Math (v.360)

9 Units · Unit Goals · Section Goals · Lesson-by-Lesson Outline

Course Overview

Accelerated 7 is the second course in the Illustrative Mathematics 6–8 Math Accelerated v.360 curriculum, organized into 9 units. It compresses the standards for grades 7 and 8 to prepare students for Algebra 1 in the next year. Students study rigid transformations and congruence; scale drawings, dilations, similarity, and slope; equations and inequalities of the forms p(x+q)=r and px+q=r; expressions and equations with variables on both sides; linear relationships and systems of equations; functions and volumes of prisms, cylinders, cones, and spheres; exponents and scientific notation; the Pythagorean Theorem and irrational numbers; and a culminating Putting It All Together unit.

The unit sequence is:

- Unit 1: Rigid Transformations and Congruence
- Unit 2: Scale Drawings, Similarity, and Slope
- Unit 3: Equations and Inequalities
- Unit 4: Expressions and More Equations
- Unit 5: Linear Relationships
- Unit 6: Functions and Volume
- Unit 7: Exponents and Scientific Notation
- Unit 8: Pythagorean Theorem and Irrational Numbers
- Unit 9: Putting It All Together

Each unit is divided into lettered sections (A, B, C, D, ... as applicable), and each section is a sequence of daily lessons. Optional lessons (often culminating tasks in “Let's Put It to Work” or extension activities) are noted as “(Optional).”

Unit 1: Rigid Transformations and Congruence

Unit Goal

Students explore translations, rotations, and reflections of plane figures in order to understand the structure of rigid transformations, and use the properties of rigid transformations to formally define what it means for shapes to be congruent.

Unit Narrative

In this unit, students explore translations, rotations, and reflections of plane figures in order to understand the structure of rigid transformations. They use the properties of rigid transformations to formally define what it means for shapes to be congruent. In earlier grades, students studied geometric measurement to find angle measures and side lengths of two-dimensional figures as well as applied area and perimeter formulas. Students begin with an informal exploration of transformations in the plane, then increase their precision of language to describe translations, rotations, and reflections with formal descriptions including coordinates. Then students identify corresponding parts of figures and conclude that angles and distances are preserved under rigid transformations. Students use this property to reason about plane figures, including parallel lines cut by a transversal. Students then learn the formal definition of "congruent" and use this definition to show that corresponding parts of congruent figures are also congruent. Students apply their understanding of congruence and rigid motions to justify that the sum of the interior angles in a triangle must be 180 degrees. 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." This unit intentionally allows extra time for students to learn new routines and establish norms for the year.

Section A: Rigid Transformations

Section Goals

- Determine coordinates that represent the image of a polygon or line segment in the coordinate plane after a transformation.
- Draw and label the image of figures that result from translations, rotations, and reflections on a square or isometric grid.
- Explain the sequence of transformations that takes one figure to its image.

Section Narrative

The purpose of this section is for students to describe translations, rotations, and reflections using precise language as well as accurately draw these transformations with and without a grid and coordinate points. Students shift from informal descriptions to precise mathematical language that identifies specific features of each transformation throughout the section. First, students describe translations and rotations of plane figures using informal language before using the formal language of "translation," "rotation," and "reflection" to describe these motions of figures on the plane. Next, students create drawings of translations, rotations, and reflections using tools like tracing paper and a straightedge. Next, students draw and label diagrams of sequences of transformations in the coordinate plane. Finally, students apply the specific features of each transformation as they identify the information needed to accurately draw the image of a figure after a sequence of transformations.

Lessons

1. **Moving in the Plane** — Let's describe ways figures can move in the plane.

2. **Naming the Moves** — Let’s be more precise about describing moves of figures in the plane.
3. **Making the Moves** — Let’s draw and describe translations, rotations, and reflections.
4. **Coordinate Moves** — Let’s transform some figures and see what happens to the coordinates of points.
5. **Describing Transformations** — Let’s transform some polygons in the coordinate plane.

Section B: Properties of Rigid Transformations

Section Goals

- Draw and label rigid transformations of lines and parallel lines and explain the relationship between the original and its image under the transformation.
- Identify a rigid transformation using a drawing of a figure and its image.
- Identify side lengths and angles that have equivalent measurements in composite shapes and explain why they are equivalent.

Section Narrative

The purpose of this section is for students to explore important properties of rigid transformations and use these properties to make arguments about the features of particular figures and their transformations. First, students observe that for a figure and its image under a translation, rotation, or reflection, corresponding sides are the same length and corresponding angles are the same measure. Next, students explore the properties of a figure under a 90- or 180-degree rotation, including that a 180-degree rotation of a segment by a point not on the line results in a line segment which is parallel to the original. Then, students apply these properties to explore the effect of rotations on lines. They also apply these properties to justify that vertical angles have the same angle measure. Finally, students create composite figures using sequences of rigid transformations.

Lessons

1. **No Bending or Stretching** — Let’s compare measurements before and after translations, rotations, and reflections.
2. **Rotation Patterns** — Let’s rotate figures in a plane.
3. **Moves in Parallel** — Let’s transform some lines.
4. **Composing Figures** — Let’s use reasoning about rigid transformations to find measurements without measuring.

Section C: Congruence

Section Goals

- Compare and contrast side lengths, angle measures, and other features of shapes using rigid transformations to explain why a shape is or is not congruent to another.
- Justify that two polygons on a grid are congruent using the definition of congruence in terms of rigid transformations.

Section Narrative

The purpose of this section is for students to connect their understanding of rigid transformations with congruence of figures. While finding a difference between features of two figures is sufficient to show the figures are not congruent, comparing features may not be enough to show that two shapes are congruent. Identifying a rigid transformation that takes one shape to the other is necessary to show congruence. First, students are introduced to the term “congruent” as they observe properties of congruent figures. Then they compare features of figures that are not congruent in order to conclude that if any feature is not the same between two figures, then the figures are not congruent. Finally, students consider figures that are not determined by a set of vertices and must apply their understanding of rigid transformations to show whether the figures are congruent.

Lessons

1. **What Is the Same?** — Let’s decide whether shapes are the same.
2. **Congruence** — Let's decide if two figures are congruent.

Section D: Angles in a Triangle

Section Goals

- Calculate angle measures using alternate interior, vertical, and supplementary angles to solve problems.
- Generalize that the sum of angles in a triangle is 180 degrees using rigid transformations or the congruence of alternate interior angles of parallel lines cut by a transversal.

Section Narrative

The purpose of this section is for students to apply their understanding of rigid transformations to figures involving parallel lines and transversals. First, students use 180-degree rotations about a point to show that parallel lines cut by a transversal have congruent alternate interior angles. Then students connect their prior understanding about straight angles with angles in a triangle as they observe that the sum of angles in a triangle appears to be 180 degrees. Finally, students apply the work with parallel lines and transversals to show that the angles in any triangle are congruent to the angles that make up a straight angle, so the sum must be 180 degrees.

