Practice for L3 Linear Programming #1

A silver mining company has two mines, mine A and mine B. Mine A yields 200 g of silver per tonne, and ore from mine B yields 300 g of silver per tonne.

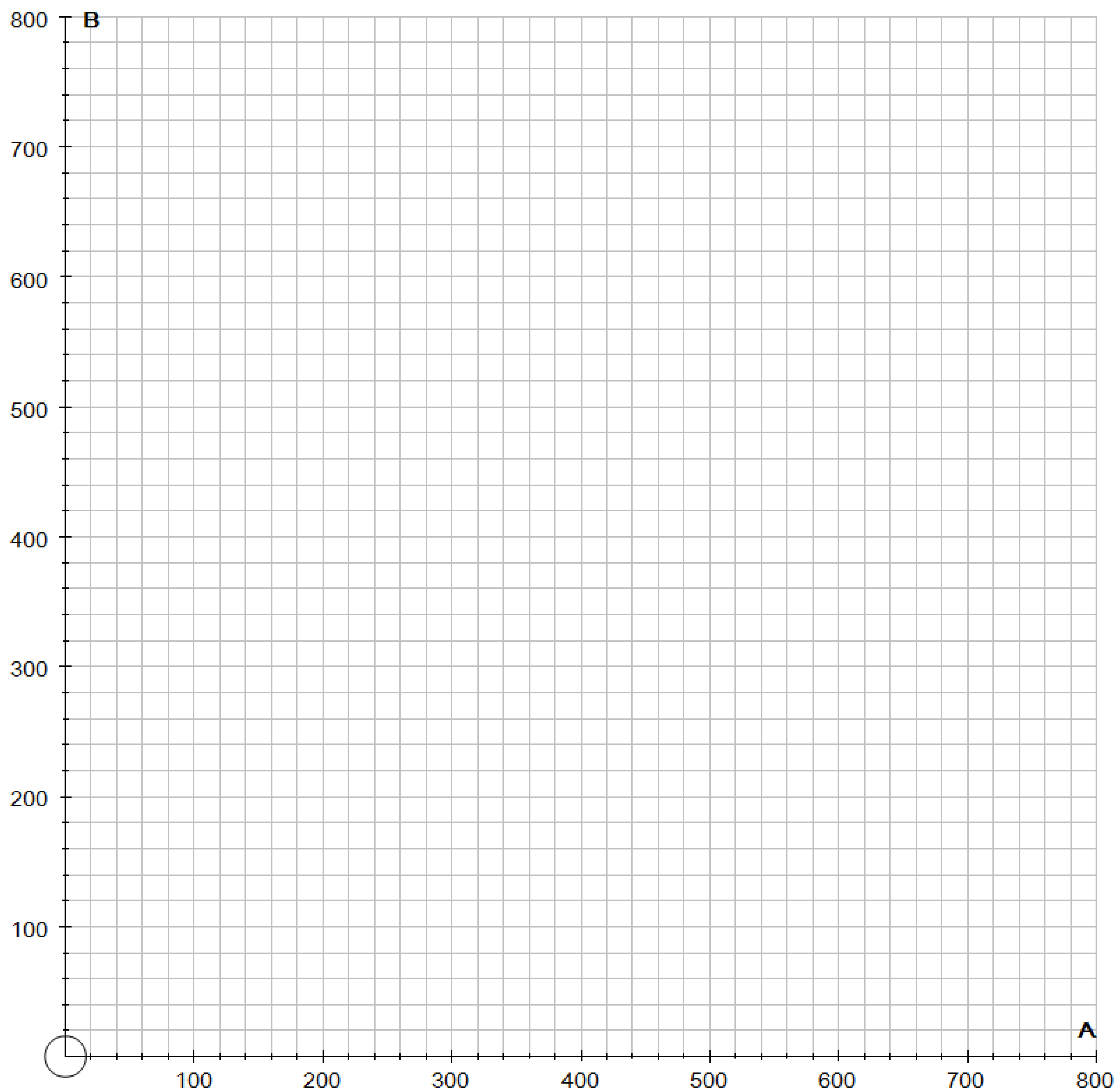
The cash flow of the company requires at least a half a kilogram (500 grams) of silver to be mined every day. Environmental regulations specify that no more ore may be taken from mine A than mine B.

Mine A costs $20 per ton to process, and mine B costs $25 per ton to process. Costs must be kept to less than $12000 per day.

