UNIT 1
Relationships Between Quantities and Reasoning with Equations

Project: Farmer’s Market

In this project students apply the skills they learned and practiced in the first four lessons. Students apply their ability to write, interpret, and translate various forms of linear equations and inequalities, and use them to solve problems. Students apply their mastery of solving linear equations and apply related solution techniques and the laws of exponents to the creation and solution of simple exponential equations. These applications are grounded on understanding quantities and on relationships between them.

Common Core State Standards by Cluster

<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Cluster</th>
<th>CCS Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Reason quantitatively and use units to solve problems</td>
<td>N.Q.3</td>
</tr>
<tr>
<td>9</td>
<td>Create equations that describe number relationships</td>
<td>A.CED.1, A.CED.3</td>
</tr>
<tr>
<td>9</td>
<td>Understand solving equations as a process of reasoning and explain the reasoning</td>
<td>A.REI.1</td>
</tr>
<tr>
<td>9</td>
<td>Solve equations and inequalities in one variable</td>
<td>A.REI.3</td>
</tr>
</tbody>
</table>

Project Preparation Materials for Teachers

- One set of dice for each student group
- 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

Project Objectives

Students will be able to:

- Determine the cost and profit of a business at a local farmer’s market
Create expressions and equations to determine business costs
Create a presentation that shows a product, cost of product, profit, and loss for a day, month and year.

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.

1. Each student groups will create a business that is a stall in their local Farmer’s Market. They will choose the product to sell.

2. Students determine the cost and profit of running this Saturday business.
   Costs:
   a. Materials for production of the product
   b. Rent for the stall space
   c. Materials for making the stall space such as serving space, awnings, fabric, table

3. Student groups organize their business and record all expenses.

4. Students groups create an expressions or equation and calculate:
   a. Cost per item or serving
   b. Percent mark-up
   c. Given the cost and mark-up create and inequality equation to determine the number of customers needed to break even

5. Student groups roll dice to determine the number of customers who will purchase at their stall on each Saturday of a month. The product of the dice determines the number of customers per hour. Students re-roll for each Saturday. Students then calculate:
   a. How much product do they need for the given number of customers?
   b. What was the profit to loss ratio for each Saturday?
   c. Analyze mark-up chosen and make pricing adjustments and re-roll the dice.

6. Each group will present to the class using posters, Powerpoint, Glogster (http://www.glogster.com/) or other media:
   a. the group product
   b. the unit cost of their product
   c. how they decided and calculated their mark-up
   d. their profit/loss for the day, month, year
7. Extension Activity
   a. Add a third die; Students analyze how this impacts cost, mark-up and profit.
   b. To add more interest, the groups will move their business to a foreign country of their choice and the profit and loss will be figured in the foreign exchange.

8. Project Assessment
   a. Teacher will evaluate the project by asking student groups to create a rubric, which describes the necessary project elements.
      Elements include
      i. Cost of Materials for project
      ii. Rent
      iii. Materials for making the stall space
      iv. Percent markup
      v. Presentation format
      vi. Presentation delivery
   b. Groups can vote on the best presentations and projects.

Project Example:
Student Group #1 will open a lemonade stand at the farmer’s market. They will sell lemonade in 16 ounce cups. They need to keep their product cool.

Costs:
1. Materials to for production of the product
   a. 16oz cups (example: cost per unit = cost per package \ # of units)
   b. lemons (cost per lemon * number of batches)
   c. sugar (cost per cup of sugar * number of cups)
   d. ice (cost per bag * number of bags)
   e. water (filtered) (free)
   f. Cost per glass (sum of parts a through e above/number of servings)

2. Rent for the stall space
   $100 a month

3. Materials for making the stall space such as serving space, awnings, fabric, tables
   i. Two long folding tables: $100
   ii. Ice cooler: $25
   iii. Folding chairs, three: $75

4. Percent mark-up
   Selling Price = Total Cost x (1 + Mark-Up Percent)
(Students will determine the percent mark-up, based on current market and their location. Students can use the following equation to determine the mark-up: \[ \text{Mark-up Percent} = \frac{(\text{Selling Price} - \text{Total Cost})}{\text{Total Cost}} \]

5. Given the cost and mark-up create and inequality equation to determine the number of customers needed to break even.
   \[ \text{Total costs} < \text{selling price} \times \text{number of customers} \]