Math 7

Course Overview: This course centers on understanding and applying proportional relationships. Students start by studying scale copies which sets up the introduction of proportional relationships. Students apply proportional relationships to understand the circumference and area of circles. This invites students to use proportional relationships to solve problems involving fractional quantities and percent change. From here, students extend what they learned in Math 6 to add, subtract, multiply, and divide positive and negative numbers, which leads into work on expressions, equations, and inequalities. The course ends with geometry, probability, and statistics as students study angles, triangles, and prisms and then finally probability and sampling.

COURSE OUTLINE		
Unit One	*Scale Drawings*	*4 weeks*
Unit Two	*Introduction to Proportional Relationships*	*3.5 weeks*
Unit Three	*Measuring Circles*	*3.5 weeks*
Unit Four	*Proportional Relationships and Percentages*	*4 weeks*
Unit Five	*Operations with Positive and Negative Numbers*	*4.5 weeks*
Unit Six	*Expressions, Equations, and Inequalities*	*5 weeks*
Unit Seven	*Angles, Triangles, and Prisms*	*4 weeks*
Unit Eight	*Probability and Sampling*	*4.5 weeks*

School- wide Academic Expectations Taught in this Course	***School- wide Social Civic Expectations Taught in this Course***
• Communication • Collaboration • Analysis • Literacy	• Demonstrate Responsibility • Demonstrate Resilience • Demonstrate Respect

Common Core Standards Taught in this Course

- 7.RP.A.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.
- 7.RP.A.2 Recognize and represent proportional relationships between quantities.
- 7.RP.A.3 Use proportional relationships to solve multistep ratio and percent problems.
- 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.
- 7.NS.A.2 Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.
- 7.NS.A.3 Solve real-world and mathematical problems involving the four operations with rational numbers.
- 7.EE.A.1 Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.
- 7.EE.A.2 Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related.
- 7.EE.B.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.
- 7.EE.B.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
- 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.
- 7.G.A.2 Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.
- 7.G.A.3 Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.
- 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.
- 7.G.B.5 Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.
- 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.
- 7.SP.A.1 Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.
- 7.SP.A.2 Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.
- 7.SP.B.3 Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference

between the centers by expressing it as a multiple of a measure of variability.

- 7.SP.B.4 Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.
- 7.SP.C.5 Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.
- 7.SP.C.6 Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability.
- 7.SP.C.7 Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.
- 7.SP.C.8 Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.

Unit 1: Scale Drawings

Introduction: Students explore objects that are and are not scaled copies of one another. They describe how scaling affects lengths, angles, and areas in scaled copies, and use scale factors to create and compare scaled copies. In Grade 8, students will extend their knowledge of scaled copies to similar figures when they study translations, rotations, reflections, and dilations. Students use what they know about scaled copies to create and analyze scale drawings of real-life objects.

Desired Outcome(s):

- Scaled copies will be explored through a variety of simulations to determine how scaling affects lengths, areas and angles of scaled copies.
- Scale factors will be used to create and compare scaled copies and use them to represent distances in the real world with scales and scale drawings.

CT / Common Core State Standard(s): 7.RP.A, 7.RP.A.1, 7.RP.A.2, 7.RP.A.2.A, 7.RP.A.2.B, 7.RP.A.3, 7.G.A.1, 7.G.B.6

Essential Question(s):

- How does scaling affect lengths, angles and areas in scaled copies?
- How can scale factors be used to create and compare scaled copies?
- In what ways can we use scales and scale drawings to represent distances in the real world?

