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IGCSE Mathematics – Extended

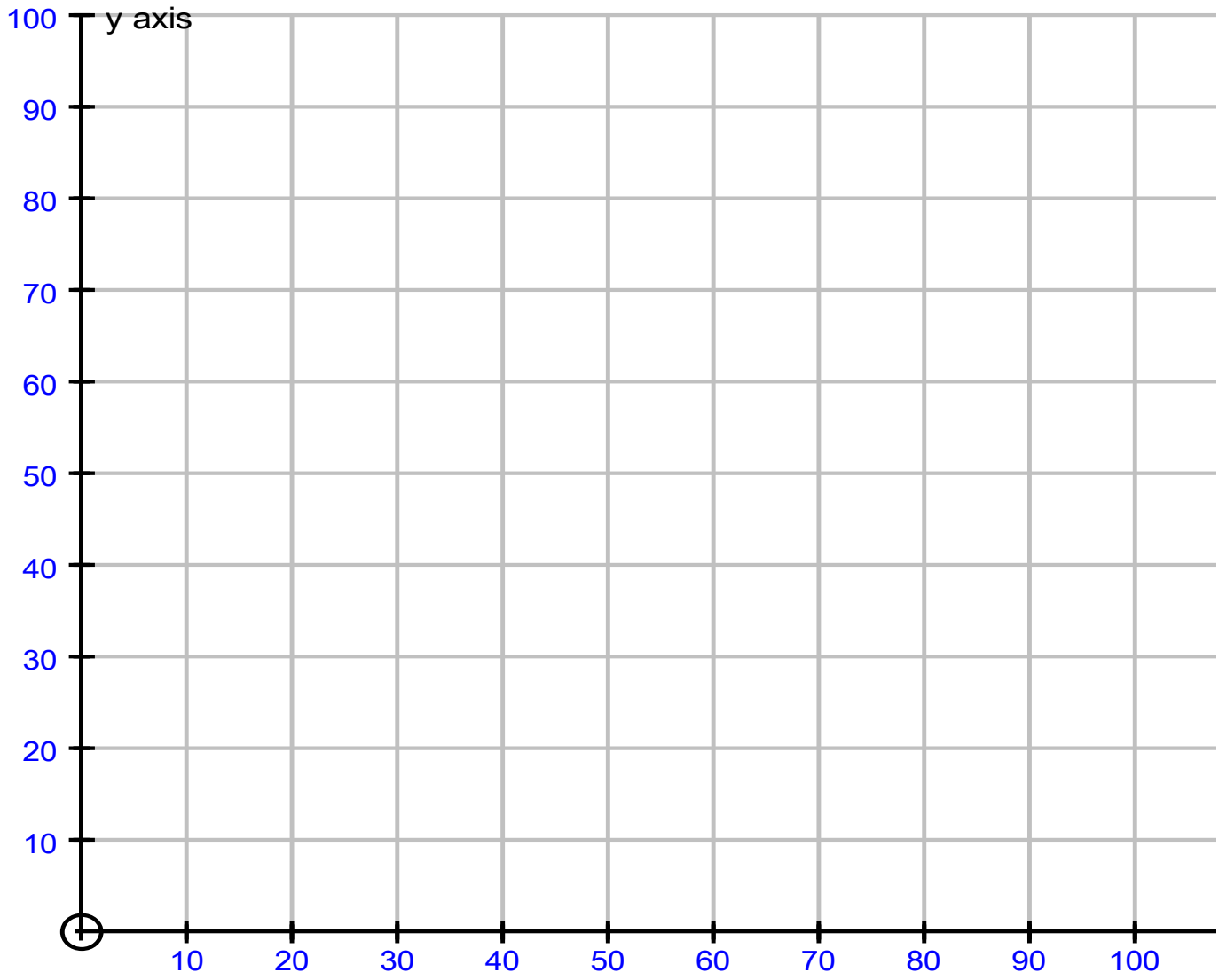
Topic: Linear Programming Worksheet

Student Name: Date:

I. Solve the following linear programming problems graphically

1. *Maximise* $Z = 4x + y$ *subject to the constraints*

$x + y \leq 50$; $3x + y \leq 90$; $x \geq 0, y \geq 0$

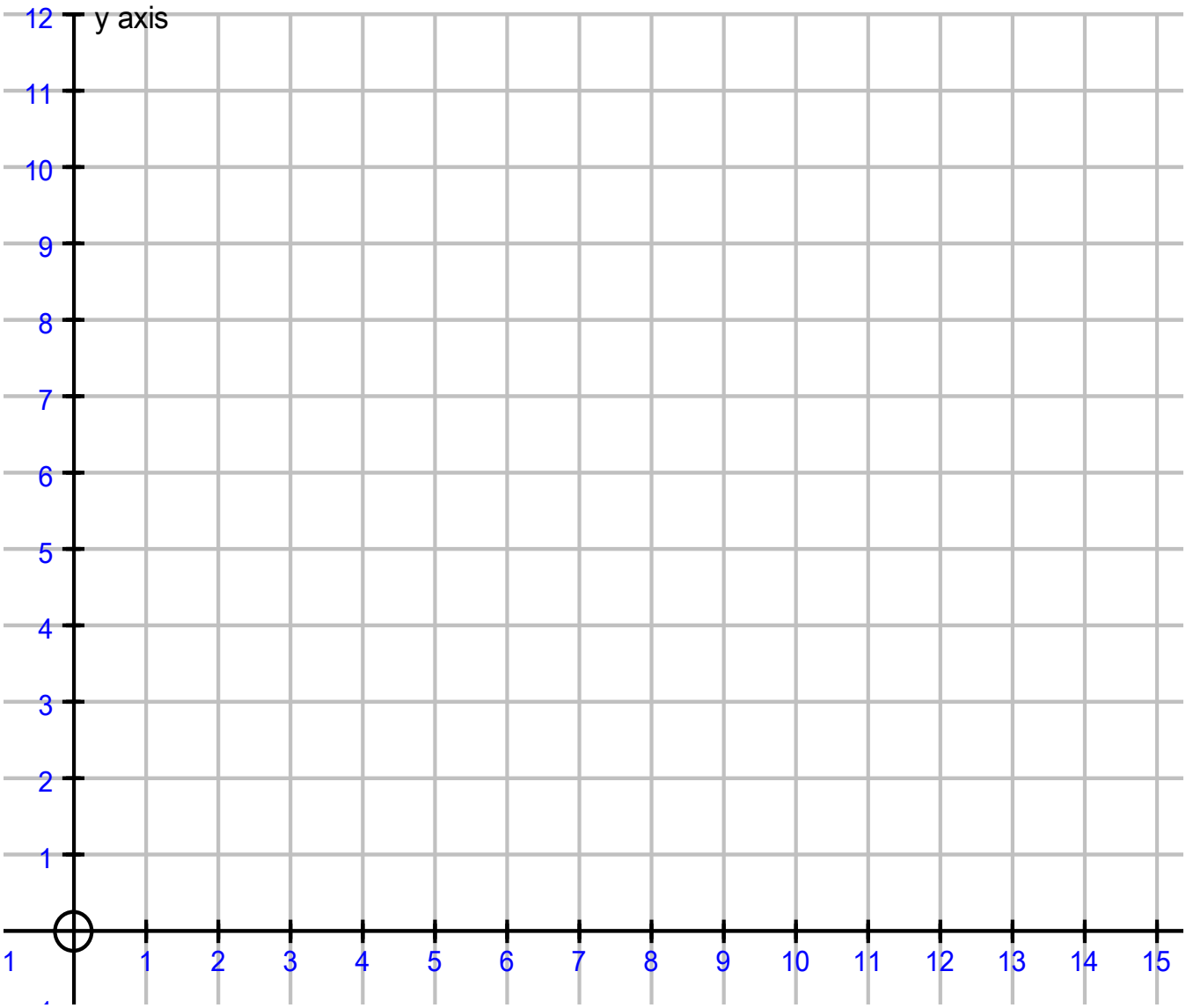


