UNIVERSITI TEKNOLOGI MARA

UiTM di hatiku

MATHEMATICS OF RETAILING

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LEARNING OUTCOMES

By the end of this chapter, student should be able to :

- explain retail price, cost price, markup and markdown,
- compute markup per cent,
- compute markdown per cent, and
- compute gross profit, operating expenses, net profit and breakeven price.

INTRODUCTION

- Business of buying and selling products at a profit
- Cost is what you pay the vendor for products.
- Retail/ Selling Price is what your customers pay for these products.

IMPORTANT TERMS

- ***Selling Price*** (Retail price**)**: the price of merchandise being sold.
- ***Cost:*** the price paid for merchandise which includes net price , buying expenses , transportation and handling charges.
- ***Markup***: the difference between the cost and selling or retail price. It usually must be enough to pay expenses and make a profit. Its sometimes called ***gross profit*** ***or*** ***gross margin.***
- **Operating Expenses**: the cost of running a business operation including such expenses as wages, salaries, rent, utilities , advertising and insurance.
- **Gross profit**: the difference between the selling price and cost when the selling price exceeds the cost of the item.
- **Loss:** the difference between the gross profit and the operating expenses when the operating expenses exceed the gross profit.
- **Net profit**: the difference between the gross profit and operating expenses when the gross profit exceeds the operating expenses.

MARKUP

- **Markup = Retail Price – Cost**
- Markup can be either in amount or a percent. When it is expressed as a percent, it is expressed as a percent of cost or selling price(retail price).
  - % of markup based on selling/retail price

$$\frac{markup\ amount}{selling\ price} \times 100\%$$

  - % of markup based on cost

$$\frac{markup\ amount}{cost\ price} \times 100\%$$

CONVERSION OF MARKUP PERCENT

The following formula converted markup percent based on retail to markup percent based on cost and vice versa.

a) markup percent based on retail price,

$$\%M_r = \frac{\%M_c}{1+\%M_c}$$

b) markup percent based on cost price

$$\%M_c = \frac{\%M_r}{1-\%M_r}$$

MARKDOWN

- Merchants often have to **reduce the price** of merchandise from the price which it was originally marked.
- ***This reduction may be due to seasonal changes, special promotions, style changes*** and so on .
- ***Markdown are reductions from the selling price.***

- Markdown = original retail price – new retail price

$$MD = OSP - NSP$$

- Where **MD** = markdown
  OSP = original retail/selling price
  NSP = new retail/selling price

The markdown percent ,%MD based on original selling price , OSP is expressed as follows

Markdown percent , %MD

$$= \frac{markdown\ amount}{original\ selling\ price} \times 100\%$$

$$= \frac{MD}{OSP} \times 100\%$$

Sometimes sellers has to decide what is the lowest price he or she can sell a product without incurring any loss. Thus, the seller can determine the Maximum markdown (MD) as

= retail price – breakeven price

= SP - BE

$$\text{maximum markdown rate} = \frac{MD}{SP} \times 100\,\%$$

PROFIT, LOSS AND BREAKEVEN

It is common that not all business make money. A business incurs operating expenses such as rents, lighting, wages bonus etc. Thus, the markup/gross profit must be able to cover the operating expenses.

3 conditions to consider in business operations:

- If gross profit/markup > operating expenses → a net profit exist
- If gross profit/markup = operating expenses → breakeven exist.
- If gross profit/markup < operating expense → loss exist

To determine whether businesses will make profit or face a loss or just breakeven, can be determined the result of (SP – BEP).

If the result is negative => loss, if positive => profit, and if 0 => breakeven

IMPORTANT FORMULA IN MATHEMATICS OF RETAILING

Selling price = Cost + markup

SP=C+M

Gross profit = Operating Expenses+ Net Profit

GP=OE+NP

Selling price = Cost + Net Profit + Operating Expenses

SP= C + NP + OE

Breakeven price exists when *markup = operating expenses*, that is

Breakeven Price = Cost + Operating Expenses

BE = C + OE

Breakeven Price → the retail price just covers the cost price and the operating expenses (no profit or loss)

EXAMPLE 1

Talent Company Sdn Bhd bought 20 coffee makers at RM110 each. They wanted a gross profit of 45% based on the selling price and the total operating expenses was RM500.

i) Find the selling price of a coffee maker.

(3 marks)

ii) Find the net profit for a coffee maker.

(3 marks)

iii) Find the breakeven price for a coffee maker.

(2 marks)

iv) The company only managed to sell 12 coffee makers. The rest of the coffee makers are sold at 50% markdown. Do they gain profit or loss?

(5 marks)

SOLUTION

i) $C = 110$

$M = 0.45SP$

$OE = \frac{500}{20} = 25$

$SP = C + M$

$= 110 + 0.45SP$

$SP - 0.45SP = 110$

$0.55SP = 110$

$SP = \frac{110}{0.55} = RM200$

ii) $M = 0.45SP = 0.45(200) = 90$

$M = NP + OE$

$90 = NP + 25$

$NP = RM65$

iii) $BE = C + OE$

$= 110 + 25$

$= RM135$

iv) 12 coffee makers --> RM200 each

8 coffee makers --> how much each?