LEARNING PLAN

LEARNING OBJECTIVES (Content and Skill)	INSTRUCTIONAL STRATEGIES	ASSESSMENTS
1. Use equivalent ratios to create a scaled copy of a figure. 2. Describe characteristics of a scaled copy. 3. Explain what a scaled copy is. 4. Explain the proportional relationships between lengths in an original figure and in a scaled copy. 5. Draw a scaled copy of a figure using a given scale factor. 6. Describe the effect on a scaled copy when a given scale factor is greater than 1, between 0 and 1, or equal to 1. 7. Explain how the scale factor that takes one figure to another figure relates to the scale factor that takes the second figure back to the first. 8. Describe how scale factor impacts the area of a scaled copy. 9. Calculate the area of a scaled copy. 10. Explain what a scale is (related to scale drawings). 11. Interpret the scale of a drawing. 12. Use a scale drawing and a scale to calculate actual and scaled distances. 13. Determine actual areas from a scale drawing. 14. Create a scale drawing given a scale. 15. Describe how different scales affect lengths in a scale drawing. 16. Calculate a distance on one scale drawing based on another drawing with a different scale. 17. Determine the scale of a scale drawing 18. Draw a complex scale drawing.	3 Act Math Anticipate, Monitor, Select, Sequence, Connect Carousel Choice Board Collaborative Learning Concrete, Representational, Abstract Model Comic Strip Writing Concept Mapping Closing Circle Counter Narratives Desmos Activities Fishbowl Gallery Wall Guided Notes Jigsaw KWL Math Workshop Model Micro Teaching Notice & Wonder Number Talk Poll the Class Simulations Small Group Learning Stop & Jot Chalk Talk Take Note Take Turns Which One Doesn't Belong? Three Truths and a Lie Direct Instruction Peer Collaboration / Guided Discussions Peer Editing Predictions Partner sorting by (pattern) Venn Diagrams Video Clip Analysis Vocabulary Preview Vocabulary Card Matching	Notes Pages Exit Tickets Warm Ups Discussion Questions Homework Problems Quizizz Illustrative Math Practice Responses Desmos Activity Responses Mid Topic 1 Quiz Performance Task: “Classroom Redesign” *(Analysis: A1, A2, A3, A4, A5)* Topic 1 Test *(Analysis: A1, A2, A3, A4, A5)*

	Math Games (Blooket, Kahoot, Gimkit, Jeopardy!) Subset of a Problem Frayer Model Word Wall Gradual Release Model Role Cards Think-Pair-Share Math Manipulatives (Algebra tiles, Geoboards) Math Exemplars Turn & Talk Stations Group Practice (Jamboard) Individual Practice (Kuta, Quizizz, IXL, Khan) Math Simulations (Desmos) Warm Up Use of Calculators Edu Protocols: Mathreps Exit Ticket	

Suggested Resources and Texts: Desmos, Illustrative Mathematics.

Unit 2: Introduction to Proportional Relationships

Introduction: Students recognize proportional relationships represented in tables and calculate constants of proportionality using tables. This builds on students' work with equivalent ratios in Grade 6. Students use what they know about the constant of proportionality to write and interpret equations describing proportional relationships. Students explore graphs of proportional relationships and use graphs to determine constants of proportionality. This work supports students with the study of slope in Grade 8. Students use all of the representations of proportional relationships to solve real-world and mathematical problems.

Desired Outcome(s):

- Students will analyze proportional relationships using tables, equations and graphs.
- This study will lead them to model real world applications using proportional relationships.

CT / Common Core State Standard(s): 7.RO.A.2, 7.RP.A.2.A, 7.RP.A.2.B, 7.RP.A.2.C, 7.RP.A.2.D

Essential Question(s):

- How can we use tables to recognize proportional relationships and calculate the constant of proportionality?
- How can we write and use equations to analyze proportional relationships?
- How can we use graphs to recognize and analyze relationships?
- In what ways can we model real-world situations using proportional relationships?

LEARNING PLAN

LEARNING OBJECTIVES (Content and Skill)	INSTRUCTIONAL STRATEGIES	ASSESSMENTS
1. Know that two mixtures will look the same if the ingredients are in equivalent ratios. 2. Use equivalent ratios to generate the same mixtures. 3. Identify patterns in tables that represent proportional relationships. 4. Use a table to calculate unknown quantities in a proportional relationship. 5. Determine the constant of proportionality from a table and explain what it means. 6. Use the constant of proportionality to calculate unknown information in a table. 7. Justify whether a table represents a proportional relationship or not. 8. Explain where to find the constant of proportionality as a value in a table. 9. Write equations to represent proportional relationships. 10. Connect each part of an equation of the form y=kx to the situation it represents. 11. Use an equation to solve problems involving a proportional relationship. 12. Explain what reciprocal means and how it is related to constants of proportionality. 13. Write two equations for the same proportional relationship. 14. Explain why a relationship is proportional or not by looking at an equation. 15. Explain what a proportional relationship looks like when represented with a graph 16. Justify if a graph represents a proportional relationship or not. 17. Interpret points on the graph of a proportional relationship. 18. Identify the constant of proportionality from the graph of a proportional relationship. 19. Write an equation of a proportional relationship from a point on a graph. 20. Compare related proportional relationships based on their graphs.	3 Act Math Anticipate, Monitor, Select, Sequence, Connect Carousel Choice Boards Collaborative Learning Concrete, Representational, Abstract Model Comic Strip Writing Concept Mapping Closing Circle Counter Narratives Desmos Activities Fishbowl Gallery Walk Guided Notes Jigsaw KWL Math Workshop Model Micro Teaching Notice & Wonder Number Talk Poll the Class Simulations Stop & Jot Take Note Take Turns Direct Instruction Group Presentations Peer Collaboration / Guided Discussions Peer Editing Predictions Partner sorting by (pattern) Venn Diagrams Vocabulary Preview Vocabulary Card Matching Math Games (Blooket, Kahoot, Gimkit, Jeopardy!) Subset of a Problem Frayer Model Word Wall	Notes Pages Exit Tickets Warm Ups Discussion Questions Homework Problems Quizizz Illustrative Math Practice Responses Desmos Activity Responses Mid Topic 2 Quiz Performance Task: “Water Efficiency” *(Analysis: A1, A2, A3, A4, A5)* Topic 2 Test *(Analysis: A1, A2, A3, A4, A5)*

