

ECONS 101 – PRINCIPLES OF MICROECONOMICS, SECTION 01
WASHINGTON STATE UNIVERSITY
Midterm 2, Answer Key

MULTIPLE CHOICE QUESTIONS [15 questions, 4.5 points each: 67.5 total points]

Use the following table to answer the following question. The table provides information about pre-tax income and then gives after-tax income for three different tax structure proposals.

Pre-tax income	Proposal 1: After-tax income	Proposal 2: After-tax income	Proposal 3: After-tax income
\$ 20,000	\$ 15,000	\$ 15,000	\$ 15,000
32,000	24,000	27,000	22,400
40,000	30,000	35,000	27,200
80,000	60,000	75,000	52,000
200,000	150,000	195,000	120,000

1. Policymakers wish to impose a regressive tax based on income. Which proposed tax structure represents this choice?

- a. Proposal 1
- b. **Proposal 2**
- c. Proposal 3

Answer b. A regressive tax structure is one in which the tax rises less than in proportion to income so that high-income taxpayers pay a smaller percentage of their income than do low-income taxpayers. Proposal 2 taxes individuals with income of \$20,000 at a rate of 25% of their income, while individuals with income of \$200,000 are taxed at a rate of 2.5% of their income.

2. In contrast to taxes at the federal level, taxes at the state and local level of government in the United States

- a. apply the ability-to-pay principle more frequently.
- b. tend to be more proportional.
- c. **tend to be more regressive.**
- d. tend to be more progressive.

Answer c. State and local taxes are more regressive than federal taxes, which are overall quite progressive. State and local governments recognize that a decision to tax high-income individuals more heavily than low-income individuals may result in the high-income individuals moving to other localities where taxes are lower.

3. Which of the following statements is true?

- I. An individual who experiences diminishing marginal utility finds that the additional satisfaction the individual gets from consuming one more unit of the good declines as the amount consumed of that good increases.
- II. Marginal utility curves that exhibit diminishing marginal utility eventually become negative.
- III. Marginal utility curves that exhibit diminishing marginal utility slope downward.

- a. Statement I is true.
- b. Statements I and II are true.
- c. **Statements I and III are true.**
- d. Statements I, II, and III are true.

Answer c. Statement I is a restatement of the concept of diminishing marginal utility. A marginal utility curve that exhibits diminishing marginal utility will be downward sloping over some range of consumption, but marginal utility need not be a negative value, so statement II is false and statement III is true.

4. Consider Mary whose weekly income (I) for purchasing fruit (F) and milk (M) is \$20. Each unit of fruit costs \$1, while each unit of milk costs \$2. The equation expressing Mary's budget line can be written as

- a. $F = 20 + 2M$
- b. $F = 10 - (1/2)M$
- c. **$F = 20 - 2M$**
- d. $F = 10 - M$

Answer c. To find Mary's equation for her budget line, recall that a budget line can be written as $I = (\text{price of good X})(\text{quantity of good X}) + (\text{price of good Y})(\text{quantity of good Y})$. In this case we have $\$20 = (\$1)(F) + (\$2)(M)$, or $F = 20 - 2M$.

5. Jamie currently consumes 4 units of tomatoes and 7 units of bread each week. The price of tomatoes is \$2 per unit while the price of bread is \$1 per unit. Jamie's marginal utility from the last unit of tomatoes he consumes each week is equal to 10 utils while his marginal utility from the last unit of bread he consumes each week is 6 utils. Jamie should

- a. continue to consume the same level of tomatoes and bread each week.
- b. **consume more bread and less tomatoes, since currently his marginal utility per dollar spent on bread exceeds his marginal utility per dollar spent on tomatoes.**
- c. consume less bread and more tomatoes, since currently his marginal utility per dollar spent on bread exceeds his marginal utility per dollar spent on tomatoes.

d. consume more bread and less tomatoes, since currently his marginal utility per dollar spent on bread is less than his marginal utility per dollar spent on tomatoes.