Lessons

1. **Alternate Interior Angles** — Let’s explore why some angles are always equal.
2. **Adding the Angles in a Triangle** — Let’s explore angles in triangles.
3. **Parallel Lines and the Angles in a Triangle** — Let’s see why the angles in a triangle add to 180 degrees.

Section E: Drawing Polygons with Given Conditions

Section Goals

- Draw triangles with two given angle measures and one side length, one given angle measure and two side lengths, or three side lengths.
- Justify whether 3 measures of angles or sides determine a unique triangle or more than one triangle, or if no triangle is possible.

Section Narrative

During these lessons students think about what conditions are needed to determine a unique figure, in preparation for future work with congruence in grade 8 and high school. These lessons continue the language used in grade 6: Two polygons are identical if they match up exactly when placed one on top of the other. Students first experiment with creating polygons using fixed side lengths to notice which conditions make it possible to construct unique shapes or impossible to construct a shape. Next, they generalize a rule for side lengths of triangles as they compare lengths that do and do not create a triangle. Then, students consider possible triangle constructions with given side length and angle combinations and notice patterns of when these combinations create unique triangles and when they do not. They then build on this work to construct triangles with given angle and side length conditions.

Lessons

1. **Building Polygons** — Let's build shapes.
2. **Drawing Triangles (Part 1)** — Let’s see how many different triangles we can draw with certain measurements.
3. **Drawing Triangles (Part 2)** — Let’s draw some more triangles.

Section F: Let's Put It to Work

Section Narrative

In this final section, students have the opportunity to apply their thinking from throughout the unit. As this is a short section followed by an End-of-Unit Assessment, there are no section goals or checkpoint questions. All lessons in this section are optional.

Lessons

1. **Rotate and Tessellate (Optional)** — Let's make complex patterns using transformations.

Unit 2: Scale Drawings, Similarity, and Slope

Unit Goal

Students study scaled copies of plane figures and scale drawings of real-world objects, extend their work to dilations and similarity, and use similar triangles to understand slope and write equations for lines.

Unit Narrative

In this unit, students study scaled copies of plane figures and scale drawings of real-world objects. Students learn that all lengths in a scaled copy are the result of multiplying the original lengths by a scale factor. Also, the angle measures in a scaled copy are the same as in the original figure. This work builds on what students learned in previous grades about measuring lengths, areas, and angles. This unit provides a geometric context to preview the type of reasoning that students will use with proportional relationships and also lays the foundation for work on dilations and similarity. Students begin the unit by looking at copies of a picture and describing what differentiates scaled and non-scaled copies. They calculate scale factors and draw scaled copies of figures. Next, students study scale drawings. They see that the principles and strategies that they used to reason about scaled copies of figures can also be used with scale drawings. They use scale drawings to calculate actual lengths and areas, and they create scale drawings. In the next two sections, students learn about dilations as a new transformation that creates scaled copies. They connect dilations to earlier work with rigid transformations as they explain why two figures are similar by describing a sequence of translations, reflections, rotations, and dilations that take one figure to the other. They discover that angle measures in similar figures are preserved, which can be used to justify that two triangles are similar if they share two (or three) angle measures. In the following section, students use the similarity of slope triangles to understand why any two distinct points on a line determine the same slope. Using these same properties of similar triangles, students practice writing equations for a given line.

Section A: Scaled Copies

Section Goals

- Determine whether a figure is a scaled copy of another figure, by examining corresponding side lengths and angle measures.
- Draw a scaled copy of a figure using a given scale factor.

Section Narrative

In this section, students study scaled copies of pictures and plane figures. Students begin by looking at copies of a picture, some of which are to scale and some of which are not. They use their own words to describe what differentiates scaled and non-scaled copies of a picture. As the section progresses, students learn that a scaled copy is created when all the lengths in the original figure are multiplied by a consistent scale factor and all the angle measures stay the same. Next, students draw scaled copies. They learn that when the scale factor is greater than 1, the copy will be larger, and when it is less than 1, the copy will be smaller.

Lessons

1. **What Are Scaled Copies?** — Let’s explore scaled copies.
2. **Scale Factors and Making Scaled Copies** — Let's draw scaled copies.
3. **Scaled Relationships** — Let’s find relationships between scaled copies.

Section B: Scale Drawings

Section Goals

- Create a scale drawing given the actual measurements of the object or given another scale drawing at a different scale.
- Explain how to use scales and scale drawings to calculate actual distances and areas.

Section Narrative

In this section, students learn about scale drawings and use them to solve problems. They see that the principles and strategies that they used to reason about scaled copies of figures can be used with scale drawings. At first, students work with scales that involve units (for example, “1 cm represents 10 km”). They interpret and draw maps and floor plans. They also reproduce a scale drawing at a different scale. Later, students work with scales that do not include units (for example, “the scale is 1 to 100”). They learn to express scales with units as scales without units, and vice versa. They determine appropriate scales to use, given restrictions in the size of the drawing. They study the relationship between regions and lengths in scale drawings, including calculating the actual area given a scale drawing.

Lessons

1. **Scale Drawings** — Let’s explore scale drawings.
2. **Creating Scale Drawings** — Let’s create our own scale drawings.
3. **Changing Scales in Scale Drawings** — Let’s explore different scale drawings of the same actual thing.
4. **Units in Scale Drawings** — Let’s explore a different way to express scales.

Section C: Dilations

Section Goals

- Create a dilation of a figure given a scale factor and center of dilation.
- Describe a figure on a coordinate grid and its image under a dilation, using coordinates to refer to points.
- Identify the center, scale factor, and image of a dilation.

Section Narrative

Work in this section builds on the concept of scaled copies to introduce a new transformation—dilations. Students begin by sorting rectangles and notice that rectangles that are scaled copies of one another can be arranged so that the diagonal of the largest rectangle contains the diagonals of the smaller rectangles. Next, students are introduced to the circular grid and draw rays out from the center through the vertices of several polygons. They observe that the dilation of a point from a given center means that the image of the point will be located somewhere along the ray depending on the scale factor. Students then transition to dilations on a grid in order to use the structure of the grid to help measure distances. Finally, they transition from the grid to a coordinate plane and see how coordinates can be used to effectively describe and communicate dilations.

Lessons

1. **Projecting and Scaling** — Let’s explore scaling.
2. **Dilations** — Let's dilate figures.
3. **Dilations on a Square Grid** — Let’s dilate figures on a square grid.

4. **More Dilations** — Let’s dilate figures in the coordinate plane.

