

1. Linear Programming Problem

Solve the following problem using MS Excel.

a. Maximize $Z = 3x_1 + 4x_2$

Subjected to,

$$x_1 + x_2 \leq 20$$

$$2x_1 + 3x_2 \leq 50$$

$$x_1, x_2 \geq 0$$

b. Minimize $Z = 3x_1 + 4x_2 + 5x_3$

Subjected to,

$$x_1 + x_2 + x_3 \geq 30$$

$$10x_1 + 15x_2 + 20x_3 \leq 600$$

$$x_1, x_2, x_3 \geq 0$$

- c. A manufacturer makes two products P1 and P2 using two machines M1 and M2. Product P1 requires 5 hours on machine M1 and no time on machine M2, product P2 requires 1 hour on machine M1 and 3 hours on machine M2. There are 16 hours of time per day available on machine M1 and 30 hours on M2. Profit margin from P1 and P2 is Rs. 2 and Rs. 10 per unit respectively. What should be the daily production mix to maximize profit?
- d. Chemicals Ltd. must produce 10,000 kgs. of a special mixture for a customer. The mix consists of ingredients A, B and C. A Costs Rs. 8 per kg., B costs Rs. 10 per kg. and C costs Rs. 11 per kg. No more than 35000 kgs of A can be used and at least 1,500 kgs. of B must be used. Also, at least 2,000 kgs of C is required. Calculate the number of kgs. For each ingredient to use in order to minimize total costs for 10,000 kgs.
- e. Martin and Son's company wants to manufacture a mixture containing three contents X, Y and Z. The cost of X, Y and Z are \$5, \$4 and \$3 respectively. The company prepares the mixture to meet out the demand of the costumers in the following manner.

The quantity of X cannot be more than 200 kgs in the mixtures.

The quantity of Y used should be at least 300 kgs.

The content of Z cannot be more than 400 kgs.

Find the optimal combination of the three contents for a mixture of 1000 kgs, so that the total cost is minimum.

2. Tax Calculation Problem

- a. Write a procedure, **tax**, to calculate (to the nearest pounds) the tax a person owes, depending on his/her yearly income. Calculate the tax using the table below:

Income Tax rates	
Tax rate	Taxable income
Basic rate 1%	£ 0 to £ 450,000
Medium rate 7%	£ 450,000 to £ 750,000
Higher rate 13%	£ 750,000 to £ 3,500,000
Additional rate 25%	Over £ 3,500,000

Also show the tax calculation for the person having yearly income ,

- i. £375000
- ii. £650000
- iii. £2750000
- iv. £5500000
- v. – (£37,500) (For Negative value should show error message)

- b. Write a procedure, **tax**, to calculate (to the nearest rupees) the tax a person owes, depending on his/her yearly income. Calculate the tax using the table below:

Income Tax rates	
Tax rate	Taxable income
Basic rate 10%	Rs 0 to Rs 750,00
Medium rate 25%	Rs 750,00 to Rs 450,000
Higher rate 35%	Rs 450,000 to Rs 2,500,000
Additional rate 50%	Over Rs 2,500,000

Also show the tax calculation for the person having yearly income ,

- i. Rs.38000
- ii. Rs.425000
- iii. Rs.2025000
- iv. Rs.4500000
- v. – (Rs.37,500) (For Negative value should show error message)