The constraints for this problem are:

$A + B \geq 500$ $\qquad$ $20A + 25B \leq 12000$ $\qquad$ $A \leq B$

Graph these constraints on the graph below and indicate the feasible region.



The objective function for the amount of silver extracted $P = 200A + 300B$

How many tons of ore from the mines should be processed in order to maximise the amount of silver extracted?

Question 2

A coal mining company owns two mines.

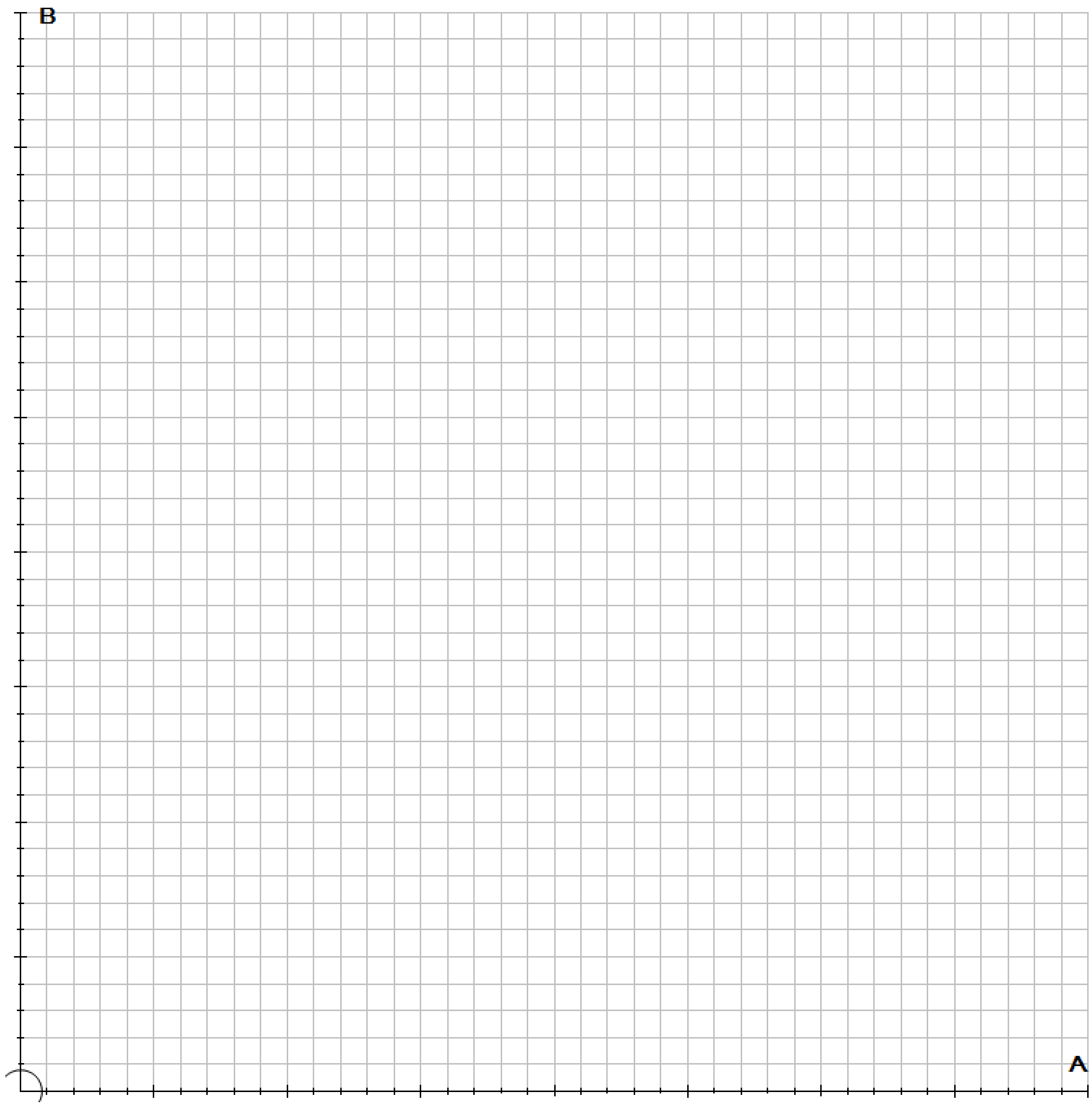
In one hour's production mine A produces 2 tonnes of high grade and 3 tonnes of low grade coal.

In one hour's production mine B produces 1 tonne of high grade and 6 tonnes of low grade coal.