Section D: Similarity

Section Goals

- Calculate unknown side lengths in similar triangles using the ratios of side lengths within the triangles and the scale factor between similar triangles.
- Justify that two triangles are similar by finding a sequence of transformations that takes one triangle to the other or by checking that two pairs of corresponding angles are congruent.

Section Narrative

Work in this section introduces students to the concept of similarity. Students begin by describing a sequence of translations, reflections, rotations, or dilations that take one figure to another to prove that the two figures are similar. This prepares them to investigate the concept of slope in future lessons. Next students examine quadrilaterals—some with congruent side lengths but different angle measures, and others with congruent angle measures but non-proportional side lengths. Both of these cases result in figures that are not similar. Then using dried pasta to create triangles with given angle constraints, students see that while two congruent side lengths will not determine similarity, two congruent angle measures will. Finally, students learn how to calculate side lengths of similar triangles using two strategies: by using the scale factor between corresponding sides and by using the quotient between pairs of corresponding sides.

Lessons

1. **Similarity** — Let's explore similar figures.
2. **Similar Triangles** — Let’s look at similar triangles.
3. **Side Length Quotients in Similar Triangles** — Let’s find missing side lengths in triangles.

Section E: Slope

Section Goals

- Comprehend the term “slope” to mean a number that tells how steep a line is.
- Create an equation relating the quotient of the vertical and horizontal side lengths of a slope triangle to the slope of a line and use it to justify whether a point is on the line by verifying that the values of x and y satisfy the equation.

Section Narrative

This section connects the geometric understanding of dilations and similar triangles with the algebraic understanding of slope and equations of a line. Students determine that all slope triangles for a given line are similar. Since corresponding side lengths in similar triangles are proportional, the quotient between the vertical and the horizontal side length of any slope triangle for a given line will always be equivalent. This ratio is called the slope of the line, and students notice that as the value of the slope increases from zero, the line gets steeper. Students continue to use the proportional relationship between slope triangles to write equations that can be satisfied by any point on the line. It is not necessary or expected for students to write the equation of a line in slope-intercept form at this time.

Lessons

1. **Meet Slope** — Let’s learn about the slope of a line.

2. **Writing Equations for Lines** — Let’s explore the relationship between points on a line and the slope of the line.
3. **Using Equations for Lines** — Let’s write equations for lines.

Section F: Let's Put It to Work

Section Narrative

In this final section, students have the opportunity to apply their thinking from throughout the unit. As this is a short section followed by an End-of-Unit Assessment, there are no section goals or checkpoint questions. All lessons in this section are optional.

Lessons

1. **Draw It to Scale (Optional)** — Let’s draw a floor plan.
2. **The Shadow Knows (Optional)** — Let’s use shadows to find the height of an object.

Unit 3: Equations and Inequalities

Unit Goal

Students write and solve equations of the forms $p(x+q)=r$ and $px+q=r$ and inequalities of the forms $px+q>r$ and $p(x+q)<r$, building on grade 6 work with one-step equations.

Unit Narrative

In this unit, students deepen their algebraic reasoning as they write and solve equations of the forms $p(x+q)=r$ and $px+q=r$ and inequalities of the forms $px+q>r$ and $p(x+q)<r$. This builds on grade 6 work with equations of the form $x+p=q$ or $px=q$. Students begin the unit by making sense of situations that involve both multiplication and addition. They represent such situations with tape diagrams and with equations. Next, students consider hanger diagrams as another way to represent equations. The diagrams help students understand solving equations in terms of "doing the same thing to each side of the equation." Then students apply what they have learned about equations to inequalities. They write inequalities to represent situations and solve inequalities by reasoning about the related equation. The inequality symbols $\leq$ and $\geq$ are introduced. Lastly, students use what they know about equations to solve problems involving relationships between angles.

Section A: Representing Situations of the Form $p(x+q)=r$ and $px+q=r$

Section Goals

- Create diagrams and equations in the form $p(x+q)=r$ and $px+q=r$ to represent situations.

Section Narrative

Students begin the unit by making sense of situations that involve both multiplication and addition. They represent such situations with tape diagrams and with equations. They see that different diagrams and equations can represent the same situation, and they use diagrams to find solutions to equations.

Lessons

1. **Relationships between Quantities** — Let's try to solve some new kinds of problems.
2. **Reasoning about Contexts with Tape Diagrams** — Let's use tape diagrams to make sense of different kinds of stories.
3. **Reasoning about Equations with Tape Diagrams** — Let's see how equations can describe tape diagrams.
4. **Reasoning about Equations and Tape Diagrams (Part 1)** — Let's see how tape diagrams can help us answer questions about unknown amounts in stories.
5. **Reasoning about Equations and Tape Diagrams (Part 2)** — Let's use tape diagrams to help answer questions about situations where the equation has parentheses.

Section B: Solving Equations of the Form $p(x+q)=r$ and $px+q=r$ and Problems That Lead to Those Equations

Section Goals

- Solve equations of the form $p(x+q)=r$ and $px+q=r$, including those that involve fractions, decimals, and negative numbers, and explain the solution method.

Section Narrative

Students consider hanger diagrams as a way to represent equations. The diagrams help students understand solving equations in terms of "doing the same thing to each side of the equation." Students examine different pathways for solving the same equation and consider whether one method is more efficient than another. Then students write equations to represent situations and solve problems, including more complicated problems involving percent increase and percent decrease.

Lessons

1. **Reasoning about Solving Equations (Part 1)** — Let's see how a balanced hanger is like an equation and how moving its weights is like solving the equation.
2. **Reasoning about Solving Equations (Part 2)** — Let's use hangers to understand two different ways of solving equations with parentheses.
3. **Dealing with Negative Numbers** — Let's show that doing the same to each side works for negative numbers too.
4. **Different Options for Solving One Equation** — Let's think about which way is better when we solve equations with parentheses.
5. **Using Equations to Solve Problems** — Let's use tape diagrams, equations, and reasoning to solve problems.
6. **Solving Problems about Percent Increase or Decrease** — Let's use tape diagrams, equations, and reasoning to solve problems with negatives and percents.

Section C: Inequalities

Section Goals

- Draw and label a graph on a number line that represents all the solutions to an inequality.
- Solve an inequality of the form $px+q>r$ or $px+q<r$ or $p(x+q)>r$ or $p(x+q)<r$ including any of the four inequality symbols, $<$, $>$, $\leq$, or $\geq$.

Section Narrative

First, students consider inequalities of the form $x>c$ or $x<c$ and determine which values make the inequality true. Next, they compare equations and inequalities that represent the same situation. They see that solving the related equation gives the boundary point between the values that make an inequality true and the values that make it false. Students learn to test values to the left or right of the boundary point to determine which side of the number line contains the solutions to the inequality. Lastly, students write and solve inequalities to represent situations with constraints.

