

SHARP

Worksheet 7 – Linear Programming

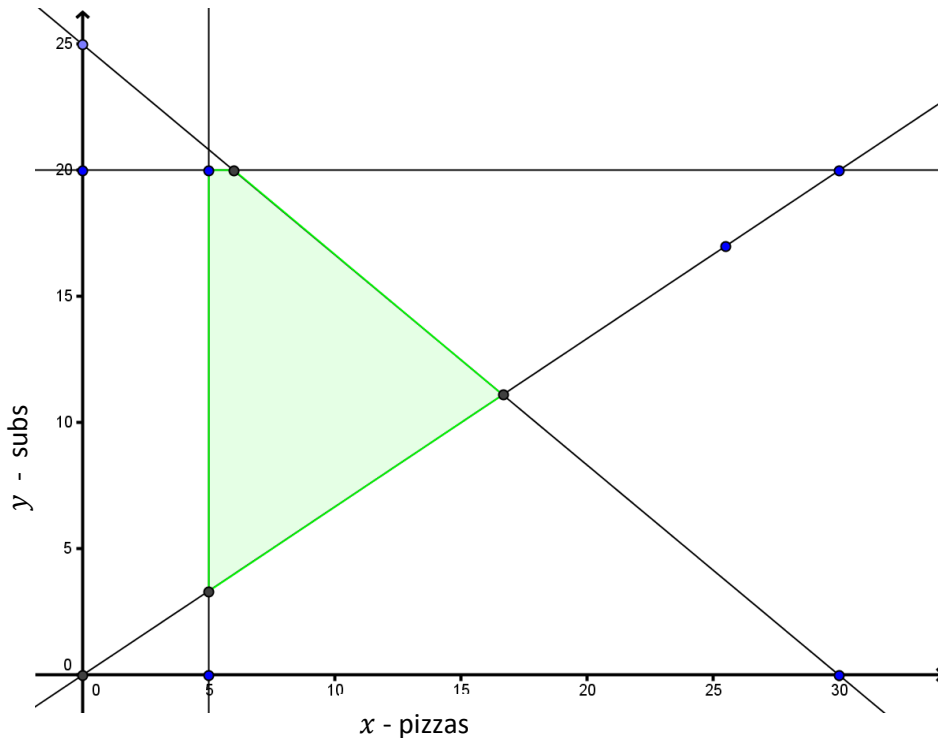
1. An ice cream manufacturer produces two types of ice-cream – the chocolate swirl and the rainbow stick. The chocolate swirl requires 25 litres of milk per batch while the rainbow swirl needs 16 litres of milk per batch. The ice-cream manufacturer only buys 400 litres of milk per day. They also know that they must produce at least 5 batches of rainbow stick per day and that they need to make at most 10 batches of chocolate swirl. They use at most 525 sticks per day and the rainbow bow sticks require 25 per batch while the chocolate swirl needs 15 per batch.
 - a) Write down the constraints of the graph if the chocolate swirl is x and the rainbow stick is y .
 - b) Draw the constraints on a set of axes and indicate clearly the feasible region.
 - c) If the profit on a chocolate swirl is R3.20 and the profit on a rainbow stick is R1.60, determine the maximum profit for these constraints.

2. A toy manufacturer makes two kinds of toy robots – a Robert (x) and a T-bot (y). It takes 7 man hours to produce one Robert and 5 man-hours to produce one T-bot. There cannot be more than three Roberts for every T-bot produced. The company only has 350 man hours available per day. At a minimum the toy manufacturer needs to make at least 10 T-bots and at most 30 Roberts.
 - a) Write down the constraints of the above information if a Robert is x and a T-bot is y .

- b) Draw the constraints on a set of axes and indicate the feasible region.
- c) If the company makes a profit of R 6.40 on each Robert and a profit of R 3.20 per T-bot, determine the maximum profit the company can make per day.
3. A car company produces two types of 4 x 4's. Type A is a sports vehicle and requires 30 man hours to produce. Type B is an off-road vehicle and needs 45 man hours to produce. Type A requires three hours for painting while type B needs 8 hours for painting. The car company has a maximum of 1 800 man hours and 240 hours for painting available per week. The company cannot produce more than 40 Type A vehicles and not less than 10 type B vehicles.
- a) Write down the constraints of the above information if a Type A 4 x 4 is x and a type B 4 x 4 is y .
- b) Draw the constraints on a set of axes and indicate the feasible region on the axes.
- c) If the company makes a profit of R 14 000 on Type A and R 21 000 on type B, determine the profit equation and then the maximum profit the company can make per week.
4. The Nut Company produces two types of nut mixes, A and B. Mix A has 3 times as many almonds as mix B. The ratio of cashews in mix A to mix B is 4: 5. The Nut Company cannot make more than 48kg of Mix A on any day while they cannot make less than 20kg of Mix B. They must use at least 4kg of almonds per day and at most 5kg of cashews per day.
- a) Write down the constraints in terms of x and y .
- b) Draw the constraints on a set of axes and indicate clearly the feasible region.

- c) If 1kg of cashews costs R130 and 1kg of almonds costs R100, determine the cost equation and determine the minimum costs for the above scenario.

5. A teacher draws the following graph of a certain set of constraints:



- a) Determine the constraints from the graph above.
- b) If the profit made on one pizza is R16 and the profit made on one sub is R12 determine the profit equation.
- c) Determine the maximum profit.
- d) If the profit on a pizza decreased to R8 and the profit on a sub increased to R16:
- Determine the new profit equation.
 - Will this new profit equation affect the maximum profit? If yes, then how? Show all calculations.