Instructional Focus Document
Grade 7 Mathematics

TITLE : Unit 06: Probability **SUGGESTED DURATION :** 13 days

UNIT OVERVIEW

Introduction
This unit bundles student expectations that address using probability to describe and solve problems involving proportional relationships. According to the Texas Education Agency, mathematical process standards including application, a problem-solving model, tools and techniques, communication, representations, relationships, and justifications should be integrated (when applicable) with content knowledge and skills so that students are prepared to use mathematics in everyday life, society, and the workplace. The introduction to the grade level standards state, “While the use of all types of technology is important, the emphasis on algebra readiness skills necessitates the implementation of graphing technology.”

Prior to this Unit
In Grade 6, students applied qualitative and quantitative reasoning to solve prediction and comparison of real-world problems involving ratios and rates.

During this Unit
Students extend the use of proportional reasoning to solve problems as they are formally introduced to probability concepts. Students use various representations, including lists, tree diagrams, tables, and the Fundamental Counting Principle to represent the sample spaces for simple and compound events. Compound events are inclusive of both independent events and dependent events. Students select, design, develop, and use various methods to simulate simple and compound events. Methods for simulation may or may not include the use of technology. When conducting simulations or investigating data from simulations, students develop an understanding of how the Law of Large Numbers will affect the experimental probability. Students are expected to distinguish between theoretical and experimental data and find the probabilities of a simple event. Students analyze and describe the relationship between the probability of a simple event and its complement. Probabilities may be represented as a decimal, fraction, or percent. Data and sample spaces are used to determine experimental and theoretical probabilities from simple and compound events. Data from experiments, experimental data, theoretical probability, and random samples are used to make qualitative and quantitative inferences about a population. Qualitative and quantitative predictions and comparisons from simple experiments are used to solve problems. Students should consider the proportional relationships within and between probabilistic situations when making predictions and inferences.

Other considerations: Reference the Mathematics COVID-19 Gap Implementation Tool Grade 7

After this Unit
In Grade 8, students will simulate generating random samples of the same size from a population with known characteristics to develop the notion of a random sample being representative of the population from which it was selected. In Geometry, students will develop strategies to use permutations and combinations to solve problems, determine probabilities based on area to solve contextual problems, and apply conditional probability and independence in contextual problems. Students will also identify whether two events are independent and compute the probability of the two events occurring together with or without replacement.

Additional Notes
In Grade 7, solving problems using qualitative and quantitative predictions and comparisons from simple experiments and determining experimental and theoretical probabilities

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related to simple and compound events using data and sample spaces are identified STAAR Readiness Standards 7.6H and 7.6I. Representing sample spaces for simple and compound events using lists and tree diagrams, making predictions and determining solutions using experimental data for simple and compound events, making predictions and determining solutions using experimental data and theoretical probability for simple and compound events and finding the probabilities of a simple event and its complement and describing the relationship between the two are STAAR Supporting Standards 7.6A, 7.6C, 7.6D, and 7.6E. These standards are listed under the Grade 7 STAAR Reporting Category: Probability and Numerical Representations. Selecting and using different simulations to represent simple and compound and using data from a random sample to make inferences about a population are identified as 7.6B and 7.6F. These two standards are neither Supporting nor Readiness, but are foundational to the conceptual understanding of probability. All of the standards in this unit are part of the Grade 7 *Texas Response to Curriculum Focal Points* (TxRCFP): Representing and applying proportional relationships. This unit is supporting the development of the *Texas College and Career Readiness Standards* (TxCCRS): I. Numeric Reasoning A2, B1; II. Algebraic Reasoning D1, D2; IV. Probabilistic Reasoning A1, B1, B2, C1; V. Statistical Reasoning A1, C2, C3; VII. Problem Solving and Reasoning A1, A2, A3, A4, A5, B1, C1, D1, D2; VIII. Communication and Representation A1, A2, A3, B1, B2, C1, C2, C3; IX. Connections A1, A2, B1, B2, B3.

Research

According to the National Council of Teachers of Mathematics (NCTM), *Navigating through Probability in Grades 6 – 8* (2003), “Students should be given many opportunities in many different settings to think probabilistically…Students take a long time to develop clear notions of chance, and in order to generalize correctly about complex ideas, they need to be exposed to many examples (and nonexamples) of each of the main ideas of probability…Students need to develop probabilistic thinking by using the data they generate in experiments as well as data from other sources.” (p. ix). Reyes, Lindquist, Lambin & Smith (2012) note that “ideas from probability serve as a foundation for the collection, description, and interpretation of data. Probability will not and should not be learned from formal definitions; rather, the presentation of varied examples and activities helps illustrate and clarify important concepts…At all stages of instruction, you must use the correct language to describe what is happening. This language serves as a model for children as they begin developing probability concepts and simultaneously add new probabilistic terms to their vocabulary” (p. 392).

National Council of Teachers of Mathematics. (2003). *Navigating through measurement in grades 6 – 8*. Reston, VA: National Council of Teachers of Mathematics, Inc.
Reyes, R. E., Lindquist, M., Lambdin, D. V., & Smith, N. L. (2012). *Helping children learn mathematics.* (10th ed.). Hoboken, NJ: Wiley.
Texas Education Agency & Texas Higher Education Coordinating Board. (2009). *Texas college and career readiness standards.* Retrieved from http://www.thecb.state.tx.us/institutional-resources-programs/public-community-technical-state-colleges/texas-college-and-career-readiness-standards/
Texas Education Agency. (2013). *Texas response to curriculum focal points for kindergarten through grade 8 mathematics.* Retrieved from https://www.texasgateway.org/resource/txrcfp-texas-response-curriculum-focal-points-k-8-mathematics-revised-2013

OVERARCHING UNDERSTANDINGS AND QUESTIONS

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Probability is used to make predictions and inferences about the degree of likelihood of outcomes in everyday life.

- When is probability applicable in everyday life?
- Why is it important to be aware of the factors that influence outcomes and how does this understanding affect how one supports or refutes the validity of predictions and inferences made by oneself or others?
- How can probability be used to reason about uncertain events in everyday life?

UNIT UNDERSTANDINGS AND QUESTIONS	OVERARCHING CONCEPTS AND UNIT CONCEPTS	PERFORMANCE ASSESSMENT(S)

Understanding how two quantities vary together (covariation) builds flexible proportional reasoning in order to make predictions and critical judgements about the relationship.
• Data from a random sample of a population can be analyzed proportionally in order to make inferences, predictions, and comparisons about the population.
  • How does a prediction made from experimental data
	Proportionality
	• Probability and Statistics
	  • Sample space and outcomes
	  • Simulations
	  • Simple, independent, compound, dependent events
	  • Complement
	  • Probability of an event
		Mathematics Grade 7 Unit 06 PA 01
		Click on the PA title to view related rubric.
		
