

Modeling with Quadratic Functions

What am I making?

In this project, you will create a business proposal for a product made from recycled materials. Your proposal will include profit projections using a quadratic model to show how pricing affects sales and revenue.

Why am I making it?

Businesses often focus on making money without considering the environmental impact. Your challenge is to prove that eco-friendly products can be profitable by using math to make smart business decisions.

How do I make it?

Individually create an upcycled product design based on trends in price, demand and discarded materials. With your group, create a quadratic model to predict the price for maximum profit and pitch your proposal to potential investors.

Driving Question

How can quadratic functions help us set the best price for a product made from recycled materials?

The driving question identifies the purpose, product, and audience.

Mission

Every day, tons of waste ends up in landfills and oceans, harming the environment. Many companies prioritize profit over environmental sustainability. Your challenge is to show that green business practices can be both good for the environment and financially successful. In this project, you will create and present a business proposal using quadratic models to predict profit and pricing for a product made from recycled materials. Your goal is to convince investors that your eco-friendly product can be successful.

Requirements for Individual Product

- Product design made from recycled materials with a description of its use and benefits including the environmental impact that you want to have as a result of producing this design.

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- Mathematical representations to describe the relationship between price, demand, and profit in a revenue model including:
 - An equation that represents the demand in units sold based on price
 - Calculations of the revenue for different prices using your revenue model to justify a pricing strategy that balances financial success and market feasibility.
 - Calculation of the maximum revenue
 - A function that outputs the cost based on the number of units sold.
 - A function that outputs the profit based on units sold.
 - Determine the prices at which the business neither makes a profit nor incurs a loss, e.g. where the profit equals zero.
 - Interpretation of the results to explain how pricing, demand, and revenue projections align with market trends and consumer behavior. Highlight key insights for investors, such as potential growth opportunities, competitive advantages, and the long-term sustainability of your product in the eco-friendly market.
 - Graphs to visualize the relationship between price, demand, cost, revenue, and profit. Annotate key features on the graph such as intercepts and the vertex and indicate their relevance in your model.

Each project has an individual product and a group product.

The teams support the individuals throughout the sprints.

Requirements for Team Product

- Final product design and revenue and profit models that the group will pitch to the group of investors.
- Business proposal to persuade investors to fund your project.
 - Background information about sustainability and eco-friendly manufacturing practices
 - The ecological and financial benefits of reusing materials
 - Description of your product and why it is innovative and necessary

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- Pricing strategy and sales projections based on quadratic models based on at least two different demand scenarios.
- An explanation of how changes in production costs affect the profit function and pricing strategy.
- Visual components to help investors understand how you decided on a price
- A list of FAQs that highlight why investors should trust your strategy and predictions

The team product is a culmination of the individuals' learning.

Badge

M103: Modeling with Quadratic Functions

Learning Goals

1. Building and analyzing quadratic models in real-world contexts helps you understand how these functions can represent relationships like costs, revenues, and profits.
2. Data visualizations enable us to uncover patterns, make predictions, and communicate findings effectively.
3. Finally, exploring and articulating the practical relevance of quadratic modeling in solving business challenges, such as maximizing profitability will equip us to use these tools for creating successful, eco-friendly business models.

Each week, students identify when and how they have met the content expectations.

In this project, we will learn to

- Engage in the modeling cycle. (103.a)
- Interpret quadratic functions that arise in applications in terms of the context. (103.b)
- Analyze quadratic functions using different representations. (103.c)
- Build quadratic functions that model relationships between two quantities. (103.d)
- Construct and compare linear and quadratic models, solve problems, and draw conclusions. (103.e)

Content expectations are reinforced through the other activities (5MM, NOWS, INTERRUPTERS, ENDS) in the module.

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- Interpret expressions for quadratic functions in terms of the situation they model. (103.f)
- Summarize, represent, and interpret data on two quantitative variables for linear and quadratic model fits. In this badge, students are encouraged to investigate patterns of association in bivariate data, which includes informal description of the fit of the curve and addresses the usefulness of the model for the particular context. (103.g)
- Understand the relevance of modeling with quadratic functions. (103.h)
- Use a quadratic function model to determine values of interest in a real-world problem. (103.i)