Lessons

1. **Writing and Graphing Inequalities** — Let's write inequalities.
2. **Solutions of Inequalities** — Let's think about the solutions to inequalities.
3. **Finding Solutions to Inequalities in Context** — Let's solve more complicated inequalities.
4. **Efficiently Solving Inequalities** — Let's solve more complicated inequalities.
5. **Interpreting Inequalities** — Let's write inequalities.
6. **Modeling with Inequalities** — Let's look at solutions to inequalities.

Section D: Let's Put It to Work

Section Narrative

In this final section, students have the opportunity to apply their thinking from throughout the unit. As this is a short section followed by an End-of-Unit Assessment, there are no section goals or checkpoint questions. All lessons in this section are optional.

Lessons

1. **Using Equations to Solve for Unknown Angles (Optional)** — Let’s figure out missing angles using equations.

Unit 4: Expressions and More Equations

Unit Goal

Students write equivalent expressions and use reasoning to solve linear equations, including those with a variable on both sides of the equal sign and equations with 0, 1, or infinite solutions.

Unit Narrative

In this unit, students work with writing equivalent expressions and use reasoning to solve equations, including equations that have a variable on both sides of the equal sign. This builds on students' previous work solving equations of the form $p(x+q)=r$ or $px+q=r$. First, students work with equivalent linear expressions that are more complex due to having more terms, more parentheses, and negative rational numbers. Students use properties of operations to justify why the expressions are equivalent. Next, the unit focuses on moves that can be done to write equivalent equations. At first, students use hanger diagrams as an intuitive representation of equality and represent their reasoning by labeling arrows that connect equivalent representations. With the reintroduction of negative values, students move away from hanger diagrams to algebraic equations and writing equivalent equations with the intention of solving for a variable. Lastly, students examine the conditions under which equations could have 0, 1, or infinite solutions as a transition to thinking about similar situations involving systems of equations.

Section A: Writing Equivalent Expressions

Section Goals

- Apply properties of operations to write an expression with fewer terms that is equivalent to a given expression.
- Apply the distributive property to factor or expand an expression.

Section Narrative

In this section, students work with linear expressions and justify whether they are equivalent. Having learned to perform arithmetic with rational numbers, students are now prepared to examine more complex expressions. First, students see that rewriting subtraction as adding the opposite makes it possible to apply properties of addition, such as the associative or commutative property, to generate equivalent expressions. Next, students apply the distributive property to factor or expand expressions with rational coefficients. They see that combining like terms is an application of the distributive property. Lastly, students combine all these skills to add and subtract linear expressions.

Lessons

1. **Subtraction in Equivalent Expressions** — Let's find ways to work with subtraction in expressions.
2. **Expanding and Factoring** — Let's use the distributive property to write expressions in different ways.
3. **Combining Like Terms (Part 1)** — Let's see how we can tell that expressions are equivalent.
4. **Combining Like Terms (Part 2)** — Let's see how we can tell that expressions are equivalent.

Section B: Equivalent Equations

Section Goals

- Write equivalent equations and describe the moves that are used.

- Write equivalent equations to solve linear equations in one variable.

Section Narrative

In this section, students focus on writing equivalent equations. They build a list of moves that can be used to write equivalent equations. Students begin by examining hanger diagrams as an intuitive way of understanding equivalence and the moves that maintain equivalence. These moves are described by labeling arrows that connect equivalent representations. Then students reach the limits of hanger diagrams with the reintroduction of negative values, and they extend their understanding of equivalence to algebraic equations.

Lessons

1. **Keeping the Equation Balanced** — Let's figure out unknown weights on balanced hangers.
2. **Balanced Moves** — Let's rewrite equations while keeping the same solutions.
3. **More Balanced Moves** — Let's rewrite some more equations while keeping the same solutions.
4. **Solving Any Linear Equation** — Let's solve linear equations.
5. **Strategic Solving** — Let's solve linear equations like a boss.

Section C: Linear Equations in One Variable

Section Goals

- Describe features of linear equations that have one solution, no solution, or many solutions.
- Interpret the solution of an equation in one variable in context.

Section Narrative

In this section, students are shown equations that do not have a single solution. Students recognize that some equations have no solutions and others have infinitely many solutions, then find conditions that indicate how many solutions an equation has without completely solving it. This work also serves as a transition to examining systems of equations in which similar situations arise under similar conditions.

Lessons

1. **All, Some, or No Solutions** — Let’s think about how many solutions an equation can have.
2. **How Many Solutions?** — Let’s solve equations with different numbers of solutions.

Section D: Let’s Put It to Work

Section Narrative

In this final section, students have the opportunity to apply their thinking from throughout the unit. As this is a short section followed by an End-of-Unit Assessment, there are no section goals or checkpoint questions. All lessons in this section are optional.

Lessons

1. **Applications of Expressions (Optional)** — Let’s use expressions to solve problems.

Unit 5: Linear Relationships

Unit Goal

Students study proportional and non-proportional linear relationships, solve systems of linear equations graphically and algebraically, and use scatter plots and lines of fit to analyze numerical and categorical data.

Unit Narrative

This unit introduces students to nonproportional linear relationships by building on earlier work around similarity and slope. Then students solve systems of linear equations using graphic and algebraic methods. Students advance their understanding of lines by examining slopes in the context of data. Lastly, they use scatter plots and fitted lines to analyze numerical data. The unit begins by revisiting different representations of proportional relationships. Next, students analyze a relationship that is linear but not proportional. They see that the rate of change has a numerical value that is the same as the slope of the line. Then students consider situations represented by linear relationships with negative rates of change. They establish a way to compute the slope of a line from any two distinct points on the line. Next students examine systems of equations graphically and find solutions algebraically. Then students are introduced to scatter plots and informally draw lines that model the general trend of the data. They also classify associations as positive, negative, linear, and non-linear. In an optional section, students look at categorical data using two-way tables and relative frequencies.

Section A: Proportional Relationships

Section Goals

- Create an equation and a graph to represent proportional relationships, including an appropriate scale and axes.
- Interpret multiple representations of a proportional relationship in context.

Section Narrative

Work in this section takes previous learning with proportional relationships and looks at it from a grade 8 perspective in preparation for work with linear relationships. Students begin the section by observing features of graphs, such as labels and scaling of the axes, to make sense of situations. When comparing graphs of two proportional relationships, students must consider the values on each axis, and not just use a visual determination when deciding which line is steeper. Next, students create their own graphs, strategically choosing the appropriate scaling for each axis. Students work flexibly between different representations of proportional relationships, sometimes using equations of the form $y=kx$ to determine the rate of change, sometimes using tables and creating graphs.

