

Practice Problems: Production & Optimal Allocation

Updated: Spring 2012

1. What is the law of diminishing returns and why does it exist? Can you think of real world example (other than the bakery example from class).
2. Explain why the law of diminishing returns also means that marginal costs are always rising.
3. The condition for optimally allocating a firm's resources is $\frac{MPL_1}{w_1} = \frac{MPL_2}{w_2}$.
 - a. Using simple numbers and a brief explanation, show a case when this equality doesn't hold and explain why it isn't optimal.
 - b. Explain how labor should be reallocated.
 - c. Finally, explain clearly (feel free to use simple numbers) why this equality is indeed optimal.
4. Consider the following table for production in a firms facilities in two different countries

Country 1							Country 2						
w 1 = \$15							w 2 = \$6						
A	K	L	q	MPL	MPL/w	Labor	A	K	L	q	MPL	MPL/w	Labor
			$AK^{-5}L^{-5}$	$\Delta q/\Delta L$		Cost				$AK^{-3}L^{-7}$	$\Delta q/\Delta L$		Cost
10	4	1	20.0			\$15	2	4	1	3.0			\$6
10	4	2	28.3	8.28	0.55	\$30	2	4	2	4.9	1.89	0.32	\$12
10	4	3	34.6	6.36	0.42	\$45	2	4	3	6.5	1.62	0.27	\$18
10	4	4	40.0	5.36	0.36	\$60	2	4	4	8.0	1.46	0.24	\$24
10	4	5	44.7	4.72	0.31	\$75	2	4	5	9.4	1.35	0.23	\$30
10	4	6	49.0	4.27	0.28	\$90	2	4	6	10.6	1.27	0.21	\$36
10	4	7	52.9	3.93	0.26	\$105	2	4	7	11.8	1.21	0.20	\$42
10	4	8	56.6	3.65	0.24	\$120	2	4	8	13.0	1.16	0.19	\$48
10	4	9	60.0	3.43	0.23	\$135	2	4	9	14.1	1.12	0.19	\$54
10	4	10	63.2	3.25	0.22	\$150	2	4	10	15.2	1.08	0.18	\$60
10	4	11	66.3	3.09	0.21	\$165	2	4	11	16.2	1.05	0.17	\$66
10	4	12	69.3	3.02	0.20	\$180	2	4	12	17.3	1.03	0.17	\$72
10	4	13	72.1	2.83	0.19	\$195	2	4	13	18.3	0.99	0.17	\$78

Suppose you are hired to consult this company. Human Resources proudly explains that they've expanded into Country 2 to take advantage of low wages there. As a result they have 10 people working in their Country 1 plant, but 12 in their Country 2 plant to take advantage of the low cost labor.

- a. Is this an efficient/optimal allocation of labor? Explain your answer.
- b. Calculate how much the company currently produces.
- c. Calculate how much the company currently spends on this allocation of labor.
- d. Show that you can use their current total labor budget but reallocate optimally and increase output. Explain how many workers you hire in each country and how much you produce now.

- e. Does your final allocation still take account of the low wages in Country 2? Explain.

5. Consider a company with three plants and the following production information.

Plant 1				Plant 2				Plant 3			
A	K	L	q	A	K	L	q	A	K	L	q
10	1.0	1.0	10.0	10	1.0	1.0	10.0	10	1.0	1.0	10.0
10	1.1	1.1	11.0	10	1.1	1.1	11.4	10	1.1	1.1	10.6
10	1.2	1.2	12.1	10	1.2	1.2	13.1	10	1.2	1.2	11.2

- Calculate which plant's production displays increasing, decreasing and constant returns to scale.
- What elasticity concept did you use?
- If you had to close down one plant, which one would it be? Explain.
- If you were to expand production at one plant which one would it be? Explain.