		Analyze the problem situation(s) described below. Organize and record your work for each of the following tasks. Using precise mathematical language, justify and explain each solution process.
		
		1. Susie buys her lunch at a local sandwich shop.

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UNIT UNDERSTANDINGS AND QUESTIONS	OVERARCHING CONCEPTS AND UNIT CONCEPTS	PERFORMANCE ASSESSMENT(S)
differ from a prediction made from theoretical probability? • How can proportions be used to make predictions from … ◦ experimental data? ◦ theoretical probability? • What are the characteristics of a random sample? • How is data from a random sample used to make … ◦ inferences ◦ predictions ◦ comparisons … about a population? • How are quantitative and qualitative inferences, predictions, and comparisons different? • How are sample spaces used to determine theoretical and experimental probabilities? • Probabilistic models are used to reason about the likelihood of an outcome or risk of error in a situation and are interpreted for reliability in order to make informed decisions. • How can the sample space be determined … ◦ with a model? ◦ algebraically? • What types of methods may be used to simulate simple and compound events?	• Theoretical and experimental probability • Predictions, comparisons, and inferences • Data <u>Associated Mathematical Processes</u> • Application • Problem Solving Model • Tools and Techniques • Communication • Representations • Relationships • Justification	 a. Use a tree diagram to represent the sample space of selecting a sandwich with one type of bread, one type of spread, and one type of meat. b. Find the probability of creating a sandwich with whole-grain bread and its complement. Write an expression that can be used to describe the relationship between the probability of this event and its complement. c. With or without technology, identify an appropriate method to simulate the experiment of randomly making a sandwich, deciding on one type of bread, one type of spread, and one type of meat. d. Complete your simulation 25 times to generate a set of experimental data. Use your data to predict the number of times a sandwich will be created with whole-grain bread if the experiment was completed 750 times.

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UNIT UNDERSTANDINGS AND QUESTIONS	OVERARCHING CONCEPTS AND UNIT CONCEPTS	PERFORMANCE ASSESSMENT(S)
• What is the process that is used to decide which method of simulation is best to represent the sample space of an event? • How is the process used to design a simulation for compound independent events different from the process used to design a simulation for compound dependent events? • How can the probability of an event be represented? • How does the probability of an event occurring or not occurring relate to the numbers 1 and 0? • What is the difference between experimental data and theoretical probability? • How can the complement of an event be determined from the probability of the event occurring? • What is the relationship between the sample space of an event, the probability of an event occurring, and its complement? • How are simple events, compound independent events, and compound dependent events different? • How is the sample space of compound dependent events different than the sample space of compound independent events?		e. Compare the theoretical and experimental probabilities of creating a sandwich with whole-grain bread and describe how the Law of Large Numbers will affect the experimental probability of this event. f. Determine the theoretical probability of selecting one type of bread, one type of spread, and two meats, roast beef and ham. If 501 sandwiches are made, predict the number of times the sandwich will have one type of bread, one type of spread, and two meats, roast beef and ham. 2. The sandwich shop also sells loaves of bread to its customers. A random sample of customers of the sandwich shop was asked which type of bread they prefer to purchase. Their responses are recorded in the table below. Sourdough 24 Wheat 46 White 58 Whole-grain 72 a. Based on the data from the random sample, how many loaves of each type of bread should they bake if they plan on baking 700 loaves of bread? Justify your inference with both qualitative and quantitative descriptions.

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UNIT UNDERSTANDINGS AND QUESTIONS	OVERARCHING CONCEPTS AND UNIT CONCEPTS	PERFORMANCE ASSESSMENT(S)
		Standard(s): 7.1A, 7.1B, 7.1C, 7.1D, 7.1E, 7.1F, 7.1G, 7.6A, 7.6B, 7.6C, 7.6D, 7.6E, 7.6F, 7.6H, 7.6I, ELPS.c.1A, ELPS.c.2C, ELPS.c.2D, ELPS.c.2E, ELPS.c.3C, ELPS.c.3D, ELPS.c.3H, ELPS.c.4D, ELPS.c.4H, ELPS.c.5B, ELPS.c.5F, ELPS.c.5G

MISCONCEPTIONS / UNDERDEVELOPED CONCEPTS

Misconceptions:

- Some students may think the probability of an event is greater than 1 rather than $0 \leq p \leq 1$.
- Some students may not understand the sum of a probability and its complement is 1.
- Some students may not understand the meaning of mutually exclusive events.
- Some students may think that when representing the probability in fraction form, they write the number of probable outcomes over the number of not possible outcomes rather than the number of favorable outcomes over the total number of outcomes in fraction form.
- Some students may not realize the probability of an outcome can be renamed into a simplified ratio.
- Some students may attempt to add the probabilities in a compound event to generate the sample space rather than multiplying them.
- Some students may confuse the words “and” and “or” when solving for the probability of compound dependent or compound independent events in a problem situation.
- Some students may not accurately reflect the total possible outcomes of an event, which may be affected by the outcome of another event, specifically when items are not replaced to the original set.
- Some students may not be able to distinguish between experimental probability and theoretical probability.
- Some students may not realize the relationship between experimental probability, theoretical probability, and the Law of Large Numbers.

UNIT VOCABULARY

- **Complement of an event** – the probability of the non-occurrence of a desired outcome

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- **Compound events** – a set of outcomes from a combination of actions or activities where the outcomes can be subdivided (e.g., flipping a coin and rolling a number cube, drawing tiles out of a bag and spinning a spinner, etc.)
- **Dependent events** – the outcome from one action or activity may affect the probability of the outcome(s) of any subsequent action(s) or activity(s); usually involves compound events
- **Data** – information that is collected about people, events, or objects
- **Event** – a probable situation or condition
- **Experimental data** – the data collected or observed from the outcomes of an experiment
- **Experimental probability** – the likelihood of an event occurring from the outcomes of an experiment
- **Fundamental Counting Principle** – if one event has *a* possible outcomes and a second independent event has *b* possible outcomes, then there are $a \cdot b$ total possible outcomes for the two events together
- **Independent events** – the outcome from one action or activity does not affect the probability of the outcome(s) of any subsequent action(s) or activity(s); usually involves compound events
- **Inference** – a conclusion or prediction based on data
- **Law of large numbers** – as the number of trials in an experiment increases, the experimental probability of an event approaches the theoretical probability of the same event, meaning the difference between the experimental and theoretical probability will be closer to zero
- **Mutually exclusive events** – events that cannot happen at the same time
- **Outcome** – the result of an action or event
- **Population** – total collection of persons, objects, or items of interest
- **Positive rational numbers** – the set of numbers that can be expressed as a fraction $\frac{a}{b}$, where *a* and *b* are counting (natural) numbers
- **Probability** – a ratio between the number of desired outcomes to the total possible outcomes, $0 \leq p \leq 1$
- **Qualitative** – a broad subjective description (e.g., the probability of an event occurring is certain, more likely, not likely, equally likely, or impossible.)
- **Quantitative** – a narrowed objective description associated with a quantity (e.g., the probability of selecting a consonant from the word EXPERIMENT is 1.5 times as likely as selecting a vowel from the same word, etc.)
- **Random sample** – a subset of the population selected without bias in order to make inferences about the entire population
- **Sample** – a subset of the population selected in order to make inferences about the entire population
- **Sample space** – a set of all possible outcomes of one or more events
- **Simple event** – a set or subset of outcomes from a single action or activity where the outcomes cannot be subdivided (e.g., flipping a coin (heads or tails), rolling of a number cube (a specific number when rolled, odd or even, prime or composite), spinning a spinner for a particular color or number, etc.)
- **Simulation** – an experiment or model used to test the outcomes of an event
- **Theoretical data** – the possible outcomes of an event without conducting an experiment
- **Theoretical probability** – the likelihood of an event occurring without conducting an experiment

