Business Math: Unit 4
Making Business Decisions
Course Philosophy/Description

Business Mathematics is an elective Mathematics course of which students learn to use mathematics effectively as a tool in their personal and business lives. After students have completed this course, they will be able to apply mathematical concepts in various personal and business situations. All standards are aligned to the New Jersey Student Learning Standards of Mathematics and the New Jersey Personal Financial Literacy Standards.

Students will review and apply mathematical concepts that they learned in four of the conceptual categories, namely Number and Quantity, Algebra, Functions, and Statistics and Probability. They will understand terminology relating to personal and business mathematics applications and apply basic math skills to the solution of both personal and business applications. They will use common mathematical formulas to solve a variety of personal and business mathematics as well as apply knowledge of computer and calculator use. Students will also learn strategies for critical thinking and problem solving both in finance and business ethics.
This ESL framework was designed to be used by bilingual, dual language, ESL and general education teachers. Bilingual and dual language programs use the home language and a second language for instruction. ESL teachers and general education or bilingual teachers may use this document to collaborate on unit and lesson planning to decide who will address certain components of the SLO and language objective. ESL teachers may use the appropriate leveled language objective to build lessons for ELLs which reflects what is covered in the general education program. In this way, whether it is a pull-out or push-in model, all teachers are working on the same Student Learning Objective connected to the Common Core standard. The design of language objectives is based on the alignment of the World-Class Instructional Design Assessment (WIDA) Consortium’s English Language Development (ELD) standards with the Common Core State Standards (CCSS). WIDA’s ELD standards advance academic language development across content areas ultimately leading to academic achievement for English learners. As English learners are progressing through the six developmental linguistic stages, this framework will assist all teachers who work with English learners to appropriately identify the language needed to meet the requirements of the content standard. At the same time, the language objectives recognize the cognitive demand required to complete educational tasks. Even though listening and reading (receptive) skills differ from speaking and writing (expressive) skills across proficiency levels the cognitive function should not be diminished. For example, an Entering Level One student only has the linguistic ability to respond in single words in English with significant support from their home language. However, they could complete a Venn diagram with single words which demonstrates that they understand how the elements compare and contrast with each other or they could respond with the support of their home language (L1) with assistance from a teacher, para-professional, peer or a technology program.

http://www.state.nj.us/education/modelcurriculum/ela/ELLOverview.pdf
<table>
<thead>
<tr>
<th>#</th>
<th>Student Learning Objectives</th>
<th>NJSLS</th>
<th>NJ-Personal Financial Literacy Standards</th>
<th>Marking Period 4</th>
</tr>
</thead>
</table>
Research about Teaching and Learning Mathematics

Structure teaching of mathematical concepts and skills around problems to be solved (Checkly, 1997; Wood & Sellars, 1996; Wood & Sellars, 1997)
Encourage students to work cooperatively with others (Johnson & Johnson, 1975; Davidson, 1990)
Use group problem-solving to stimulate students to apply their mathematical thinking skills (Artzt & Armour-Thomas, 1992)
Students interact in ways that support and challenge one another’s strategic thinking (Artzt, Armour-Thomas, & Curcio, 2008)
Activities structured in ways allowing students to explore, explain, extend, and evaluate their progress (National Research Council, 1999)
There are three critical components to effective mathematics instruction (Shellard & Moyer, 2002):

- Teaching for conceptual understanding
- Developing children’s procedural literacy
- Promoting strategic competence through meaningful problem-solving investigations

Teachers should be:

- Demonstrating acceptance and recognition of students’ divergent ideas.
- Challenging students to think deeply about the problems they are solving, extending thinking beyond the solutions and algorithms required to solve the problem
- Influencing learning by asking challenging and interesting questions to accelerate students’ innate inquisitiveness and foster them to examine concepts further.
- Projecting a positive attitude about mathematics and about students’ ability to “do” mathematics

Students should be:

- Actively engaging in “doing” mathematics
- Solving challenging problems
- Investigating meaningful real-world problems
- Making interdisciplinary connections
- Developing an understanding of mathematical knowledge required to “do” mathematics and connect the language of mathematical ideas with numerical representations
- Sharing mathematical ideas, discussing mathematics with one another, refining and critiquing each other’s ideas and understandings
- Communicating in pairs, small group, or whole group presentations
- Using multiple representations to communicate mathematical ideas
- Using connections between pictures, oral language, written symbols, manipulative models, and real-world situations
- Using technological resources and other 21st century skills to support and enhance mathematical understanding
Mathematics is not a stagnant field of textbook problems; rather, it is a dynamic way of constructing meaning about the world around us, generating knowledge and understanding about the real world every day. Students should be metaphorically rolling up their sleeves and “doing mathematics” themselves, not watching others do mathematics for them or in front of them. (Protheroe, 2007)

Balanced Mathematics Instructional Model

Balanced math consists of three different learning opportunities: guided math, shared math, and independent math. Ensuring a balance of all three approaches will build conceptual understanding, problem solving, computational fluency, and procedural fluency. Building conceptual understanding is the focal point of developing mathematical proficiency. Students should frequently work on rigorous tasks, talk about the math, explain their thinking, justify their answer or process, build models with graphs or charts or manipulatives, and use technology.

When balanced math is used in the classroom it provides students opportunities to:

- solve problems
- make connections between math concepts and real-life situations
- communicate mathematical ideas (orally, visually and in writing)
- choose appropriate materials to solve problems
- reflect and monitor their own understanding of the math concepts
- practice strategies to build procedural and conceptual confidence

Teacher builds conceptual understanding by modeling through demonstration, explicit instruction, and think alouds, as well as guiding students as they practice math strategies and apply problem solving strategies. (whole group or small group instruction)

Teacher and students practice mathematics processes together through interactive activities, problem solving, and discussion. (whole group or small group instruction)

Students practice math strategies independently to build procedural and computational fluency. Teacher assesses learning and reteaches as necessary. (whole group instruction, small group instruction, or centers)
| Effective Pedagogical Routines/Instructional Strategies |
|---------------------------------|---------------------------------|
| Collaborative Problem Solving   | Analyze Student Work            |
| Connect Previous Knowledge to New Learning | Identify Student’s Mathematical Understanding |
| Making Thinking Visible         | Identify Student’s Mathematical Misunderstandings |
| Develop and Demonstrate Mathematical Practices | Interviews |
| Inquiry-Oriented and Exploratory Approach | Role Playing |
| Multiple Solution Paths and Strategies | Diagrams, Charts, Tables, and Graphs |
| Use of Multiple Representations | Anticipate Likely and Possible Student Responses |
| Explain the Rationale of your Math Work | Collect Different Student Approaches |
| Quick Writes                    | Multiple Response Strategies    |
| Pair/Trio Sharing               | Asking Assessing and Advancing Questions |
| Turn and Talk                   | - Revoicing                     |
| Charting                        | - Marking                       |
| Gallery Walks                   | - Recapping                     |
| Small Group and Whole Class Discussions | - Challenging                   |
| Student Modeling                | - Pressing for Accuracy and Reasoning |
|                                 | - Maintain the Cognitive Demand |
Educational Technology

Standards


- Technology Operations and Concepts
  - Create professional documents (e.g., newsletter, personalized learning plan, business letter or flyer) using advanced features of a word processing program.
  - Select and use appropriate tools and digital resources to accomplish a variety of tasks and to solve problems.

- Digital Citizenship
  - Model appropriate online behaviors related to cyber safety, cyber bullying, cyber security, and cyber ethics.

- Research and Information Literacy
  - Gather and analyze findings to produce a possible solution for a content-related or real world problem using data collection technology.

- Design: Critical Thinking, Problem Solving, and Decision Making
  - Design and create a product using the design process that addresses a real world problem with specific criteria and constraints.
Career Ready Practices

Career Ready Practices describe the career-ready skills that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

- **CRP1. Act as a responsible and contributing citizen and employee**
  Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.