Lessons

1. **Understanding Proportional Relationships** — Let’s study some graphs.
2. **Representing Proportional Relationships** — Let's graph proportional relationships.
3. **Comparing Proportional Relationships** — Let’s compare proportional relationships.

Section B: Representing Linear Relationships

Section Goals

- Create an equation that represents a linear relationship.

- Create and compare graphs that represent linear relationships with the same rate of change but different initial values.
- Interpret the slope and y-intercept of the graph of a line in context.

Section Narrative

Work in this section builds on students' understanding of proportional relationships to introduce linear relationships that are not proportional. Students begin by determining the height of stacks of cups to make predictions. The relationship in this situation has a constant rate of change, making it linear. Students are then introduced to the vertical intercept. Next, students drop identical objects into a graduated cylinder full of water and observe how the water is displaced as each object is added. They write equations to represent linear situations by considering a starting or initial value and adding multiples of the rate of change. Finally, students observe how equations of lines can be seen geometrically as vertical translations of lines going through the origin.

Lessons

1. **Introduction to Linear Relationships** — Let's explore some relationships between two variables.
2. **More Linear Relationships** — Let's explore some more relationships between two variables.
3. **Representations of Linear Relationships** — Let's write equations from real situations.
4. **Translating to y=mx+b** — Let's see what happens to the equations of translated lines.

Section C: Finding Slopes and Linear Equations

Section Goals

- Create multiple representations of a linear relationship, including a graph, equation, and table.
- Determine pairs of values that satisfy or do not satisfy a linear relationship using an equation or graph.
- Interpret the slope of a non-increasing line in context.

Section Narrative

Work in this section introduces students to situations that can be represented by lines with a non-positive slope. Students explore a situation where one quantity decreases at a constant rate. Next, students recall earlier work using slope triangles in order to describe a procedure they can use to calculate the slope of any line given just the coordinates of two points. In an optional lesson, students write equations to describe vertical and horizontal lines. Work in this section continues with what it means to be a solution to a linear equation with two variables. Finally, students consider linear equations and their graphs without a context.

Lessons

1. **Slopes Don't Have to Be Positive** — Let's find out what a negative slope means.
2. **Calculating Slope** — Let's calculate slope from two points.
3. **Equations of All Kinds of Lines** — Let's write equations for vertical and horizontal lines.
4. **Solutions to Linear Equations** — Let's think about what it means to be a solution to a linear equation with two variables in it.
5. **More Solutions to Linear Equations** — Let's find solutions to more linear equations.

Section D: Systems of Linear Equations

Section Goals

- Categorize systems of equations, including systems with infinitely many or no solutions, and calculate the solution for a system using a variety of strategies.
- Comprehend that solving a system of equations means finding values of the variables that make both equations true at the same time.
- Create a system of equations that represents a situation and interpret the solution in context.

Section Narrative

In this section, students examine systems of linear equations and solve them by finding pairs of values that make both equations true. They begin by revisiting what it means when points are on or off a graphed line in relation to the equation represented by the line. Then, they recognize that a system of equations can be solved by finding the intersection point of 2 lines on a graph. Students move from using graphical representations to algebraic ones for solving systems for more precision. Systems with no solution or infinitely many solutions also emerge.

Lessons

1. **On Both of the Lines** — Let’s use lines to think about situations.
2. **Systems of Equations** — Let’s learn what a system of equations is.
3. **Solving Systems of Equations** — Let’s solve systems of equations.
4. **Solving More Systems** — Let’s solve systems of equations.
5. **Writing Systems of Equations** — Let’s write systems of equations from real-world situations.

Section E: Associations in Numerical Data

Section Goals

- Create a scatter plot from a table of data, and describe the trend of the data.
- Describe the relationship between two variables using a line fit to data on a scatter plot.
- Interpret features of data on a scatter plot, including linear and non-linear association, outliers, slope of a linear model, and clustering.

Section Narrative

In this section, students look at organizing data from two variables. They interpret and create scatter plots to visualize numerical data and look for basic trends. Then students look more closely at associations between variables using scatter plots. They informally assess the fitness of linear models, attempt to draw their own linear models, and interpret slope of a linear model in context of the data. They also work to recognize other patterns in a scatter plot, such as clustering, outliers, and non-linearity.

Lessons

1. **Organizing Data** — Let’s find ways to show patterns in data.
2. **What a Point in a Scatter Plot Means** — Let’s investigate points in scatter plots.
3. **Fitting a Line to Data** — Let’s look at the scatter plots as a whole.
4. **Describing Trends in Scatter Plots** — Let’s look for associations between variables.
5. **The Slope of a Fitted Line** — Let's look at how changing one variable changes another.

6. **Observing More Patterns in Scatter Plots** — Let’s look for other patterns in data.

Section F: Associations in Categorical Data

Section Goals

- Calculate relative frequencies, and describe associations between variables using a relative frequency table.
- Create a two-way table and a segmented bar graph that represent relative frequencies, and interpret the frequencies in context.

Section Narrative

In this section, students turn their attention to bivariate categorical data. They interpret two-way tables and turn them into tables showing relative frequencies. They informally determine whether the relative frequencies suggest an association between the categorical variables by comparing the percentages within different categories.

Lessons

1. **Looking for Associations** — Let’s look for associations in data.
2. **Using Data Displays to Find Associations** — Let’s use data displays to find associations.

Section G: Let's Put It to Work

Section Narrative

In this final section, students have the opportunity to apply their thinking from throughout the unit. As this is a short section followed by an End-of-Unit Assessment, there are no section goals or checkpoint questions. All lessons in this section are optional.

Lessons

1. **Using Linear Relations to Solve Problems (Optional)** — Let’s write equations for real-world situations and think about their solutions.
2. **Solving Problems with Systems of Equations (Optional)** — Let's solve some gnarly problems.
3. **Gone in 30 Seconds (Optional)** — Let’s gather and analyze some timing data.

Unit 6: Functions and Volume

Unit Goal

Students are introduced to functions as relationships between inputs and outputs, then apply functions to find volumes and surface areas of prisms, cylinders, cones, and spheres.

Unit Narrative

In this unit, students are formally introduced to the concept of a function as a relationship between “inputs” and “outputs” in which each allowable input determines exactly one output. First, students work with relationships that are familiar from previous grades or units (perimeter formulas, proportional relationships, linear relationships), expressing them as functions. They study the different ways functions can be represented, making connections between the representations and interpreting what they mean in context. The use of function notation is left for a future course. Next, 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. Students build on their knowledge of the formula for the volume of a right rectangular prism, learning formulas for volumes of cylinders, cones, and spheres. Students express functional relationships described by these formulas as equations, focusing on situations involving proportional relationships.