21. Create four different representations of a proportional relationship (description, table, graph, equation) 22. Model a real-world situation by deciding what information is important and making assumptions. 23. Use proportional relationships to answer a question about a real world situation.	Gradual Release Model Role Cards Think-Pair-Share Math Manipulatives (Algebra tiles, Geoboards) Math Exemplars Turn & Talk Stations Individual Practice (Kuta, Quizizz, IXL, Khan) Math Simulations (Desmos) Warm Up Use of Calculators Edu Protocols: Mathreps	

Suggested Resources and Texts: Desmos, Illustrative Mathematics.

Unit 3: Measuring Circles

Introduction: Students recognize that the relationships between radius, diameter, and circumference of a circle are proportional and use those relationships to calculate missing measurements. Students recognize that the relationships between the radius and area of a circle is not proportional. They explain and use the formula for the area of a circle to solve problems. Students will use this work to determine the volume of cylinders, cones, and spheres in Grade 8.

Desired Outcome(s):

- Students will use the relationships between radius, diameter, and circumference to calculate missing measurements.
- Students will also be able to explain and use the formula for the area of a circle to solve problems.

CT / Common Core State Standard(s): 7.RP.A.2.A, 7.PR.A.2.B, 7.RP.A.3, 7.G.B.4, 7.G.B.6

Essential Question(s):

- How can we use the relationships between radius, diameter and circumference to calculate missing measurements?
- In what ways can we use the formula for the area of a circle to solve real world problems?

LEARNING PLAN

LEARNING OBJECTIVES (Content and Skill)	INSTRUCTIONAL STRATEGIES	ASSESSMENTS
1. Explain whether or not the relationship between a side length or a diagonal of a shape and its perimeter is proportional. 2. Use proportional relationships to figure out missing side lengths, diagonals, and perimeters. 3. Describe the characteristics of a circle. 4. Identify the diameter and radius of a circle and explain how they are related. 5. Describe the relationship between the radius, diameter, and circumference of a circle. 6. Given the radius, diameter, or circumference of a circle, relate the other two measurements. 7. Calculate the perimeter of a complex shape that includes parts of circles. 8. Write perimeter and area as an expression that includes π, such as $20\pi + 50$. 9. Determine the area of a complex shape using a variety of strategies. 10. Estimate the area of a shape with curved edges. 11. Describe the relationship between the radius of any circle and its area. 12. Calculate the area of a circle. 13. Explain whether the relationship between the radius and area of a circle is proportional or not. 14. Explain the formula of a circle's area by rearranging the circle into a triangle of the same area. 15. Calculate the area of a complex shape that includes parts of circles. 16. Describe the relationship between perimeter and area for both a circle and a square. 17. Calculate the area of a circle given its circumference.	3 Act Math Anticipate, Monitor, Select, Sequence, Connect Carousel Choice Boards Collaborative Learning Concrete, Representational, Abstract Model Concept Mapping Desmos Activities Gallery Walk Guided Notes Jigsaw KWL Math Workshop Model Micro Teaching Notice & Wonder Number Talk Simulations Small Group Learning Stop & Jot Chalk Talk Take Note Take Turns Which One Doesn't Belong? Direct Instruction Group Presentations Peer Collaboration / Guided Discussions Peer Editing Partner sorting by (pattern) Vocabulary Preview Vocabulary Card Matching Math Games (Blooket, Kahoot, Gimkit, Jeopardy!) Subset of a Problem Frayer Model Gradual Release Model Role Cards Think-Pair-Share Math Manipulatives (Algebra tiles, Geoboards)	Exit Tickets Warm Ups Discussion Questions Homework Problems Quizizz Illustrative Math Practice Responses Desmos Activity Responses Mid Topic 3 Quiz Performance Task: "Area Challenges " *(Analysis: A1, A2, A3, A4, A5)* Topic 3 Test *(Analysis: A1, A2, A3, A4, A5)*

	Math Exemplars Turn & Talk Stations Group Practice (Jamboard) Individual Practice (Kuta, Quizizz, IXL, Khan) Math Simulations (Desmos) Warm Up Edu Protocols: Mathreps	

Suggested Resources and Texts: Desmos, Illustrative Mathematics.

