Arizona's Common Core Standards

Mathematics Curriculum Map

Honors Business Math/Brief Calculus

The Mathematical Practices: Student Dispositions and Related Teacher Actions and Questions

Mathematics Practices		Student Dispositions	Teacher Actions	Related Questions
Overarching habits of mind of a productive math thinker	**1. Make sense of problems and persevere in solving them**	• Have or value sense-making • Use patience and persistence to listen to others • Be able to use strategies • Use self-evaluation and redirections • Be able to show or use multiple representations • Communicate both verbally and in written format • Be able to deduce what is a reasonable solution	• Provide open-ended and rich problems • Ask probing questions • Model multiple problem-solving strategies through Think- Alouds • Promotes and values discourse and collaboration • Cross-curricular integrations • Probe student responses (correct or incorrect) for understanding and multiple approaches • Provide solutions	• How would you describe the problem in your own words? • How would you describe what you are trying to find? • What do you notice about...? • What information is given in the problem? • Describe the relationship between the quantities. • Describe what you have already tried. What might you change? • Talk me through the steps you've used to this point. • What steps in the process are you most confident about? • What are some other strategies you might try? • What are some other problems that are similar to this one? • How might you use one of your previous problems to help you begin? • How else might you organize...represent... show...?
	6. Attend to precision	• Communicate with precision-orally & written • Use mathematics concepts and vocabulary appropriately. • State meaning of symbols and use appropriately • Attend to units/labeling/tools accurately • Carefully formulate explanations • Calculate accurately and efficiently • Express answers in terms of context • Formulate and make use of definitions with others and their own reasoning.	• Think aloud/Talk aloud • Explicit instruction given through use of think aloud/talk aloud • Guided Inquiry including teacher gives problem, students work together to solve problems, and debriefing time for sharing and comparing strategies • Probing questions targeting content of study	• What mathematical terms apply in this situation? • How did you know your solution was reasonable? • Explain how you might show that your solution answers the problem. • What would be a more efficient strategy? • How are you showing the meaning of the quantities? • What symbols or mathematical notations are important in this problem? • What mathematical language...,definitions..., properties can you use to explain...? • How could you test your solution to see if it answers the problem?

Actions and dispositions from NCSM Summer Leadership Academy, Atlanta, GA • Draft, June 22, 2011)
Most questions from all Grades Common Core State Standards Flip Book

The Mathematical Practices: Student Dispositions and Related Teacher Actions and Questions

Mathematics Practices		Student Dispositions	Teacher Actions	Related Questions
Reasoning and Explaining	**2. Reason abstractly and quantitatively**	• Create multiple representations • Interpret problems in contexts • Estimate first/answer reasonable • Make connections • Represent symbolically • Visualize problems • Talk about problems, real life situations • Attending to units • Using context to think about a problem	• Develop opportunities for problem solving • Provide opportunities for students to listen to the reasoning of other students • Give time for processing and discussing • Tie content areas together to help make connections • Give real world situations • Think aloud for student benefit • Value invented strategies and representations • Less emphasis on the answer	• What do the numbers used in the problem represent? • What is the relationship of the quantities? • How is _____ related to _____? • What is the relationship between _____ and _____? • What does _____ mean to you? (e.g. symbol, quantity, diagram) • What properties might we use to find a solution? • How did you decide in this task that you needed to use...? • Could we have used another operation or property to solve this task? Why or why not?
	3. Construct viable arguments and critique the reasoning of others	• Ask questions • Use examples and non-examples • Analyze data • Use objects, drawings, diagrams, and actions • Students develop ideas about mathematics and support their reasoning • Listen and respond to others • Encourage the use of mathematics vocabulary	• Create a safe environment for risk-taking and critiquing with respect • Model each key student disposition • Provide complex, rigorous tasks that foster deep thinking • Provide time for student discourse • Plan effective questions and student grouping	• What mathematical evidence would support your solution? • How can we be sure that...? / How could you prove that...? • Will it still work if...? • What were you considering when...? • How did you decide to try that strategy? • How did you test whether your approach worked? • How did you decide what the problem was asking you to find? • Did you try a method that did not work? Why didn't it work? Could it work? • What is the same and what is different about...? • How could you demonstrate a counter-example?