- **CRP2. Apply appropriate academic and technical skills.**
  Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.

- **CRP4. Communicate clearly and effectively and with reason.**
  Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others’ time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.

- **CRP6. Demonstrate creativity and innovation.**
  Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.

- **CRP7. Employ valid and reliable research strategies.**
  Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.
Career Ready Practices

- **CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.**
  Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.

- **CRP11. Use technology to enhance productivity.**
  Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks—personal and organizational—of technology applications, and they take actions to prevent or mitigate these risks.

- **CRP12. Work productively in teams while using cultural global competence.**
  Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.
WIDA Proficiency Levels

At the given level of English language proficiency, English language learners will process, understand, produce or use:

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
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</thead>
</table>
| 6- Reaching | - Specialized or technical language reflective of the content areas at grade level  
- A variety of sentence lengths of varying linguistic complexity in extended oral or written discourse as required by the specified grade level  
- Oral or written communication in English comparable to proficient English peers |
| 5- Bridging | - Specialized or technical language of the content areas  
- A variety of sentence lengths of varying linguistic complexity in extended oral or written discourse, including stories, essays or reports  
- Oral or written language approaching comparability to that of proficient English peers when presented with grade level material. |
| 4- Expanding | - Specific and some technical language of the content areas  
- A variety of sentence lengths of varying linguistic complexity in oral discourse or multiple, related sentences or paragraphs  
- Oral or written language with minimal phonological, syntactic or semantic errors that may impede the communication, but retain much of its meaning, when presented with oral or written connected discourse, with sensory, graphic or interactive support |
| 3- Developing | - General and some specific language of the content areas  
- Expanded sentences in oral interaction or written paragraphs  
- Oral or written language with phonological, syntactic or semantic errors that may impede the communication, but retain much of its meaning, when presented with oral or written, narrative or expository descriptions with sensory, graphic or interactive support |
| 2- Beginning | - General language related to the content area  
- Phrases or short sentences  
- Oral or written language with phonological, syntactic, or semantic errors that often impede of the communication when presented with one to multiple-step commands, directions, or a series of statements with sensory, graphic or interactive support |
| 1- Entering | - Pictorial or graphic representation of the language of the content areas  
- Words, phrases or chunks of language when presented with one-step commands directions, WH-, choice or yes/no questions, or statements with sensory, graphic or interactive support |
Language Development Supports For English Language Learners
To Increase Comprehension and Communication Skills

Environment

- Welcoming and stress-free
- Respectful of linguistic and cultural diversity
- Honors students' background knowledge
- Sets clear and high expectations
- Includes routines and norms
- Is thinking-focused vs. answer-seeking
- Offers multiple modalities to engage in content learning and to demonstrate understanding
- Includes explicit instruction of specific language targets
- Provides participation techniques to include all learners
- Integrates learning centers and games in a meaningful way
- Provides opportunities to practice and refine receptive and productive skills in English as a new language
- Integrates meaning and purposeful tasks/activities that:
  - Are accessible by all students through multiple entry points
  - Are relevant to students' lives and cultural experiences
  - Build on prior mathematical learning
  - Demonstrate high cognitive demand
  - Offer multiple strategies for solutions
  - Allow for a language learning experience in addition to content

Sensory Supports*

- Real-life objects (realia) or concrete objects
- Physical models
- Manipulatives
- Pictures & photographs
- Visual representations or models such as diagrams or drawings
- Videos & films
- Newspapers or magazines
- Gestures
- Physical movements
- Music & songs

Graphic Supports*

- Graphs
- Charts
- Timelines
- Number lines
- Graphic organizers
- Graphing paper

Interactive Supports*

- In a whole group
- In a small group
- With a partner such as Turn-and-Talk
- In pairs as a group (first, two pairs work independently, then they form a group of four)
- In triads
- Cooperative learning structures such as Think-Pair-Share
- Interactive websites or software
- With a mentor or coach

Verbal and Textual Supports

- Labeling
- Students' native language
- Modeling
- Repetitions
- Paraphrasing
- Summarizing
- Guiding questions
- Clarifying questions
- Probing questions
- Leveled questions such as What? When? Where? How? Why?
- Questioning prompts & cues
- Word Banks
- Sentence starters
- Sentence frames
- Discussion frames
- Talk moves, including Wait Time

# BUILDING EQUITY IN YOUR TEACHING PRACTICE

How do the essential questions highlight the connection between the big ideas of the unit and equity in your teaching practice?