50% MD --> NSP = OSP(1 - d)

= 200(1 - 0.5)

= RM100

8 coffee makers --> RM100 each

NP = SP - BE

= (200 x 12)+(100 x 8) – (135 x 20)

= 3200 – 2700

= 500

Profit = RM500

EXAMPLE 2

A retailer bought a refrigerator listed at RM1,200 with a trade discount of 20%. He then sold the refrigerator with a 10% net profit on the selling price. Operating expenses were 5% based on cost. Find

i) the selling price of the refrigerator,

(4 marks)

ii) the markup rate based on selling price.

(3 marks)

SOLUTION

i) NP=LP(1-d)
=1200(1-0.2)
=RM960

C = 960
NP = 0.1SP
OE = 0.05C = 0.05(960) = 48

SP = C + OE + NP
= 960 + 48 + 0.1SP
SP – 0.1SP = 1008
0.9SP = 1008
SP = RM1120

ii) $M = SP - C$
$= 1120 - 960$
$= RM\ 160$

$\%\, M_r = \frac{M}{SP} \times 100\ \%$
$= \frac{160}{1120} \times 100\ \%$
$= 14.29\ \%$

EXAMPLE 3

Steven purchased a few sets of Correl kitchenware on 18th August 2013 with a total list price of RM4,800. The trade discount given was 10% while the cash terms were 3/15, n/30. He then sold the kitchenware and made a gross profit of 20% of the selling price. The operating expenses were 5% of the selling price. Find the

i) amount paid by Steven on 1 September 2013,

(3 marks)

ii) selling price,

(2 marks)

iii) breakeven price,

(2 marks)

iv) net profit,

(3 marks)

v) maximum markdown rate that could be offered without incurring any loss.

(3 marks)

SOLUTION

i) 18 Aug – 1 Sept = 14 days

Paid on 1 Sept, entitled for 3% cash discount

$NP = LP(1 - d_1)(1 - d_2)$

$= 4800(1 - 0.1)(1 - 0.03)$

$= RM4{,}190.40$

Amount paid = RM4190.40

ii)
$$C = 4190.40$$
$$M = 0.2SP$$
$$OE = 0.05SP$$
$$SP = C + M$$
$$= 4190.40 + 0.2SP$$
$$SP - 0.2SP = 4190.40$$
$$0.8SP = 4190.40$$
$$SP = \frac{4190.40}{0.8} = RM5238$$

iii)
$$BE = C + OE$$
$$= 4190.40 + 0.05SP$$
$$= 4190.40 + 0.05(5238)$$
$$= RM4452.30$$

iv)
$$NP = M - OE$$
$$= 0.2SP - 0.05SP$$
$$= 0.15SP$$
$$= 0.15(5238)$$
$$= RM\ 785.70$$

v)
$$\%\,MD_{max} = \frac{SP - BE}{SP} \times 100\%$$
$$= \frac{5238 - 4452.30}{5238} \times 100\%$$
$$= \frac{785.70}{5238} \times 100\%$$
$$= 15\%$$

EXAMPLE 4

The Sweet Garden Company bought 80 roses at RM8 each and 40 sunflowers at RM6 each. The company wanted a net profit of 15% based on the cost. The operating expenses for all the flowers are 10% based on the cost for all the flowers.

i) Find the total selling price for all the flowers.

(4 marks)

ii) Find the gross profit for all the flowers.

(2 marks)

iii) Find the breakeven price for all the flowers.

(2 marks)

iv) Find the maximum percentage of markdown that can be offered without incurring any loss.

(3 marks)

SOLUTION

i) $C = (80 \times 8) + (40 \times 6) = 880$

$NP = 0.15C = 0.15(880) = 132$

$OE = 0.1C = 0.1(880) = 88$

$SP = C + OE + NP$

$= 880 + 88 + 132$

$= RM1100$

ii) $M = OE + NP$

$= 88 + 132$

$= RM\ 220$

iii) $BE = C + OE$

$= 880 + 88$

$= RM\ 968$

iv) $\%\ \text{Max MD} = \dfrac{SP - BE}{SP} \times 100\%$

$= \dfrac{1100 - 968}{1100} \times 100\%$

$= \dfrac{132}{1100} \times 100\%$

$= 12\%$

EXAMPLE 5

Saleha Boutique purchased 50 dresses for RM3,250. Saleha wanted a net profit of 40% based on the selling price. If the operating expenses were 18% based on the cost, determine

i) the selling price of a dress,

(3 marks)

ii) the gross profit of a dress,

(2 marks)

iii) the breakeven price.

(2 marks)

SOLUTION

i) $C = \frac{3250}{50} = 65$

$NP = 0.4SP$

$OE = 0.18C = 0.18(65) = 11.70$

$SP = C + OE + NP$

$= 65 + 11.70 + 0.4SP$

$SP - 0.4SP = 76.70$

$0.6SP = 76.70$

$SP = \frac{76.70}{0.6} = RM127.83$

ii) $M = SP - C$

$= 127.83 - 65$

$= RM62.83$

iii) $BE = C + OE$

$= 65 + 11.70$

$= RM76.70$

EXERCISE

The Strawberry Candy Company wants to produce limited edition special candy for the New Year celebration. The company decides to produce only 1000 the limited edition candy at a cost of RM12500. The net profit for each candy is 15% based on cost and the total operating expenses for the candies is RM555.50.

i) What is the selling price for each candy?

(3 marks)

ii) Calculate the total gross profit for the candies.

(2 marks)

iii) Find the breakeven price for the candies.

(2 marks)

iv) What is the maximum percentage of markdown that can be offered without incurring any loss?

(3 marks)