

# Linear Systems: Supply and Demand Applications

Provide all answers for this OTL on graph paper.

## Introduction

Supply and demand problems are common for businesses.

For a desirable product, setting the price too low will result in increased demand that may be higher than the supply of the product that is available, leading to shortages, which are viewed poorly by consumers.

If the price is set too high, demand from consumers may be artificially lowered, leading to poor sales -- not enough product will be sold, and profits (if there are any) will be slim.

Businesses are looking for the equilibrium point -- the price to set for a product so that the supply of a product and the demand for a product are equal.

## Case Study: BurgerRama Cartoon Dolls

Joan King is marketing director for the BurgerRama fast food restaurant chain. BurgerRama has decided to have a cartoon-character doll made to sell at a premium price at participating BurgerRama locations. BurgerRama's supplier has offered several different versions of the doll that could be sold at different prices. The marketing director's problem is to decide which selling price will best suit the needs of BurgerRama customers and store managers. King has data from previous similar promotions to help her make a decision.

SELLING PRICE OF EACH DOLL	NUMBER SUPPLIED PER WEEK PER STORE	NUMBER REQUESTED PER WEEK PER STORE
\$1.00	35	530
\$2.00	130	400
\$4.00	320	140

1. Use the data from the table on the previous page to plot points representing selling price and the number of dolls supplied (supply) on a graph. (Selling Price of Each Doll should appear on the x-axis, and Number of Dolls Per Week per Store should appear on the y-axis.) Draw the line through the data points, and write the word "Supply" on this line.
2. Plot points representing selling price and number of dolls requested (demand) on the same graph. Draw the line through these points. Write the word "Demand" on this line.
3. Use your graph to answer the following questions.
  - a) If King sets the price at \$2.50 per doll, how many disappointed customers will each store have during the week?
  - b) If King sets the price at \$3.80 per doll, how many unsold dolls will remain at each store at the end of a week?
  - c) According to this graph, if the company could give the dolls away, how many would each store need per week?
  - d) According to this graph, what price would make the doll supply so tight that the average number available to each store would be zero?
  - e) Estimate the price where supply and demand will be in equilibrium.
4. Use two of the points given to find an equation that relates  $n$ , the number of dolls supplied, to  $p$ , the price of a doll. To do this, you will need to use skills from grade 9. Optionally, consult the handout provided (Finding the Equation of a Line).
5. Use two of the points given to find an equation that relates  $n$ , the number of dolls in demand, to  $p$ , the price of a doll.
6. You now have two equations: one that relates supply to price, and another that relates demand to price. Solve this linear system. What *price*,  $p$ , will result in *demand* and *supply*,  $n$ , being equal?

**Do your best on this OTL.**

**There are no math skills required that you have not already learned.  
It may take a while to remember how to do something (like finding the two equations) but you can do it.**

**Good luck!**