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Related Vocabulary:

- Equally likely
- Face card (deck of cards)
- Favorable outcome
- Less likely
- More likely
- Ratio
- Suit (deck of cards)
- Tree diagram

UNIT ASSESSMENT ITEMS	SYSTEM RESOURCES	OTHER RESOURCES
Unit Assessment Items that have been published by your district may be accessed through **Search All Components** in the District Resources tab. Assessment items may also be found using the Assessment Center if your district has granted access to that tool.	**Mathematics Concepts Charts** **Mathematics COVID-19 Gap Implementation Tool Grade 7** **Mathematics COVID-19 Gap Implementation Tool Instructions** **Mathematics Grade 7 Backward Design Document** **Mathematics Grade 7 Enhanced TEKS Clarification** **Mathematics Grade 7 Focal Points with Aligned Standards and TEKS Introduction** **Mathematics Grade 7 STAAR Analysis Resources** **Mathematics Grade 7 STAAR Blueprint and Item Percentages** **Mathematics Grade 7 STAAR Enhanced Blueprint** **Mathematics Grade 7 Vertical Alignment**	Texas Higher Education Coordinating Board – **Texas College and Career Readiness Standards** Texas Education Agency – **Texas Response to Curriculum Focal Points for K-8 Mathematics Revised 2013** Texas Education Agency – **Mathematics Curriculum** Texas Education Agency – **STAAR Mathematics Resources** Texas Education Agency Texas Gateway – **Revised Mathematics TEKS: Vertical Alignment Charts** Texas Education Agency Texas Gateway – **Mathematics TEKS: Supporting Information** Texas Education Agency Texas Gateway – **Interactive Mathematics Glossary** Texas Education Agency Texas Gateway – **Resources Aligned to Grade 7 Mathematics TEKS**

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	Mathematics Grade 7_Unit 06_TEKS Resource System STAAR Analysis **Mathematics K-HS Overarching Understandings and Questions** **Mathematics Long Term Transfer Goals** **Mathematics Suggested Basic Manipulatives by Grade Level** **Mathematics Suggested Engaging Literature** **Mathematics Texas Education Agency Grade 7 TEKS Supporting Information (with TEKS Resource System Comments)** **Mathematics Vertical Quick Guide**	Texas Instruments – **Graphing Calculator Tutorials**

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TAUGHT DIRECTLY TEKS

TEKS INTENDED TO BE EXPLICITLY TAUGHT IN THIS UNIT.

TEKS/SE Legend:

- ***Knowledge and Skills Statements (TEKS) identified by TEA are in italicized, bolded, black text.***
- **Student Expectations (TEKS) identified by TEA are in bolded, black text.**
- ***Student Expectations (TEKS) are labeled Readiness as identified by TEA of the assessed curriculum.***
- ***Student Expectations (TEKS) are labeled Supporting as identified by TEA of the assessed curriculum.***
- ***Student Expectations (TEKS) are labeled Process standards as identified by TEA of the assessed curriculum.***
- Portions of the Student Expectations (TEKS) that are not included in this unit but are taught in previous or future units are indicated by a ~~strike-through~~.

Specificity Legend:

- Supporting information / clarifications (specificity) written by TEKS Resource System are in blue text.
- *Unit-specific clarifications are in italicized, blue text.*
- Information from Texas Education Agency (TEA), Texas College and Career Readiness Standards (TxCCRS), Texas Response to Curriculum Focal Points (TxRCFP) is labeled.
- A Partial Specificity label indicates that a portion of the specificity not aligned to this unit has been removed.

TEKS# / SE#	TEKS	SPECIFICITY
7.1	***Mathematical process standards. The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:***	
7.1A	**Apply mathematics to problems arising in everyday life, society, and the workplace.** ***Process Standard***	Apply MATHEMATICS TO PROBLEMS ARISING IN EVERYDAY LIFE, SOCIETY, AND THE WORKPLACE

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		Including, but not limited to:
		• Mathematical problem situations within and between disciplines
		  ◦ Everyday life
		  ◦ Society
		  ◦ Workplace
		
		Note(s):
		• The mathematical process standards may be applied to all content standards as appropriate.
		• TxRCFP:
		  ◦ Developing fluency with rational numbers and operations to solve problems in a variety of contexts
		  ◦ Representing and applying proportional relationships
		  ◦ Using expressions and equations to describe relationships in a variety of contexts, including geometric problems
		  ◦ Comparing sets of data
		• TxCCRS:
		  ◦ VII.D. Problem Solving and Reasoning – Real-world problem solving
		  • VII.D.1. Interpret results of the mathematical problem in terms of the original real-world situation.
		  ◦ IX.A. Connections – Connections among the strands of mathematics
		  • IX.A.1. Connect and use multiple key concepts of mathematics in situations and problems.
		  • IX.A.2. Connect mathematics to the study of other disciplines.
		  ◦ IX.B. Connections – Connections of mathematics to nature, real-world situations, and everyday life
		  • IX.B.1. Use multiple representations to demonstrate links between mathematical and real-world situations.

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TEKS# / SE#	TEKS	SPECIFICITY
		• IX.B.2. Understand and use appropriate mathematical models in the natural, physical, and social sciences. • IX.B.3. Know and understand the use of mathematics in a variety of careers and professions.