Unit 4: Proportional Relationships and Percentages

Introduction: Students apply what they have learned in Unit 2 about proportional relationships to solve problems involving fractional quantities and percent change. Students use tape diagrams, tables, and double number lines to represent proportional relationships involving fractional quantities and percentages. Students also practice writing and using equations of proportional relationships involving percent change. This prepares students to explore exponential functions involving percent change in high school. Students interpret and solve problems about real-world situations involving proportional relationships and percent change.

Desired Outcome(s): Students will determine missing measurements in proportional relationships involving fractional quantities or percentages. Students will represent proportional relationships using tape diagrams, tables, double number lines, and equations. Students will interpret and solve problems about real-world situations involving proportional relationships and percent change.

CT / Common Core State Standard(s): 7.RP.A.1, 7.RP.A.2, 7.RP.A.3, 7.NS.A.2.D, 7.EE.A.2, 7.EE.B.4

Essential Question(s):

- How can we use proportional relationships to determine missing measurements of fractional quantities or percentages?
- How can we represent proportional relationships using tape diagrams, tables, double number lines, and equations?
- In what ways can we use proportional relationships and percent change to model, solve and interpret real-world situations?

LEARNING PLAN

LEARNING OBJECTIVES (Content and Skill)	INSTRUCTIONAL STRATEGIES	ASSESSMENTS
1. Visualize and model percentages on a grid. 2. Calculate the percentage of a number. 3. Use the constant of proportionality to solve problems that involve fractions. 4. Use tape diagrams and tables to represent adding or subtracting a percentage from 100%. 5. Determine the new amount, knowing the original amount and the percent change 6. Write an equation to represent adding or subtracting a percentage from 100%. 7. Use double number lines to represent adding or subtracting a percentage from 100%. 8. Determine the original amount if I know the new amount and the percent change. 9. Determine the original amount if I know the new amount and the percent change for one-step and multistep problems. 10. Solve multistep problems about sales tax and tip. 11. Use proportional relationships and percent change to analyze an issue in society. 12. Write equations to represent the cost of college over time. 13. Solve problems about the cost of college over time. 14. Explain what percent error is and how to calculate it. 15. Decide whether a value is within an acceptable percent error. 16. Write a question about a real-world situation that involves percent increase or decrease. 17. Use what I know to answer questions about the world we live in. 18. Use long division to write a fraction as a decimal	3 Act Math Anticipate, Monitor, Select, Sequence, Connect Carousel Choice Boards Collaborative Learning Concrete, Representational, Abstract Model Concept Mapping Desmos Activities Gallery Walk Guided Notes Jigsaw KWL Math Workshop Model Micro Teaching Notice & Wonder Number Talk Simulations Small Group Learning Stop & Jot Chalk Talk Take Note Take Turns Which One Doesn't Belong? Direct Instruction Group Presentations Peer Collaboration / Guided Discussions Peer Editing Partner sorting by (pattern) Vocabulary Preview Vocabulary Card Matching Math Games (Blooket, Kahoot, Gimkit, Jeopardy!) Subset of a Problem Frayer Model Gradual Release Model Role Cards Think-Pair-Share Math Manipulatives (Algebra tiles, Geoboards)	Notes Pages Exit Tickets Warm Ups Discussion Questions Homework Problems Quizizz Illustrative Math Practice Responses Desmos Activity Responses Mid Topic 4 Quiz Performance Task: “Posing Percent Problems” (*Analysis: A1, A2, A3, A4, A5)* Topic 4 Test *(Analysis: A1, A2, A3, A4, A5)*

19. Decide whether a decimal is terminating or repeating and explain how I know.	Math Exemplars Turn & Talk Stations Group Practice (Jamboard) Individual Practice (Kuta, Quizizz, IXL, Khan) Math Simulations (Desmos) Warm Up Edu Protocols: Mathreps	

Suggested Resources and Texts: Desmos, Illustrative Mathematics.

Unit 5: Operations with Positive and Negative Numbers

Introduction: In this unit, students extend what they learned in Grade 6 to add, subtract, multiply, and divide positive and negative numbers. Students use a variety of strategies and mental models to add and subtract negative numbers. Students extend what they learned in Section 1 to make sense of multiplying and dividing positive and negative numbers. Sections 1 and 2 prepare students to solve equations with positive and negative numbers in Unit 6. Students apply what they have learned to understand issues in society.

Desired Outcome(s):

- Students will add and subtract positive and negative numbers using a variety of strategies.
- Students will perform all four operations with positive and negative numbers using a variety of strategies.
- Students will apply all four operations with positive and negative numbers to analyze an issue in society.

CT / Common Core State Standard(s): 7.NS.A.1, 7.NS.A.1.A, 7.NS.A.1.B, 7.NS.A.1.C, 7.NS.A.1.D, 7.NS.A.2, 7.NS.A.2.A, 7.NS.A.2.B, 7.NS.A.2.C, 7.NS.A.3, 7.EE.B.3

Essential Question(s):

- How can we add and subtract positive and negative numbers using a variety of strategies?
- How can we perform all four operations with positive and negative numbers using a variety of strategies?
- How can we use positive and negative numbers to analyze issues in our society?

LEARNING PLAN

LEARNING OBJECTIVES (Content and Skill)	INSTRUCTIONAL STRATEGIES	ASSESSMENTS
1. Use floats and anchors to solve integer addition and subtraction problems. 2. Identify different ways to represent the same change. 3. Connect adding and removing floats and anchors to adding and subtracting integers. 4. Identify different expressions that have the same value. 5. Add and subtract integers, decimals, and fractions on a number line. 6. Determine the value of a variable that makes an equation true. 7. Draw a number line to add and subtract positive and negative numbers. 8. Compare and contrast similar expressions (e.g., 2. 5 − 3. 5 and 3. 5 − 2. 5). 9. Make arguments about addition and subtraction with variables. 10. Add and subtract positive and negative numbers in complicated expressions. 11. Use floats and anchors to represent multiplying positive and negative numbers. 12. Explain why the product of two numbers will be positive or negative. 13. Use position, rate, and time to represent multiplying positive and negative numbers. 14. Explain why multiplying two negative numbers has a positive value. 15. Multiply and divide positive and negative numbers. 16. Identify different expressions that have the same value. 17. Reason about expressions that involve variables. 18. Add, subtract, multiply, and divide integers in complicated expressions. 19. Apply what has been learned to solve problems about changing temperatures.	3 Act Math Anticipate, Monitor, Select, Sequence, Connect Carousel Choice Boards Collaborative Learning Concrete, Representational, Abstract Model Concept Mapping Desmos Activities Gallery Walk Guided Notes Jigsaw KWL Math Workshop Model Micro Teaching Notice & Wonder Number Talk Simulations Small Group Learning Stop & Jot Chalk Talk Take Note Take Turns Which One Doesn't Belong? Direct Instruction Group Presentations Peer Collaboration / Guided Discussions Peer Editing Partner sorting by (pattern) Vocabulary Preview Vocabulary Card Matching Math Games (Blooket, Kahoot, Gimkit, Jeopardy!) Subset of a Problem Frayer Model Gradual Release Model Role Cards Think-Pair-Share Math Manipulatives (Algebra tiles, Geoboards) Math Exemplars	Notes Pages Exit Tickets Warm Ups Discussion Questions Homework Problems Quizizz Illustrative Math Practice Responses Desmos Activity Responses Mid Topic 5 Quiz #1 Mid Topic 5 Quiz #2 Performance Task: “Arctic Sea Ice” *(Analysis: A1, A2, A3, A4, A5)* Topic 5 Test *(Analysis: A1, A2, A3, A4, A5)*

20. Solve problems and make predictions using positive and negative rates. 21. Apply what has been learned to analyze ways of reducing carbon emissions.	Turn & Talk Stations Group Practice (Jamboard) Individual Practice (Kuta, Quizizz, IXL, Khan) Math Simulations (Desmos) Warm Up Edu Protocols: Mathreps	

Suggested Resources and Texts: Desmos, Illustrative Mathematics.

Unit 6: Expressions, Equations & Inequalities

Introduction: In this unit, students extend what they learned in Grade 6 about solving one-step equations to solve equations of the form $px + q = r$ and $p(x + q) = r$, and equations that include expanding, factoring, or adding terms. Students also solve inequalities and graph their solutions on a number line. Students use tape diagrams to represent equations and situations in context and to determine unknown values. This builds on students' work with tape diagrams in Grade 7, Unit 4 and with determining unknown values in equations in Grade 7, Unit 5. Students learn how to solve equations of the form $px + q = r$ and $p(x + q) = r$ in and out of context. They also rewrite expressions using fewer terms by adding, expanding, and factoring, which can help make complex equations look more familiar before solving. This section builds on work from Grade 6 with solving one-step equations, which will support students when solving equations with variables on both sides in Grade 8.