Answer: *The maximum value of* Z *is* 120 *at* $(30, 0)$

2. Solve the following linear programming problems graphically

$$Maximise\ Z\ =\ 200x\ +\ 500\ y\ subject\ to\ the\ constraints$$

$$x + 2y \geq 10\ ; \qquad 3x + 4y \leq 24\ ; \qquad x \geq 0\ , y\ \geq 0$$

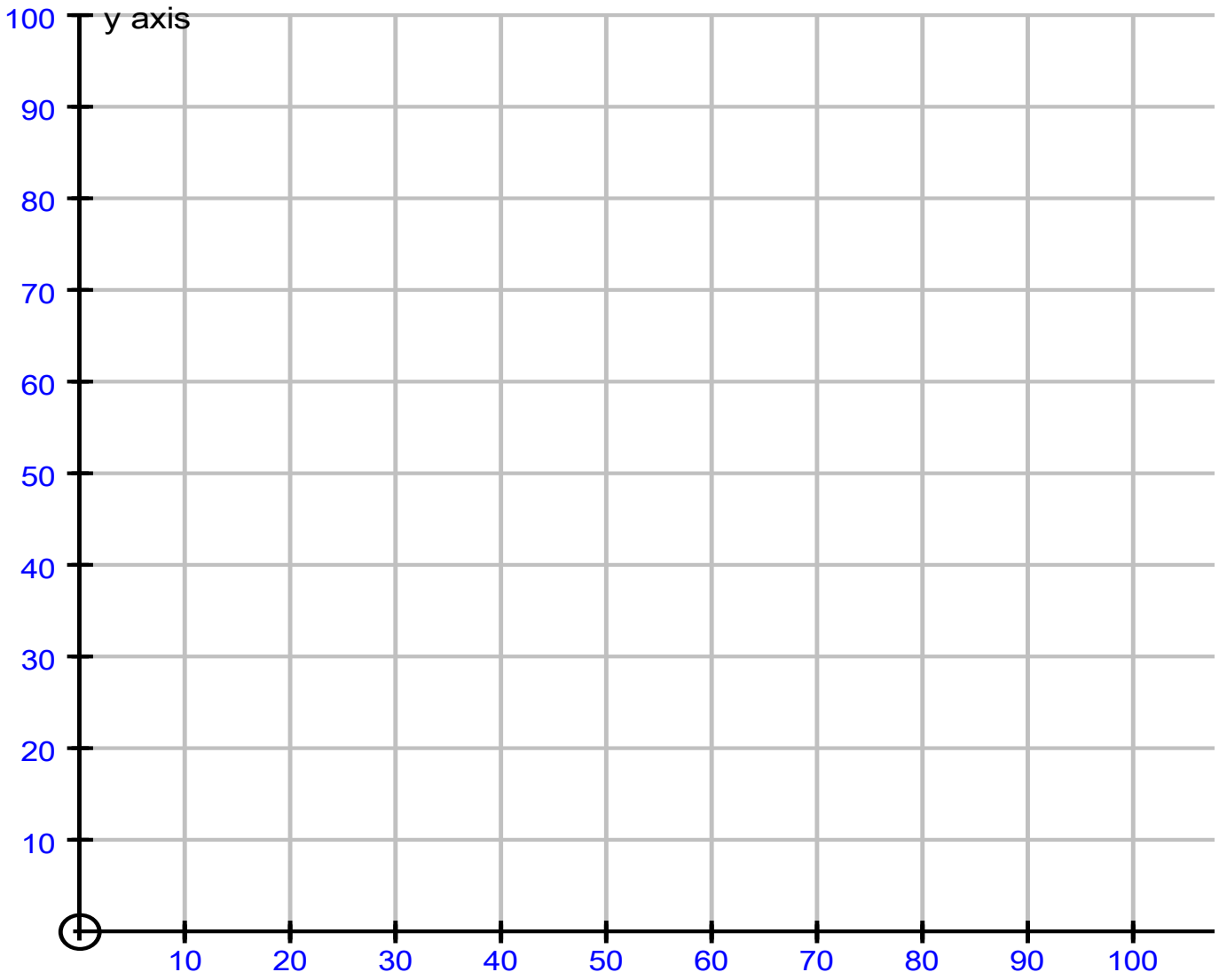


$Answer$: $Minimum\ Value\ of\ Z\ is\ 2300\ at\ (\ 4, 3)$

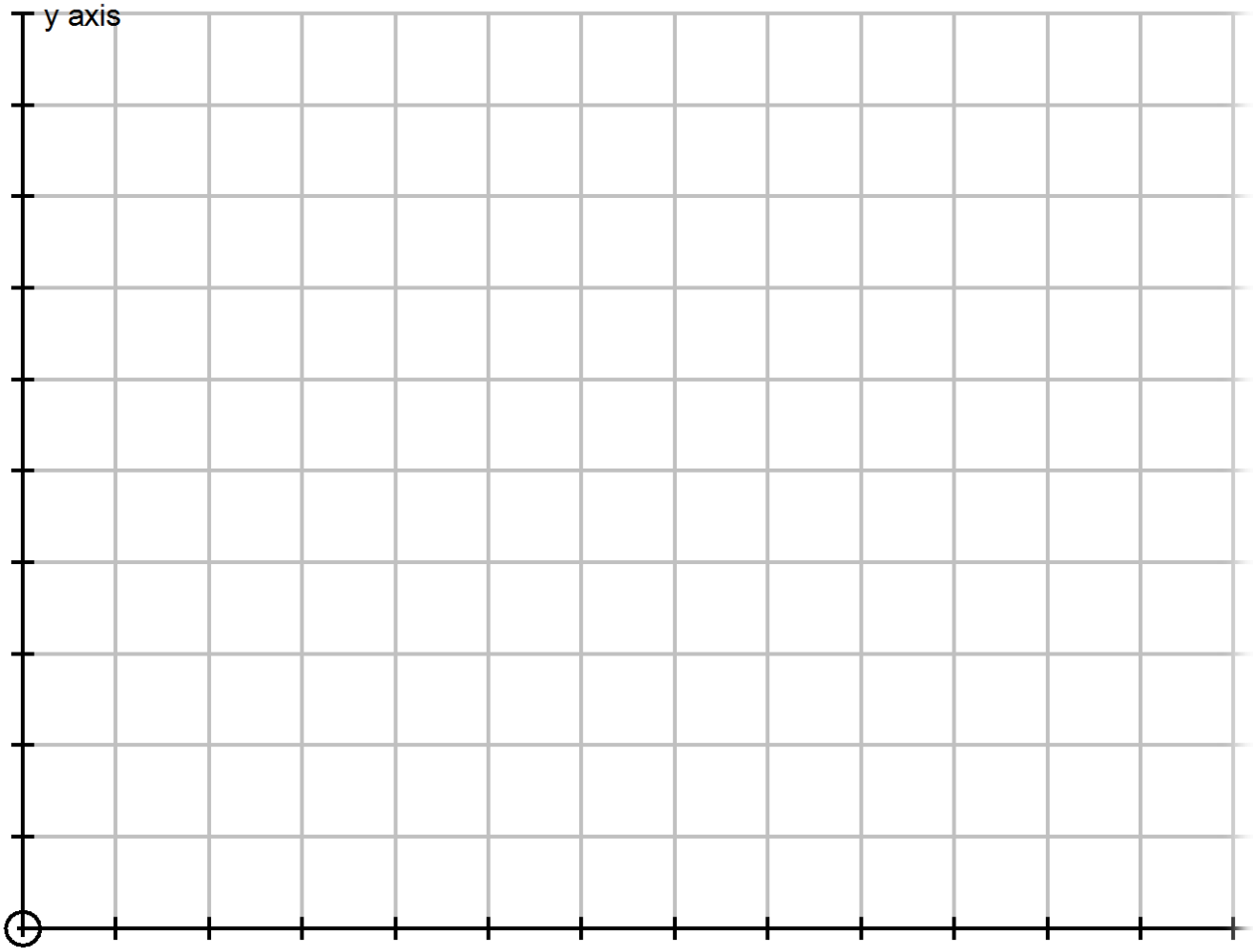
3. Solve the following linear programming problems graphically