7.1B	**Use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution.** ***Process Standard***	Use
		
		A PROBLEM-SOLVING MODEL THAT INCORPORATES ANALYZING GIVEN INFORMATION, FORMULATING A PLAN OR STRATEGY, DETERMINING A SOLUTION, JUSTIFYING THE SOLUTION, AND EVALUATING THE PROBLEM-SOLVING PROCESS AND THE REASONABLENESS OF THE SOLUTION
		
		Including, but not limited to:
		
		• Problem-solving model
		  ◦ Analyze given information
		  ◦ Formulate a plan or strategy
		  ◦ Determine a solution
		  ◦ Justify the solution
		  ◦ Evaluate the problem-solving process and the reasonableness of the solution
		
		Note(s):
		
		• The mathematical process standards may be applied to all content standards as appropriate.
		• TxRCFP:
		  ◦ Developing fluency with rational numbers and operations to solve problems in a variety of contexts
		  ◦ Representing and applying proportional relationships
		  ◦ Using expressions and equations to describe relationships in a variety of contexts,

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		including geometric problems ◦ Comparing sets of data • TxCCRS: ◦ I.B. Numeric Reasoning – Number sense and number concepts • I.B.1. Use estimation to check for errors and reasonableness of solutions. ◦ V.A. Statistical Reasoning – Design a study • V.A.1. Formulate a statistical question, plan an investigation, and collect data. ◦ VII.A. Problem Solving and Reasoning – Mathematical problem solving • VII.A.1. Analyze given information. • VII.A.2. Formulate a plan or strategy. • VII.A.3. Determine a solution. • VII.A.4. Justify the solution. • VII.A.5. Evaluate the problem-solving process. ◦ VII.D. Problem Solving and Reasoning – Real-world problem solving • VII.D.2. Evaluate the problem-solving process.
7.1C	**Select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems.** ***Process Standard***	Select TOOLS, INCLUDING REAL OBJECTS, MANIPULATIVES, PAPER AND PENCIL, AND TECHNOLOGY AS APPROPRIATE, AND TECHNIQUES, INCLUDING MENTAL MATH, ESTIMATION, AND NUMBER SENSE AS APPROPRIATE, TO SOLVE PROBLEMS Including, but not limited to: • Appropriate selection of tool(s) and techniques to apply in order to solve problems ◦ Tools • Real objects • Manipulatives • Paper and pencil

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		• Technology ◦ Techniques • Mental math • Estimation • Number sense Note(s): • The mathematical process standards may be applied to all content standards as appropriate. • TxRCFP: ◦ Developing fluency with rational numbers and operations to solve problems in a variety of contexts ◦ Representing and applying proportional relationships ◦ Using expressions and equations to describe relationships in a variety of contexts, including geometric problems ◦ Comparing sets of data • TxCCRS: ◦ I.B. Numeric Reasoning – Number sense and number concepts • I.B.1. Use estimation to check for errors and reasonableness of solutions. ◦ V.C. Statistical Reasoning – Analyze, interpret, and draw conclusions from data • V.C.2. Analyze relationships between paired data using spreadsheets, graphing calculators, or statistical software.
7.1D	**Communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, ~~graphs,~~ and language as appropriate.** ***Process Standard***	Partial Specificity Communicate MATHEMATICAL IDEAS, REASONING, AND THEIR IMPLICATIONS USING MULTIPLE REPRESENTATIONS, INCLUDING SYMBOLS, DIAGRAMS, AND LANGUAGE AS APPROPRIATE Including, but not limited to:

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		• Mathematical ideas, reasoning, and their implications
		  ◦ Multiple representations, as appropriate
		  • Symbols
		  • Diagrams
		  • Language
		
		Note(s):
		
		• The mathematical process standards may be applied to all content standards as appropriate.
		• TxRCFP:
		  ◦ Developing fluency with rational numbers and operations to solve problems in a variety of contexts
		  ◦ Representing and applying proportional relationships
		  ◦ Using expressions and equations to describe relationships in a variety of contexts, including geometric problems
		  ◦ Comparing sets of data
		• TxCCRS:
		  ◦ II.D. Algebraic Reasoning – Representing relationships
		  • II.D.1. Interpret multiple representations of equations, inequalities, and relationships.
		  • II.D.2. Convert among multiple representations of equations, inequalities, and relationships.
		  ◦ VIII.A. Communication and Representation – Language, terms, and symbols of mathematics
		  • VIII.A.1. Use mathematical symbols, terminology, and notation to represent given and unknown information in a problem.
		  • VIII.A.2. Use mathematical language to represent and communicate the mathematical concepts in a problem.
		  • VIII.A.3. Use mathematical language for reasoning, problem solving, making

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		connections, and generalizing. ◦ VIII.B. Communication and Representation – Interpretation of mathematical work • VIII.B.1. Model and interpret mathematical ideas and concepts using multiple representations. • VIII.B.2. Summarize and interpret mathematical information provided orally, visually, or in written form within the given context. ◦ VIII.C. Communication and Representation – Presentation and representation of mathematical work • VIII.C.1. Communicate mathematical ideas, reasoning, and their implications using symbols, diagrams, models, graphs, and words. • VIII.C.2. Create and use representations to organize, record, and communicate mathematical ideas. • VIII.C.3. Explain, display, or justify mathematical ideas and arguments using precise mathematical language in written or oral communications. ◦ IX.B. Connections – Connections of mathematics to nature, real-world situations, and everyday life • IX.B.1. Use multiple representations to demonstrate links between mathematical and real-world situations.
7.1E	**Create and use representations to organize, record, and communicate mathematical ideas.** ***Process Standard***	Create, Use REPRESENTATIONS TO ORGANIZE, RECORD, AND COMMUNICATE MATHEMATICAL IDEAS Including, but not limited to: • Representations of mathematical ideas ◦ Organize ◦ Record ◦ Communicate

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		• Evaluation of the effectiveness of representations to ensure clarity of mathematical ideas being communicated
		• Appropriate mathematical vocabulary and phrasing when communicating mathematical ideas
		
		Note(s):
		
		• The mathematical process standards may be applied to all content standards as appropriate.
		• TxRCFP:
		  ◦ Developing fluency with rational numbers and operations to solve problems in a variety of contexts
		  ◦ Representing and applying proportional relationships
		  ◦ Using expressions and equations to describe relationships in a variety of contexts, including geometric problems
		  ◦ Comparing sets of data
		• TxCCRS:
		  ◦ VIII.B. Communication and Representation – Interpretation of mathematical work
		  • VIII.B.1. Model and interpret mathematical ideas and concepts using multiple representations.
		  • VIII.B.2. Summarize and interpret mathematical information provided orally, visually, or in written form within the given context.
		  ◦ VIII.C. Communication and Representation – Presentation and representation of mathematical work
		  • VIII.C.1. Communicate mathematical ideas, reasoning, and their implications using symbols, diagrams, models, graphs, and words.
		  • VIII.C.2. Create and use representations to organize, record, and communicate mathematical ideas.