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The Mathematical Practices: Student Dispositions and Related Teacher Actions and Questions

Mathematics Practices	Student Dispositions	Teacher Actions	Related Questions
Modeling and Using Tools 4. **Model with mathematics**	• Realize they use mathematics (numbers and symbols) to solve/work out real-life situations • When approached with several factors in everyday situations, be able to pull out important information needed to solve a problem. • Show evidence that they can use their mathematical results to think about a problem and determine if the results are reasonable. If not, go back and look for more information • Make sense of the mathematics	• Allow time for the process to take place (model, make graphs, etc.) • Model desired behaviors (think alouds) and thought processes (questioning, revision, reflection/written) • Make appropriate tools available • Create an emotionally safe environment where risk taking is valued • Provide meaningful, real world, authentic, performance-based tasks (non-traditional work problems)	• What number model could you construct to represent the problem? • What are some ways to represent the quantities? • What is an equation or expression that matches the diagram, number line, chart, table, and your actions with the manipulatives? • Where did you see one of the quantities in the task in your equation or expression? What does each number in the equation mean? • How would it help to create a diagram, graph, table...? • What are some ways to visually represent...? • What formula might apply in this situation?
5. **Use appropriate tools strategically**	• Choose the appropriate tool to solve a given problem and deepen their conceptual understanding (paper/pencil, ruler, base 10 blocks, compass, protractor) • Choose the appropriate technological tool to solve a given problem and deepen their conceptual understanding (e.g., spreadsheet, geometry software, calculator, web 2.0 tools)	• Maintain appropriate knowledge of appropriate tools • Effective modeling of the tools available, their benefits and limitations • Model a situation where the decision needs to be made as to which tool should be used	• What mathematical tools can we use to visualize and represent the situation? • Which tool is more efficient? Why do you think so? • What information do you have? • What do you know that is not stated in the problem? • What approach are you considering trying first? • What estimate did you make for the solution? • In this situation would it be helpful to use...a graph..., number line..., ruler..., diagram..., calculator..., manipulative? • Why was it helpful to use...? • What can using a _____ show us that _____may not? • In what situations might it be more informative or helpful to use...?

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The Mathematical Practices: Student Dispositions and Related Teacher Actions and Questions

Mathematics Practices		Student Dispositions	Teacher Actions	Related Questions
Seeing structure and generalizing	**7. Look for and make use of structure**	• Look for, interpret, and identify patterns and structures • Make connections to skills and strategies previously learned to solve new problems/tasks • Reflect and recognize various structures in mathematics • Breakdown complex problems into simpler, more manageable chunks	• Be quiet and allow students to think aloud • Facilitate learning by using open-ended questioning to assist students in exploration • Careful selection of tasks that allow for students to make connections • Allow time for student discussion and processing • Foster persistence/stamina in problem solving • Provide graphic organizers or record student responses strategically to allow students to discover patters	• What observations do you make about...? • What do you notice when...? • What parts of the problem might you eliminate..., simplify...? • What patterns do you find in...? • How do you know if something is a pattern? • What ideas that we have learned before were useful in solving this problem? • What are some other problems that are similar to this one? • How does this relate to...? • In what ways does this problem connect to other mathematical concepts?
	8. Look for and express regularity in repeated reasoning	• Identify patterns and make generalizations • Continually evaluate reasonableness of intermediate results • Maintain oversight of the process	• Provide rich and varied tasks that allow students to generalize relationships and methods, and build on prior mathematical knowledge • Provide adequate time for exploration • Provide time for dialogue and reflection • Ask deliberate questions that enable students to reflect on their own thinking • Create strategic and intentional check in points during student work time.	• Explain how this strategy works in other situations? • Is this always true, sometimes true or never true? • How would we prove that...? • What do you notice about...? • What is happening in this situation? • What would happen if...? • Is there a mathematical rule for...? • What predictions or generalizations can this pattern support? • What mathematical consistencies do you notice?

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Honors Business Math/Brief Calculus Blueprint Semester 1			
Topic: Linear Equations and Functions (Prerequisites to 212 I)			
2010 AZ Mathematics Standards	**ACT College Readiness Standards**	**Standards for Mathematical Practice**	**Maricopa Community Colleges Syllabus Alignment and Resources**
HS.F-IF.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.* HS.F-IF.7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. a. Graph linear and quadratic functions and show intercepts, maxima, and minima.		HS.MP.2. Reason abstractly and quantitatively. HS.MP.4. Model with mathematics. HS.MP.5. Use appropriate tools strategically. HS.MP.6. Attend to precision.	Resources:

<table>
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Semester 1</td></tr>
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HS.F-BF.1. Write a function that describes a relationship between two quantities. HS.F-IF.8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. CUSD-HS.F-BF.6 Write a system of three linear equations in three variables that models the relationship described in a contextual situation.		HS.MP.1. Make sense of problems and persevere in solving them. HS.MP.2. Reason abstractly and quantitatively. HS.MP.4. Model with mathematics. HS.MP.5. Use appropriate tools strategically. HS.MP.6. Attend to precision. HS.MP.7. Look for and make use of structure. HS.MP.8. Look for and express regularity in repeated reasoning.	Resources:
CUSD-HS.F-LE.6 Use linear modeling with real world applications. HS.F-LE.5. Interpret the parameters in a linear or exponential function in terms of a context. HS.A-CED.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.		HS.MP.2. Reason abstractly and quantitatively. HS.MP.4. Model with mathematics. HS.MP.5. Use appropriate tools strategically.	Resources:

Honors Business Math/Brief Calculus Blueprint
Semester 1

Topic: Quadratics (Prerequisite 212I)			
2010 AZ Mathematics Standards	**ACT College Readiness Standards**	**Standards for Mathematical Practice**	**Maricopa Community Colleges Syllabus Alignment and Resources**
HS.F-IF.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.* HS.F-IF.7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. b. Graph linear and **quadratic** functions and show intercepts, maxima, and minima.		HS.MP.2. Reason abstractly and quantitatively. HS.MP.4. Model with mathematics. HS.MP.5. Use appropriate tools strategically. HS.MP.6. Attend to precision.	Resources:

Honors Business Math/Brief Calculus Blueprint Semester 1			
HS.F-BF.1. Write a function that describes a relationship between two quantities. HS.F-IF.8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. CUSD c. Use Business contexts (e.g., Supply and Demand, market equilibrium, and the break-even point) to construct, interpret, compare, and analyze linear and exponential models. CUSD d. Model and interpret relationships in context using Curve Fitting.		HS.MP.1. Make sense of problems and persevere in solving them. HS.MP.2. Reason abstractly and quantitatively. HS.MP.4. Model with mathematics. HS.MP.5. Use appropriate tools strategically. HS.MP.6. Attend to precision. HS.MP.7. Look for and make use of structure. HS.MP.8. Look for and express regularity in repeated reasoning.	Resources:
HS.F-IF.7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.		HS.MP.5. Use appropriate tools strategically. HS.MP.6. Attend to precision.	Resources:

Honors Business Math/Brief Calculus Blueprint
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Topic: Matrices (217IIIA)			
2010 AZ Mathematics Standards	**ACT College Readiness Standards**	**Standards for Mathematical Practice**	**Maricopa Community Colleges Syllabus Alignment and Resources**
HS.N-VM.9. Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties.		HS.MP.2. Reason abstractly and quantitatively. HS.MP.6. Attend to precision.	Resources:
HS.N-VM.10. Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse. CUSD.HS.N-VM.13. Explore and use Gauss-Jordan Elimination.		HS.MP.2. Reason abstractly and quantitatively. HS.MP.6. Attend to precision.	MAT 217 IIIB Resources:
HS.N-VM.10. Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.		HS.MP.2. Reason abstractly and quantitatively. HS.MP.6. Attend to precision.	MAT 217 IIIC Resources:

Honors Business Math/Brief Calculus Blueprint Semester 1			
HS.N-VM.6. Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network. HS.A-REI.8. Represent a system of linear equations as a single matrix equation in a vector variable. HS.A-REI.9. Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3 × 3 or greater). CUSD-HS.A-REI.13 Understand and Apply Cramer's rule. CUSD-HS.A-REI.14 Use determinants strategically. ****Note that the intent of this group of standards is that they will be <u>taught</u> <u>through</u> <u>applications to the</u> <u>real world</u>.**		HS.MP.2. Reason abstractly and quantitatively. HS.MP.4. Model with mathematics. HS.MP.5. Use appropriate tools strategically. HS.MP.6. Attend to precision. HS.MP.7. Look for and make use of structure.	MAT 217 IIID MAT 217 IIIE Resources:

Honors Business Math/Brief Calculus Blueprint
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Topic: Linear Programming/Inequalities (217IIA, 217 IIB)

2010 AZ Mathematics Standards	ACT College Readiness Standards	Standards for Mathematical Practice	Maricopa Community Colleges Syllabus Alignment and Resources
HS.F-IF.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.* CUSD-HS.F-IF.11. For an inequality that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Attend to the following topics: • Simplex Method • Maximization, Duality/Minimization • Non-Unique Solutions • Mixed Constraints	Write equations and inequalities that require planning, manipulating, and/or solving.	HS.MP.2. Reason abstractly and quantitatively. HS.MP.4. Model with mathematics. HS.MP.5. Use appropriate tools strategically. HS.MP.6. Attend to precision.	Resources:

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HS.S-ID.7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.	Identify characteristics of graphs based on a set of conditions or on a general equation such as $y = ax^2 + c$. Draw conclusions based on a set of conditions. Solve multi-step geometry problems that involve integrating concepts, planning, visualization, and/or making connections with other content areas.	HS.MP.1. Make sense of problems and persevere in solving them. HS.MP.2. Reason abstractly and quantitatively. HS.MP.4. Model with mathematics. HS.MP.5. Use appropriate tools strategically. HS.MP.6. Attend to precision.	MAT 217 IIA Resources:

Topic: Exponential and Logarithm Functions (Prerequisite 212I)

2010 AZ Mathematics Standards	ACT College Readiness Standards	Standards for Mathematical Practice	Maricopa Community Colleges Syllabus Alignment and Resources
HS.F-IF.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.* *** Note: the functions modeled should be exponential or logarithmic.** HS-F-LE-4	Exhibit knowledge of logarithms and geometric sequences.	HS.MP.2. Reason abstractly and quantitatively. HS.MP.4. Model with mathematics. HS.MP.5. Use appropriate tools strategically. HS.MP.6. Attend to precision.	Resources:

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HS.F-IF.7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.		HS.MP.5. Use appropriate tools strategically. HS.MP.6. Attend to precision.	Resources:

Honors Business Math/Brief Calculus Blueprint Semester 1			
HS.F-IF.7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. HS.F-BF.1. Write a function that describes a relationship between two quantities. HS.F-BF.5. Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents. CUSD-HS.F-BF.7 Use the Properties of Logarithms to solve problems and simplify expressions and equations. HS.F-LE.1. Distinguish between situations that can be modeled with linear functions and with exponential functions. CUSD-HS.F-LE.7. Solve exponential equations.		HS.MP.1. Make sense of problems and persevere in solving them. HS.MP.2. Reason abstractly and quantitatively. HS.MP.3. Construct viable arguments and critique the reasoning of others. HS.MP.4. Model with mathematics. HS.MP.5. Use appropriate tools strategically. HS.MP.6. Attend to precision. HS.MP.7. Look for and make use of structure. HS.MP.8. Look for and express regularity in repeated reasoning.	Resources:

Honors Business Math/Brief Calculus Blueprint Semester 1			
Topic: Finance			
2010 AZ Mathematics Standards	**ACT College Readiness Standards**	**Standards for Mathematical Practice**	**Maricopa Community Colleges Syllabus Alignment and Resources**
HS.F-LE.5. Interpret the parameters in a linear or exponential function in terms of a context (e.g., simple interest).		HS.MP.2. Reason abstractly and quantitatively. HS.MP.4. Model with mathematics.	Resources:
HS.F-LE.5. Interpret the parameters in a linear or exponential function in terms of a context. (e.g., compound interest).		HS.MP.2. Reason abstractly and quantitatively. HS.MP.4. Model with mathematics.	Resources:
HS.F-LE.5. Interpret the parameters in a linear or exponential function in terms of a context (e.g., future and present value of annuities).		HS.MP.2. Reason abstractly and quantitatively. HS.MP.4. Model with mathematics.	Resources:

Honors Business Math/Brief Calculus Blueprint
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HS.F-LE.1. Distinguish between situations that can be modeled with linear functions and with exponential functions. c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another (e.g., Loans and Amortization).		HS.MP.3. Construct viable arguments and critique the reasoning of others. HS.MP.4. Model with mathematics. HS.MP.5. Use appropriate tools strategically. HS.MP.7. Look for and make use of structure. HS.MP.8. Look for and express regularity in repeated reasoning.	Resources:

| Honors Business Math/Brief Calculus Blueprint Semester 1			
Topic: Introduction to Probability			
2010 AZ Mathematics Standards	**ACT College Readiness Standards**	**Standards for Mathematical Practice**	**Maricopa Community Colleges Syllabus Alignment and Resources**
CUSD_ HS.S-IC.7 Model situations in context and use the model to answer questions and make predictions (e.g., Odds)			Resources:
HS.S-CP.1. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").		HS.MP.2. Reason abstractly and quantitatively. HS.MP.4. Model with mathematics. HS.MP.6. Attend to precision. HS.MP.7. Look for and make use of structure.	MAT 217 IVA Resources:

Honors Business Math/Brief Calculus Blueprint Semester 1

Explanations and Examples

HS.S-CP.1.

Intersection: The **intersection** of two sets A and B is the set of elements that are common to both set A **and** set B. It is denoted by $A \cap B$ and is read 'A intersection B'.

- $A \cap B$ in the diagram is {1, 5}
- this means: BOTH/AND
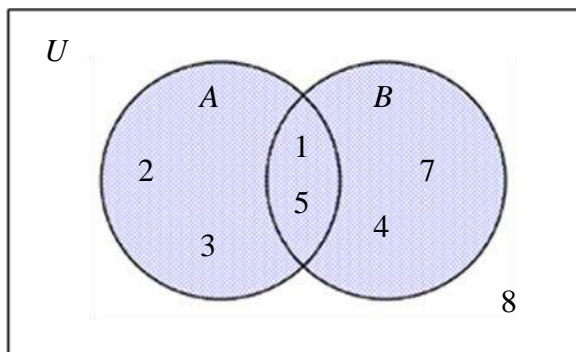
Union: The union of two sets A and B is the set of elements, which are in A or in B or in both. It is denoted by A **U** B and is read 'A union B'.