Answer b. Jamie's marginal utility per dollar spent on bread is equal to 6 utils per dollar (6 utils/\$1), and his marginal utility per dollar spent on tomatoes is equal to 5 utils per dollar (10 utils/\$2). Jamie is better off consuming more bread and fewer tomatoes. As Jamie increases his bread consumption, the marginal utility from the last unit of bread consumed will fall, and as he consumes fewer tomatoes, the marginal utility from the last unit of tomatoes consumed will rise. He will adjust his consumption of these two goods until the marginal utility per dollar spent on either good is equivalent.

6. Suppose this individual moves downward along his indifference curve from consumption bundle *A* toward consumption bundle *E*. Which of the following statements is true?

- I. The decrease in consumption of meals reduces this individual's utility.
- II. The increase in consumption of clothing increases this individual's utility.
- III. The decrease in utility from consuming fewer units of meals exactly equals the increase in utility from consuming more units of clothing, so this individual's utility stays constant as he moves downward along the indifference curve.

- a. Statement I is true.
- b. Statement II is true.
- c. Statement III is true.
- d. **Statements I, II, and III are true.**

Answer d. All these statements are true. Decreasing consumption of meals does lower the individual's utility while increasing consumption of clothing increases the individual's utility. However, since all of these consumption bundles lie on the same indifference curve, the individual's total utility does not change, so the decrease in utility is exactly offset by the increase in utility.

7. The vertical intercept of the individual's budget line is equal to

- a. the price of the good measured on the vertical axis divided by the individual's income.
- b. the price of the good measured on the horizontal axis divided by the individual's income.

- c. the individual's income divided by the price of the good measured on the vertical axis.
- d. the individual's income divided by the price of the good measured on the horizontal axis.

Answer c. The vertical intercept of the individual's budget line identifies the total number of units of that good that the individual can afford, given their income and the price of the good. To find how many units of the good the individual can afford if he uses all of his income to purchase the good measured on the y-axis, simply divide the individual's income by the price of the good measured on the y axis.

8. An individual's budget line rotates out along the y-axis while maintaining the same *x*-axis intercept. This rotation in the budget line is due to a(n)

- a. increase in the individual's income.
- b. decrease in the individual's income.
- c. increase in the price of the good measured on the y-axis.
- d. **decrease in the price of the good measured on the y-axis.**

Answer d. Since the budget line has rotated out along the y-axis, this implies that the individual can now afford to purchase more units of the good measured on the y-axis than was possible initially. Thus, the price of the good measured on the y-axis must have decreased.

9. Suppose Joe initially consumes 25 pasta dinners and 5 steak dinners. Then suppose the price of a steak dinner rises to \$20 while the price of a pasta dinner is unchanged. Given the new price, Joe's optimal consumption bundle is 20 pasta dinners and 3 steak dinners. If Joe's income was adjusted so that he maintained the same level of utility after the price change as he had before the price change, Joe would consume 35 pasta dinners and 4 steak dinners. Given this information,

- a. the substitution effect is a decrease of 1 steak dinner, and the income effect is an increase of 1 steak dinner.
- b. the substitution effect is an increase of 1 steak dinner, and the income effect is a decrease of 1 steak dinner.
- c. **the substitution effect is a decrease of 1 steak dinner, and the income effect is a decrease of 1 steak dinner.**
- d. the income and substitution effects cannot be quantified without additional information.

Answer c. Maintaining the same level of utility, Joe alters his steak dinner consumption from 5 dinners to 4 dinners: this represents his substitution effect, or his response to the change in the relative price of steak dinners to pasta dinners. Then, when Joe adjusts to the decrease in his purchasing power due to the increase in the price of a steak dinner, he reduces his steak dinner consumption from 4 dinners to 3 dinners: this represents his income effect, or his response to the change in his purchasing power due to the change in the price of steak dinners.

10. The spreading effect refers to the

- a. decrease in AVC as the firm produces greater levels of output.
- b. **decrease in AFC as the firm produces greater levels of output.**
- c. combined effect on AVC and AFC of the firm producing higher levels of output.
- d. combined effect on AVC , AFC , and MC of the firm producing higher levels of output

Answer b. The spreading effect refers to the idea that since fixed costs are constant at all short-run levels of output this implies that the AFC will decline as output increases, since those constant fixed costs will be spread over a larger number of units of output. The spreading effect does not impact the AVC or the MC .

