MATH 5 SN Worked out example Optimization Quiz

Red and blue seats are sold for a hockey game.
There are 6000 seats or more sold, as well as a minimum of 2000. There at at least 1500 reds and a maximum of 3000 blues. There are at most twice as many blues as reds. Red seats yield a profit of $ 20 each and blue seats $ 10 each; expenses are $1500, however.

a) What is the maximum profit?

b) By how much is the profit reduced if the capacity is reduced to 4000 seats?

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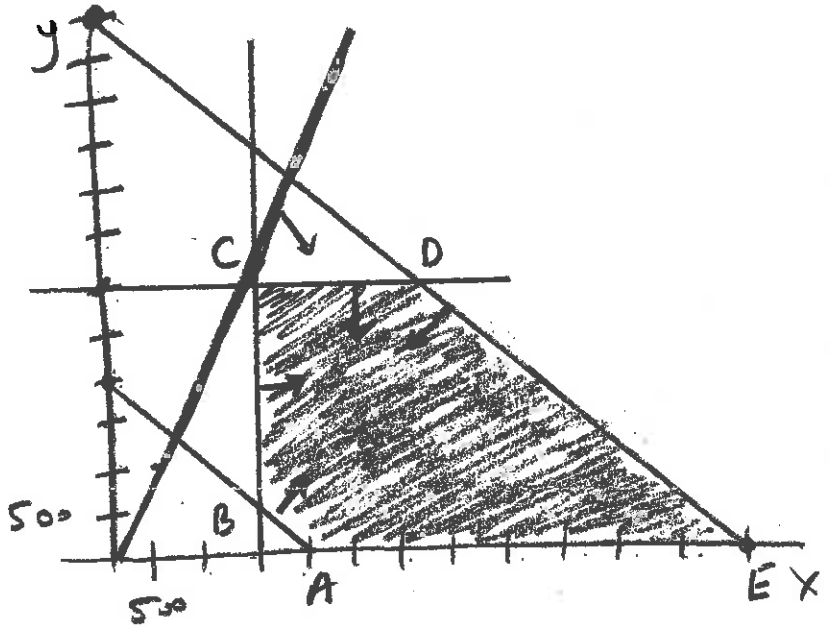
a) What is the maximum profit?

b) By how much is the profit reduced if the capacity is reduced to 4000 seats?

1. let x = number of red seats ✓
   let y = number of blue seats ✓

2. $x + y \leq 6000$ ✓
   $x + y \geq 2000$ ✓
   $x \geq 1500$ ✓
   $y \leq 3000$ ✓
   $y \leq 2x$ ✓
   $x \geq 0$ ✓
   $y \geq 0$ ✓

3. 

4. A (2000, 0) ✓

B $x + y = 2000$ (1500, 500) ✓

$x = 1500$

C $x = 1500$ (1500, 3000) ✓

$y = 3000$

$y = 2x$

D $x + y = 6000$ (3000, 3000) ✓

$y = 3000$

E (6000, 0) ✓

5 $N = 20x + 10y - 1500$

6. $N = 20x + 10y - 1500$

A (2000, 0) $38500 ✓

B (1500, 500) $33500 ✓

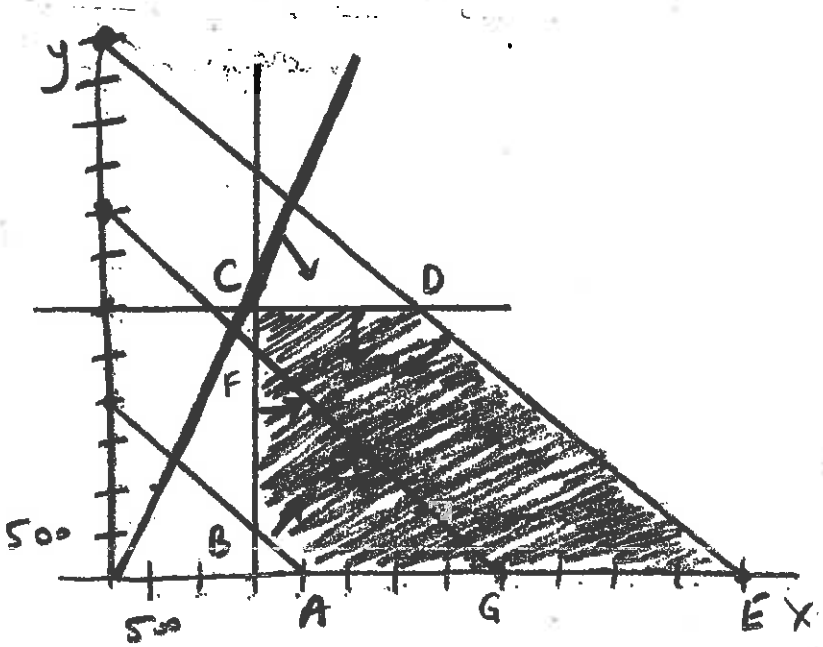
C (1500, 3000) $58500 ✓

D (3000, 3000) $88500 ✓

E (6000, 0) $118500 ✓

MAXIMUM = $118500

7.



$x + y \leq 4000$

(new constraint)

7. A = (2000, 0) ✓

B = (1500, 500) ✓

F $x = 1500$, $xy = 4000$ (1500, 2500) ✓

G (4000, 0) ✓

$M = 20x + 40y - 1500$

$38 500

$33 500 ✓

$53 500 ✓

$78 500 ✓

New maximum = $78 500

$118 500 - 78 500 = $40 000 returned