## CONTENT INTEGRATION

Teachers use examples and content from a variety of cultures & groups.

- This unit / lesson is connected to other topics explored with students.
- There are multiple viewpoints reflected in the content of this unit / lesson.
- The materials and resources are reflective of the diverse identities and experiences of students.
- The content affirms students, as well as exposes them to experiences other than their own.

## KNOWLEDGE CONSTRUCTION

Teachers help students understand how knowledge is created and influenced by cultural assumptions, perspectives & biases.

- This unit / lesson provides context to the history of privilege and oppression.
- This unit / lesson addresses power relationships.
- This unit / lesson helps students to develop research and critical thinking skills.
- This curriculum creates windows and mirrors for students.

## PREJUDICE REDUCTION

Teachers implement lessons and activities to assert positive images of ethnic groups & improve intergroup relations.

- This unit / lesson helps students question and unpack biases & stereotypes.
- This unit / lesson helps students examine, research and question information and sources.
- The curriculum encourages discussion and understanding about the groups of people being represented.
- This unit / lesson challenges dominant perspectives.

## EQUITABLE PEDAGOGY

Teachers modify techniques and methods to facilitate the academic achievement of students from diverse backgrounds.

- The instruction has been modified to meet the needs of each student.
- Students feel respected and their cultural identities are valued.
- Additional supports have been provided for students to become successful and independent learners.
- Opportunities are provided for students to reflect on their learning and provide feedback.

## EMPOWERING SCHOOL CULTURE

Using the other four dimensions to create a safe and healthy educational environment for all.

- There are opportunities for students to connect with the community.
- My classroom is welcoming and supportive for all students?
- I am aware of and sensitive to the needs of my students and their families.
- There are effective parent communication systems established. Parents can talk to me about issues as they arise in my classroom.

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## Culturally Relevant Pedagogy Examples

- **Use Media that Positively Depict a Range of Cultures:** Include different cultures and languages in your curriculum by presenting relevant materials, such as movies, about them.  
  Example: The following link explains markup and markdown.  

- **Learn About Your Students:** Open communication should uncover your students’ learning styles. Distribute surveys and questionnaires, and hold class discussions.  
  Example: When students understand themselves it can prove beneficial to them in a real-life situation. The article below discusses the importance of developing a spending plan and actually following the plan for it to work.  

- **Bring in Guest Speakers:** Invite guest speakers who can add context to your lesson and speak from a specific culture’s general perspective.  
  Example: Invite guest speakers who can engage and motivate students who share a sense of culture. Reach out to local business owners and human resource staff to come into the classroom and share with students.

- **Run Problem-Based Learning Scenarios:** Present relatable real-world problems for your students to solve, explicitly referencing cultures and communities when applicable.  
  Example: This allows you to bridge two cultural connections. First, include cultural links in the questions, whether they are explicit or students make it themselves. Second, allow students to apply different approaches to solve the question, using unique cultural perspectives.
# Differentiated Instruction