A **U** B in the diagram is {1, 2, 3, 4, 5, 7}

- this means: EITHER/OR/ANY
- could be both

Complement:: The complement of the set A **U** B is the set of elements that are members of the universal set U but are not in A **U** B. It is denoted by (A **U** B)'

- (A **U** B)' in the diagram is {8}

Honors Business Math/Brief Calculus Blueprint Semester 1			
HS.S-CP.2. Understand that two events *A* and *B* are independent if the probability of *A* and *B* occurring together is the product of their probabilities, and use this characterization to determine if they are independent.		HS.MP.2. Reason abstractly and quantitatively. HS.MP.4. Model with mathematics. HS.MP.6. Attend to precision. HS.MP.7. Look for and make use of structure.	MAT 217 IVD Resources:
HS.S-CP.3. Understand the conditional probability of *A* given *B* as *P*(*A* and *B*)/*P*(*B*), and interpret independence of *A* and *B* as saying that the conditional probability of *A* given *B* is the same as the probability of *A*, and the conditional probability of *B* given *A* is the same as the probability of *B*.	Exhibit knowledge of conditional and joint probability.	HS.MP.2. Reason abstractly and quantitatively. HS.MP.4. Model with mathematics. HS.MP.6. Attend to precision. HS.MP.7. Look for and make use of structure.	MAT 217 IVC Resources:

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HS.S-CP.5. Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. *For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.* HS.S-CP.6. Find the conditional probability of *A* given *B* as the fraction of *B*'s outcomes that also belong to *A*, and interpret the answer in terms of the model (e.g., using trees or Bayes Formula).		HS.MP.1. Make sense of problems and persevere in solving them. HS.MP.4. Model with mathematics. HS.MP.5. Use appropriate tools strategically. HS.MP.6. Attend to precision. HS.MP.7. Look for and make use of structure. HS.MP.8. Look for and express regularity in repeated reasoning.	MAT 217 IVE Resources:

Explanations and Examples
HS.S-CP.5.
Examples:
- What is the probability of drawing a heart from a standard deck of cards on a second draw, given that a heart was drawn on the first draw and not replaced? Are these events independent or dependent?
- At Johnson Middle School, the probability that a student takes computer science and French is 0.062. The probability that a student takes computer science is 0.43. What is the probability that a student takes French given that the student is taking computer science?

Honors Business Math/Brief Calculus Blueprint
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HS.S-MD.7. Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game). HS.S-CP.7. Apply the Addition Rule, $P(A$ or $B) = P(A) + P(B) – P(A$ and $B)$, and interpret the answer in terms of the model. HS.S-CP.8. Apply the general Multiplication Rule in a uniform probability model, $P(A$ and $B) = P(A)P(B|A) = P(B)P(A|B)$, and interpret the answer in terms of the model. HS.S-CP.9. Use permutations and combinations to compute probabilities of compound events and solve problems.		HS.MP.1. Make sense of problems and persevere in solving them. HS.MP.2. Reason abstractly and quantitatively. HS.MP.3. Construct viable arguments and critique the reasoning of others. HS.MP.4. Model with mathematics. HS.MP.5. Use appropriate tools strategically. HS.MP.6. Attend to precision. HS.MP.7. Look for and make use of structure.	MAT 217 IVB Resources:

Honors Business Math/Brief Calculus Blueprint
Semester 1

Explanations and Examples

HS.S-MD.7.
Students may use graphing calculators or programs, spreadsheets, or computer algebra systems to model and interpret parameters in linear, quadratic or exponential functions.

HS.S-CP.7.
Students could use graphing calculators, simulations, or applets to model probability experiments and interpret the outcomes.

Example:
- In a math class of 32 students, 18 are boys and 14 are girls. On a unit test, 5 boys and 7 girls made an A grade. If a student is chosen at random from the class, what is the probability of choosing a girl or an A student?

HS.S-CP.8.
Students could use graphing calculators, simulations, or applets to model probability experiments and interpret the outcomes.

HS.S-CP.9.
Students may use calculators or computers to determine sample spaces and probabilities.

Example:
You and two friends go to the grocery store and each buys a soda. If there are five different kinds of soda, and each friend is equally likely to buy each variety, what is the probability that no one buys the same kind?

Honors Business Math/Brief Calculus Blueprint Semester 1			
HS.S-MD.5. Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values. a. 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. 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.* HS.S-MD.6. Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator, Markov Chains).		HS.MP.1. Make sense of problems and persevere in solving them. HS.MP.2. Reason abstractly and quantitatively. HS.MP.3. Construct viable arguments and critique the reasoning of others. HS.MP.4. Model with mathematics. HS.MP.5. Use appropriate tools strategically. HS.MP.6. Attend to precision. HS.MP.7. Look for and make use of structure. HS.MP.8. Look for and express regularity in repeated reasoning.	Resources:

Explanations and Examples
HS.S-MD.5.
Different types of insurance to be discussed include but are not limited to: health, automobile, property, rental, and life insurance.

Students may use graphing calculators or programs, spreadsheets, or computer algebra systems to model and interpret parameters in linear, quadratic or exponential functions.

