

Recitation 2 Answer Key

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Week 2 (9/4-9/10): Consumer choice

Recap of this week's most important concepts (Consumer Choice):

- Indifference curves:
 - Draw on graph (approximately!), know slope ($MRS_{xy} = MU_x/MU_y$)
 - Convex shape because of diminishing MRS
 - Extreme cases (perfect substitutes, perfect complements)
 - Budget constraint:
 - Write equation, draw on graph, know slope (P_x/P_y) and intercepts (Income/price)
 - Parallel shift (if income changes) or pivot (if a price changes)
 - Optimal consumption point: slopes are equal at that point (so $MU_x/P_x = MU_y/P_y$)
 - Using consumer choice (and optimal consumption decision) to interpret relationship between goods: change in the price of one good will change consumption of other good in a different direction depending on relationship (complements or substitutes).
 - How to use consumer choice (and optimal consumption decision) to construct consumer's demand curve.
 - Demand is marginal benefit
 - From individual demand to market demand
 - Shifts of demand curve
 - Consumer surplus (definition, graphical representation, mathematical computation)
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1. Suppose that Kelly spends her income, \$10, on two goods, apples and oranges. She gets exactly the same additional satisfaction from 1 apple as she does from 1 orange. The current price of apples is \$2 per unit, and the current price of oranges is \$1 per unit. If the price of apples decreases to \$0.5 per unit, how will her optimal consumption of apples change?

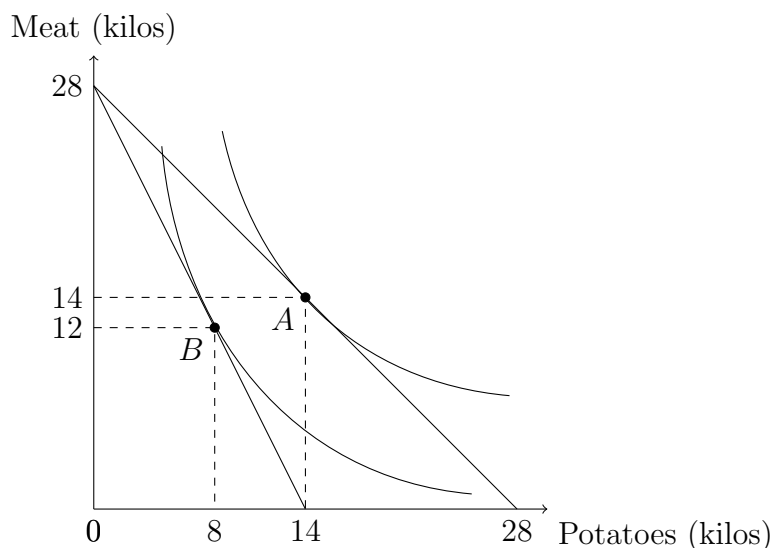
- a. It increases by 15
- b. It increases by 20
- c. It decreases by 15
- d. It decreases by 20
- e. It does not change
- f. Not enough information

Solution: b. Apples and oranges are perfect substitutes for Kelly, so if oranges are cheaper than apples she spends all her income on oranges and buys 10 oranges and 0 apple. If the price of apples decreases to \$0.5, apples are now cheaper so she now spends all her income on apples and buys 20. So her consumption of apples increases by 20. More formally: Her indifference curves are straight downward sloping lines, with a slope of $(-)$ 1. With oranges on the Y-axis, her initial budget constraint has a Y-intercept of 10 and an X-intercept of 5, so it is "tangent" to the highest indifference curve at (0,10). Her new budget constraint has a Y-intercept of 10 and an X-intercept of 20, so it is "tangent" to the highest indifference curve at (20,0).

2. Allwyn likes to consume cake and cups of tea. His income is \$12. When the price of cake is \$2 and the price of tea is \$1, he consumes bundle A: ($Q_{\text{cakes}} = 3, Q_{\text{tea}} = 6$). Due to price volatility in the market, the price of cake drops to \$1 and the price of tea rises to \$1.50. It is observed that he now consumes bundle B: ($Q_{\text{cakes}} = 6, Q_{\text{tea}} = 4$). What can we say about his preferences between the two bundles A and B?
 - a. A is preferred to B
 - b. B is preferred to A
 - c. Both are preferred equally
 - d. Not enough information

Solution: b. With cakes on the X-axis, his initial budget constraint has a Y-intercept of 12 and an X-intercept of 6. His new budget constraint has a Y-intercept of 8; and an X-intercept of 12. The two budget constraints intersect at bundle A, which is therefore feasible with the new budget constraint but it is not the optimal bundle. Therefore, B must be preferred to A.