**Accommodate Based on Students Individual Needs: Strategies**

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<thead>
<tr>
<th>Time/General</th>
<th>Processing</th>
<th>Comprehension</th>
<th>Recall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extra time for assigned tasks</td>
<td>Extra Response time</td>
<td>Precise processes for balanced math instructional model</td>
<td>Teacher-made checklist</td>
</tr>
<tr>
<td>Adjust length of assignment</td>
<td>Have students verbalize steps</td>
<td>Short manageable tasks</td>
<td>Use visual graphic organizers</td>
</tr>
<tr>
<td>Timeline with due dates for reports and projects</td>
<td>Repeat, clarify or reword directions</td>
<td>Brief and concrete directions</td>
<td>Reference resources to promote independence</td>
</tr>
<tr>
<td>Communication system between home and school</td>
<td>Mini-breaks between tasks</td>
<td>Provide immediate feedback</td>
<td>Visual and verbal reminders</td>
</tr>
<tr>
<td>Provide lecture notes/outline</td>
<td>Provide a warning for transitions</td>
<td>Small group instruction</td>
<td>Graphic organizers</td>
</tr>
<tr>
<td></td>
<td>Partnering</td>
<td>Emphasize multi-sensory learning</td>
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</tbody>
</table>

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<thead>
<tr>
<th>Assistive Technology</th>
<th>Tests/Quizzes/Grading</th>
<th>Behavior/Attention</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer/whiteboard</td>
<td>Extended time</td>
<td>Consistent daily structured routine</td>
<td>Individual daily planner</td>
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<tr>
<td>Tape recorder</td>
<td>Study guides</td>
<td>Simple and clear classroom rules</td>
<td>Display a written agenda</td>
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<tr>
<td>Video Tape</td>
<td>Shortened tests</td>
<td>Frequent feedback</td>
<td>Note-taking assistance</td>
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<td></td>
<td>Read directions aloud</td>
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<td>Color code materials</td>
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15 | P a g e
Interdisciplinary Connections

Model interdisciplinary thinking to expose students to other disciplines.

Social Studies and Personal finance

Making The focus More Personal:

- Students will think about the last time they bought something from a retail store, Write a short paragraph about how they decided what to purchase. Why did they need to buy a certain type of product? Did they have a specific brand in mind? Why? If they did not, what attracted them to the product they bought?

Saving for Retirement:

- Students will analyze how why companies prefer not to round up their prices and use for example a price of $49.99 instead of $50.00.
# Enrichment

**What is the Purpose of Enrichment?**

- The purpose of enrichment is to provide extended learning opportunities and challenges to students who have already mastered, or can quickly master, the basic curriculum. Enrichment gives the student more time to study concepts with greater depth, breadth, and complexity.
- Enrichment also provides opportunities for students to pursue learning in their own areas of interest and strengths.
- Enrichment keeps advanced students engaged and supports their accelerated academic needs.
- Enrichment provides the most appropriate answer to the question, “What do you do when the student already knows it?”

### Enrichment is…

- Planned and purposeful
- *Different,* or differentiated, work – not just *more* work
- Responsive to students’ needs and situations
- A promotion of high-level thinking skills and making connections within content
- The ability to apply different or multiple strategies to the content
- The ability to synthesize concepts and make real world and cross-curricular connections
- Elevated contextual complexity
- Sometimes independent activities, sometimes direct instruction
- Inquiry based or open ended assignments and projects
- Using supplementary materials in addition to the normal range of resources
- Choices for students
- Tiered/Multi-level activities with flexible groups (may change daily or weekly)

### Enrichment is not…

- Just for gifted students (some gifted students may need intervention in some areas just as some other students may need frequent enrichment)
- Worksheets that are more of the same (busywork)
- Random assignments, games, or puzzles not connected to the content areas or areas of student interest
- Extra homework
- A package that is the same for everyone
- Thinking skills taught in isolation
- Unstructured free time
Assessments

Suggested Formative/Summative Classroom Assessments

Describe Learning Vertically
Identify Key Building Blocks
Make Connections (between and among key building blocks)
Short/Extended Constructed Response Items
Multiple-Choice Items (where multiple answer choices may be correct)
Drag and Drop Items
Use of Equation Editor
Quizzes
Journal Entries/Reflections/Quick-Writes
Accountable talk
Projects
Portfolio
Observation
Graphic Organizers/ Concept Mapping
Presentations
Role Playing
Teacher-Student and Student-Student Conferencing
Homework
New Jersey Student Learning Standards

N.Q.A.1: Use units as a way to understand problems and to guide the solution of multi-step problems; Choose and interpret units consistently in formulas; Choose and interpret the scale and the origin in graphs and data displays.