11. The diminishing returns effect causes the AVC to

- a. decline initially as output increases.
- b. decline at all levels of output.
- c. **increase eventually as output increases.**
- d. increase at all levels of output.

Answer c. The diminishing returns effect refers to the idea that as the firm increases its production in the short run it must hire additional units of the variable input, but that as the firm's usage of the variable input increases it finds that additional units of the variable input are less productive than the preceding unit. This means that the firm's AVC eventually rises due to the variable cost of production increasing faster than the increase in the level of output.

12. At high levels of output for a firm, the spreading effect is

- a. stronger than the diminishing returns effect.
- b. **weaker than the diminishing returns effect.**

Answer b. At high levels of output, the firm's ATC curve increases, indicating that the spreading effect, which causes AFC to fall as output increases, is not as strong as the diminishing returns effect, which causes AVC to rise as output increases.

13. The firm's *LRATC* curve illustrates the relationship between output and

- a. average total cost when fixed cost has been chosen to minimize average total cost for each level of output.
- b. marginal cost when fixed cost has been chosen to minimize average total cost for each level of output.
- c. average total cost when variable cost has been chosen to minimize average total cost for each level of output.
- d. average total cost when marginal cost has been chosen to minimize average total cost for each level of output.

Answer a. This is the definition of the *LRATC* curve, which identifies the lowest average total cost of production for every level of output, assuming that the firm has the freedom to set its fixed input at the optimal level for each level of output.

14. Suppose good Z is an inferior good. If the price of good Z changes, the income and substitution effects will

- a. reinforce one another.
- b. work in opposite directions.

Answer b. If the price of good Z increases, the consumer will substitute away from the relatively more expensive good Z toward some other relatively less expensive good: the substitution effect will be negative. But if the price of good Z increases, this reduces the individual's purchasing power, and the individual will also see a change in their consumption of good Z due to this change in purchasing power. When the individual's purchasing power falls, the individual will consume more units of good Z since good Z is an inferior good: the income effect is positive. Thus, the income and substitution effects for an inferior good work in opposite directions.

15. In this year's presidential election in Tinseltown, one of the candidates is running on a platform that advocates a change in the income tax. This candidate proposes that individuals in the bottom half of the income distribution should pay 50% of their income to the government, while individuals in the top half of the income distribution should pay 30% of their income. This candidate reasons that the higher-income individuals will still end up paying much more dollars to the government than the lower income people. The tax structure advocated by this candidate is

- a. regressive, because higher income individuals pay a lower percentage of their income than lower income individuals.
- b. progressive, because higher income individuals pay a higher percentage of their income than lower income individuals.
- c. proportional, because higher income individuals pay the same percentage of their income than lower income individuals.
- d. efficient, because this type of tax structure generates the minimum deadweight loss, among all possible taxes.

Answer a. Since lower-income individuals will pay a larger percentage of their income to the government with this tax structure, this tax structure is regressive.

WRITTEN EXERCISES [32.5 total points]

1. **[Isoquants and Isocosts, 12.5 points]** Western Jeans Company produces jeans with machines that cut and sew the material and workers that run the machines, finish the detail work, and inspect and pack the product. The company can produce 500 pairs of jeans per day with the following combinations of capital and labor:

- What is the marginal rate of technical substitution ($MRTS$) of capital in place of labor between points A and B?

Combination	Capital (K)	Labor (L)	ΔK	ΔL	$MRTS_{KL}$
A	1	40			
			1	-15	$= -\left(\frac{-15}{1}\right) = 15$
B	2	25			
			1	-7	$= 7$
C	3	18			
			1	-5	$= 5$
D	4	13			
			1	-3	$= 3$
E	5	10			

$$MRTS_{KL} = \frac{MP_K}{MP_L} = -\frac{\Delta L}{\Delta K}$$

- Suppose now that the hourly wage rate at Western Jeans Company is \$6.25 and all workers work 8 hours per day. Also assume that the rental rate of capital is \$625 per day. Finally, assume that the firm has budgeted \$2,500 per day for production costs. How much labor could the firm hire if it decided to spend its entire daily budgeted total cost on labor and use no capital?

