



TOPIC: LINEAR PROGRAMMING –Lesson 3

TOPIC:GRAPHING LINEAR INEQUALITIES

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LEARNING OUTCOMES

- By the end of this lesson you should be able to represent the inequalities on the graph and identify the required region

Graphical Solution Steps

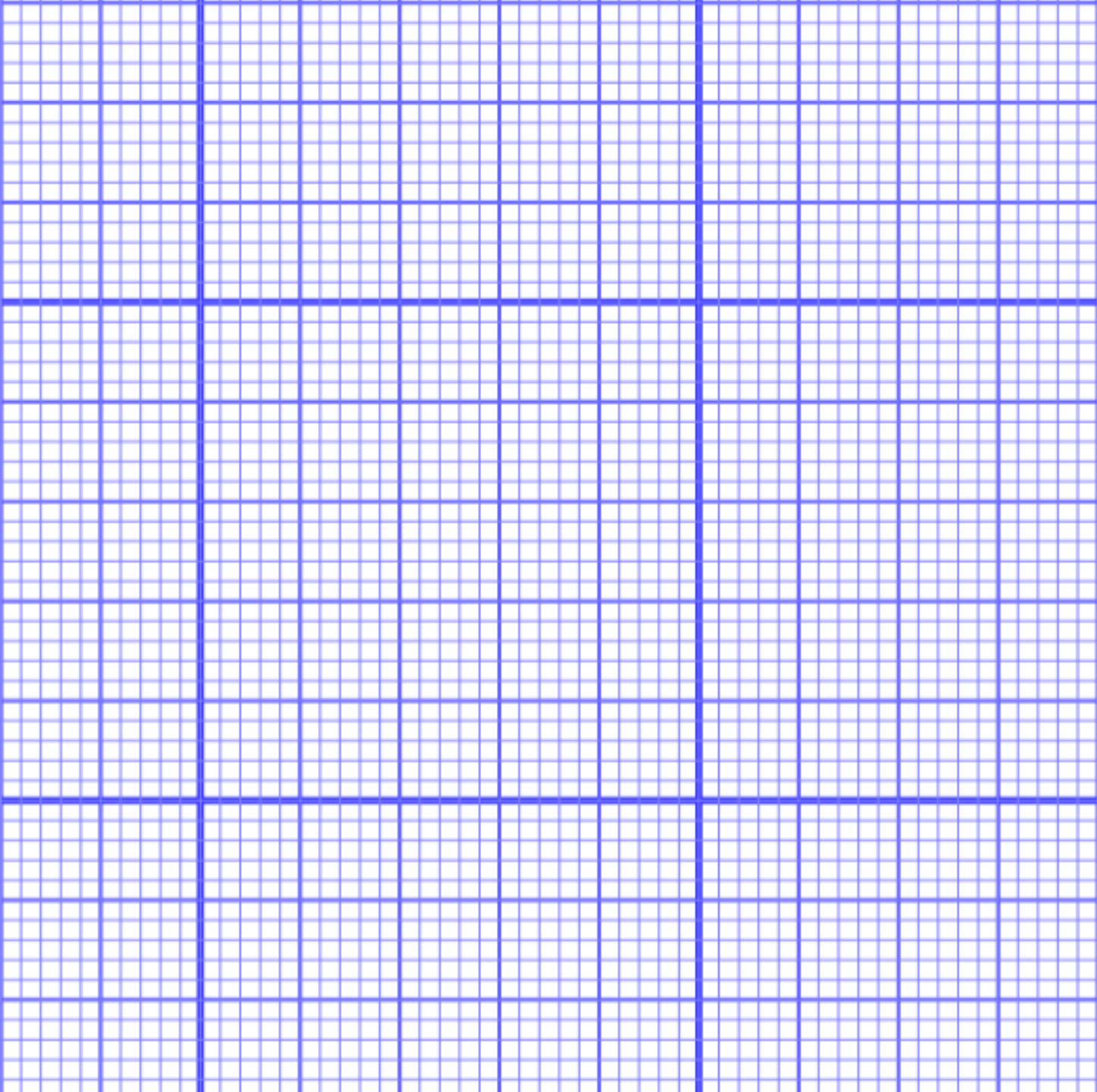
- Step 1: Find the feasible region of the LLP.
- Step 2: Find the co-ordinates of each vertex of the feasible region.
- These co-ordinates can be obtained from the graph or by solving the equation of the lines.
- Step 3: At each vertex (corner point) compute the value of the objective function.
- Step 4: Identify the corner point at which the value of the objective function is maximum (or minimum depending on the LP)
- The co-ordinates of this vertex is the optimal solution and the value of Z the optimal value

