

## 2021 - 2022, HS, Applied Mathematical Concepts

The following Practice Standards and Literacy Skills will be used throughout the course:

### Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

### Literacy Skills for Mathematical Proficiency

1. Use multiple reading strategies.
2. Understand and use correct mathematical vocabulary.
3. Discuss and articulate mathematical ideas.
4. Write mathematical arguments.

## Quarter 1

### Ongoing Standards

**Note to Teachers:** *The following ongoing standards will be practiced all year long and embedded into your instruction instead of being taught in isolation.*

**AM.A.PS.A.1** Apply problem solving strategies to real-world situations. Strategies include, but are not limited to making orderly lists or tables, drawing diagrams, considering simpler problems, looking for patterns, working backwards, guess and check, using logical reasoning, etc.

**A2.N.Q.A.1** Identify, interpret, and justify appropriate quantities for the purpose of descriptive modeling.

Standards	Student Friendly "I Can" Statements
<b>AM.WCE.1</b> Create spreadsheets to represent data in various formats.	I can create a Google Sheet or Excel document that can represent data in various formats.
<b>AM.WCE.2</b> Create and use spreadsheet calculators.	I can create spreadsheet "calculators" that allow for user input and provide correct results.
<b>AM.WCE.3</b> Analyze data by interpreting spreadsheet solutions.	I can interpret solutions to analyze data I have used to create a spreadsheet.
<b>AM.N.NQ.A.1</b> Define interest, compound interest, annuities, sinking funds, amortizations, annuity's, future value, and present value.	I can calculate simple and compound interest.  I can apply simple interest to questions involving future value, present value, interest rate, and interest owed.
<b>AM.N.NQ.A.2</b> Recognize the importance of applying a financial model to business.	I can recognize the importance of applying a financial model to business.

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<b>AM.N.NQ.A.3</b> Determine future value and present value of an annuity.	I can apply simple interest rate calculations to determine discounts, face value and final prices of a simple discount loan.  I can interpret a compounding period (e.g. monthly) as a number of compounding periods per year (i.e. $n=12$ ).
<b>AM.N.NQ.A.4</b> Determine the amortization schedule for an annuity and a home mortgage.	I can determine the payment amount and amortization schedule for an annuity, such as a home mortgage.
<b>AM.N.NQ.B.5</b> Apply financial mathematics to depreciation schedules.	I can create and compare different types of depreciation schedules.
<b>AM.N.NQ.B.6</b> Solve contextual problems involving financial decision-making.	I can use the mathematics of finance to justify a particular financial decision.
<b>AM.N.NQ.B.7</b> Apply arithmetic and geometric sequences to simple and compound interest, annuities, loans, and amortization.	I can apply compound interest to questions involving future value, present value, interest rate, and interest owed.  I can determine the doubling time for a principal growing with compound interest.  I can estimate the doubling time using the rule of seventy-two.
<b>AM.N.NQ.B.8</b> Solve problems in mathematics of finance involving compound interest using exponential and logarithmic techniques.	I can solve problems involving compound interest using exponential and logarithmic techniques
<b>AM.N.NQ.C.9</b> Know when to use transcendental functions to accomplish various application purposes such as predicting population growth.	I can determine the appropriate exponential or logarithmic technique to use to solve a variety of real-world problems such as predicting population growth.

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<b>AM.N.NQ.C.10</b> Use orders of magnitude estimates for determining an appropriate model for a contextual situation.	I can develop an appropriate model for contextual problems using orders of magnitude estimates.