Honors Business Math/Brief Calculus Blueprint Semester 1			
Topic: Advanced Topics in Probability/Statistics			
2010 AZ Mathematics Standards	**ACT College Readiness Standards**	**Standards for Mathematical Practice**	**Maricopa Community Colleges Syllabus Alignment and Resources**
HS.S-MD.1. Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.		HS.MP.1. Make sense of problems and persevere in solving them. HS.MP.2. Reason abstractly and quantitatively. HS.MP.3. Construct viable arguments and critique the reasoning of others. HS.MP.4. Model with mathematics. HS.MP.5. Use appropriate tools strategically. HS.MP.6. Attend to precision. HS.MP.7. Look for and make use of structure. HS.MP.8. Look for and express regularity in repeated reasoning.	MAT 217 VA MAT 217 VIB Resources:

Honors Business Math/Brief Calculus Blueprint Semester 1

Explanations and Examples

HS.S-MD.1.

Students may use spreadsheets, graphing calculators and statistical software to represent data in multiple forms.
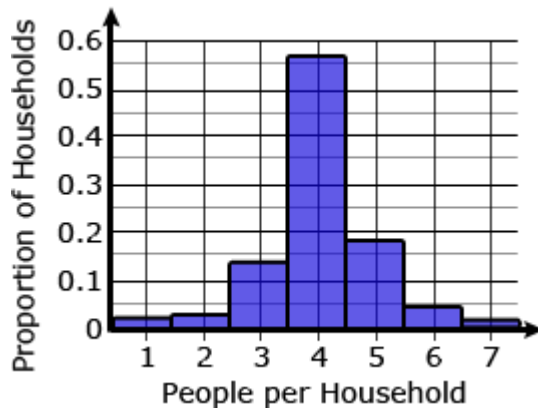
Example:

- Suppose you are working for a contractor who is designing new homes. She wants to ensure that the home models match the demographics for the area. She asks you to research the size of households in the region in order to better inform the floor plans of the home.

Solution:

- A possible solution could be the result of research organized in a variety of forms. In this case, the results of the research are shown in a table and graph. The student has defined their variable as x as the number of people per household.

People per Household	Proportion of Households
1	0.026
2	0.031
3	0.132
4	0.567
5	0.181
6	0.048
7	0.015

Honors Business Math/Brief Calculus Blueprint Semester 1			
HS.S-MD.3. Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value. *For example, find the theoretical probability distribution for the number of correct answers obtained by guessing on all five questions of a multiple-choice test where each question has four choices, and find the expected grade under various grading schemes.* HS.S-MD.4. Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value. *For example, find a current data distribution on the number of TV sets per household in the United States, and calculate the expected number of sets per household. How many TV sets would you expect to find in 100 randomly selected households?* CUSD-HS.S-MD.9 Analyze binomial probability experiments, and develop binomial distributions.		HS.MP.1. Make sense of problems and persevere in solving them. HS.MP.3. Construct viable arguments and critique the reasoning of others. HS.MP.4. Model with mathematics. HS.MP.5. Use appropriate tools strategically. HS.MP.7. Look for and make use of structure.	Resources:

Honors Business Math/Brief Calculus Blueprint
Semester 1

Explanations and Examples

HS.S-MD.3. and HS.S-MD.4.
Students may use graphing calculators or programs, spreadsheets, or computer algebra systems to model and interpret parameters in linear, quadratic or exponential functions.

HS.S-MD.2. Calculate the expected value of a random variable; interpret it as the mean of the probability distribution. HS.S-MD.5. Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values. a. 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. 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.*		HS.MP.1. Make sense of problems and persevere in solving them. HS.MP.2. Reason abstractly and quantitatively. HS.MP.3. Construct viable arguments and critique the reasoning of others. HS.MP.4. Model with mathematics. HS.MP.5. Use appropriate tools strategically. HS.MP.6. Attend to precision. HS.MP.7. Look for and make use of structure. HS.MP.8. Look for and express regularity in repeated reasoning.	MAT 217 VB Resources:

Honors Business Math/Brief Calculus Blueprint
Semester 1

Explanations and Examples

HS.S-MD.2.

Students may use spreadsheets or graphing calculators to complete calculations or create probability models.

The expected value of an uncertain event is the sum of the possible points earned multiplied by each points' chance of occurring.

Example:

- In a game, you roll a six sided number cube numbered with 1, 2, 3, 4, 5 and 6. You earn 3 points if a 6 comes up, 6 points if a 2, 4 or 5 comes up, and nothing otherwise. Since there is a 1/6 chance of each number coming up, the outcomes, probabilities and payoffs look like this:

Outcome	Probability	Points
1	1/6	0 points
2	1/6	6 points
3	1/6	0 points
4	1/6	6 points
5	1/6	6 points
6	1/6	3 points

The expected value is sum of the products of the probability and points earned for each outcome (the entries in the last two columns multiplied together):

$$\left(\frac{1}{6}\right)\bullet 0+\left(\frac{1}{6}\right)\bullet 6+\left(\frac{1}{6}\right)\bullet 0+\left(\frac{1}{6}\right)\bullet 6+\left(\frac{1}{6}\right)\bullet 6+\left(\frac{1}{6}\right)\bullet 3=3.50 \text{ points}$$

HS.S-MD.5.