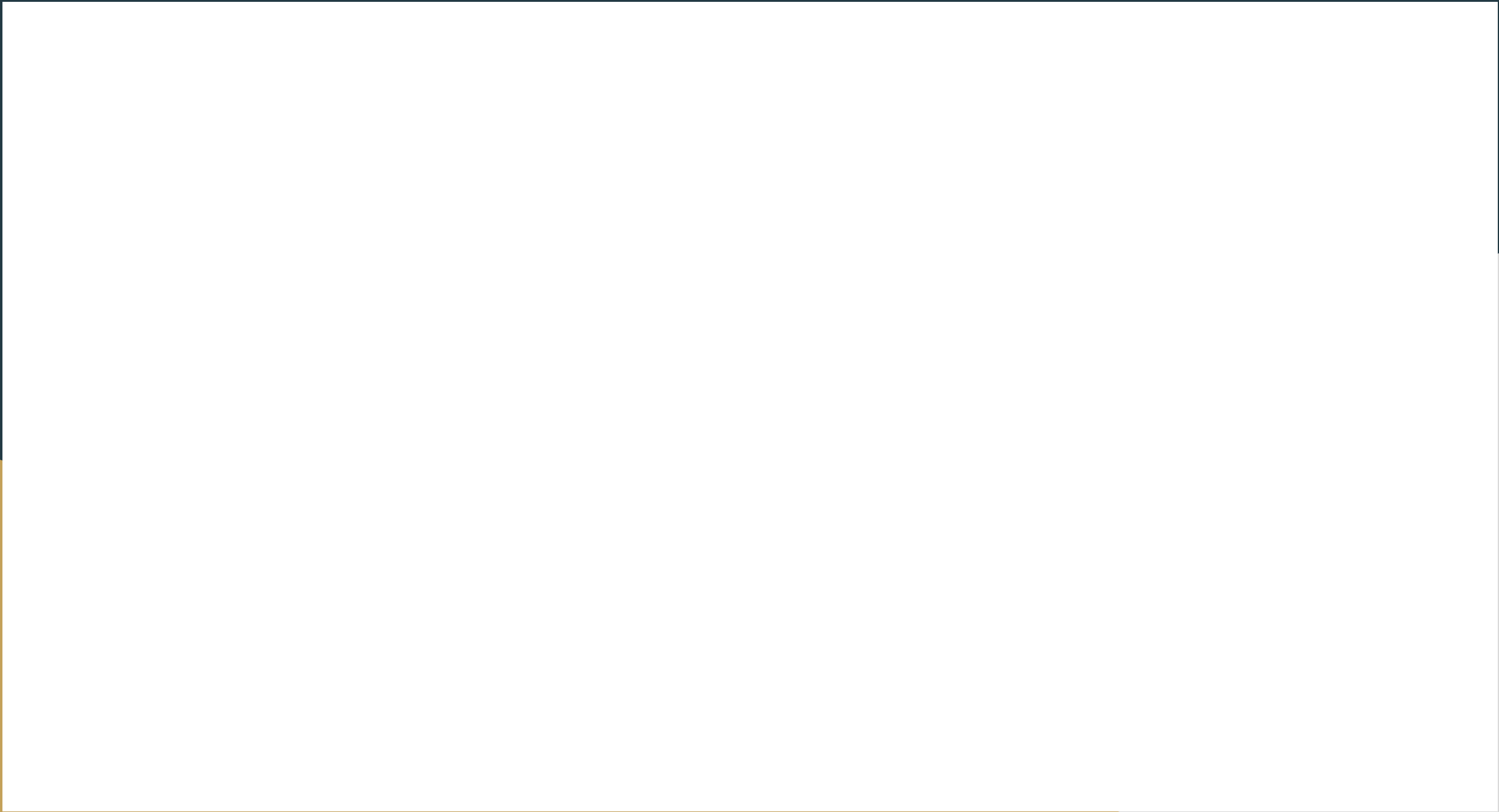
Activity 1

Mark is planning to buy notebooks and pens for his siblings. A notebook costs sh.1000 each, and a pen costs sh.500 each. He has a total budget of sh.5000. Mark must buy at least 3 notebooks, and he wants the total number of items (notebooks and pens) to be at least 8.

Task:

- a) Write down the inequalities representing Mark's constraints.
- b) Represent the feasible region for Mark's purchases on a Cartesian plane.
- c) Determine the combination of notebooks and pens Mark should buy to maximize the total number of items while staying within his budget.