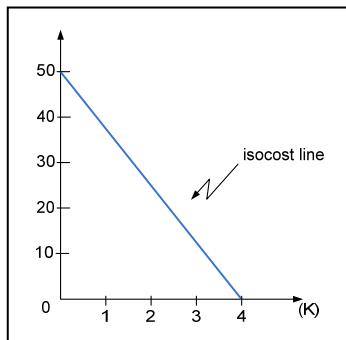
hourly wage: \$6.25
of hours = 8
rental rate = \$625
budget: \$2500
daily wage per labor is: \$6.25 X 8 = \$50

Therefore, the firm can hire # of workers daily is: $\frac{\text{Budget}}{\text{wage}} = \frac{\$2500}{\$50} = 50 \text{ workers}$

c. How much capital could the firm hire if it spent its entire daily budgeted total cost on capital?

The amount of capital could be hired is: $\frac{\text{Budget}}{\text{rental rate of } K} = \frac{\$2500}{\$625} = 4 \text{ units}$

d. Graph this isocost line (with capital on the horizontal axis and labor on the vertical axis).

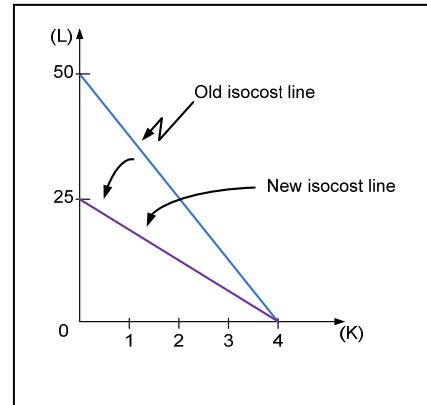


e. Now suppose the daily production budget was returned to \$2,500 and the wage rate were raised to \$12.50 per hour. Draw the new isocost line on the same graph.

Daily labor cost is: $\$12.50 \times 8 = \100

Therefore, the number of workers that can be hired daily is: $\frac{\text{Budget}}{\text{wage}} = \frac{\$2500}{\$100} = 25 \text{ workers}$

The new isocost line pivots inwards:



2. [Income and Substitution effects. 20 points] Libby purchases cookies and milk. Cookies initially sell for \$2 a unit and milk sells for \$4 a unit. Libby's available income for purchases of cookies and milk is \$40.

a. Draw a graph depicting Libby's budget line ($BL1$) with cookies measured on the horizontal axis and milk measured on the vertical axis. Libby's optimal consumption bundle given her preferences and this budget line results in her consuming 10 units of cookies. How many units of milk does she consume? On the graph, indicate this optimal consumption bundle as consumption bundle A .

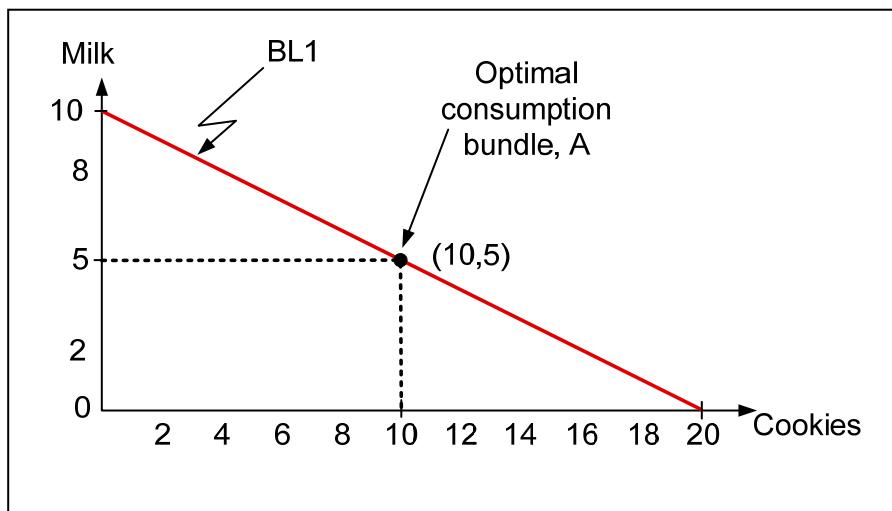
Cookies: \$2/unit; milk: \$4/unit; income: \$40

If you spend all income on cookies, then $\frac{Income}{P_{cookies}} = \frac{\$40}{\$2} = 20$ cookies

If you spend all income on milk, then $\frac{Income}{P_{milk}} = \frac{\$40}{\$4} = 10$ units of milk

From the graph, if he consumes 10 units of cookies \Rightarrow she will consume 5 units of milk. You may check this by noting that, when the consumer buys 10 cookies she spends $\$2 \times 10$ cookies = \$20. Then, her remaining income for purchasing milk is \$20. Since every

unit of milk costs \$4, then Libby can buy $\frac{\$20}{\$4} = 5$ units of milk.