3. The following graph shows Sacha's preferred consumption points A and B under two different budget lines. In both cases her income is \$280.



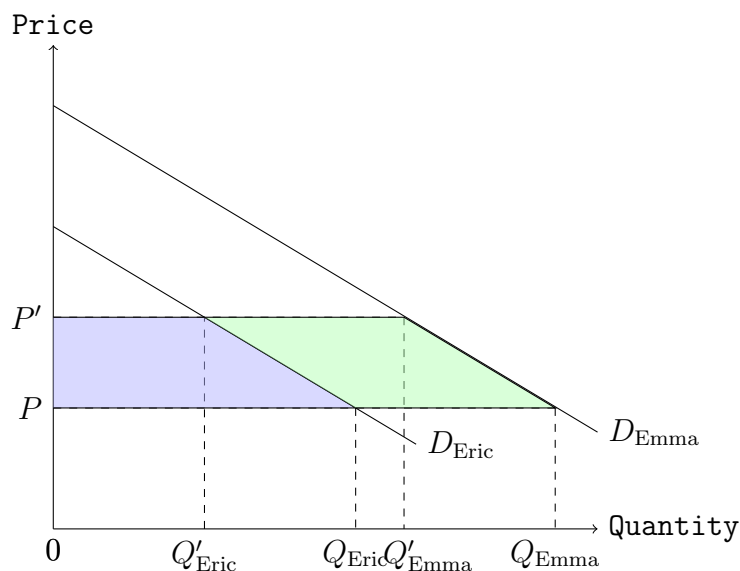
Which of the following points will be on Sacha's potatoes demand curve:

- $(Q = 8, P = 12), (Q = 14, P = 14)$
- $(Q = 12, P = 20), (Q = 14, P = 10)$
- $(Q = 14, P = 28), (Q = 28, P = 24)$
- $(Q = 14, P = 10), (Q = 8, P = 20)$

Solution: d. The X-intercept of the budget line is $Income/P_X$, so with the first budget line (flattest, where point A is), the price of potatoes is \$10 and with the second budget line (steepest, where point B is), the price of potatoes is \$20. At a price of \$10, Sacha demands 14 kilos of potatoes (X-coordinate of point A), so one point on her demand curve for potatoes will be $(Q = 14, P = 10)$. At a price of \$20, Sacha demands 8 kilos of potatoes (X-coordinate of point B), so another point on her demand curve for potatoes will be $(Q = 8, P = 20)$.

- Emma's linear downward sloping demand curve for pizza has the same slope as Eric's; however, it lies to the right of Eric's. The same increase in the price of pizza will cause:
 - Emma to incur a greater loss of consumer surplus than Eric will.
 - Eric to incur a greater loss of consumer surplus than Emma will.
 - Emma and Eric to incur the same loss of consumer surplus.
 - Emmas demand curve to shift closer to Eric's.

Solution: a. In the picture below, when the price increases from P to P' , the loss of consumer surplus is the purple area for Eric and the purple plus the green area for Emma.



The next questions are for your own practice.

5. Rick's income is \$1400 and he consumes only two goods, food and books. We know that the price of food is \$2 and the price of books is \$20. Which of the following are true?
- I. Rick's marginal rate of substitution of one unit of food per book at his consumption point is 1/10 books.
 - II. If Rick got an extra \$600 for income, he would consume at a point where his marginal rate of substitution of food per book is the same as without the change in income.
 - III. After receiving his extra \$600 for income, Rick consumes food and books in the same proportion as before.
- a. I only
 - b. II only.
 - c. I and II only.
 - d. I and III only.
 - e. II and III only.
 - f. All the statements are true

Solution: c. At the optimal consumption point, the budget line is tangent to the highest feasible indifference curve, so their slopes are equal: the price ratio is equal

to the marginal rate of substitution. So the MRS of 1 unit of food per book is equal to the price of food over the price of books, equal to $1/10$, so I. is correct. The slope of the budget line (i.e. the price ratio) is independent from the income, so at the optimal consumption point, the MRS remains the same regardless of the income, so II. is correct. If the income increases, the budget line shifts out and the consumption point changes, but there is no reason why the consumption of both goods would change in the same proportion.