7.1F	**Analyze mathematical relationships to connect and communicate mathematical ideas.**	Analyze

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	Process Standard	MATHEMATICAL RELATIONSHIPS TO CONNECT AND COMMUNICATE MATHEMATICAL IDEAS
		
		Including, but not limited to:
		
		• Mathematical relationships
		  ◦ Connect and communicate mathematical ideas
		  • Conjectures and generalizations from sets of examples and non-examples, patterns, etc.
		  • Current knowledge to new learning
		
		Note(s):
		
		• The mathematical process standards may be applied to all content standards as appropriate.
		• TxRCFP:
		  ◦ Developing fluency with rational numbers and operations to solve problems in a variety of contexts
		  ◦ Representing and applying proportional relationships
		  ◦ Using expressions and equations to describe relationships in a variety of contexts, including geometric problems
		  ◦ Comparing sets of data
		• TxCCRS:
		  ◦ VII.A. Problem Solving and Reasoning – Mathematical problem solving
		  • VII.A.1. Analyze given information.
		  ◦ VIII.A. Communication and Representation – Language, terms, and symbols of mathematics
		  • VIII.A.1. Use mathematical symbols, terminology, and notation to represent given and unknown information in a problem.
		  • VIII.A.2. Use mathematical language to represent and communicate the mathematical concepts in a problem.
		  • VIII.A.3. Use mathematical language for reasoning, problem solving, making

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		connections, and generalizing. ◦ VIII.B. Communication and Representation – Interpretation of mathematical work • VIII.B.1. Model and interpret mathematical ideas and concepts using multiple representations. ◦ VIII.C. Communication and Representation – Presentation and representation of mathematical work • VIII.C.1. Communicate mathematical ideas, reasoning, and their implications using symbols, diagrams, models, graphs, and words. • VIII.C.2. Create and use representations to organize, record, and communicate mathematical ideas. • VIII.C.3. Explain, display, or justify mathematical ideas and arguments using precise mathematical language in written or oral communications. ◦ IX.A. Connections – Connections among the strands of mathematics • IX.A.1. Connect and use multiple key concepts of mathematics in situations and problems. • IX.A.2. Connect mathematics to the study of other disciplines.
7.1G	**Display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.** ***Process Standard***	Display, Explain, Justify MATHEMATICAL IDEAS AND ARGUMENTS USING PRECISE MATHEMATICAL LANGUAGE IN WRITTEN OR ORAL COMMUNICATION Including, but not limited to: • Mathematical ideas and arguments ◦ Validation of conclusions • Displays to make work visible to others ◦ Diagrams, visual aids, written work, etc. • Explanations and justifications

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		◦ Precise mathematical language in written or oral communication Note(s): • The mathematical process standards may be applied to all content standards as appropriate. • TxRCFP: ◦ Developing fluency with rational numbers and operations to solve problems in a variety of contexts ◦ Representing and applying proportional relationships ◦ Using expressions and equations to describe relationships in a variety of contexts, including geometric problems ◦ Comparing sets of data • TxCCRS: ◦ VII.A. Problem Solving and Reasoning – Mathematical problem solving • VII.A.4. Justify the solution. ◦ VII.B. Problem Solving and Reasoning – Proportional reasoning • VII.B.1. Use proportional reasoning to solve problems that require fractions, ratios, percentages, decimals, and proportions in a variety of contexts using multiple representations. ◦ VII.C. Problem Solving and Reasoning – Logical reasoning • VII.C.1. Develop and evaluate convincing arguments. ◦ VIII.A. Communication and Representation – Language, terms, and symbols of mathematics • VIII. A.3. Use mathematical language for reasoning, problem solving, making connections, and generalizing. ◦ VIII.B. Communication and Representation – Interpretation of mathematical work • VIII.B.1. Model and interpret mathematical ideas and concepts using multiple representations. • VIII.B.2. Summarize and interpret mathematical information provided orally, visually, or in written form within the given context.

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		○ VIII.C. Communication and Representation – Presentation and representation of mathematical work • VIII. C.3. Explain, display, or justify mathematical ideas and arguments using precise mathematical language in written or oral communications.
7.6	***Proportionality. The student applies mathematical process standards to use probability and statistics to describe or solve problems involving proportional relationships. The student is expected to:***	
7.6A	**Represent sample spaces for simple and compound events using lists and tree diagrams.** ***Supporting Standard***	Represent SAMPLE SPACES FOR SIMPLE AND COMPOUND EVENTS USING LISTS AND TREE DIAGRAMS Including, but not limited to: • Event – a probable situation or condition • Outcome – the result of an action or event • Mutually exclusive events – events that cannot happen at the same time • Simple event – a set or subset of outcomes from a single action or activity where the outcomes cannot be subdivided (e.g., flipping a coin (heads or tails), rolling of a number cube (a specific number when rolled, odd or even, prime or composite), spinning a spinner for a particular color or number, etc.) • Compound events – a set of outcomes from a combination of actions or activities where the outcomes can be subdivided (e.g., flipping a coin and rolling a number cube, drawing tiles out of a bag and spinning a spinner, etc.) • Independent events – the outcome from one action or activity does not affect the probability of the outcome(s) of any subsequent action(s) or activity(s); usually involves compound events

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		• Dependent events – the outcome from one action or activity may affect the probability of the outcome(s) of any subsequent action(s) or activity(s); usually involves compound events
		• Sample space – a set of all possible outcomes of one or more events
		  ◦ Various representations of sample space for simple and compound events
		  • Lists
		  • Tree diagrams
		  • Tables
		  ◦ Fundamental Counting Principle – if one event has *a* possible outcomes and a second independent event has *b* possible outcomes, then there are *a* • *b* total possible outcomes for the two events together
		  • This principle can be applied to determine the sample space for more than two events.
		• Connections between various representations
		
		Note(s):
		
		• Grade Level(s):
		  ◦ Grade 7 introduces representing sample spaces for simple and compound events using lists and tree diagrams.
		  ◦ Various mathematical process standards will be applied to this student expectation as appropriate.
		• TxRCFP:
		  ◦ Representing and applying proportional relationships
		• TxCCRS:
		  ◦ IV.A. Probabilistic Reasoning – Counting principles
		  • IV.A.1. Determine the nature and the number of elements in a finite sample space.
		  ◦ VIII.C. Communication and Representation – Presentation and representation of mathematical work
		  • VIII.C.2. Create and use representations to organize, record, and communicate

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		mathematical ideas.