A.CED.A.2: Create equations in two or more variables to represent relationships between quantities; Graph equations on coordinate axes with labels and scales.

A.CED.A.3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.

A.REI.C.5: Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.

A.REI.C.6: Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

A.REI.D.10: Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). [Focus on linear equations.]

A.REI.D.11: Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x): find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.* [Focus on linear equations.]

A.REI.D.12: Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

F.BF.A.1: Write a function that describes a relationship between two quantities.
### New Jersey Student Learning Standards

<table>
<thead>
<tr>
<th>Standard Code</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>F.IF.B.6</td>
<td>Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.</td>
</tr>
<tr>
<td>F.IF.C.9</td>
<td>Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). <em>For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.</em></td>
</tr>
<tr>
<td>S.IC.A.2</td>
<td>Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. <em>For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?</em></td>
</tr>
<tr>
<td>S.IC.B.3</td>
<td>Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.</td>
</tr>
<tr>
<td>S.ID.A.4</td>
<td>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.</td>
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</tbody>
</table>
| S.ID.B.6      | Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.  
  
  **S.ID.B.6a:** Fit a function to the data (including the use of technology); use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.  
  
  **S.ID.B.6c:** Fit a linear function for a scatter plot that suggests a linear association. |
| S.ID.C.7      | Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. |
| S.ID.C.8      | Compute (using technology) and interpret the correlation coefficient of a linear fit. |
| S.ID.C.9      | Distinguish between correlation and causation. |
### New Jersey Personal Financial Literacy Standards

<table>
<thead>
<tr>
<th>Standard</th>
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</thead>
<tbody>
<tr>
<td>9.1.12.A.1</td>
<td>Differentiate among the types of taxes and employee benefits.</td>
</tr>
<tr>
<td>9.1.12.A.2</td>
<td>Differentiate between taxable and nontaxable income.</td>
</tr>
<tr>
<td>9.1.12.A.3</td>
<td>Analyze the relationship between various careers and personal earning goals.</td>
</tr>
<tr>
<td>9.1.12.B.1</td>
<td>Prioritize financial decisions by systematically considering alternatives and possible consequences.</td>
</tr>
<tr>
<td>9.1.12.E.2</td>
<td>Analyze and apply multiple sources of financial information when prioritizing financial decisions.</td>
</tr>
<tr>
<td>9.1.12.E.3</td>
<td>Determine how objective, accurate, and current financial information affects the prioritization of financial decisions.</td>
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</table>
Mathematical Practices

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.
<table>
<thead>
<tr>
<th>Grade: Business Math</th>
<th>Unit: 4 (Four)</th>
<th>Topic: Making Business Decisions</th>
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**Unit Focus:**
- Perform arithmetic operations on polynomials
- Interpret the structure of expressions
- Solve equations and inequalities in one variable
- Create equations that describe numbers or relationships
- Interpret functions that arise in applications in terms of the context
- Represent and solve equations and inequalities graphically
- Build a function that models a relationship between two quantities
- Construct & compare linear, quadratic, & exponential models
- Build new functions from existing functions
- Analyze functions using different representations
- Analyze various labor costs
- Analyze purchasing and inventory decisions
- Make pricing and sales decisions
- Design marketing plans and calculate sales projections
New Jersey Student Learning Standard(s):
F.BF.A.1: Write a function that describes a relationship between two quantities.

F.BF.A.1a: Determine an explicit expression, a recursive process, or steps for calculation from a context.

F.BF.A.1b: Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.

9.1.12.A.1: Differentiate among the types of taxes and employee benefits.


9.1.12.A.3: Analyze the relationship between various careers and personal earning goals.