Different types of insurance to be discussed include but are not limited to: health, automobile, property, rental, and life insurance.

Students may use graphing calculators, programs, spreadsheets, or computer algebra systems to model and interpret parameters in linear, quadratic or exponential functions.

Honors Business Math/Brief Calculus Blueprint Semester 1			
HS.S-ID.2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation i.e., measures of dispersion) of two or more different data sets.		HS.MP.2. Reason abstractly and quantitatively. HS.MP.3. Construct viable arguments and critique the reasoning of others. HS.MP.4. Model with mathematics.HS.MP.5. Use appropriate tools strategically. HS.MP.7. Look for and make use of structure.	MAT 217 VC MAT 217 VID MAT 217 VIE MAT 217 VIF MAT 217 VIG Resources:

Explanations and Examples
HS.S-ID.2.
Students may use spreadsheets, graphing calculators and statistical software for calculations, summaries, and comparisons of data sets.

Examples:
- The two data sets below depict the housing prices sold in the King River area and Toby Ranch areas of Pinal County, Arizona. Based on the prices below which price range can be expected for a home purchased in Toby Ranch? In the King River area? In Pinal County?
  - King River area {1.2 million, 242000, 265500, 140000, 281000, 265000, 211000}
  - Toby Ranch homes {5million, 154000, 250000, 250000, 200000, 160000, 190000}

Given a set of test scores: 99, 96, 94, 93, 90, 88, 86, 77, 70, 68, find the mean, median and standard deviation. Explain how the values vary about the mean and median. What information does this give the teacher?

Honors Business Math/Brief Calculus Blueprint
Semester 1

HS.S-ID.4. 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 (e.g., Uniform and Exponential Distributions). Use calculators, spreadsheets, and tables to estimate areas under the normal curve.		HS.MP.1. Make sense of problems and persevere in solving them. HS.MP.2. Reason abstractly and quantitatively. HS.MP.3. Construct viable arguments and critique the reasoning of others. HS.MP.4. Model with mathematics. HS.MP.5. Use appropriate tools strategically. HS.MP.6. Attend to precision. HS.MP.7. Look for and make use of structure. HS.MP.8. Look for and express regularity in repeated reasoning.	MAT 217 VIC Resources:

Honors Business Math/Brief Calculus Blueprint
Semester 1

**Explanations and Examples**

HS.S-ID.4.

Students may use spreadsheets, graphing calculators, statistical software and tables to analyze the fit between a data set and normal distributions and estimate areas under the curve.

Examples:

- The bar graph below gives the birth weight of a population of 100 chimpanzees. The line shows how the weights are normally distributed about the mean, 3250 grams. Estimate the percent of baby chimps weighing 3000-3999 grams.

Birth Weight Distribution for a Population
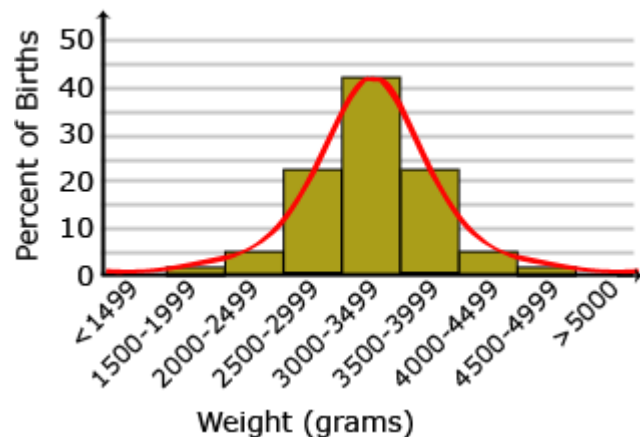
- Determine which situation(s) is best modeled by a normal distribution. Explain your reasoning.
  - Annual income of a household in the U.S.
  - Weight of babies born in one year in the U.S.

Honors Business Math/Brief Calculus Blueprint
Semester 2

Topic: Derivatives

2010 AZ Mathematics Standards	ACT College Readiness Standards	Standards for Mathematical Practice	Maricopa Community Colleges Syllabus Alignment and Resources
CUSD-A-SEE.5. Explore and Determine Limits.			MAT 212 IA Resources:
CUSD-A-SEE.6. Determine and describe continuity.			Resources:
CUSD-A-SEE.7. Determine and explain Average and Instantaneous Rate of Change.			MAT 212 IB Resources:
CUSD-A-SEE.8. Use Derivative Formulas: - Product Rule - Quotient Rule - Power Rule - Chain Rule - Implicit Differentiation - Related Rates		HS.MP.4. Model with mathematics. HS.MP.5. Use appropriate tools strategically. HS.MP.7. Look for and make use of structure. HS.MP.8. Look for regularity in repeated reasoning.	MAT 212 IC & MAT 212 ID MAT 212 IDi MAT 212 IDii MAT 212 IDiii MAT 212 IDiv MAT 212 IDv Resources:
CUSD-A-SEE.9. Find Higher Order Derivatives		HS.MP.4. Model with mathematics. HS.MP.7. Look for and make use of structure.	MAT 212 IDvi Resources:

ARIZONA'S COMMON CORE STANDARDS

Honors Business Math/Brief Calculus Blueprint Semester 2			
CUSD-A-SEE.10. Apply the concepts of Limits, continuity, rate of change/derivatives (average and instantaneous) to Business Contexts.		HS.MP.4. Model with mathematics.	Resources:

Honors Business Math/Brief Calculus Blueprint Semester 2			
Topic: Applications of Derivitives			
2010 AZ Mathematics Standards	**ACT College Readiness Standards**	**Standards for Mathematical Practice**	**Maricopa Community Colleges Syllabus Alignment and Resources**
CUSD-A-SEE.11. Explore Maxima, Minima, Inflections Points, Concavity, Curve Sketching, and Asymptotes in context.		HS.MP.4. Model with mathematics.	MAT 212 IIA MAT 212 IIB MAT 212 IIC MAT 212 IIE Resources:
CUSD-A-SEE.12. Explore Optimization in the contexts of • Maximizing Revenue • Minimizing Costs • Maximizing Profit		HS.MP.4. Model with mathematics. HS.MP.5. Use appropriate tools strategically.	MAT 212 IID Resources:
Topic: Advanced Derivitive Topics			
2010 AZ Mathematics Standards	**ACT College Readiness Standards**	**Standards for Mathematical Practice**	**Maricopa Community Colleges Syllabus Alignment and Resources**
CUSD-A-SEE.13. Logarithms and Exponentials		HS.MP.5. Use appropriate tools strategically.	Resources:

ARIZONA'S
COMMON CORE STANDARDS

Honors Business Math/Brief Calculus Blueprint Semester 2			
CUSD-A-SEE.14. Explore Applications of Elasticity of Demand and Taxation in Competitive Marketing.		HS.MP.4. Model with mathematics.	Resources:

Honors Business Math/Brief Calculus Blueprint Semester 2			
Topic: Indefinite Integral			
2010 AZ Mathematics Standards	**ACT College Readiness Standards**	**Standards for Mathematical Practice**	**Maricopa Community Colleges Syllabus Alignment and Resources**
CUSD-A-SEE.16. Explore and solve application problems involving antiderivatives (e.g., polynomials, exponentials, logarithms).		HS.MP.4. Model with mathematics. HS.MP.7. Look for and make use of structure. HS.MP.8. Look for regularity in repeated reasoning.	MAT 212 IIIA MAT 217 VIA Resources:
CUSD-A-SEE.19. Explore and use Differential Equations.		HS.MP.4. Model with mathematics.	Resources:
Topic: Definite Integral			
2010 AZ Mathematics Standards	**ACT College Readiness Standards**	**Standards for Mathematical Practice**	**Maricopa Community Colleges Syllabus Alignment and Resources**

Honors Business Math/Brief Calculus Blueprint Semester 2			
CUSD-A-SEE.20. Find the area under a curve, understand and use the Fundamental Theorem of Calculus, and find the area between two curves.		HS.MP.1. Make sense of problems and persevere in solving them. HS.MP.4. Model with mathematics. HS.MP.5. Use appropriate tools strategically. HS.MP.6. Attend to precision.	MAT 212 IVA MAT 212 IIIB MAT 212 IVB Resources:
CUSD-A-SEE.22. Use Integration by Parts to solve problems		HS.MP.4. Model with mathematics. HS.MP.5. Use appropriate tools strategically.	MAT 212 IVC Resources:
CUSD-A-SEE.23. Explore and use Improper Integrals		HS.MP.5. Use appropriate tools strategically. HS.MP.8. Look for regularity in repeated reasoning.	MAT 212 IIIC Resources:
CUSD-A-SEE.24. Use the Trapezoidal Rule and Simpson's Rule for integration.		HS.MP.2. Reason abstractly and quantitatively. HS.MP.7. Look for and make use of structure.	Resources:
Topic: Partial Derivatives			
2010 AZ Mathematics Standards	**ACT College Readiness Standards**	**Standards for Mathematical Practice**	**Maricopa Community Colleges Syllabus Alignment and Resources**

Honors Business Math/Brief Calculus Blueprint Semester 2			
CUSD-A-SEE.26. Use LaGrange Multipliers for Optimization problems and find partial derivatives of multi-variable equations.		HS.MP.7. Look for and make use of structure. HS.MP.8. Look for regularity in repeated reasoning.	MAT 217 IA MAT 217 IB MAT 217 IC MAT 217 ID Resources: