

Econ 172A, Fall 2014: Quiz III

Quiz 3 Results: High 8, Low 1, Median: 6, Mean 5.94. For Questions 6 and 7 you received credit if your answer was consistent with “at least” or “exactly” interpretations.

Please enter your answers here. (Circle the appropriate choice. There is one correct answer per question. Select “OTHER” either if you have insufficient information or if none of the OTHER choices is correct.)

1	<i>NO</i>	<i>YES</i>	OTHER		
2	\$2300	\$2160	\$2100	OTHER	
3	0	\$1950	\$2340	\$2720	OTHER
4	\$1560	\$3120	\$2300	OTHER	
5	<i>NO</i>	<i>YES</i>	OTHER		
6	\$2340	\$2310	\$1560	OTHER	
7	\$2340	\$2310	\$1560	OTHER	
8	(a)	(b)	(c)	(d)	(e)

Tom makes Thanksgiving decorations (model turkeys). He uses 10 feathers and 15 cotton balls to make a small turkey and 15 feathers and 45 cotton balls to make a large one. He has available 60 feathers and 135 cotton balls. If Tom makes \$390 profit on a small model turkey and \$520 on a large one, how many of each type of model should Tom build to maximize his profit?

Here is a formulation:

Let x_s represent the number of small models and x_l represent the number of large models. Then his problem is to find x_s and x_l to solve: $\max 390x_s + 520x_l$ subject to $10x_s + 15x_l \leq 60$, $15x_s + 45x_l \leq 135$, and $x_s, x_l \geq 0$.

I solved this problem using Excel. The output follows this problem. Use the output to answer the questions on your form. Answer the questions independently (so that a change described in one part applies only to that part). Answer as many questions below as you can using the available information.

Econ 172A, Fall 2014: Quiz III Form 1

(PID's FIRST NUMBER (SECOND SYMBOL) IS ODD)

1. Would Tom sell large models if the profit per unit of large model increased to 580?

No. He doesn't sell them now and adding 60 to increase the objective function to 580) is in the allowable range.

2. If small model sold for 350 what would Tom's total profit be?

Decrease of 40 still in allowable range. So profit is 6 times 350, 2100.

3. What would Tom's total profits be if he had 50 additional cotton balls?

\$ 2340 (same as before). He has more cotton balls than he needs now even without the extras.

4. What would Tom's total profits if his supply of feathers is 40 (instead of 60)?

Decrease of 20 is in allowable range. So profits decrease by 39 (dual variable) times amount of decrease (20) . So profits are $2340 - 780 = 1560$.

5. Suppose that Tom could combine 12 feathers and 30 cotton balls to make a bald eagle model. Would it be profitable for him to make one of these models if he could sell it for 480 dollars?

Yes. The "value" of the ingredients is $39 \text{ times } 12 + 0 \text{ times } 30$ (because the dual variables are 39 and 0), which is equal to 468.

6. What would Tom's profits be he were required to produce three large models?

Doing so uses up all of Tom's cotton, so he would not be able to produce small turkey models. Profit would be 3 times 520 or 1560. (This is true whether you interpret the question as asking "at least three" or "exactly three.")

7. What would Tom's profits be if he were required to produce five small models?

Current plan still feasible. Solution does not change. (If you interpret five to mean "exactly five", then the answer is "other.")

8. Which piece of information on the Answer Report can be derived from other information in the answer report. (That is, I am asking whether you could deduce the reduced cost of x_l or the allowable decrease of x_s from other information on answer report.)

- (a) The reduced cost of x_l .
- (b) The allowable decrease of x_s .
- (c) The shadow price of cotton.
- (d) More than one of the above.
- (e) None of the above.

You can deduce (a) and (c), but not (b). So the answer is (d).

Econ 172A, Fall 2014: Quiz III Form 2
(PID's FIRST NUMBER (SECOND SYMBOL) IS EVEN)

1. Would Tom sell small models if the profit per unit of small model sold increased to 580?

Yes. He sells them now and the allowable range includes any increase in the price of small models.

2. If small model sold for 360 what would Tom's total profit be?

Decrease of 30 still in allowable range. So profit is 6 times 360, 2160.

3. What would Tom's total profit be if he had 10 additional cotton balls?

No change: profits remain \$ 2340. He has more cotton balls than he needs now.

4. What are Tom's total profits if his supply of feathers is 80 (instead of 60)?

Increase of 20 is in allowable range. So profits increase by 39 (dual variable) times amount of increase (20) . So profits are $2340 + 780 = 3120$.

5. Suppose that Tom could combine 12 feathers and 30 cotton balls to make a bald eagle model. Would it be profitable for him to make one of these models if he could sell it for 460 dollars?

No. The "value" of the ingredients is 39 times 12 + 0 times 30 (because the dual variables are 39 and 0), which is equal to 468.

6. What would Tom's total profits be if he were required to produce five small models?

Current plan still feasible. Solution does not change. If you interpret "five" as "exactly five" other is the correct choice.

7. How would Tom's profits be if he were required to produce three large models?

Doing so uses up all of Tom's cotton, so he would not be able to produce small turkey models. Profit would be 3 times 520 or 1560. (Same answer if you interpret "three" as "exactly three.")

8. Which piece of information on the Answer Report cannot be derived from other information on the answer report. (That is, I am asking whether you could deduce the reduced cost of x_l or the allowable decrease of x_s from other information on answer report.)

- (a) The reduced cost of x_l .
- (b) The allowable decrease of x_s .
- (c) The shadow price of cotton.
- (d) More than one of the above.
- (e) None of the above.

You can deduce (a) and (c), but not (b). So the answer is (b).