

## FPS ONLINE. Individual Assignment 2

Shopmart is a grocery retail chain located on the Jeju island in Korea. Traditionally, Shopmart's management has followed a conservative pricing strategy, relying on predictability and ease of implementation. To this end, Shopmart would charge consistent prices for most products and were very selective with promotions.

After a change in management, Shopmart's new pricing and sales team is determined to better understand consumers' shopping behaviour and to price products accordingly. Specifically, the management is considering heavier reliance on quantity discounts, i.e. charging consumers a lower price if they purchase more. To assess the effectiveness of such pricing, Shopmart is considering offering quantity discounts on a number of products, including Tetto cookies, one of the most popular brands in the market. The following data is available.

**Table 2.1 Tetto Sales Information**

Tetto price per pack	<del>₩</del> 3,000 <sup>1</sup>
Cost per sales	<del>₩</del> 1,000
Average number of sales per week	12,500 packs
Number of unique buyers	10,000
Average number of packs per buyer	1.25 packs

Using scanner sales data, Shopmart knows the distribution of the 10,000 unique buyers based on the number of packs they purchased.

**Table 2.2 Distribution of Customers Based on the Number of Packs Purchased**

Number of packs	Percentage of buyers
1	80%
2	15%

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<sup>1</sup> \$1 = ~~₩~~1,170 as of October 2021. ~~₩~~ stands for Korean Won. You do **not** need to make any currency conversions – provide your estimates in won. You also do not need to use any currency sign in your solution.

3	5%
4 or more	0%

Shopmart wants to use quantity discounts to increase the number of buyers who buy 2 packs per week. Specifically, the new pricing scheme will be “Buy one, get one X% off.” For example, if the unit price is maintained at ₩ 3,000 and  $X=50\%$ , then a customer will pay ₩ 4,500 for two packs ( $\cancel{\text{₩ } 3,000} + \cancel{\text{₩ } 1,500}$ ). Customers who buy 3 packs will pay ₩ 7,500 ( $\cancel{\text{₩ } 3,000} + \cancel{\text{₩ } 1,500} + \cancel{\text{₩ } 3,000}$ ). Similar logic holds if X is some other number.

The sales team expects that if “Buy one, get one X% off” scheme is used, then  $(0.75 \cdot X)$  percent of customers who normally buy only 1 pack would now buy 2 packs. Further,  $(0.3 \cdot X)$  percent of customers who normally buy 2 packs would now buy 3 packs. Finally, customers who normally buy 3 packs would still buy 3 packs under the new pricing scheme. For simplicity, it is assumed that the number of unique weekly customers will remain at the current 10,000 level.

**a. [25 points]** Suppose that  $X=50\%$ . Find the number of customers who will buy 1, 2 and 3 packs of Tetto cookies. Then, estimate Shopmart’s gross profit from selling Tetto. Will this price scheme generate more profit than the old pricing scheme (i.e., ₩ 3,000 per pack without any quantity discount)?

**b. [30 points]** Next, keep X as a variable and estimate the number of customers who will buy 1, 2 and 3 packs of Tetto cookies as a function of X. Using these estimates, find Shopmart’s gross profit from Tetto as a function of X. Finally, using WolframAlpha (<https://www.wolframalpha.com/>), find optimal X that maximizes Shopmart’s profit.

**c. [10 points]** Are quantity discounts a type of price discrimination? If so, which type (first, second or third)? Briefly explain your answer.

**d. [35 points]** Alternatively, Shopmart can pursue a strategy of price promotions. That is, Shopmart would reduce the price of certain products, such as Tetto cookies, for a short

period of time, followed by a period of regular, high prices. Without going into math, what are the advantages and disadvantages of regular price promotions over quantity discounts? For what products could quantity discounts work better than price promotions?