7.6B	**Select and use different simulations to represent simple and compound events with and without technology.**	Select, Use
		
		DIFFERENT SIMULATIONS TO REPRESENT SIMPLE AND COMPOUND EVENTS WITH AND WITHOUT TECHNOLOGY
		
		Including, but not limited to:
		
		• Event – a probable situation or condition
		• Outcome – the result of an action or event
		• Simple event – a set or subset of outcomes from a single action or activity where the outcomes cannot be subdivided (e.g., flipping a coin (heads or tails), rolling of a number cube (a specific number when rolled, odd or even, prime or composite), spinning a spinner for a particular color or number, etc.)
		• Compound events – a set of outcomes from a combination of actions or activities where the outcomes can be subdivided (e.g., flipping a coin and rolling a number cube, drawing tiles out of a bag and spinning a spinner, etc.)
		• Independent events – the outcome from one action or activity does not affect the probability of the outcome(s) of any subsequent action(s) or activity(s); usually involves compound events
		• Dependent events – the outcome from one action or activity may affect the probability of the outcome(s) of any subsequent action(s) or activity(s); usually involves compound events
		• Sample space – a set of all possible outcomes of one or more events
		• Simulation – an experiment or model used to test the outcomes of an event
		• Developing a design for a simulation
		• Appropriate methods to simulate simple and compound events
		  ◦ With technology
		  • Calculator
		  • Computer model

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		• Random number generators ◦ Without technology • Spinners (even and uneven sections) • Color tiles • Two-color counters • Coins • Deck of cards • Marbles • Number cubes Note(s): • Grade Level(s): ◦ Grade 7 introduces selecting and using different simulations to represent simple and compound events with and without technology. ◦ Various mathematical process standards will be applied to this student expectation as appropriate. • TxRCFP: ◦ Representing and applying proportional relationships • TxCCRS: ◦ I.A. Numeric Reasoning – Number representations and operations • I.A.2. Perform computations with rational and irrational numbers. ◦ IV.C. Probabilistic Reasoning – Measurement involving probability • IV.C.1. Use probability to make informed decisions.
7.6C	**Make predictions and determine solutions using experimental data for simple and compound events.** ***Supporting Standard***	Predict, Determine SOLUTIONS USING EXPERIMENTAL DATA FOR SIMPLE AND COMPOUND EVENTS

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		Including, but not limited to:
		• Positive rational numbers – the set of numbers that can be expressed as a fraction $\frac{a}{b}$, where *a* and *b* are counting (natural) numbers
		• Various forms of positive rational numbers
		  ◦ Counting (natural) numbers
		  ◦ Decimals
		  ◦ Fractions
		  ◦ Percents
		• Event – a probable situation or condition
		• Outcome – the result of an action or event
		• Mutually exclusive events – events that cannot happen at the same time
		• Experimental data – the data collected or observed from the outcomes of an experiment
		  ◦ Various types of experiments
		  ◦ Representation of experimental data as a fraction, decimal, or percent
		  ◦ Data should be used for experimental probabilities, and sample spaces should be used for theoretical probabilities.
		• Simple event – a set or subset of outcomes from a single action or activity where the outcomes cannot be subdivided (e.g., flipping a coin (heads or tails), rolling of a number cube (a specific number when rolled, odd or even, prime or composite), spinning a spinner for a particular color or number, etc.)
		• Compound events – a set of outcomes from a combination of actions or activities where the outcomes can be subdivided (e.g., flipping a coin and rolling a number cube, drawing tiles out of a bag and spinning a spinner, etc.)
		• Independent events – the outcome from one action or activity does not affect the probability of the outcome(s) of any subsequent action(s) or activity(s); usually involves compound events
		• Dependent events – the outcome from one action or activity may affect the probability of the outcome(s) of any subsequent action(s) or activity(s); usually involves compound events
		• Proportional reasoning to make predictions using experimental data

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		Note(s): • Grade Level(s): ◦ Grade 7 introduces making predictions and determining solutions using experimental data for simple and compound events. ◦ Various mathematical process standards will be applied to this student expectation as appropriate. • TxRCFP: ◦ Representing and applying proportional relationships • TxCCRS: ◦ I.A. Numeric Reasoning – Number representations and operations • I.A.2. Perform computations with rational and irrational numbers. ◦ IV.B. Probabilistic Reasoning – Computation and interpretation of probabilities • IV.B.1. Compute and interpret the probability of an event and its complement. • IV.B.2. Compute and interpret the probability of conditional and compound events. ◦ IV.C. Probabilistic Reasoning – Measurement involving probability • IV.C.1. Use probability to make informed decisions. ◦ VII.B. Problem Solving and Reasoning – Proportional reasoning • VII.B.1. Use proportional reasoning to solve problems that require fractions, ratios, percentages, decimals, and proportions in a variety of contexts using multiple representations.
7.6D	**Make predictions and determine solutions using theoretical probability for simple and compound events.** ***Supporting Standard***	Predict, Determine SOLUTIONS USING THEORETICAL PROBABILITY FOR SIMPLE AND COMPOUND EVENTS Including, but not limited to:

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		• Positive rational numbers – the set of numbers that can be expressed as a fraction $\frac{a}{b}$, where *a* and *b* are counting (natural) numbers
		• Various forms of positive rational numbers
		  ◦ Counting (natural) numbers
		  ◦ Decimals
		  ◦ Fractions
		  ◦ Percents
		• Event – a probable situation or condition
		• Outcome – the result of an action or event
		• Mutually exclusive events – events that cannot happen at the same time
		• Sample space – a set of all possible outcomes of one or more events
		• Probability – a ratio between the number of desired outcomes to the total possible outcomes, $0 \leq p \leq 1$
		  ◦ Probability = $\frac{\text{number of favorable outcomes}}{\text{total number of outcomes}}$
		  ◦ Notation for probability
		  • P(event)
		  ◦ The closer a probability of an outcome is to 1, the more likely the outcome will occur; whereas, the closer a probability of an outcome is to 0, the less likely the outcome will occur.
		• Theoretical probability – the likelihood of an event occurring predicted by using formulas and mathematical calculations without conducting an experiment
		  ◦ Various types of theoretical experiments
		  ◦ Representation of theoretical probability as a fraction, decimal, or percent
		  ◦ Sample spaces should be used for theoretical probabilities, and data should be used for experimental probabilities.
		• Simple event – a set or subset of outcomes from a single action or activity where the outcomes cannot be subdivided (e.g., flipping a coin (heads or tails), rolling of a number cube (a specific number when rolled, odd or even, prime or composite), spinning a spinner for a particular color

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		or number, etc.) • Compound events – a set of outcomes from a combination of actions or activities where the outcomes can be subdivided (e.g., flipping a coin and rolling a number cube, drawing tiles out of a bag and spinning a spinner, etc.) • Independent events – the outcome from one action or activity does not affect the probability of the outcome(s) of any subsequent action(s) or activity(s); usually involves compound events • Dependent events – the outcome from one action or activity may affect the probability of the outcome(s) of any subsequent action(s) or activity(s); usually involves compound events • Proportional reasoning to make predictions using theoretical probability Note(s): • Grade Level(s): ◦ Grade 7 introduces making predictions and determining solutions using theoretical probability for simple and compound events. ◦ Geometry will identify whether two events are independent and compute the probability of the two events occurring together with or without replacement. ◦ Various mathematical process standards will be applied to this student expectation as appropriate. • TxRCFP: ◦ Representing and applying proportional relationships • TxCCRS: ◦ I.A. Numeric Reasoning – Number representations and operations • I.A.2. Perform computations with rational and irrational numbers. ◦ IV.B. Probabilistic Reasoning – Computation and interpretation of probabilities • IV.B.1. Compute and interpret the probability of an event and its complement. • IV.B.2. Compute and interpret the probability of conditional and compound events. ◦ IV.C. Probabilistic Reasoning – Measurement involving probability • IV.C.1. Use probability to make informed decisions. ◦ VII.B. Problem Solving and Reasoning – Proportional reasoning

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		• VII.B.1. Use proportional reasoning to solve problems that require fractions, ratios, percentages, decimals, and proportions in a variety of contexts using multiple representations.