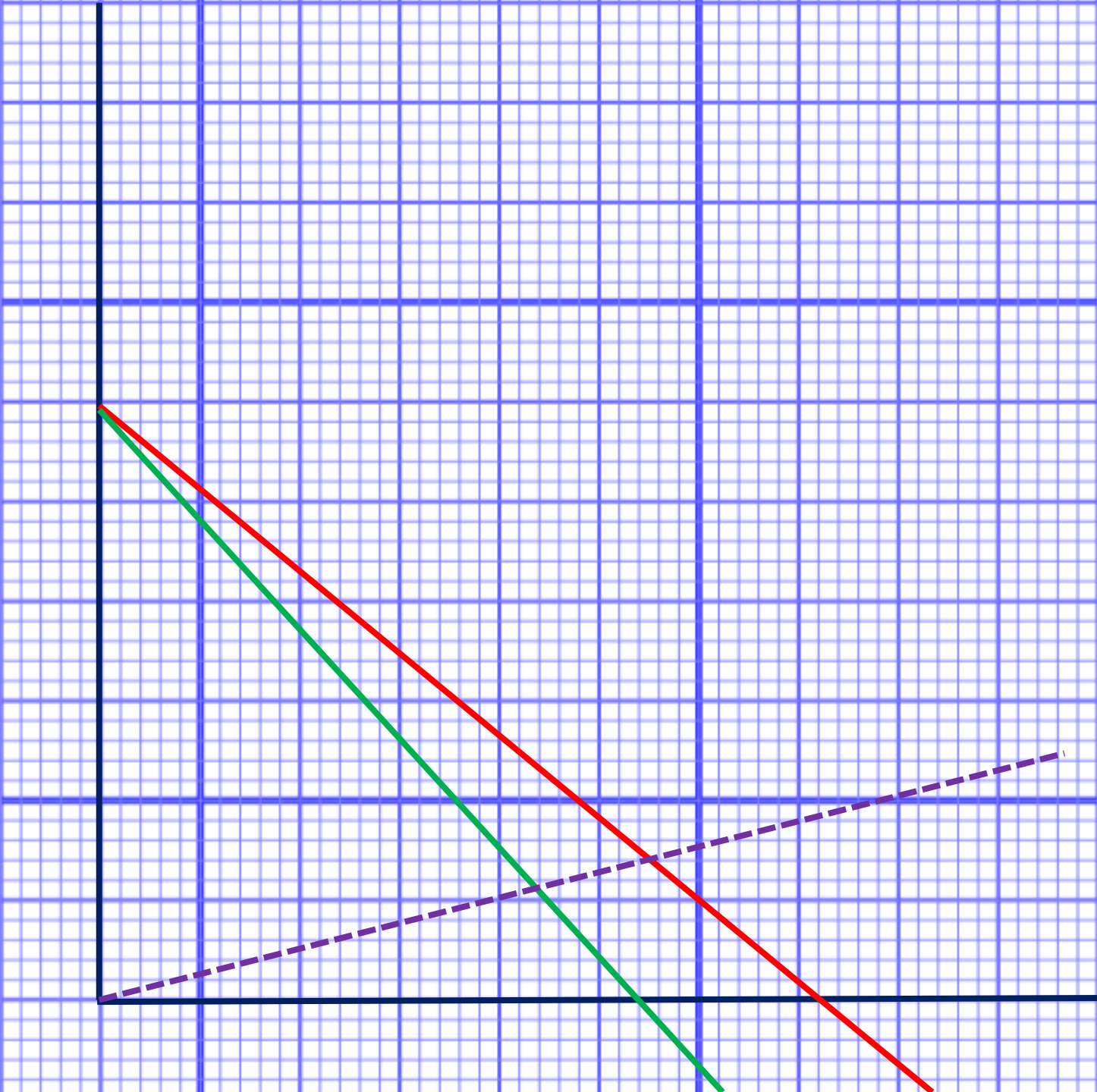


Activity 2

A wholesaler wishes to transport at least 240 bags of sugar from the factory to his shop. He has a lorry that can carry 90 bags per trip and a pick up that can carry 20 bags per trip. The cost of each trip is Shs50,000 for the lorry and Shs 15,000 for a pick up. He has Shs180,000 available to transport the sugar. The pick up makes more trips than the lorry.