$$Minimise\ and\ Maximise\ Z\ =\ 3x\ +9\ y\ subject\ to\ the\ constraints$$

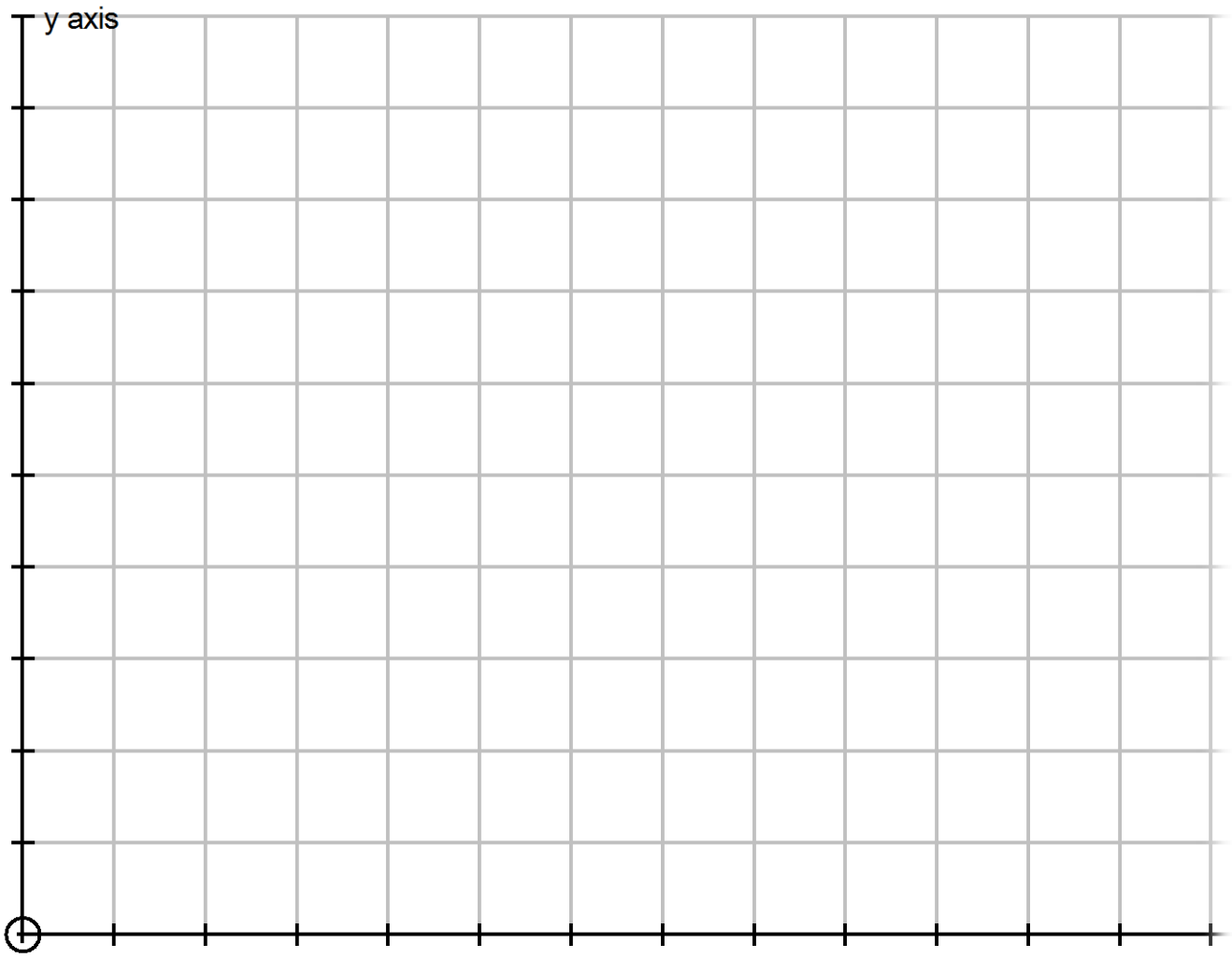
$$x + 3y \leq 10\ ; \qquad x + y \geq 10\ ; \qquad y \geq x,\ \ x \geq 0\ ,\ \ \ y\ \geq 0$$



4. A student buys x number of Pencils and y numbers of Erasers
    a. Explain what x > 3
    b. Write an inequality to show that he buys at least 2 erasers.
    c. He doesn't want to buy more than 8 items of pens and erasers together. Write this as an inequality
    d. Draw a graph to show possible values of x and y



5. A bot trip costs \$20 for adults and \$10 for children. Suppose there are x adults and y children on the trip
   [a] there must not be more than 10 people on the trip
   [b] the money taken for tickets must be at least \$120.
   [c] Show the region satisfied by both these inequalities.
   [d] What is the least number of students that should be carried?