Student Learning Objective 1: Analyze the various labor costs including recruiting, training, and providing benefits.

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<tr>
<th>MPs</th>
<th>Skills, Strategies &amp; Concepts</th>
<th>Essential Understandings/Questions (Accountable Talk)</th>
<th>Tasks/Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP 2 MP 7 MP 6</td>
<td>Calculate the cost of employment advertisement.</td>
<td>How much does it cost to hire and train the right employee?</td>
<td>Computing Recruiting Cost</td>
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<td>Calculate the cost of recruiting new employees.</td>
<td>How can a company retain its employees?</td>
<td>Hire the Right Fit</td>
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<td>Compute the new salary after merit increase and cost-of living adjustment.</td>
<td>How can a business track its total cost of recruiting new employees?</td>
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<td>Calculate bonuses.</td>
<td>Other than hourly rate or salary raises, how might an employee receive an increase in pay?</td>
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<td>Calculate profit sharing.</td>
<td>What are the differences in costs between a full-time employee and part-time employee?</td>
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<td>Calculate the rate of employee benefit based on annual gross pay.</td>
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<td>Determine disability benefits under independent retirement systems and under social security.</td>
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<td>Compute the employer cost for workers’ compensation insurance.</td>
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<td>Compute total business travel expenses.</td>
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<td>Compute employee training costs.</td>
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<td>Calculate the cost of full-time employees.</td>
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<tr>
<td>Calculate the cost of part-time employees.</td>
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</table>
New Jersey Student Learning Standard(s):

F.IF.C.9: Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.

F.IF.B.6: Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.

9.1.12.B.1: Prioritize financial decisions by systematically considering alternatives and possible consequences.


9.1.12.E.3: Determine how objective, accurate, and current financial information affects the prioritization of financial decisions.

Student Learning Objective 2: Analyze purchasing and inventory decisions. Consider term of payments and the different type of discounts. Value current and carried inventories using different calculation methods.

<table>
<thead>
<tr>
<th>MPs</th>
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</thead>
</table>
| MP 1 MP 3 MP 5 MP 7 | Compute the trade discount, the net price, and the trade-discount rate. Calculate the net price using the complement method. Determine the final net price after chain discounts, or a series of trade discounts. Compute the cash price when the discount is based on ordinary dating and on end of month dating. Calculate inventory using the average cost, FIFO, and LIFO methods. | Can companies benefit from discounts to reduce their costs? How do companies make inventory decisions and what are the associated costs? | Inventory Review  
Inventory Cost  
Purchasing and Inventory  
The Spending Power of Youth |
Calculate the average cost of carrying inventory.

**New Jersey Student Learning Standard(s):**

A.CED.A.2: Create equations in two or more variables to represent relationships between quantities; Graph equations on coordinate axes with labels and scales.

A.REI.D.10: Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). [Focus on linear equations.]

N.Q.A.1: Use units as a way to understand problems and to guide the solution of multi-step problems; Choose and interpret units consistently in formulas; Choose and interpret the scale and the origin in graphs and data displays.

A.REI.D.12: Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

A.REI.C.6: Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

A.REI.C.5: Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.

A.CED.A.3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.

A.REI.D.11: Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.* [Focus on linear equations.]

9.1.12.B.1: Prioritize financial decisions by systematically considering alternatives and possible consequences.
### Student Learning Objective 3: Make pricing and sales decision and calculate bet profit. Analyze different markup options and calculate the final selling price.

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>MP 1</td>
<td>Compute the markup in dollars and as a percent of the selling price.</td>
<td>Why do companies have markups and markdowns?</td>
<td>Markups and Markdowns</td>
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<tr>
<td>MP 3</td>
<td>Calculate the markup rate based on the selling price and based on cost.</td>
<td>How do companies calculate their markups and markdowns?</td>
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<tr>
<td>MP 5</td>
<td>Calculate the markdown in dollars and as a percent of the regular selling price.</td>
<td>Why do companies offer coupons?</td>
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<td>MP 7</td>
<td>Calculate cost of goods sold.</td>
<td>Do companies make money from consumers using coupons? Explain.</td>
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<td>Calculate gross profit.</td>
<td>How does a company know if it making a profit?</td>
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<td>Calculate net income or net loss.</td>
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New Jersey Student Learning Standard(s):
S.ID.B.6: Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

S.ID.B.6a: Fit a function to the data (including the use of technology); use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.

