

Econ 172A, Fall 2010: Quiz III

IMPORTANT

1. The quiz has 3 forms. You should answer the questions from only one form.
 - If your student identification number ends in 1, 2, 3 answer the questions from Form 1.
 - If your student identification number ends in 4, 5, 6, 7 answer the questions from Form 2.
 - If your student identification number ends in 8, 9, 0, or if you have no student identification number, answer the questions from Form 3.
2. You may not use calculators, books, or notes during this quiz.
3. If you do not know how to interpret a question, then ask me.
4. Please remain in your seat until the exam is over.
5. You will not receive credit unless you put your answers in the spaces below.
6. I will collect the quizzes at 12:20.
7. Fill in the information below:
 - NAME:
 - STUDENT IDENTIFICATION NUMBER:
 - I read the instructions and I am answering the questions corresponding to the appropriate form, which is FORM:
8. Put your answers on the next page.

Quiz 3

A company produces two products: A and B . Product A sells for \$11 per unit and product B sells for \$23 per unit. Producing a unit of product A requires 2 hours on assembly line 1 and 1 unit of raw material. Producing a unit of product B requires 2 units of raw material, 1 unit of A , and 2 hours on assembly line 2. On line 1, L_1 hours of time are available, and L_2 hours are available on line 2. A unit of raw material can be bought (for \$5 a unit) or produced (at no cost) using 2 hours of time on line 1.

I solved the problem using the formulation below.

Definition of variables:

x_A number of product A sold

x_B number of product B sold

x_R units of raw material purchased

x_P units of raw material produced

objective function: $\max 11x_A + 23x_B - 5x_R$

Constraints:

Assembly line 1 constraint: $2x_A + 2x_B + 2x_P \leq L_1$

Assembly line 2 constraint: $2x_B \leq L_2$

Raw material: $x_A + 3x_B - x_R - x_P \leq 0$

Answer the following questions as completely as possible (if you have insufficient information, say so). You should state whether the proposed change is inside the allowable range and how the indicated quantity or quantities (solution or value) changes. If you do not know exactly how a quantity changes, say as much as you can (for example, "it goes up," or "it goes down by at least 40," or "it does not go up by more than 10.")

Warning: Use the Answer Report Associated with your form.

1. What is L_1 ?
2. What is the solution?
3. What is the value of the problem if the amount of Assembly line 2 time doubles (from L_2 to $2L_2$)?
4. How does the solution and value change if Product A 's sale price increases by 1 (to \$12)?
5. How does the solution and value change if the price of raw material increases by 1 (to \$6 per unit)?
6. How does the solution and value change if Product B 's sale price decreases by 3 (to \$20).
7. Suppose that the company could use one hour of Assembly line #1 time and one hour of Assembly Line # 2 time and 4 units of raw material to produce one unit of a new product, C . Would it be profitable to produce C if it could be sold for \$25 per unit?
8. How would the value change if the company faced an additional constraint that required the total amount of machine time used to be less than 1200 hours?

QUIZ 3 -- FORM 1 DATA

Adjustable Cells

Cell	Name	Final Value	Reduced Cost	Objective Coefficient	Allowable Increase	Allowable Decrease
\$E\$8	xA	400	0	11	2	1
\$F\$8	xB	250	0	23	1.00E+30	2
\$G\$8	xR	1150	0	-5	5	0.5
\$H\$8	xP	0	-1	0	1	1.00E+30

Constraints

Cell	Name	Final Value	Shadow Price	Constraint R.H. Side	Allowable Increase	Allowable Decrease
\$\$13	Line 1	1300	3	1300	1.00E+30	800
\$\$14	Line 2	500	1	500	800	500
\$\$15	Raw Mat.	0	5	0	1150	1.00E+30

This is Form 1.
Use this information if PID ends in 1,
2, 3

QUIZ 3 -- FORM 2 DATA

Adjustable Cells

Cell	Name	Final Value	Reduced Cost	Objective Coefficient	Allowable Increase	Allowable Decrease
\$E\$8	xA	150	0	11	2	1
\$F\$8	xB	100	0	23	1.00E+30	2
\$G\$8	xR	450	0	-5	5	0.5
\$H\$8	xP	0	-1	0	1	1.00E+30

Constraints

Cell	Name	Final Value	Shadow Price	Constraint R.H. Side	Allowable Increase	Allowable Decrease
\$\$13	Line 1	500	3	500	1.00E+30	300
\$\$14	Line 2	200	1	200	300	200
\$\$15	Raw Mat.	0	5	0	450	1.00E+30

**This is Form 2.
Use this information if PID ends in 4, 5, 6, 7**

QUIZ 3 - FORM 3 DATA

Adjustable Cells

Cell	Name	Final Value	Reduced Cost	Objective Coefficient	Allowable Increase	Allowable Decrease
\$E\$8	xA	300	0	11	2	1
\$F\$8	xB	200	0	23	1.00E+30	2
\$G\$8	xR	900	0	-5	5	0.5
\$H\$8	xP	0	-1	0	1	1.00E+30

Constraints

Cell	Name	Final Value	Shadow Price	Constraint R.H. Side	Allowable Increase	Allowable Decrease
\$I\$13	Line 1	1000	3	1000	1.00E+30	600
\$I\$14	Line 2	400	1	400	600	400
\$I\$15	Raw Mat.	0	5	0	900	1.00E+30

This is Form 3.

**Use this information if PID ends in 8, 9, 0
(or no PID)**