

CURRIKI ALGEBRA UNIT 2
Linear and Exponential Relationships

Project: Baseball Mania

Unit 2: Linear and Exponential Relationships

In earlier grades, students define, evaluate, and compare functions, and use them to model relationships between quantities. In this unit, students will learn function notation and develop the concepts of domain and range. They move beyond viewing functions as processes that take inputs and yield outputs and start viewing functions as objects in their own right. They explore many examples of functions, including sequences; they interpret functions given graphically, numerically, symbolically, and verbally, translate between representations, and understand the limitations of various representations. They work with functions given by graphs and tables, keeping in mind that, depending upon the context, these representations are likely to be approximate and incomplete. Their work includes functions that can be described or approximated by formulas as well as those that cannot. When functions describe relationships between quantities arising from a context, students reason with the units in which those quantities are measured. Students explore systems of equations and inequalities, and they find and interpret their solutions. Students build on and informally extend their understanding of integer exponents to consider exponential functions. They compare and contrast linear and exponential functions, distinguishing between additive and multiplicative change. They interpret arithmetic sequences as linear functions and geometric sequences as exponential functions.

The nine lessons in unit 2 (2.1-2.9) provide the instruction and practice that supports the culminating activity in the final two-day unit project.

Project Unit 2: Baseball Mania

In this project, we address many of the skills and standards taught in the nine lessons in this unit. We ask students to work in small groups to create a baseball-related business. Students will reason quantitatively and use units to determine costs of creating a part of a proposal for a new baseball organization; this includes costs of building, team selection and salary, marketing and sales, building maintenance and management requirements and salaries and stadium concessions.

Common Core State Standards by Cluster:

Grade Level	Cluster	CCS Standard
9	Create equations that describe numbers or relationships	A.CED.1, A.CED.2, A.CED.3
9	Understand solving equations as	A.REI.1

	a process of reasoning and explain the reasoning	
9-	Represent and solve equations and inequalities graphically	A.REI.10, A.REI.11, A.REI.12

Special Materials for Project:

- Poster paper for group presentations with appropriate marking pens, crayons, etc. OR
- Computer/projector or interactive whiteboard with Glogster, PowerPoint for group presentations (If available, but not necessary)
- Calculators for groups
- Sample Business Plan

Project Preparation Resources for Teachers:

Introduction to [Economics and to the Project](#) (Jesse Mercer)

Major League Baseball salaries

[Gathering and Compiling Sales Data](#) (Jesse Mercer)

[Creating and Executing a Market Research Survey](#) (Jesse Mercer)

Square Footage Calculator for Parking lot asphalt and commercial building

<http://www.squarefootage.org/square-footage-calculator.php>

Exponential Functions

http://www.curriki.org/xwiki/bin/view/Coll_Group_SanDiegoCommunityCollegesDevelopmentalMathExchange/Lesson30ExponentialFunctions

Sample Business Plan

TE_Business Plan Unit 2 Project

Instructional Materials for Students (Print one copy per student)

SE_ProjectPlanningChecklist

SE_Baseball Mania Rubric

Time: Two 50-minute sessions

Project Objectives:

Students will be able to:

- Apply what they learned in lessons 2.1-2.9 to complete the project activities that focus on relationships between quantities and reasoning with equations.
- Reason quantitatively and use units to determine costs of creating a part of a proposal for a new baseball organization. The proposal must include costs of building, team selection and salary, marketing and sales, building maintenance and management

requirements and salaries and stadium concessions.

- Create equations to determine costs and salaries.
- Solve equations and explain the reasoning for financial decisions.
- Use graphs to represent and solve equations and inequalities through determining costs.
- Interpret functions that arise in applications in terms of a context of creating a baseball organization and facility.
- Gain a general understanding of the structure of the business project and how it will proceed.
- Gain a clear understanding of the expectations for this project in terms of participation, class work, and assessment.

