

1. Thomas Private Limited Company is about to start production of new products to sell to customers. Before the start of the new production, it costs the company \$ 200,000 to construct the factory's building. Once the construction is over, the cost per unit of production is estimated to be birr 20. Upon selling, the company will incur a 20% commission expense. Moreover, the price per unit of products is decided to be Birr 50.

Required:

- a) Construct the total cost equation in terms of quantity.
 - b) Determine the break-even quantity (Revenue)
2. In its first year, "Helen Trading" had the following experience:

Unit selling price	birr	100	Sales 50,000
units			
Total fixed cost	birr	400,000	TVC birr
3,000,000			

Required:

- a) Develop TR, TC and profit functions for the company in terms of quantity
 - b) Find the breakeven point in terms of quantity and sales volume.
 - c) If profit had been br. 500,000 what would have been the sales volume (Revenue) and quantity of sales.
 - d) What would have been the profit if sales are br. 2,000,000
3. ALUMMUNI PLC. Produces three models of tractors: Metakeb, Mewesson, Metekem Each unit of Metakeb, Mewesson and Metekem requires the following amounts of time in minumtes in each of the indicated departments.

	Machining dep't	Assembly dep't
Inspection dep't		
	(in minutes)	(in minutes)
Metakeb	1200	2400
600		
Mewesson	1800	1200
3000		
Metekem	3000	2400
1200		

Suppose the total time available per month in machining, assembly and inspection departments are 1050, 1160 and 830 hours respectively.

Required:

Determine the number of units of each product to be produced in a month to use up all the available resources (use Gaussaian method)

- Attendance record indicated that 80,000 South Koreans attended the 2002 world cup at its opening ceremony. Total ticket receipts were \$ 3,500,000. Admission prices were \$ 37.50 for the second class and \$ 62.50 for the first class. Determine the number of South Koreans who attended the opening ceremony at the first and second class.
- There are two competing brands of toothpastes in a market. The brands are colget and Akuafresh. A survey was undertaken to determine the extent customers switch over from one brand to another every quarter. The survey has identified that every quarter 1/3 of 45% of customers of Akuafresh in the previous quarter continue to purchase Akuafresh. And $\frac{3}{4}$ of 60% customers of colget in the previous quarter become customers

of Akuafresh. Moreover, it was identified that the two brands have a constant customers of 10,000 and no one stops purchasing one or the other brand. Currently the number of customers of colget are 6000 persons.

Required:

- a. What will be the number of customers of colget and Akuafresh after two transitions?
 - b. Find the steady state market share.
6. Abush Manufacturing Company produces two different types of Tractor. These are Hiwot and Durex. Hiwot requires 9 minutes to assemble and 2 minutes to package. While Durex requires 12 minutes to assemble and 6 minutes to package. In addition, each type has an engine. The company has 720 minutes of assembly time available 75 engines and 300 minutes of packaging time. Profits are b. 45 for Hiwot and br. 70 for Durex both per unit.

Required:

- a. Formulate the Linear anagramming model for the problem. (Show all the necessary steps)
 - b. Determine how many tractors of each type to make in order to maximize total profit (use simplex method)
 - c. Interpret your result
- 7 . Ato Bekele is thinking of buying a G+2 building 5 years form now on a mortgage basis. The building will be used for office purpose for his new business that costs

Br. 500, 000. The required down payment is Br. 100, 000, with monthly mortgage

payment for 30 years at a rate of 12% compounded monthly. To cover the down

payment Bekele has established a sinking fund account in Dashen Bank, which

pays 10% interest compounded quarterly.

- Required:**
- a) How much Bekele should deposit at the end of every quarter to meet the objective of the down payment?
 - b) Determine the amount of monthly mortgage payment to be made to discharge the mortgage within 30 yrs.
 - c) What is the amount of total interest paid on the mortgage?
 - d) What is the total amount paid over the entire period of the mortgage?

8. Find the derivatives of the following

a) $f(X) = 25$

b) $g(X) = X^6$

c) $h(X) = \frac{1}{X^4}$

d) $f(X) = 5X^3 + 3X^4$

e) $g(X) = (3X^2 - 3)(X + 5)$