Section A: Representing and Interpreting Functions

Section Goals

- Comprehend the structure of a function as having one and only one output for each allowable input.
- Draw the graph of a function that represents a context, and explain which quantity is a function of which.
- Interpret multiple representations of functions, including graphs, tables, and equations, and explain how to find information in each type of representation.

Section Narrative

This section introduces students to functions and develops the idea of a function as a rule that assigns to each allowable input exactly one output. A focus of this section is on examples of “input–output rules,” such as “Divide by 3” or “If even, then . . . . If odd, then . . . .” Next, students connect the terms “independent variable” and “dependent variable” with the inputs and outputs of a function. They use equations to express a dependent variable as a function of an independent variable, viewing formulas from earlier grades as determining functions. They work with tables, graphs, and equations for functions, learning the convention that the independent variable is generally shown on the horizontal axis. Then students model relationships between quantities in real-world situations.

Lessons

1. **Inputs and Outputs** — Let’s make some rules.
2. **Introduction to Functions** — Let’s learn what a function is.
3. **Equations for Functions** — Let’s find outputs from equations.
4. **Graphs of Functions** — Let’s interpret graphs of functions.
5. **Even More Graphs of Functions** — Let’s draw a graph from a story.
6. **Connecting Representations of Functions** — Let’s connect tables, equations, graphs, and stories of functions.

7. **Linear Functions and Models** — Let’s investigate linear functions.

Section B: Prisms and Cylinders

Section Goals

- Calculate the surface area and volume of a prism.
- Calculate the volume of a cylinder.

Section Narrative

In this section, students find the surface area and volume of right prisms and the volume of cylinders. They begin with making sense of the structure of a prism using cross-sections parallel to the base of the prism. They build on this idea, and on their work in earlier grades with rectangular prisms, to conclude that the volume of any prism can be determined by multiplying the area of the base by the height of the prism. Students then decompose prisms with various types of bases, to continue making sense of the volume of a prism. Students extend their understanding of volume from right rectangular prisms to right cylinders. Then students use nets to understand the parts of the prism as a two-dimensional surface. They associate the lateral surface area with a large rectangle whose height is the height of the prism and whose length is the perimeter of the base of the prism. Finally, students consider whether situations call for finding the surface area or the volume of a given figure and solve these problems in context.

Lessons

1. **Slicing Solids** — Let's see what shapes you get when you slice a three-dimensional object.
2. **Volume of Right Prisms** — Let’s look at volumes of prisms.
3. **Decomposing Bases for Area** — Let’s look at how some people use volume.
4. **The Volume of a Cylinder** — Let’s explore cylinders and their volumes.
5. **Finding Cylinder Dimensions** — Let’s figure out the dimensions of cylinders.
6. **Surface Area of Right Prisms** — Let’s work with surface area and volume in context.
7. **Applying Volume and Surface Area** — Let's explore things that are proportional to volume or surface area.

Section C: Cones and Spheres

Section Goals

- Calculate the value of one dimension of a cone, and explain the reasoning.
- Calculate the volume of a cone or sphere.
- Solve problems involving cones, cylinders, and spheres.

Section Narrative

In this section, students extend their understanding of volume from right prisms and cylinders to right cones and spheres. After gaining familiarity with a formula for the volume of a cylinder by using it to solve problems, students perceive similar structure in a formula for the volume of a cone. There are two optional lessons. In the first, students use equations and graphs of proportional relationships to make sense of what happens to the volumes of familiar shapes when one dimension changes. The second optional lesson contains work beyond the scope of the grade: nonlinear functions. Next, students reason about the volume of hemispheres and how it compares to the volume of prisms, cylinders, and cones of similar dimensions. Building on the foundation of these connections, the formula for the volume of a sphere is established. The section concludes with a lesson using the Information Gap routine.

Lessons

1. **The Volume of a Cone** — Let’s explore cones and their volumes.
2. **Finding Cone Dimensions** — Let’s figure out the dimensions of cones.
3. **Scaling One Dimension** — Let’s see how changing one dimension changes the volume of a shape.
4. **Scaling Two Dimensions (Optional)** — Let’s change more dimensions of shapes.
5. **Estimating a Hemisphere** — Let’s estimate volumes of hemispheres with figures we know.
6. **The Volume of a Sphere** — Let’s explore spheres and their volumes.
7. **Cylinders, Cones, and Spheres** — Let’s find the volume of shapes.

Section D: Let's Put It to Work

Section Narrative

In this final section, students have the opportunity to apply their thinking from throughout the unit. As this is a short section followed by an End-of-Unit Assessment, there are no section goals or checkpoint questions. All lessons in this section are optional.

Lessons

1. **Building Prisms (Optional)** — Let’s build a triangular prism from scratch.
2. **Volume as a Function of . . . (Optional)** — Let’s compare water heights in different containers.

Unit 7: Exponents and Scientific Notation

Unit Goal

Students deepen their understanding of exponents, generalize exponent rules, work with very large and small numbers, and use scientific notation to compute and compare quantities.

Unit Narrative

In this unit, students deepen their understanding of exponents, powers of 10, and place value before being introduced to scientific notation. They build on work done in a previous course where students focused on whole-number exponents with whole-number, fraction, decimal, or variable bases, but did not formulate rules regarding the use of exponents. Students begin this unit by identifying patterns that emerge when multiplying and dividing powers of 10, and when raising powers of 10 to another power. Students generalize these patterns to develop exponent rules. They extend these rules to see why 10^0 must be equal to 1 and to understand what negative exponents mean. Next, students determine that the rules developed for powers of 10 also work with other bases, as long as the bases in both expressions are the same. In the next section, students use multiples of powers of 10 to describe magnitudes of very large and very small quantities. After building a foundation connecting powers of 10 with place value, students are finally introduced to scientific notation as a specific and useful way of writing numbers as a power of 10.

Section A: Exponent Rules

Section Goals

- Use exponent rules to generate equivalent numerical expressions for powers of 10.

Section Narrative

Work in this section introduces students to the exponent rules for multiplication, division, and powers of powers of 10. Students begin by revisiting earlier work with exponents, and expand on the definition of an exponent to include powers greater than 3. Students are also introduced to non-whole number bases. Next, students investigate patterns to determine the rules for multiplying and dividing powers of 10, and for raising a power of 10 to another power. By extending these patterns to explore the case of negative exponents, students see that 10^0 must have a value of 1 and that 10^(-n)=1/10^n.

Lessons

1. **Exponent Review** — Let’s review exponents.
2. **Multiplying Powers of 10** — Let’s explore patterns with exponents when we multiply powers of 10.
3. **Dividing Powers of 10** — Let’s explore patterns with exponents when we divide powers of 10.
4. **Negative Exponents with Powers of 10** — Let’s see what happens when exponents are negative.