Task:

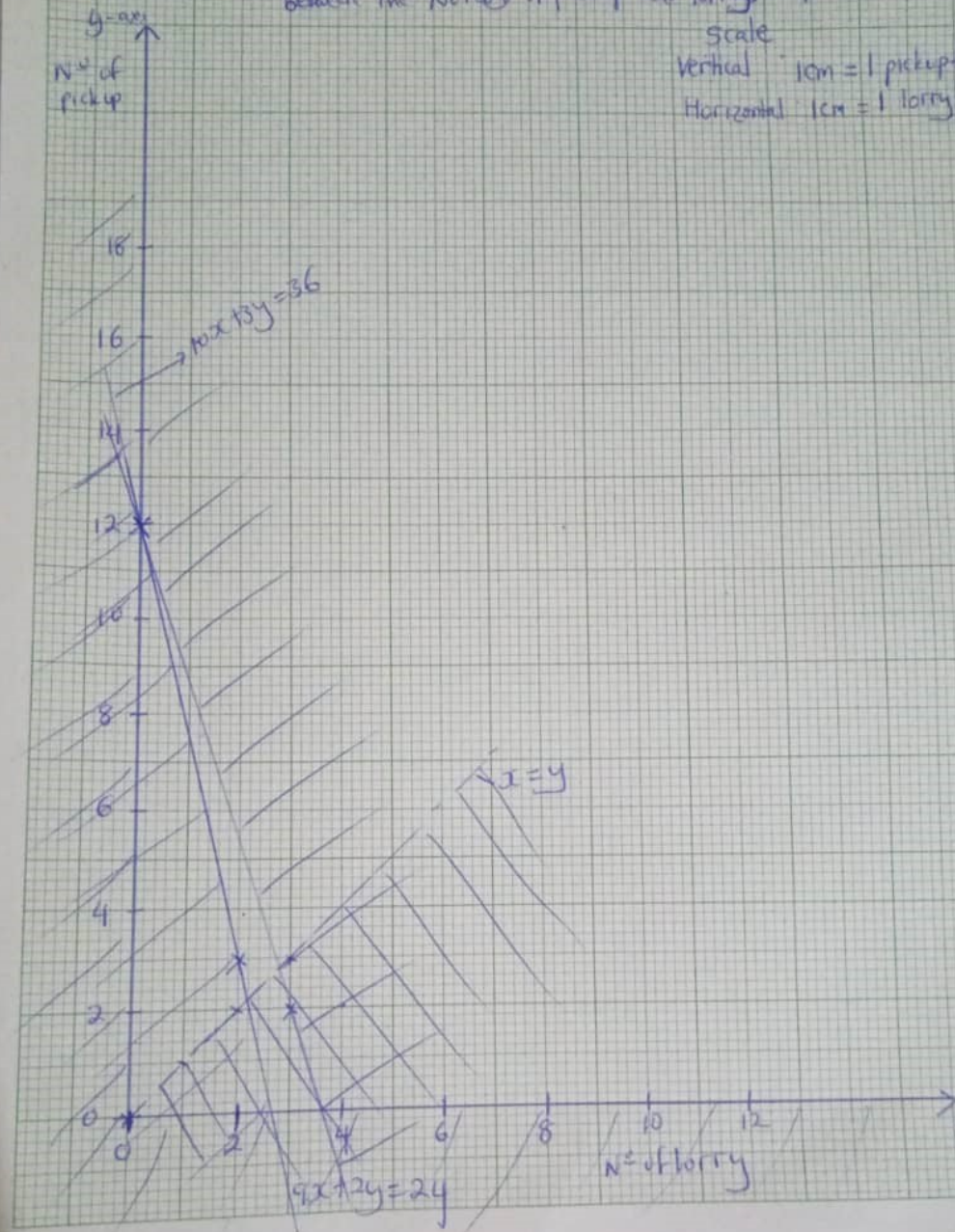
- a) Write mathematical statements that show the relation between the lorry and the pick up.
- b) Show the feasible region of the relation on the Cartesian plane.
- c) Use the graph to find the possible number of trips to be made by the lorry and the pick up .Hence find the minimum cost of transporting the bags of sugar