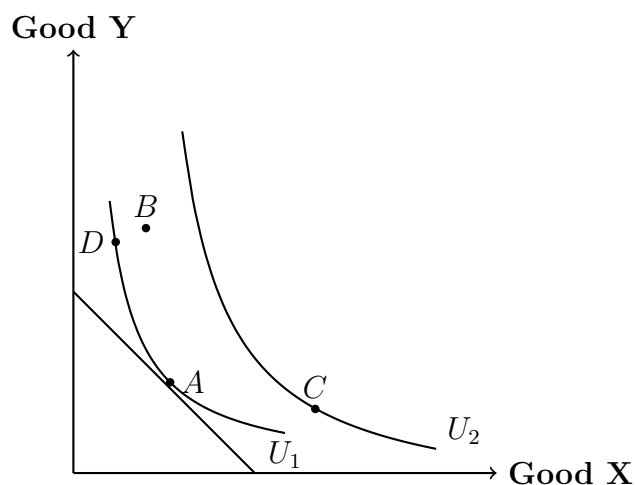
6. Suppose that ice cream and frozen yogurt are perfect substitutes to Ryan. Currently, he consumes 1 ice cream and no frozen yogurt. He receives a coupon for one free frozen yogurt. The coupon cannot be traded and can only be used for the consumption of one frozen yogurt. Which of the following is his new optimal bundle?
- a. 2 ice cream, 0 frozen yogurt
 - b. 1 ice cream, 1 frozen yogurt
 - c. 0 ice cream, 2 frozen yogurt
 - d. 2 ice cream, 1 frozen yogurt

Solution: b. Since the coupon can only be used for 1 frozen yogurt, there is no reason for Ryan to change the way he allocates his budget to ice cream and frozen yogurt, so his consumption of ice cream stays the same and his consumption of frozen yogurt increases by one unit because of the coupon. Formally: if we draw his budget constraint with frozen yogurt on the X-axis, the initial budget constraint is downward sloping with a Y-intercept (0 frozen yogurt, 1 ice cream), while the new budget constraint is horizontal from the Y-intercept of (0 frozen yogurt, 1 ice cream) to the point (1 frozen yogurt, 1 ice cream) and then becomes downward sloping with the same slope as the initial one.

7. Suppose that $MU_X = Y$ and $MU_Y = X$. The prices of good X and good Y are \$5 and \$4, respectively. How many units of good X does the consumer buy if she has \$410 of income?
- a. 15
 - b. 41
 - c. 25
 - d. 33

Solution: b. The equation of the budget constraint is $5X + 4Y = 410$. At the optimal consumption point, the marginal utilities ratio is equal to the price ratio: $\frac{MU_X}{MU_Y} = \frac{P_X}{P_Y} \Rightarrow 4Y = 5X$. Together, these two equations yield $X = 41$.

8. The graph below shows a consumer's budget line, two of her indifference curves and four possible consumption bundles of goods X and Y.



Bundle A is at the exact tangency point of the indifference curve U_1 and the budget line. Given this information, which of the following statements are true?

- I. If it were feasible, the consumer would choose bundle B
 - II. The consumer chooses bundle A
 - III. Bundle A is preferred to bundle D;
 - IV. Both bundles B and C yield the consumer higher utility than A
- a. I and II
 - b. I and III
 - c. I and IV
 - d. II and III
 - e. II and IV
 - f. III and IV

Solution: e. If B was feasible (i.e. if it was on the consumer's budget line), the consumer would choose B if and only if it was the point of tangency between the budget line and the highest possible indifference curve. However, that point of tangency could be anywhere on the consumer's budget constraint so I may be false. Point A yields the highest possible level of utility while being feasible, so that's the optimal consumption point, so II is true. Bundles A and D are on the same indifference curve so there is not one that is preferred to the other, so III is not true. Bundle B is located higher to the right of bundle D so it has more of both goods than bundle D. More is better, so the

consumer must prefer B to D. Since the consumer is indifferent between D and A, they must prefer B to A, so B yields a higher utility than A. C is on a higher indifference curve than A so it also yields a higher utility than A, so IV is true.