Section B: More Exponent Rules

Section Goals

- Use exponent rules to generate equivalent numerical expressions for expressions with different bases and bases other than 10.

Section Narrative

Work in this section extends students' understanding of exponents with a base of 10 to exponents with other bases. Students notice that the same rules previously determined for powers of 10 also hold for other bases, as long as the bases in a single expression are the same. Students investigate operations with expressions that contain different bases and come to generalize the rule that $a^n \cdot b^n = (ab)^n$.

Lessons

1. **What about Other Bases?** — Let's explore exponent patterns with bases other than 10.
2. **Practice with Rational Bases** — Let's practice with exponents.
3. **Combining Bases** — Let's multiply expressions with different bases.

Section C: Large and Small Numbers

Section Goals

- Compare very large or very small quantities expressed as a multiple of a power of 10.
- Use exponent rules and powers of 10 to solve problems in context.

Section Narrative

Work in this section introduces students to very large and very small numbers described using multiples of powers of 10. Students begin by matching expressions to base 10 diagrams. Students also represent very large and very small numbers on a zooming number line where the first number line is partitioned into 10 equal parts. The second number line zooms into one interval of the previous number line and has units one place value smaller. Next, students find equivalent expressions for very large and very small numbers written as powers of 10. The focus in this section is for students to move flexibly between representations of the same value.

Lessons

1. **Representing Large Numbers on the Number Line** — Let's visualize large numbers on the number line using powers of 10.
2. **Representing Small Numbers on the Number Line** — Let's visualize small numbers on the number line using powers of 10.
3. **Applications of Arithmetic with Powers of 10** — Let's use powers of 10 to help us make calculations with large and small numbers.

Section D: Scientific Notation

Section Goals

- Calculate with numbers in scientific notation and interpret them in context.
- Identify numbers written in scientific notation, including scientific notation that has been generated by technology.

Section Narrative

This section introduces students to scientific notation. They begin by revisiting a table of the speeds of light through different materials alongside a zooming number line, and observe that this time, some of the values are written with a × symbol instead of a · symbol. The discussion that follows allows for the introduction of scientific notation as a specific way of writing very large and very small numbers as a number between 1 and 10 multiplied by a power of 10. Students perform arithmetic using scientific notation as they solve problems related to distances in the solar system and the masses and diameters of planets.

Lessons

1. **Definition of Scientific Notation** — Let’s use scientific notation to describe large and small numbers.
2. **Estimating with Scientific Notation** — Let’s multiply and divide with scientific notation to answer questions about animals and planets.
3. **Adding and Subtracting with Scientific Notation** — Let’s add and subtract using scientific notation to answer questions about animals and the solar system.

Section E: Let's Put It to Work

Section Narrative

In this final section, students have the opportunity to apply their thinking from throughout the unit. As this is a short section followed by an End-of-Unit Assessment, there are no section goals or checkpoint questions. All lessons in this section are optional.

Lessons

1. **Is a Smartphone Smart Enough to Go to the Moon? (Optional)** — Let’s compare digital media and computer hardware using scientific notation.

Unit 8: Pythagorean Theorem and Irrational Numbers

Unit Goal

Students develop the concepts of square roots, cube roots, irrational numbers, and the Pythagorean Theorem, applying them to two- and three-dimensional problems and to distances in the coordinate plane.

Unit Narrative

This unit introduces students to irrational numbers with a focus on connecting geometric and algebraic representations of square roots, cube roots, and the Pythagorean Theorem. In the first section, students extend work from grade 6, composing and decomposing shapes to find the areas of tilted squares. They see “square root of n” and $\sqrt{n}$ to mean the side length of a square with area n square units, and understand that finding the solution to equations of the form $x^2=n$ means determining which values of x make the equation true. Students learn and use definitions for “rational number” and “irrational number,” learn (without proof) that $\sqrt{2}$ is irrational, and plot square roots on the number line. In the second section, students continue using tilted squares as they investigate relationships between side lengths of right and non-right triangles. They use the Pythagorean Theorem and its converse to solve problems in two and three dimensions. In the third section, students see that “cube root of n” means the side length of a cube with volume n cubic units. In the fourth section, students consider the decimal expansions of rational and irrational numbers.

Section A: Side Lengths and Areas of Squares

Section Goals

- Comprehend the term “irrational number” to mean a number that is not rational and that $\sqrt{2}$ is an example of an irrational number.
- Comprehend the term “square root of n” and the notation $\sqrt{n}$ to mean the side length of a square whose area is n square units.
- Use the square root symbol to represent solutions to equations of the form $x^2=n$ and represent the square root as a point on the number line.

Section Narrative

Work in this section begins with investigating square roots from a geometric perspective relating the areas and side lengths of squares and then transitions to working with square roots as numbers on the number line. First, students find the areas of tilted squares using various strategies and estimate their side lengths by reasoning about the areas and side lengths of known squares. Students are then formally introduced to square roots and square root notation. To support thinking about square roots as numbers, students make a table of values and graph the relationship between side length and area. Students then investigate $\sqrt{2}$ and use multiplication to attempt to find a value that when squared equals exactly 2. As no such value exists, this leads to defining irrational numbers and then comparing and contrasting them with rational numbers. Finally, students practice plotting square roots on the number line.

Lessons

1. **The Areas of Squares** — Let’s investigate the areas of squares.
2. **Side Lengths and Areas** — Let’s investigate some more squares.
3. **Square Roots** — Let's find some side lengths of squares.

4. **Rational and Irrational Numbers** — Let’s learn about irrational numbers.
5. **Square Roots on the Number Line** — Let's approximate square roots.

Section B: The Pythagorean Theorem

Section Goals

- Calculate the distance between two points in the coordinate plane by using the Pythagorean Theorem.
- Explain an area-based algebraic proof of the Pythagorean Theorem.
- Use the Pythagorean Theorem to calculate unknown side lengths of right triangles and to solve problems within a context.

Section Narrative

Work in this section prepares students to understand and apply the Pythagorean Theorem. First, students investigate properties of right and non-right triangles by looking for patterns between their side lengths and the squares of their side lengths. Some students may notice that for right triangles only, a^2 + b^2 = c^2, where a and b are the legs of the right triangle and c is the longest side, or hypotenuse. This is formally introduced as the Pythagorean Theorem. Students are guided through an area-based algebraic proof of the Pythagorean Theorem. Students then spend time applying the Pythagorean Theorem in various contexts to find unknown side lengths of right triangles. They also consider the converse of the Pythagorean Theorem. Finally, students use the Pythagorean Theorem to find the distance between two points.