Desired Outcome(s):

- Students will use tape diagrams to represent equations and situations in context and to determine unknown values.
- Students will solve equations of the form $px + q = r$ and $p(x + q) = r$ in real-world and mathematical problems.
- Students will write equivalent expressions by adding, subtracting, expanding, and factoring.
- Students will solve inequalities of the form $px + q > r$ and $px + q < r$ that represent real-world and mathematical problems.
- Students will create graphs that represent solutions to inequalities, including those with $\geq$ and $\leq$.

CT / Common Core State Standard(s): 7.EE.A.1, 7.EE.B.3, 7.EE.B.4, 7.EE.B.4.A, 7.EE.B.4.B

Essential Question(s):

- How can we use tape diagrams and equations to represent situations and solve them to determine unknown values?
- How can we determine if expressions are equivalent?
- How can we write and solve inequalities to represent and solve real world situations?

LEARNING PLAN

LEARNING OBJECTIVES (Content and Skill)	INSTRUCTIONAL STRATEGIES	ASSESSMENTS
1. Use patterns to determine unknown values. 2. Connect a tape diagram to a story. 3. Use a tape diagram to figure out an unknown value. 4. Add and subtract integers, decimals, and fractions on a number line. 5. Determine the value of a variable that makes an equation true. 6. Connect a situation to a tape diagram, equation, and solution. 7. Write an equation to represent a situation and use a tape diagram to answer a question about it. 8. Figure out an unknown value in a hanger diagram and explain my strategy. 9. Make moves to keep a hanger balanced. 10. Connect balancing moves on hangers to solving equations. 11. Solve equations with positive numbers. 12. Solve equations with positive and negative numbers and explain my strategy. 13. Expand and factor expressions. 14. Solve equations that involve expanding. 15. Compare different strategies for solving the same equation. 16. Write equivalent expressions. 17. Explain whether or not two expressions are equivalent. 18. Write equivalent expressions with fewer terms. 19. Add and expand expressions to help me solve equations. 20. Compare and contrast different strategies for solving the same equation. 21. Write and solve equations that represent situations. 22. Connect an equation, a visual, and a description of a situation. 23. Understand and can use the symbols $\leq$ and $\geq$. 24. Graph inequalities on a number line. 25. Figure out the solutions to an inequality. 26. Explain the difference between the solution to an equation and the solutions to an inequality.	3 Act Math Anticipate, Monitor, Select, Sequence, Connect Carousel Choice Boards Collaborative Learning Concrete, Representational, Abstract Model Concept Mapping Desmos Activities Gallery Walk Guided Notes Jigsaw Math Workshop Model Micro Teaching Notice & Wonder Number Talk Simulations Small Group Learning Stop & Jot Chalk Talk Take Note Take Turns Which One Doesn't Belong? Direct Instruction Group Presentations Peer Collaboration / Guided Discussions Peer Editing Partner sorting by (pattern) Vocabulary Preview Vocabulary Card Matching Math Games (Blooket, Kahoot, Gimkit, Jeopardy!) Subset of a Problem Frayer Model Gradual Release Model Role Cards Think-Pair-Share Math Manipulatives (Algebra tiles, Geoboards) Math Exemplars Turn & Talk	Notes Pages Exit Tickets Warm Ups Discussion Questions Homework Problems Quizizz Illustrative Math Practice Responses Desmos Activity Responses Mid Topic 6 Quiz Performance Task: “Community Day” *(Analysis: A1, A2, A3, A4, A5)* Topic 6 Test *(Analysis: A1, A2, A3, A4, A5)*

27. Write an inequality to represent a context. 28. Solve an inequality in context by using a related equation. 29. Solve an inequality with positive and negative numbers and graph the solutions. 30. Test values to decide which inequality symbol makes sense. 31. Explain whether or not fractions or negative numbers make sense as solutions to an inequality. 32. Write and solve an inequality to answer a question about a situation.	Stations Group Practice (Jamboard) Individual Practice (Kuta, Quizizz, IXL, Khan) Math Simulations (Desmos) Warm Up Edu Protocols: Mathreps	

Suggested Resources and Texts: Desmos, Illustrative Mathematics.

Unit 7: Angles, Triangles and Prisms

Introduction: In this unit, students solve real-life and mathematical problems involving angle measures, volume, and surface area. Students also explore whether it is possible to draw no triangles, one triangle, or more than one triangle given three measures of sides or angles. Students use facts about complementary, supplementary, and vertical angles to determine unknown angle measures. They also build on their work from Unit 6 to write and solve equations for unknown angles in a diagram. This work supports students in using transformations to discover the relationship between angles in a triangle in Grade 8. Students build and draw triangles given three measures of side lengths or angles, and then determine whether it is possible to draw one unique triangle, more than one triangle, or no triangle with these measurements. This work supports students in understanding congruence in Grade 8 and criteria for triangle congruence in high school.