S.ID.B.6c: Fit a linear function for a scatter plot that suggests a linear association.

S.ID.C.7: Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

S.ID.C.8: Compute (using technology) and interpret the correlation coefficient of a linear fit.

S.ID.C.9: Distinguish between correlation and causation.

S.ID.A.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. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.

S.IC.B.3: Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.

S.IC.A.2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?


9.1.12.E.3: Determine how objective, accurate, and current financial information affects the prioritization of financial decisions.

Student Learning Objective 4: Use surveys, probability distributions, estimation and line of best fit to design marketing plans and calculate sales’ projections.

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<tr>
<td>Compute the rate of a particular response in an opinion survey.</td>
<td>Why should companies advertise?</td>
<td>Marketing and Potential Sales</td>
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<tr>
<td>Calculate the results of a survey.</td>
<td>Can we predict potential sales from a current market?</td>
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<td>Determine the annual sales potential of a new product.</td>
<td>Do companies listen to the consumers’ opinions?</td>
<td>Make the Focus More Personal</td>
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<td>Calculate the market share of a new product.</td>
<td>Provide examples.</td>
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<td>Use the factor method or a graph to determine projected sales.</td>
<td>Explain why a business rely on surveys to produce goods and services.</td>
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<td>Calculate advertising costs.</td>
<td>How do businesses use sales forecast to estimate future sales?</td>
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<td>Calculate the selling price that results in maximum profit.</td>
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<td>Calculate future sales using trend data.</td>
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<td>Calculate future sales using forecast methods.</td>
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<td>Unit 4 Vocabulary</td>
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<td>• Carrying Inventory</td>
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<td>• Chain Discount</td>
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<td>• Complement Method</td>
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<td>• First In, First Out (FIFO)</td>
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<td>• Gross Profit</td>
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<td>• Last In, First Out (LIFO)</td>
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<td>• Market</td>
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<td>• Net-Price Rate</td>
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<td>• Opinion Research Firm</td>
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<td>• Salary Scale</td>
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<td>• Sales Potential</td>
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<td>• Sales Projection</td>
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<td>• Sample</td>
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<td>• Selling Price</td>
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<td>• Stock Reorder Point</td>
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<td>• Travel Expenses</td>
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<tr>
<td>• Workers’ Compensation Insurance</td>
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### References & Suggested Instructional Websites

- [http://www.bizmove.com/marketing/m2y3.htm](http://www.bizmove.com/marketing/m2y3.htm)
- [https://www.moneyinstructor.com/business.asp](https://www.moneyinstructor.com/business.asp)
- [https://www.hsfpp.org/resources.aspx](https://www.hsfpp.org/resources.aspx)
- [https://toggl.com/net-income-formula/](https://toggl.com/net-income-formula/)
Field Trip Ideas

**MUSEUM OF AMERICAN FINANCE** (New York, NY) For more than 20 years, educators from around the country have been bringing students to the Museum to help them understand how finance impacts their daily lives. The Museum offers discounted admission for pre-booked groups of eight or more, as well as a variety of classes for students in middle school through college.

http://www.moaf.org/index

**MUSEUM of MATHEMATICS** (New York) Mathematics illuminates the patterns that abound in our world. The National Museum of Mathematics strives to enhance public understanding and perception of mathematics. Its dynamic exhibits and programs stimulate inquiry, spark curiosity, and reveal the wonders of mathematics. The Museum’s activities lead a broad and diverse audience to understand the evolving, creative, human, and aesthetic nature of mathematics.

www.momath.org


https://www.newyorkfed.org/aboutthefed/visiting.html