### Quarter 2

Standards	Student Friendly "I Can" Statements
<b>AM.A.LP.A.1</b> Use mathematical models involving equations and systems of equations to represent, interpret, and analyze quantitative relationships, change in various contexts, and other real-world phenomena.	I can use equations and systems of equations to model real-world problems.
<b>AM.A.LP.A.2</b> Read, interpret, and solve linear programming problems graphically and by computational methods.	I can graph a system of inequalities. I can define a feasible region and determine its boundary points.
<b>AM.A.LP.B.3</b> Use linear programming to solve optimization problems.	I can identify constraints from a problem context and represent them algebraically. I can create an objective (optimization) function from a problem context.
<b>AM.A.LP.B.4</b> Interpret the meaning of the maximum or minimum value in terms of the objective function.	I can explain that the optimal values for an objective function always fall at the boundary points of that function's feasible region. I can find optimal values for a given objective function subject to given constraints.
<b>AM.D.CR.A.1</b> Use permutations, combinations, and the multiplication principle to solve counting problems.	I can solve counting problems using permutations, combinations, and the multiplication principle
<b>AM.D.CR.A.2</b> Design and interpret simple experiments using tree-diagrams, permutations, and combinations.	I can create and use formulas and tree diagrams to solve probability problems.
<b>AM.D.CR.A.3</b> Apply counting principles to probabilistic situations involving equally likely outcomes.	I can use counting principles to find probabilities. I can use the Fundamental Counting Principle to find the number of ways two or more events can occur.

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<b>AM.D.CR.A.4</b> Solve counting problems by using Venn diagrams and show relationships modeled by the Venn diagram.	I can interpret Venn diagrams to analyze data subsets.
<b>AM.D.CR.A.5</b> Use permutations and combinations to compute probabilities of compound events and solve problems.	I can create and use formulas and tree diagrams to solve probability problems. I can find the number of ways a group of objects can be arranged in order.
<b>AM.D.CR.B.6</b> Apply the Law of Large numbers to contextual situations.	I can demonstrate an understanding of the Law of Large Numbers.
<b>AM.D.CR.B.7</b> Discuss the various examples and consequences of innumeracy; consider poor estimation, improper experimental design, inappropriate comparisons, and scientific notation comparisons.	I can, through examples, discuss the impact of innumeracy as it relates to poor estimation, poor experimental design, and inappropriate comparisons.
<b>AM.D.CR.B.8</b> Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values. <b>a.</b> Find the expected payoff for a game of chance. For example, find the expected winnings from a state lottery ticket or a game at a fast-food restaurant. <b>b.</b> Evaluate and compare strategies on the basis of expected values. For example, compare a high-deductible versus a low-deductible automobile insurance policy using various, but reasonable, chances of having a minor or a major accident.	I can use permutations and combinations to compute probabilities using the formula and using technology. I can find the expected payoff for a game of chance. I can weigh possible outcomes by assigning probabilities to payoff values and finding expected values.
<b>AM.D.CR.B.9</b> Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).	I can use a random number generator to make predictions. I can use probabilities to make fair decisions.
<b>AM.D.CR.B.10</b> Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).	I can use probability to analyze decisions and strategies.

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Quarter 3

Standards	Student Friendly "I Can" Statements
<p><b>AM.D.ID.A.1</b> Organize data for problem solving.</p>	<p>I am familiar with the vocabulary of statistics and can use it to describe data.</p> <p>I can collect data and have a toolkit of ways to represent and describe the data.</p>
<p><b>AM.D.ID.A.2</b> Use a variety of counting methods to organize information, determine probabilities, and solve problems.</p>	<p>I can identify whether a counting situation requires applying the fundamental counting principle, a combination, or a permutation.</p> <p>I can identify the sample space for a given probability experiment.</p>
<p><b>AM.D.ID.A.3</b> Translate from one representation of data to another, e.g., a bar graph to a circle graph.</p>	<p>I can use circle graphs to display data in percentages and line graphs to display data over time.</p>
<p><b>AM.D.ID.A.4</b> Calculate and interpret statistical problems using measures of central tendency and graphs.</p>	<p>I can calculate the mean, median, and mode of a data set and use them to explain trends.</p> <p>I can calculate a weighted mean or the mean of data in a frequency table.</p>
<p><b>AM.D.ID.A.5</b> Calculate expected value, e.g., to determine the fair price of an investment.</p>	<p>I can interpret a probability distribution table or histogram.</p> <p>I can apply expected value to real-world situations, such as business decisions.</p> <p>I can calculate and interpret the expected value of a probability distribution.</p> <p>I can use expected value to compare and contrast two investment options.</p>
<p><b>AM.D.ID.A.6</b> Analyze survey data using Venn diagrams.</p>	<p>I can create a Venn diagram from survey data or other similar problem contexts.</p> <p>I can use a Venn diagram to analyze and draw conclusions about survey data.</p>
<p><b>AM.D.ID.A.7</b> Evaluate and compare two investments or strategies, where one investment or strategy is safer but has lower expected value. Include large and small investments and situations with serious consequences.</p>	<p>I can determine how long it will take for a given principal to grow to a given future value under compound interest.</p> <p>I can determine the effective rate for a given nominal rate and compounding</p>