1. Activity:

Students will work in groups of 4-5 to complete the project activities that focus on the skills taught and practiced in the Unit One Lessons.

- a. Students will be assigned to 5 groups. Each group will work together to create a proposal as a business plan for a new baseball organization and facility using the skills taught and practiced in the Unit Two Lessons. Cost will be determined through available resources; estimations are acceptable.
- b. Student groups will choose one aspect of creating a new baseball organization from the following list:
 - i. costs of building, (construction, seating, size, etc)
 - ii. team selection & salary, (players, coaches, managers)
 - iii. marketing & sales (ticket prices, advertisement, coupons, etc)
 - iv. building maintenance and management requirements and salaries (utilities - water, electricity, sewer, garbage; maintenance workers; technology, IT department - scoreboards, lights, etc; announcers; ushers)
 - v. stadium concessions (food, beverages, shirts, caps, souvenirs, etc)
- c. All student groups will evaluate their aspect of the baseball organization using the 3 steps in the following procedure. (Note: Students may use the Project Planning Checklist to guide their thinking and be sure all parts of the proposal are complete, source: Jesse Mercer on Curriki)
- d. Planning -- Find the costs associated with your groups aspect of the baseball organization for the following:
 - size of stadium and the number of seats and seat types, adequate parking space
 - how much will people be willing to pay to attend
 - how much people are willing to pay for our product
 - predict attendance required before we begin making money
 - how much money we need to borrow money from bank or venture capitalists to begin

our business (and they will want to have some guarantee of getting that money back!)

- e. Research – Use the Internet to determine the approximate:
 - cost of land
 - construction and design costs
 - current average player salaries
 - utility costs
- f. Proposal – Each group will need to ask for a loan from the bank or venture capitalists for our start-up costs. You will need to work together to create a *snazzy* proposal using posters, PowerPoint, [Glogster](#) or other media resources to convince them that we are a good credit risk.
- g. Give each student a copy of a sample business plan as a broad guideline.
Sample Business Plan
TE_Business Plan Unit 2 Project

Each group will write a proposal that will include a written explanation based on the 3 steps listed above (planning, research and proposal) that will justify funding as well as include the following:

- results of market research survey (if conducted)
- costs associated with assigned aspect of baseball organization
- graphs and equations to represent projected sales and other income sources
- graphs and equations to show projected exponential growth of sales to show the return on investment

Give each student a copy of a sample business plan as a broad guideline.

- h. Each group will present their proposal to the class using posters, PowerPoint, [Glogster](#) or other media, to share the following:
 - written justification
 - graphs and equations used to determine sales and return on investments

2. Assessment:

- a. Distribute copies of the Baseball Mania Rubric to student groups to use in the development of their proposals.
- b. In a whole class activity, students will play the role of the bankers or venture capitalists to determine the strength of the proposals based on the information presented and graphical data. Individual student groups will take turns presenting their proposals to the whole class for evaluation. The rubric will be used as a guide for proposal evaluation.

3. Extension Activity

- a. NEWS FLASH!!! Due to natural disaster, material costs have increased by 10%. Determine how this impacts your proposal. Make necessary adjustments.
- b. NEWS FLASH!!! Players are threatening to strike. Can you afford to increase their salaries by 3%? Adjust your proposal accordingly.
- c. NEWS FLASH!! The minimum wage has increased by 1.5%. How will this impact your proposal. Adjust as needed.
- d. NEWS FLASH!!! Attendance is down. Ticket pricing needs to be reduced by 8% to encourage higher attendance numbers. How will this impact your proposal? Adjust as needed.
- e. To further study economics, students may work on the following extension problem:
Use the Internet, encyclopedia, and/or other resources to answer the following questions. You must cite your source of information and paraphrase anything that you read (instead of copying word for word).
 - What is the difference between supply and demand?
 - What is a *demand curve*?
 - What is the difference between *revenue* and *profit*?
 - What is the difference between *fixed costs* and *variable costs*?
 - How do businesses determine what price to set for their products?