# Econ 101 | Demo E4

## Question 1 (of 2) | Parallel Wandmaker's Dillemma

Suppose the demand for wands is given by

$$P = 100 - Q$$

and there are two main wand sellers, Olivander and Gregorovitch. Olivander can make wands at a constant marginal cost of 10, while Gregorovitch can make wands at a constant marginal cost of 5. The marginal revenue for Olivander is

$$MR_O = 100 - 2q_O - q_G$$

and for Gregorovitch it is

$$MR_G = 100 - 2q_G - q_O$$

Units are in galleons and stones. Calculate the Nash equilibrium level of output for the two wandsellers and put it in the blanks below.

**Note.** This Oligopoly is not symmetric. So the trick we used in class won't work here. Simply solve for both firm's optimization decisions separately.

### Q1.a Olivarnder's Quantity

What is the best response for Olivander?

$$MC_{0} = 100 - 2q_{0} - q_{0}$$

$$MC_{0} = 100 - 2q_{0} - q_{0}$$

$$IO = 100 - 2q_{0} - q_{0}$$

$$Zq_{0} = 40 - q_{0}$$

$$BZ_{0}: q_{0} = 4S - \frac{1}{2}q_{0}$$

### Q1.b Gregorovitch's Quantity

What is the best response for Gregorovitch?

$$MC_{6} = S \qquad MC_{6} = MR_{6}$$

$$MR_{6} = 100 - 2q_{6} - q_{0} \qquad S = 100 - 2q_{6} - q_{0}$$

$$Zq_{6} = q_{5} - q_{0}$$

$$BR_{6} : q_{6} = \frac{q_{5}}{2} - \frac{1}{2}q_{0}$$

#### Q1.c Equilibrium Price

What is the Nash equilibrium quantity and price in this market?



In a highly unethical move, the Ministry of Magic imposed a 10 galleon tax on wand sales, ensuring only the wealthiest were able to attend wizarding school. Model this as a 10 galleon increase in the marginal cost of making a wand and find the Nash equilibrium quantity and price after the tax.

$$BP_{6}: q_{6} = \frac{85}{2} - \frac{1}{2}q_{0}$$

$$q_{c} = \frac{25}{2} - \frac{1}{2}\left(\frac{20}{2} - \frac{1}{2}q_{0}\right) = \frac{170}{4} - \frac{80}{4} + \frac{1}{4}q_{6}$$

$$BP_{6}: q_{0} = \frac{30}{2} - \frac{1}{2}q_{6}$$

$$\frac{3}{4}q_{c} = \frac{40}{4} \qquad q_{c}^{*} = 30$$

$$q_{0} = \frac{80}{2} - \frac{1}{2} \cdot 30 = 40 - 15$$

$$q_{0}^{*} = 25$$

$$Q_{0}^{*} = 55$$

$$P = 100 - 55$$

$$p_{0}^{*} = 45$$

### Question 2 (of 2) | Wizard's Chess

Wizard's Chess is a somewhat common game played by witches and wizards, similar to chess but with self-moving pieces. Due to it's proprietary production process the game can only be obtained at Weasley's Wizard Wheezes through a secretive supplier, X. The demand for Wizard's Chess is given by:

$$P = 10 - 2Q$$

The marginal cost of producing each game is a constant 1 galleon, and there are no fixed costs. The marginal revenue per game is:



MR = 10 - 4Q

### Q2.a Quantity

What is the profit maximizing number of games X should sell? Label on the graph above.

$$| = (0 - 40)$$
$$40 = 9$$
$$0 = 9^{7} = 9$$

### Q2.b Price

What price should X charge per game? Label on the graph above.

$$P = 10 - 2 \cdot \frac{q}{4}$$
$$= 10 - \frac{q}{2}$$
$$= \frac{22}{2} - \frac{q}{2}$$
$$P^{*} = \frac{11}{2}$$

### Q2.c Profit

What is X's profit from selling the games? Label on the graph above.

$$\mathcal{D} = \left(\frac{\mathbb{H}}{2} - 1\right) \cdot \frac{2}{9} = \frac{9}{2} \frac{9}{9}$$
$$\mathcal{D} = \frac{9}{9}$$

### Q2.d Subsidizing X

As TikTok began to capture the attention of the magical world's youth, the Ministry of Magic implemented a 1 galleon subsidy on Wizard's Chess in an attempt to encourage more cognitively challenging pastimes. Use a graph to show the affect this subsidy had on the market.