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	<p>period.</p> <p>I can calculate the future and present value of ordinary annuities (including sinking funds).</p> <p>I can apply financial mathematics to depreciation schedules.</p>
<p><b>AM.D.ND.A.1</b> Calculate the mean (expected value) and standard deviation of both a random variable and a linear transformation of a random variable.</p>	<p>I can calculate the mean and standard deviation of both a random variable and a linear transformation of a random variable.</p>
<p><b>AM.D.ND.A.2</b> Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.</p>	<p>I can calculate standard (z) scores.</p> <p>I can interpret a z-table and use technology to calculate percentages.</p>
<p><b>AM.D.CI.A.1</b> Understand the meaning of confidence level, of confidence intervals, and the properties of confidence intervals.</p>	<p>I can construct confidence intervals for a population mean.</p> <p>I can find the standard error of the mean.</p> <p>I can construct a confidence interval when <math>n &lt; 30</math>, the population is normally distributed, and the standard deviation is unknown.</p>
<p><b>AM.D.CI.A.2</b> Construct and interpret a large sample confidence interval for a proportion and for a difference between two proportions.</p>	<p>I can construct a confidence interval for a population proportion.</p> <p>I can construct a confidence interval for a difference between two proportions.</p>
<p><b>AM.D.CI.A.3</b> Construct the confidence interval for a mean and for a difference between two means.</p>	<p>I can interpret confidence intervals for a population mean.</p> <p>I can construct the confidence interval for a difference between two means.</p>

Standards	Student Friendly "I Can" Statements
<b>AM.A.LB.A.1</b> Develop the symbols and properties of Boolean algebra; connect Boolean algebra to standard logic.	I can describe Boolean logic in words and with symbols.
<b>AM.A.LB.A.2</b> Construct truth tables to determine the validity of an argument.	I can construct a truth table, determine the truth value of a statement, and identify whether or not a given argument is valid using truth tables.
<b>AM.A.LB.B.3</b> Analyze basic electrical networks; compare the networks to Boolean Algebra configurations.	I can represent logical statements with networks.
<b>AM.A.LB.B.4</b> Develop electrical networks and translate them into Boolean Algebra equations.	I can develop electrical networks and translate them into Boolean Algebra equations.
<b>AM.G.L.A.1</b> Define the order of operations for the logical operators.	I can construct the conjunction, disjunction, conditional, or biconditional of two given statements.
<b>AM.G.L.A.2</b> Define conjunction, disjunction, negation, conditional, and biconditional.	I can form the negation of a simple or quantified statement.
<b>AM.G.L.A.3</b> Solve a variety of logic puzzles.	I can solve a logic puzzle by drawing logical conclusions from the information given.
<b>AM.G.L.A.4</b> Construct and use a truth table to draw conclusions about a statement.	I can construct a truth table, determine the truth value of a statement, and identify whether or not a given argument is valid using truth tables.
<b>AM.G.L.B.5</b> Apply the laws of logic to judge the validity of arguments.	I can identify several standard forms of argument and common fallacies.
<b>AM.G.L.B.6</b> Give counterexamples to disprove statements.	I can identify a counterexample that will disprove a given statement if one exists.
<b>AM.G.L.B.7</b> Analyze arguments with quantifiers using Venn diagrams.	I can interpret outcomes for solving applications involving Venn diagrams.
<b>AM.G.L.B.8</b> Represent logical statements with networks	I can represent quantified statements with Euler diagrams.  I can represent logical statements with networks.