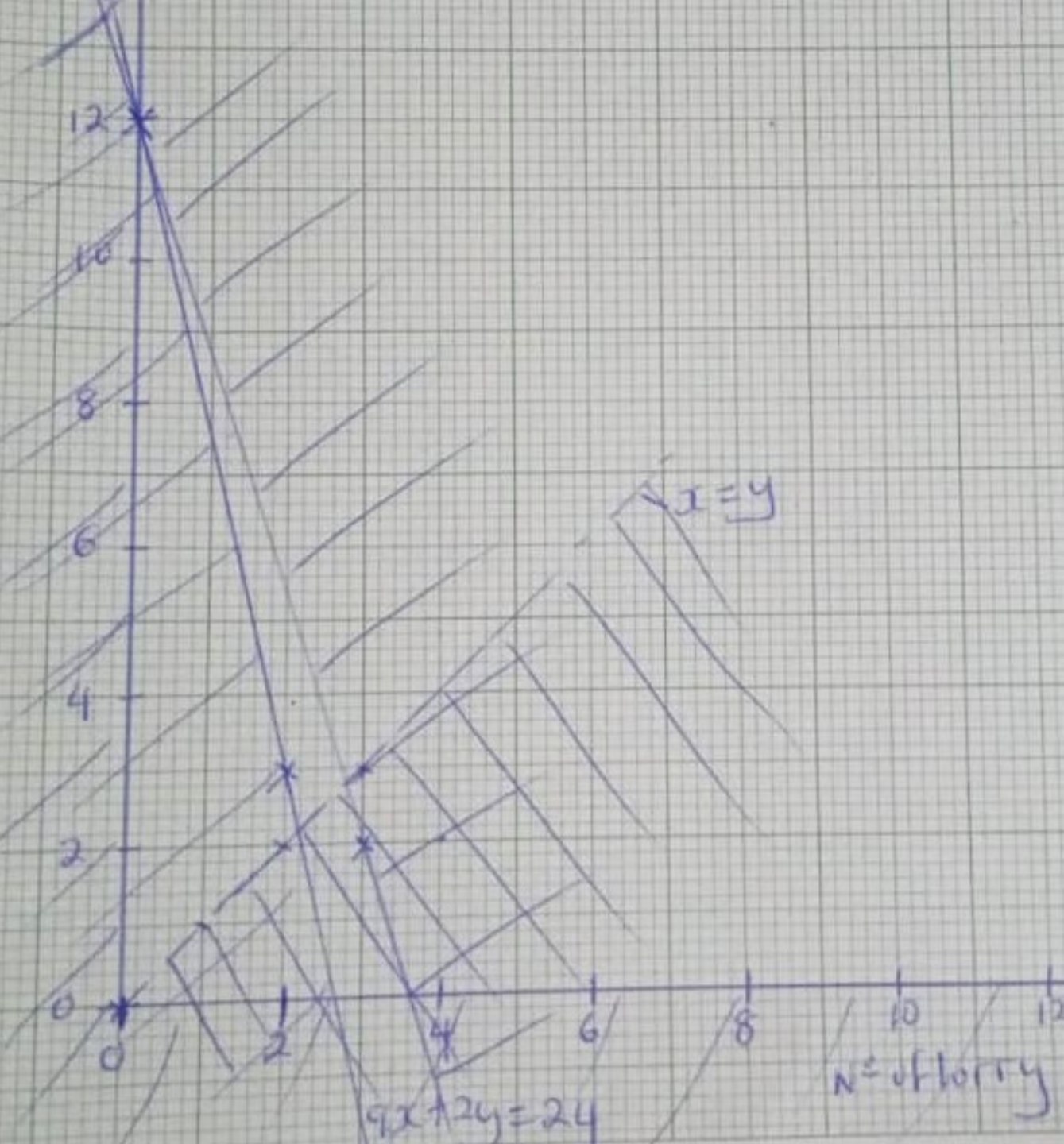




A graph showing the feasible region
between the Number of pickup and lorry trips.

scale
Vertical 1cm = 1 pickup
Horizontal 1cm = 1 lorry





Activity

Judith has been sent to the nearby supermarket to buy some Apples and oranges . Apples cost sh.500 each and oranges cost sh.250 each. She is given only sh.2000 to spend. She must not buy more than 2 Apples and she must buy at least 4 oranges. She must also buy at least 6 fruits all together because her family has 6 members.

Task

- a) Express Judith's Conditions as inequalities and equations.
- b) Show the feasible region of Judith's conditions on a Cartesian plane
- c) Help Judith to determine the possible number of apples and oranges she should purchase so as to minimize her expenditure while maximizing purchases.

ACTIVITY

The manager of the cinema hall wishes to divide the seats available into two classes executive and ordinary. There are not more than 120 seats available. There must be at least twice as many ordinary seats as there are executive seats. Executive seats are priced at Shs 15,000 each. Ordinary seats are priced at Shs 10,000 each. At least Shs 1,000,000 should be collected at each show to meet the expenses

Task

- (a) Write down the information above using algebraic statements.
- (b) Show the feasible region
- (c) From your graph, find the number of seats of each kind which must be sold to give the maximum profit

ACTIVITY

- Your uncle owns a small bakery and plans to bake two types of loaves of bread: whole wheat bread and white bread. Due to the bakery's oven capacity, your uncle can bake at most 15 loaves of bread in a day. He wants to bake at least 3 loaves of whole wheat bread. Additionally, he wants to bake more whole wheat bread than white bread because it is more popular among his customers. The selling prices are as follows:
- Whole wheat bread is sold at Shs 6500 per loaf. White bread is sold at Shs 5000 per loaf.
- To cover his costs and make a profit, your uncle needs to earn more than Shs 30,000 from the sales each day.

Task:

- a) Write mathematical statements that show the relation between the whole wheat bread and white bread.
- b) Show the feasible region of the relation on the Cartesian plane.
- c) How many loaves of each type should your uncle bake in order to make the maximum profit?
- d) What is the minimum number of loaves he can bake and still make a profit?

ACTIVITY

You are in a management committee that is organizing a farewell party. The committee wants to establish the number of people to attend the party keeping the cost as minimum as possible. You have been assigned a department of drinks which has a maximum amount of Ugx 450,000. You are planning to buy crates of soda and jerrycans of juice. Each crate of soda costs ugx 20,000 a jerrycans of juice Ugx 30,000. You intend to buy more crates of soda than jerrycans of juice. The jerrycans of juice should be more than 6 and the crates of soda should be less than 12. Each person will be served only one type of drink once and in the budget 24 students are to take a crate of soda and 20 students are to take a full jerrycans of juice.

TASK

- Write down mathematical statements to show the relation between the number of crates of soda and number of jerrycans of juice.
- Show the feasible regions of the relation on a Cartesian plane.
- Help the committee establish the number of students who are to attend the party at a minimum cost.