7.6E	**Find the probabilities of a simple event and its complement and describe the relationship between the two.**
	Supporting Standard
		Find
		
		THE PROBABILITIES OF A SIMPLE EVENT AND ITS COMPLEMENT AND DESCRIBE THE RELATIONSHIP BETWEEN THE TWO
		
		Including, but not limited to:
		
		• Positive rational numbers – the set of numbers that can be expressed as a fraction $\frac{a}{b}$, where a and b are counting (natural) numbers
		• Various forms of positive rational numbers
		  ◦ Counting (natural) numbers
		  ◦ Decimals
		  ◦ Fractions
		  ◦ Percents
		• Event – a probable situation or condition
		• Outcome – the result of an action or event
		• Sample space – a set of all possible outcomes of one or more events
		• Probability – a ratio between the number of desired outcomes to the total possible outcomes, $0 \leq p \leq 1$
		  ◦ Probability = $\frac{\text{number of favorable outcomes}}{\text{total number of outcomes}}$
		  ◦ Notation for probability
		  • P(event)
		  ◦ The closer a probability of an outcome is to 1, the more likely the outcome will occur;

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		whereas, the closer a probability of an outcome is to 0, the less likely the outcome will occur.
		• Various types of simple experiments
		• Simple event – a set or subset of outcomes from a single action or activity where the outcomes cannot be subdivided (e.g., flipping a coin (heads or tails), rolling of a number cube (a specific number when rolled, odd or even, prime or composite), spinning a spinner for a particular color or number, etc.)
		• Complement of an event – the probability of the non-occurrence of a desired outcome
		  ◦ The complement can be addressed by determining the probability of an event and subtracting that probability from 1 or by using the sample space to eliminate the possible outcomes of a given event and determining the probability of the remaining outcomes of the given event.
		  ◦ The outcomes of a simple event and its complement complete the sample space.
		• Representation of probability and complements as a fraction, decimal, or percent
		• Relationship between a simple event and its complement expressed as a ratio or numerical expression.
		  ◦ The sum of the probability of a simple event and its complement will always be 1.
		
		Note(s):
		
		• Grade Level(s):
		  ◦ Grade 7 introduces finding the probabilities of a simple event and its complement and describing the relationship between the two.
		  ◦ Various mathematical process standards will be applied to this student expectation as appropriate.
		• TxRCFP:
		  ◦ Representing and applying proportional relationships
		• TxCCRS:
		  ◦ I.A. Numeric Reasoning – Number representations and operations
		  • I.A.2. Perform computations with rational and irrational numbers.

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		◦ IV.B. Probabilistic Reasoning – Computation and interpretation of probabilities • IV.B.1. Compute and interpret the probability of an event and its complement. • IV.B.2. Compute and interpret the probability of conditional and compound events. ◦ VII.B. Problem Solving and Reasoning – Proportional reasoning • VII.B.1. Use proportional reasoning to solve problems that require fractions, ratios, percentages, decimals, and proportions in a variety of contexts using multiple representations.
7.6F	**Use data from a random sample to make inferences about a population.**	Use DATA FROM A RANDOM SAMPLE TO MAKE INFERENCES ABOUT A POPULATION Including, but not limited to: • Positive rational numbers – the set of numbers that can be expressed as a fraction $\frac{a}{b}$, where *a* and *b* are counting (natural) numbers • Various forms of positive rational numbers ◦ Counting (natural) numbers ◦ Decimals ◦ Fractions ◦ Percents • Data – information that is collected about people, events, or objects • Inference – a conclusion or prediction based on data • Population – total collection of persons, objects, or items of interest • Sample – a subset of the population selected in order to make inferences about the entire population • Random sample – a subset of the population selected without bias in order to make inferences about the entire population

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		◦ Random samples are more likely to contain data that can be used to make predictions about a whole population. • Data from a random sample given or collected in various forms ◦ Verbal ◦ Tabular (vertical/horizontal) ◦ Graphical • Inferences based on random sample ◦ Qualitative – a broad subjective description (e.g., the probability of an event occurring is certain, more likely, not likely, equally likely, or impossible.) ◦ Quantitative – a narrowed objective description associated with a quantity (e.g., the probability of selecting a consonant from the word EXPERIMENT is 1.5 times as likely as selecting a vowel from the same word, etc.) • The size of a sample influences the strength of the inference about the population. ◦ The larger the sample, the stronger the inference about the population. ◦ The smaller the sample, the weaker the inference about the population. • Proportional reasoning from data in a random sample to make inferences about the population Note(s): • Grade Level(s): ◦ Grade 7 introduces using data from random samples to make inferences about a population. ◦ Various mathematical process standards will be applied to this student expectation as appropriate. • TxRCFP: ◦ Representing and applying proportional relationships • TxCCRS: ◦ I.A. Numeric Reasoning – Number representations and operations • I.A.2. Perform computations with rational and irrational numbers. ◦ IV.C. Probabilistic Reasoning – Measurement involving probability

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		• IV.C.1. Use probability to make informed decisions. ◦ V.C. Statistical Reasoning – Analyze, interpret, and draw conclusions from data • V.C.3. Make predictions using summary statistics. ◦ VII.B. Problem Solving and Reasoning – Proportional reasoning • VII.B.1. Use proportional reasoning to solve problems that require fractions, ratios, percentages, decimals, and proportions in a variety of contexts using multiple representations. ◦ VIII.B. Communication and Representation – Interpretation of mathematical work • VIII.B.2. Summarize and interpret mathematical information provided orally, visually, or in written form within the given context. ◦ IX.B. Connections – Connections of mathematics to nature, real-world situations, and everyday life • IX.B.1. Use multiple representations to demonstrate links between mathematical and real-world situations.
7.6H	**Solve problems using qualitative and quantitative predictions and comparisons from simple experiments.** ***Readiness Standard***	Solve PROBLEMS USING QUALITATIVE AND QUANTITATIVE PREDICTIONS AND COMPARISONS FROM SIMPLE EXPERIMENTS Including, but not limited to: • Positive rational numbers – the set of numbers that can be expressed as a fraction $\frac{a}{b}$, where *a* and *b* are counting (natural) numbers • Various forms of positive rational numbers ◦ Counting (natural) numbers ◦ Decimals ◦ Fractions

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		◦ Percents • Event – a probable situation or condition • Outcome – the result of an action or event • Sample space – a set of all possible outcomes of one or more events • Probability – a ratio between the number of desired outcomes to the total possible outcomes, $0 \leq p \leq 1$ ◦ Probability = $\frac{\text{number of favorable outcomes}}{\text{total number of outcomes}}$ ◦ Notation for probability • P(event) ◦ The closer a probability of an outcome is to 1, the more likely the outcome will occur; whereas, the closer a probability of an outcome is to 0, the less likely the outcome will occur. • Simple experiment – an experiment with one simple event ◦ Various types of simple experiments • Theoretical data – the possible outcomes of an event without conducting an experiment • Experimental data – the data collected or observed from the outcomes of an experiment • Predictions and comparisons ◦ Qualitative – a broad subjective description (e.g., the probability of an event occurring is certain, more likely, not likely, equally likely, or impossible.) ◦ Quantitative – a narrowed objective description associated with a quantity (e.g., the probability of selecting a consonant from the word EXPERIMENT is 1.5 times as likely as selecting a vowel from the same word, etc.) • Proportional reasoning to make predictions and comparisons from simple experiments Note(s): • Grade Level(s): ◦ Grade 7 introduces solving problems using qualitative and quantitative predictions and comparisons from simple experiments.