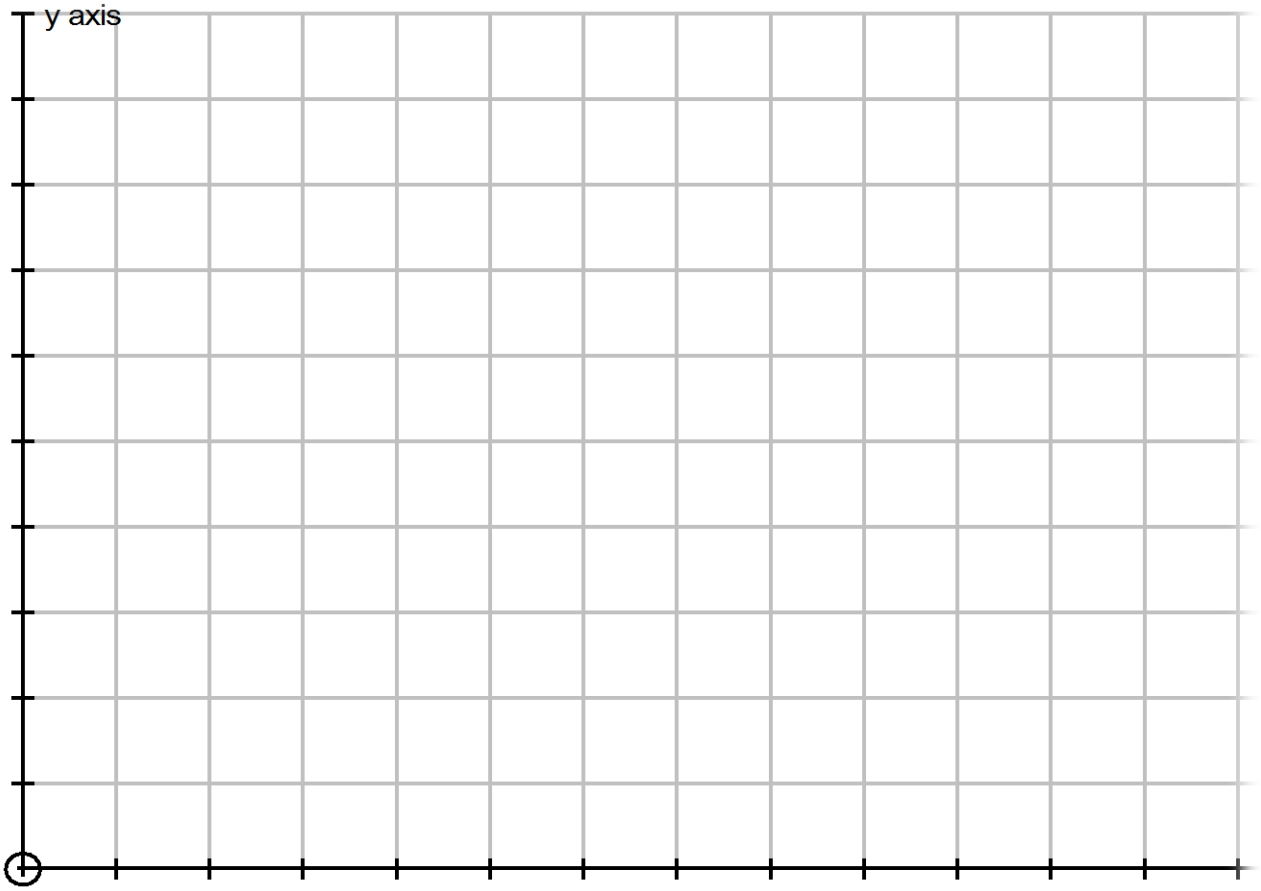


6. A company makes two products (X and Y) using two machines (A and B). Each unit of X that is produced requires 50 minutes processing time on machine A and 30 minutes processing time on machine B. Each unit of Y that is produced requires 24 minutes processing time on machine A and 33 minutes processing time on machine B.

   At the start of the current week there are 30 units of X and 90 units of Y in stock. Available processing time on machine A is forecast to be 40 hours and on machine B is forecast to be 35 hours.

   The demand for X in the current week is forecast to be 75 units and for Y is forecast to be 95 units. Company policy is to maximize the combined sum of the units of X and the units of Y in stock at the end of the week.

   - Formulate the problem of deciding how much of each product to make in the current week as a linear program.
   - Solve this linear program graphically.



Ans: x=45 and y=6.25 with the value of the objective function being 1.25

Ref:-people.brunel.ac.uk