The hourly running costs are $2,500 for mine A and $2,750 for mine B.

Currently the mining company has outstanding orders for at least 100 tonnes of high grade coal and 240 tonnes of low grade coal.

Write a system of inequalities for production and graph this information.

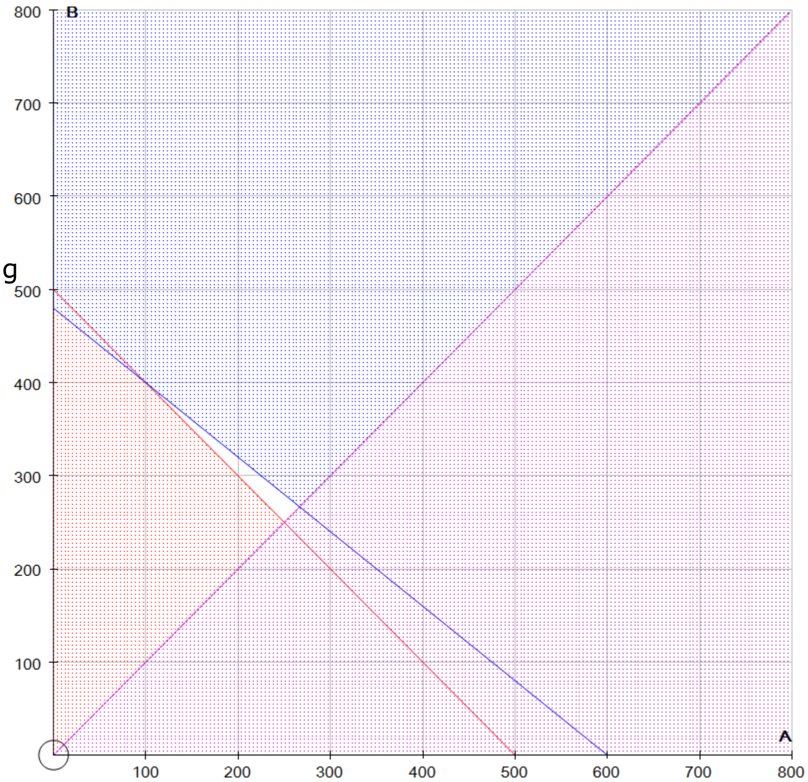


Indicate the feasible region, where production targets are met.

How many hours should each mine operate in order to meet all outstanding orders as well as minimising costs?

Answers: Practice for L3 Linear Programming #1

feasible region is white triangle in middle



Vertices, with profit

(100, 400) = 140000 g

(250, 250) = 125000

(266⅔, 266⅔) = 133333

(must calculate all three profit values)

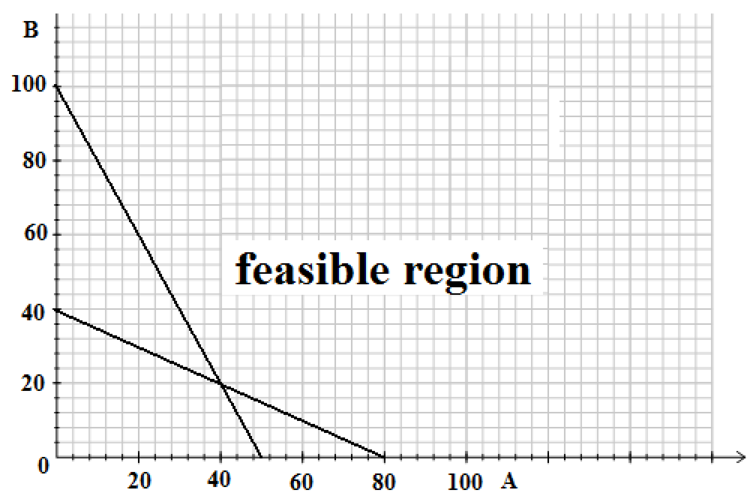
Maximum silver is for 100 tonnes from mine A and 400 from mine B. A

Given: H = 2A + B and L = 3A + 6B and also that H ≥ 100 and L ≥ 240

Combining these gives our inequalities: **2A + B** ≥ **100** and **3A + 6B** ≥ **240**

Also **A** ≥ **0** and **B** ≥ **0**

Note feasible region is **outside**



Vertices at (0, 100) $275,000 costs

(40, 20) $155,000

and (80, 0) $200,000 (must calculate **all** vertices)

Minimum cost of $155,000 at 40 hours for mine A and 20 hours for mine B.