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		◦ Various mathematical process standards will be applied to this student expectation as appropriate. • TxRCFP: ◦ Representing and applying proportional relationships • TxCCRS: ◦ I.A. Numeric Reasoning – Number representations and operations • I.A.2. Perform computations with rational and irrational numbers. ◦ IV.C. Probabilistic Reasoning – Measurement involving probability • IV.C.1. Use probability to make informed decisions. ◦ VII.A. Problem Solving and Reasoning – Mathematical problem solving • VII.A.3. Determine a solution.
7.6I	**Determine experimental and theoretical probabilities related to simple and compound events using data and sample spaces.** ***Readiness Standard***	Determine EXPERIMENTAL AND THEORETICAL PROBABILITIES RELATED TO SIMPLE AND COMPOUND EVENTS USING DATA AND SAMPLE SPACES Including, but not limited to: • Positive rational numbers – the set of numbers that can be expressed as a fraction $\frac{a}{b}$, where *a* and *b* are counting (natural) numbers • Various forms of positive rational numbers ◦ Counting (natural) numbers ◦ Decimals ◦ Fractions ◦ Percents • Event – a probable situation or condition • Outcome – the result of an action or event

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		• Mutually exclusive events – events that cannot happen at the same time
		• Sample space – a set of all possible outcomes of one or more events
		  ◦ Various representations of sample space
		  • Lists
		  • Tree diagrams
		  • Tables
		  ◦ Fundamental Counting Principle – if one event has *a* possible outcomes and a second independent event has *b* possible outcomes, then there are $a \cdot b$ total possible outcomes for the two events together
		  • This principle can be applied to determine the sample space for more than two events.
		• Probability – a ratio between the number of desired outcomes to the total possible outcomes, $0 \leq p \leq 1$
		  ◦ Probability = $\frac{\text{number of favorable outcomes}}{\text{total number of outcomes}}$
		  ◦ Notation for probability
		  • P(event)
		  ◦ The closer a probability of an outcome is to 1, the more likely the outcome will occur; whereas, the closer a probability of an outcome is to 0, the less likely the outcome will occur.
		• Theoretical probability – the likelihood of an event occurring predicted by using formulas and mathematical calculations without conducting an experiment
		  ◦ Sample spaces should be used for theoretical probabilities, and data should be used for experimental probabilities.
		• Experimental probability – the likelihood of an event occurring from the outcomes of an experiment
		  ◦ Data should be used for experimental probabilities, and sample spaces should be used for theoretical probabilities,
		• Various types of experiments
		• Representation of probability as a fraction, decimal, or percent

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		• Complement of an event – the probability of the non-occurrence of a desired outcome
		  ◦ The outcomes of an event and its complement complete the sample space.
		• Relationship between an event and its complement expressed as a ratio or numerical expression
		  ◦ The sum of the probability of an event and its complement will always be 1.
		• Relationship between theoretical and experimental probability
		  ◦ Law of large numbers – as the number of trials in an experiment increases, the experimental probability of an event approaches the theoretical probability of the same event, meaning the difference between the experimental and theoretical probability will be closer to zero
		• Simple event – a set or subset of outcomes from a single action or activity where the outcomes cannot be subdivided (e.g., flipping a coin (heads or tails), rolling of a number cube (a specific number when rolled, odd or even, prime or composite), spinning a spinner for a particular color or number, etc.)
		• Compound events – a set of outcomes from a combination of actions or activities where the outcomes can be subdivided (e.g., flipping a coin and rolling a number cube, drawing tiles out of a bag and spinning a spinner, etc.)
		  ◦ Independent events – the outcome from one action or activity does not affect the probability of the outcome(s) of any subsequent action(s) or activity(s); usually involves compound events
		  ◦ Dependent events – the outcome from one action or activity may affect the probability of the outcome(s) of any subsequent action(s) or activity(s); usually involves compound events
		
		Note(s):
		
		• Grade Level(s):
		  ◦ Grade 7 introduces determining experimental and theoretical probabilities related to simple and compound events using data and sample spaces.
		  ◦ Geometry will determine probabilities based on area to solve contextual problems.

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		◦ Various mathematical process standards will be applied to this student expectation as appropriate. • TxRCFP: ◦ Representing and applying proportional relationships • TxCCRS: ◦ I.A. Numeric Reasoning – Number representations and operations • I.A.2. Perform computations with rational and irrational numbers. ◦ IV.B. Probabilistic Reasoning – Computation and interpretation of probabilities • IV.B.1. Compute and interpret the probability of an event and its complement. • IV.B.2. Compute and interpret the probability of conditional and compound events. ◦ VII.B. Problem Solving and Reasoning – Proportional reasoning • VII.B.1. Use proportional reasoning to solve problems that require fractions, ratios, percentages, decimals, and proportions in a variety of contexts using multiple representations.

ELPS#	SUBSECTION C: CROSS-CURRICULAR SECOND LANGUAGE ACQUISITION ESSENTIAL KNOWLEDGE AND SKILLS.

The English Language Proficiency Standards (ELPS), as required by 19 Texas Administrative Code, Chapter 74, Subchapter A, §74.4, outline English language proficiency level descriptors and student expectations for English language learners (ELLs). School districts are required to implement ELPS as an integral part of each subject in the required curriculum.

School districts shall provide instruction in the knowledge and skills of the foundation and enrichment curriculum in a manner that is linguistically accommodated commensurate with the student's levels of English language proficiency to ensure that the student learns the knowledge and skills in the required curriculum.

School districts shall provide content-based instruction including the cross-curricular second language acquisition essential knowledge and skills in subsection (c) of the ELPS in a manner that is linguistically accommodated to help the student acquire English language proficiency.
http://ritter.tea.state.tx.us/rules/tac/chapter074/ch074a.html#74.4

Choose appropriate ELPS to support instruction.

Instructional Focus Document
Grade 7 Mathematics

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