Desired Outcome(s):

- Students will determine unknown angle measures using facts about complementary, supplementary, and vertical angles.
- Students will write and solve equations for unknown angles in a diagram, draw triangles given three measures of side lengths or angles.
- Students will also determine whether it is possible to draw a unique triangle, more than one triangle, or no triangle, given a set of measurements.
- Students will describe, compare, and contrast cross sections of prisms and pyramids.
- Students will also solve real-world and mathematical problems involving the volume and surface area of right prisms.

CT / Common Core State Standard(s): 7.EE.A.2, 7.EE.B.4, 7.G.A.2, 7.G.A.3, 7.G.B.5, 7.G.B.6

Essential Question(s):

- How can we determine unknown angle measures using facts about complementary, supplementary, and vertical angles?
- How can we write and solve equations for unknown angles in a diagram?
- How can we draw triangles given three measures of side lengths or angles?
- How can we determine whether it is possible to draw a unique triangle, more than one triangle, or no triangle given a set of measurements?
- How can we describe, compare, and contrast cross sections of prisms and pyramids?
- How can we solve real-world and mathematical problems involving the volume and surface area of right prisms?

LEARNING PLAN

LEARNING OBJECTIVES (Content and Skill)	INSTRUCTIONAL STRATEGIES	ASSESSMENTS
1. Figure out angle measures around a vertex. 2. Describe what complementary and supplementary angles are. 3. Determine unknown angles using what I know about complementary and supplementary angles. 4. Connect an angle diagram with an equation that represents it. 5. Describe what vertical angles are. 6. Write and use equations to determine unknown angles. 7. Solve multistep problems using what I know about complementary, supplementary, and vertical angles. 8. Decide whether or not three side lengths will make a triangle. 9. Explain what it means for shapes to be identical copies. 10. Determine whether you can make zero, one, or more than one shape given a set of side lengths. 11. Build triangles given three measurements. 12. Explain why there is sometimes more than one possible triangle given three measurements. 13. Construct, using a ruler and a protractor, to draw triangles that match a description. 14. Design cross sections of a solid. 15. Compare and contrast cross sections of prisms and pyramids. 16. Explain how the volume of a prism is related to the area of its base and its height. 17. Calculate the volume of rectangular and triangular prisms. 18. Calculate volumes of right prisms 19. Calculate the volume of more complicated prisms. 20. Calculate the surface area of a prism. 21. Compare and contrast different strategies for calculating surface area.	3 Act Math Anticipate, Monitor, Select, Sequence, Connect Carousel Choice Boards Collaborative Learning Concrete, Representational, Abstract Model Concept Mapping Desmos Activities Gallery Walk Guided Notes Jigsaw Math Workshop Model Micro Teaching Notice & Wonder Number Talk Simulations Small Group Learning Stop & Jot Chalk Talk Take Note Take Turns Which One Doesn't Belong? Direct Instruction Group Presentations Peer Collaboration / Guided Discussions Peer Editing Partner sorting by (pattern) Vocabulary Preview Vocabulary Card Matching Math Games (Blooket, Kahoot, Gimkit, Jeopardy!) Subset of a Problem Frayer Model Gradual Release Model Role Cards Think-Pair-Share	Notes Pages Exit Tickets Warm Ups Discussion Questions Homework Problems Quizizz Illustrative Math Practice Responses Desmos Activity Responses Mid Topic 7 Quiz Performance Task: “Popcorn Possibilities” (Analysis: A1, A2, A3, A4, A5) Topic 7 Test (Analysis: A1, A2, A3, A4, A5)

22. Defend whether volume or surface area is more useful to answer a question about a situation. 23. Simulate to answer a question about a real-world situation using knowledge of surface area and volume.	Math Manipulatives (Algebra tiles, Geoboards) Math Exemplars Turn & Talk Stations Group Practice (Jamboard) Individual Practice (Kuta, Quizizz, IXL, Khan) Math Simulations (Desmos) Warm Up Edu Protocols: Mathreps	

Suggested Resources and Texts: Desmos, Illustrative Mathematics.