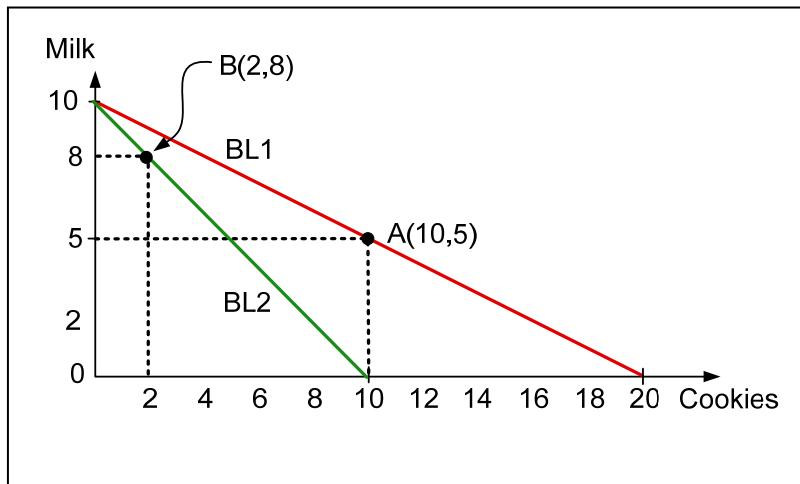


b. Suppose the price of cookies increases to \$4 a unit. On a new graph, draw Libby's original budget line (BL_1) and her new budget line (BL_2). Libby's optimal consumption bundle with this budget line contains 8 units of milk. How many units of cookies will Libby consume at this optimal consumption bundle? Label this optimal consumption bundle B in your graph, and label the original optimal consumption A as well.

If you spend all income on cookies, then $\$40/\$4 = 10$ cookies.

From the graph, if she consumes 8 units of milk \Rightarrow 2 cookies for optimal consumption bundle. You can also see that by first noticing that, if Libby buys 8 units of milk, she spends $\$4 \times 8$ units of milk = $\$32$. Her remaining budget to buy cookies is then only $\$40 - \$32 = \$8$. Since every cookie costs $\$4$, then Libby can

afford $\frac{\$8}{\$4} = 2$ cookies.



c. Suppose Libby's income is adjusted so that she can achieve her original level of utility while paying \$4 per unit of cookies and \$4 per unit of milk (the new prices). Suppose Libby's optimal consumption bundle C with this income compensated budget line (BL_3) contains 4 units of cookies and 9 units of milk. How much additional income must Libby receive to maintain her original level of utility?

We know that the income that would allow her to maintain her original utility level is:

$$\begin{aligned}
 \text{Income} &= \underbrace{(\text{price of cookie}) \times (\text{quantity of cookie})}_{\text{money spent on cookies}} + \underbrace{(\text{price of milk}) \times (\text{quantity of milk})}_{\text{money spent on milk}} \\
 &= (4 \times 4) + (4 \times 9) \\
 &= \$16 + \$36 \\
 &= \$52
 \end{aligned}$$

In addition, we know that the original income is \$40
 The additional income that Libby needs to maintain her original utility level is
 $\$52 - \$40 = \$12$

d. Draw a final graph of Libby's various budget lines ($BL1$, $BL2$, and $BL3$) and optimal consumption bundles (A , B , and C). On your graph, identify the income and substitution effects.

Income = \$52

If she spends all income of \$52 on milk, then: $\frac{\$52}{\$4} = 13$ units of milk.

If all income of \$52 is spent on cookies, then $\frac{\$52}{\$4} = 13$ units of cookies.

