Section 1.3
Applications of Inequalities

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MATHS 103: Mathematics for Business I

Manufacturing Firms

Recall (Section 1.1):

- **Fixed Cost** is the cost that is independent of the level of production (it must be paid regardless of the production level). For example, the rent, insurance, etc.
- **Variable Cost** is the cost that is dependent on the level of production. For example, labor charge, material, electricity, etc.
- **Total Cost** is the sum of the fixed cost and the variable cost, i.e.,

$$\text{Total cost} = \text{fixed cost} + \text{variable cost}$$

- **Total revenue** is the money received for selling the product to the customer.

$$\text{Total Revenue} = (\text{price per unit})(\text{number of units sold})$$

- **Profit** is difference between the total revenue and the total cost.

$$\text{Profit} = \text{Total revenue} - \text{Total cost}$$

Example

A company that manufactures pipes. The variable cost is 21 BD per pipe and the fixed cost is 70000 BD. If the selling price of a pipe is 35 BD. How many pipes should be sold for the company to earn profit?

Solution: Let the number of pipes that we are looking for is x. First we find the total revenue and the the the total cost

$$\text{Total Revenue} = (\text{price per unit})(\text{number of units sold}) = 35x$$
$$\text{Total cost} = \text{fixed cost} + \text{variable cost} = 70000 + 21x$$

Here we are asking about getting a profit, so the profit should be greater than zero.

Continue...

$$\text{Profit} > 0$$
$$\text{Total Revenue - Total Cost} > 0$$
$$35x - (70000 + 21x) > 0$$
$$35x - 70000 - 21x > 0$$
$$14x > 70000$$
$$x > \frac{70000}{14} = 5000$$

So the company should sell about 5000 pipes to get a profit.

Exercise

To produce one unit of a new product, a company determines that the cost for the material is 2.5 BD per unit, the cost of the labor charge is 4 BD per unit, and the fixed cost is 5000 BD. If the cost of wholesale is 7.4 BD per unit, determine the least number of units that must be sold by the company to realize a profit.

Example

To rent a car, the rental fees would be 30 BD monthly and the total daily cost (gas, insurance, etc) is 1.8 BD per day.
To buy a car, the monthly payment is 16.6 BD and it costs 2.3 BD per day. What is the least number of days each year that one would have to use the car to justify renting it rather than buying it¿

Solution:

$$\text{cost of rent} > \text{cost of buy}$$
$$30(12) + 1.8x(365) > 16.6(12) + 2.3x(365)$$

Exercise

Complete the above example using what have you learnt in Section 1.2.

Current Ratio

Definition

For any company, the current ratio is the given by

$$\text{Current Ration} = \frac{\text{current assets (cash, merchandise,...)}}{\text{current liablities (loans),...}}$$

Example

A company has current assets of 350000 BD and current liabilities of 80000 BD. How much they can borrow if the current ratio is no less than 2.5?

Solution: Let x be the amount to borrow so the current ration is no less than 2.5.

Continue

$$\text{current ratio} \geq 2.5$$

$$\frac{350000 + x}{80000 + x} \geq 2.5$$

$$(80000 + x)\frac{350000 + x}{80000 + x} \geq (80000 + x)2.5$$

$$350000 + x \geq 200000 + 2.5x$$

$$100000 \geq x$$