IE407 - Homework 1

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Question 1

a) As can be seen in Figure 1, optimal solution to this problem is on the point $(200, 50)$, where the line for wood constraint and the cotton constraint intersect. At this point, profit is 3200\$.
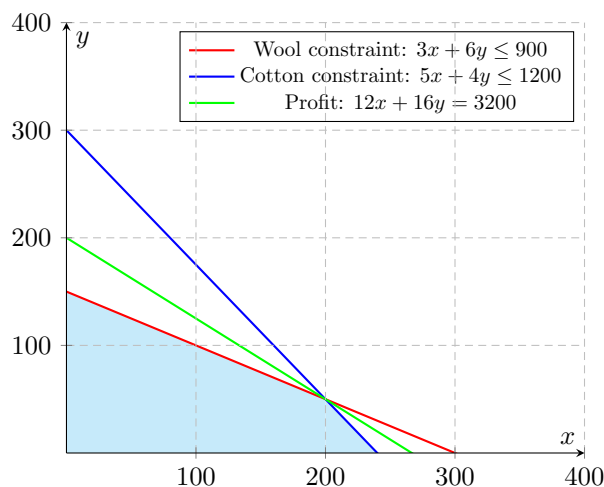

Figure 1: Graphical Solution for Question 1a

b) If the profit for a sweatshirt is increased by 1 and changed to 17\$, the profit function becomes $12x + 17y$. As can be seen in Figure 2, the optimal solution for this problem does not change.
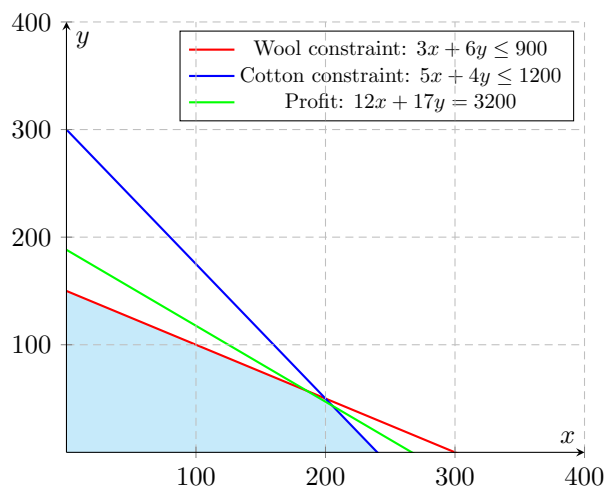

Figure 2: Graphical Solution for Question 1b

c) When the profit for a t-shirt is changed to 20$, the profit function becomes $20x + 16y$. In this case, the profit line's slope is same with the cotton constraint line. The optimal solution is all the points on the cotton constraint line, which satisfy the wool constraint.

If the profit is increased even more, the wool constraint stops being a binding constraint, and the optimal solution changes to $(240, 0)$.

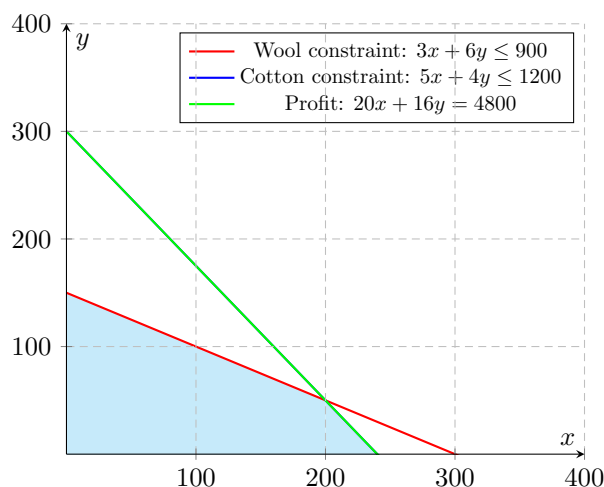In either case, the optimal solution is on the line $20x + 16y = 4800$.

Figure 3: Graphical Solution for Question 1c

d) If 300 additional pounds of wool can be obtained, the wool constraint becomes $3x + 6y \leq 1200$. As can be seen in Figure 4, the optimal solution is on the point $(133.33, 133.33)$. On this point, the profit is $12(133.33) + 16(133.33) = 3733.3$.
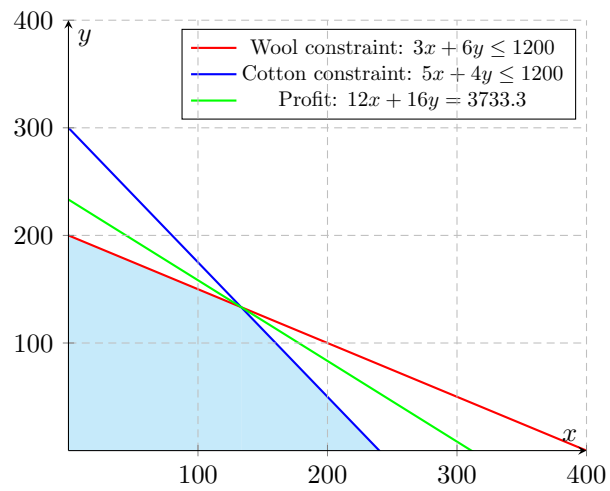
Figure 4: Graphical Solution for Question 1d

Question 2