Lessons

1. **Finding Side Lengths of Triangles** — Let’s find triangle side lengths.
2. **A Proof of the Pythagorean Theorem** — Let's prove the Pythagorean Theorem.
3. **The Converse** — Let’s figure out if a triangle is a right triangle.
4. **Applications of the Pythagorean Theorem** — Let’s explore some applications of the Pythagorean Theorem.
5. **More Applications of the Pythagorean Theorem** — Let’s solve problems using the Pythagorean Theorem.
6. **Finding Distances in the Coordinate Plane** — Let’s find distances in the coordinate plane.

Section C: Representations of Rational and Irrational Numbers

Section Goals

- Coordinate representations of a cube root, including cube root notation, decimal representation, the edge length of a cube of given volume, and a point on the number line.
- Represent rational numbers as equivalent decimals and fractions.

Section Narrative

Work in this section connects the work with squares and square roots to the concept of cubes and cube roots. Students understand that the cube root of n represents the edge length of a cube with volume n cubic units and is also the solution to equations of the form x^3=n. Students approximate values of cube roots and plot those points on a number line, reinforcing the idea that irrational numbers are points on a number line. Students then explore different representations of rational numbers. First, students find decimal representations of rational numbers using long division. Next, students learn how to rewrite a repeating decimal as a fraction. Finally, they use a zooming number line to make sense of approximating some irrational numbers.

Lessons

1. **Edge Lengths, Volumes, and Cube Roots** — Let's explore the relationship between volume and edge lengths of cubes.
2. **Decimal Representations of Rational Numbers** — Let’s learn more about how rational numbers can be represented.
3. **Infinite Decimal Expansions** — Let’s think about infinite decimals.

Section D: Let's Put It to Work

Section Narrative

In this final section, students have the opportunity to apply their thinking from throughout the unit. As this is a short section followed by an End-of-Unit Assessment, there are no section goals or checkpoint questions. All lessons in this section are optional.

Lessons

1. **When Is the Same Size Not the Same Size? (Optional)** — Let’s figure out how aspect ratio affects screen area.

Unit 9: Putting It All Together

Unit Goal

Students apply concepts and skills from previous units to solve problems involving tessellations, running a restaurant, Fermi-style estimation, deforestation, and predicting temperature.

Unit Narrative

In this optional unit, students use concepts and skills from previous units to solve problems. In the first several lessons, they consider tessellations of the plane, understanding and using the terms "tessellation" and "regular tessellation" in their work, as well as using properties of shapes (for example, the sum of the interior angles of a quadrilateral is 360 degrees) and transformations to make inferences about regular tessellations. The second section focuses on calculating or estimating quantities associated with running a restaurant. The third section explores a variety of different contexts, such as Fermi problems, a souvenir stand, and deforestation. In the last section, students investigate factors that impact predicting the temperature. In particular, they use scatter plots and lines of best fit to model the association between temperature and latitude. All related standards in this unit have been addressed in prior units.

Section A: Tessellations

Section Goals

- Create tessellations using one or more polygons.
- Justify (in words and other representations) what shapes can and can't tessellate the plane.

Section Narrative

This optional sequence of three lessons can be done any time after the first unit in the course. The activities across the three lessons build on one another and should be done in order. As students progress through the activities, they see a variety of ways some shapes can be put together to build a tessellation and that not all shapes can tessellate the plane. They start with general tessellations, and then look at regular tessellations. Finally, they generalize which polygons can always make a tessellation. All standards in this unit have been addressed in prior units.

Lessons

1. **Tessellations of the Plane (Optional)** — Let's explore geometric patterns!
2. **Regular Tessellations (Optional)** — Let's make some regular tessellations.
3. **Tessellating Polygons (Optional)** — Let's make tessellations with different polygons.

Section B: Running a Restaurant

Section Goals

- Apply proportional reasoning, algebraic expressions, and percentages to model aspects of running a restaurant.
- Justify numerical decisions involved in running a restaurant.

Section Narrative

This optional sequence of lessons uses the context of running a restaurant to review mathematical concepts from previous units. Students begin this section by using spreadsheets to determine the cost per serving of a recipe. They then use their knowledge of the cost of food as well as other expenses to decide how much money a restaurant needs to earn to make a profit. Finally, students design a scale model of a floor plan of a restaurant. All standards in this section have been addressed in prior units.

Lessons

1. **Cost of a Meal (Optional)** — Let's explore how much a recipe's ingredients cost.
2. **Costs of Running a Restaurant (Optional)** — Let's explore how much running a restaurant costs.
3. **Restaurant Floor Plan (Optional)** — Let's design the floor plan for a restaurant.

Section C: Making Connections

Section Goals

- Apply proportional reasoning, algebraic expressions, and percentages to model real-world situations.
- Choose an appropriate level of accuracy when reporting estimates of quantities.

Section Narrative

These optional lessons do not build on each other and can be completed in any order. The lessons focus on proportional reasoning, writing algebraic expressions representing real-world situations, decomposing regions, and scale drawings. Each lesson builds on skills developed in earlier units. All standards in this section have been addressed in prior units.

Lessons

1. **Fermi Problems (Optional)** — Let's estimate some quantities.
2. **More Expressions and Equations (Optional)** — Let's solve harder problems by writing equivalent expressions.
3. **Deforestation at Scale (Optional)** — Let's compare the forested area over time.

Section D: Predicting the Temperature

Section Goals

- Create a mathematical model of bivariate data using a scatter plot.
- Describe the limitations of a mathematical model.

Section Narrative

This optional sequence of three lessons can be done any time after Unit 6 in this course. The activities in these lessons provide students a chance to go more deeply and apply grade 8 mathematics to a real-world context. Students get a chance to engage in aspects of mathematical modeling throughout this section. In this section, the lessons and activities follow the steps of the modeling cycle and result in students creating a simple mathematical model to predict temperature. Throughout this section, students make and discuss choices, assumptions, and approximations as part of their work.

Lessons

1. **What Influences Temperature? (Optional)** — Let's see if we can predict the temperature.
2. **Plotting the Temperature (Optional)** — Let's construct a model.
3. **Using and Interpreting a Mathematical Model (Optional)** — Let's use a model to make some predictions.

About This Syllabus

This syllabus was compiled from the publicly available Illustrative Mathematics 6–8 Accelerated v.360 curriculum at accessim.org. Unit and section narratives, goals, and lesson titles and “Let's…” prompts are sourced from the teacher view. Optional lessons (typically culminating tasks in “Let's Put It to Work” sections and selected enrichment activities) are labeled “(Optional).”
Assessments (checkpoints, mid-unit assessments, and end-of-unit assessments) are referenced in the source curriculum but require a Kendall Hunt educator account to view; they are not included here.
https://accessim.org/6-8-accelerated/accelerated-7?a=teacher