Unit 8: Probability and Sampling

Introduction: In the first section of the unit, students learn about probability as a way to describe the likelihood of unknown events and use simulations to estimate the probability of real-world situations. In the second section, students use samples to draw conclusions about and compare populations. Students determine the probability of unknown events and compare the results of repeated experiments and the expected probability. They also design and perform simulations to estimate the probability of multistep real-world situations. Students use measures of center and measures of variability from random samples to draw conclusions about and compare populations. Students also explain the purpose of sampling and which methods tend to produce representative samples. This builds on the work students did in Grade 6 analyzing data sets and distributions using mean, median, MAD, and IQR.

Desired Outcome(s):

- Students will determine the probability of unknown events, comparing the results of repeated experiments and the expected probability.
- Explain the purpose of sampling and which methods of obtaining a sample tend to produce representative samples.
- Use measures of center and measures of variability from random samples to draw conclusions about and compare populations.

CT / Common Core State Standard(s): 7.SP.A.1, 7.SP.A.2, 7.SP.B.3, 7.SP.B.4, 7.SP.C.5, 7.SP.C.6, 7.SP.C.7, 7.SP.C.7.A, 7.SP.C.7.B, 7.SP.C.8, 7.SP.C.8.A, 7.SP.C.8.B, 7.SP.C.8.C

Essential Question(s):

- In what ways can we determine the probability of unknown events, comparing the results of repeated experiments and the expected probability?
- How can we explain the purpose of sampling and which methods of obtaining a sample tend to produce representative samples?
- How can we use measures of center and measures of variability from random samples to draw conclusions about and compare populations.?

LEARNING PLAN

LEARNING OBJECTIVES (Content and Skill)	INSTRUCTIONAL STRATEGIES	ASSESSMENTS
1. Explain how experiments can be used to figure out the likelihood of events. 2. Describe the likelihood of events. 3. Determine the probability of an event using its sample space. 4. Compare probabilities written as fractions, decimals, and percentages. 5. Know that sometimes outcomes of an experiment are not equally likely. 6. Use proportional reasoning with data from a repeated experiment to make predictions. 7. Explain how the results of a repeated experiment are related to the probability of the event. 8. Explain why the results of a repeated experiment may not exactly match the probability of the event. 9. Decide whether or not something is fair based on the results of a repeated experiment. 10. Use the results from a repeated experiment to approximate the probability of an event. 11. Write out the sample space for a multistep experiment using a list, table, or tree diagram. 12. Calculate the probability of a multistep event. 13. Use a simulation to estimate the probability of a multistep real-world event. 14. Connect real-world situations and the probability tools I could use to simulate those situations. 15. Design a simulation to estimate the probability of a multistep real-world event. 16. Calculate the mean and mean absolute deviation (MAD) for a data set. 17. Compare and contrast populations using mean and MAD. 18. Explain what a sample is and when it is useful. 19. Compare the means of samples to the mean of the population. 20. Explain why a sampling method is or is not likely to produce a biased sample. 21. Use proportional reasoning and a sample to estimate information about a population.	3 Act Math Anticipate, Monitor, Select, Sequence, Connect Carousel Choice Boards Collaborative Learning Concrete, Representational, Abstract Model Concept Mapping Desmos Activities Gallery Walk Guided Notes Jigsaw Math Workshop Model Micro Teaching Notice & Wonder Number Talk Simulations Small Group Learning Stop & Jot Chalk Talk Take Note Take Turns Which One Doesn't Belong? Direct Instruction Group Presentations Peer Collaboration / Guided Discussions Peer Editing Partner sorting by (pattern) Vocabulary Preview Vocabulary Card Matching Math Games (Blooket, Kahoot, Gimkit, Jeopardy!) Subset of a Problem Frayer Model Gradual Release Model Role Cards Think-Pair-Share Math Manipulatives (Algebra tiles, Geoboards) Math Exemplars Turn & Talk Stations	Notes Pages Exit Tickets Warm Ups Discussion Questions Homework Problems Quizizz Illustrative Math Practice Responses Desmos Activity Responses Mid Topic 8 Quiz Performance Task: “Asthma Rates” (Analysis: A1, A2, A3, A4, A5) Topic 8 Test (Analysis: A1, A2, A3, A4, A5)

22. Estimate the mean or median of a population based on a sample of the population. 23. Use the variability of a sample to get an idea for how accurate my estimate is. 24. Use measures of center and the variability of two samples to decide if two populations are very different. 25. Measure of variability to explain the difference between measures of center. 26. Compare two groups by taking random samples, then calculating and interpreting the statistics.	Group Practice (Jamboard) Individual Practice (Kuta, Quizizz, IXL, Khan) Math Simulations (Desmos) Warm Up Edu Protocols: Mathreps	

Suggested Resources and Texts: Desmos, Illustrative Mathematics.