Theory of Consumer Choice

How do consumers make decisions about what to buy? Where does the Demand curve come from?

➔ They consider **preferences and budget**
➔ **Maximize utility subject to budget constraint**

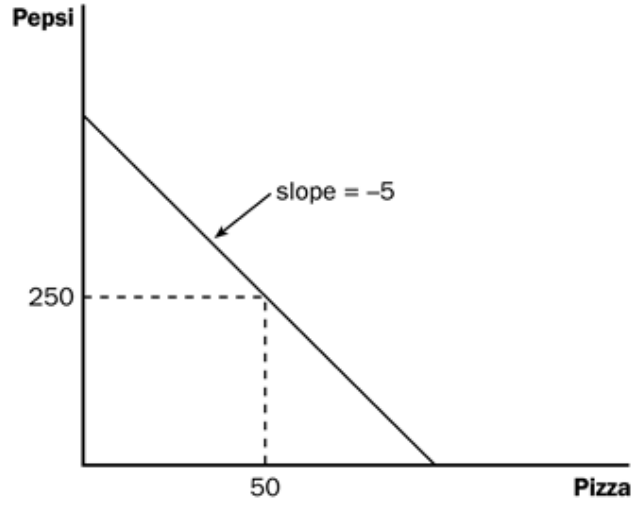
I. Budget Constraint ("BC"): What Can the Consumer Afford?

1. Example 1:

- A consumer has an income of $1,000 per month to spend on pizza and Pepsi.
- The price of a pizza is $10.
- The price of a litre of Pepsi is $2.

- If the consumer spends all of his income on pizza, he can buy 100 pizzas per month.
- If the consumer spends all of his income on litres of Pepsi, he can buy 500 litres per month.

Using this information, we can draw the consumer's budget constraint.



- The slope of the budget constraint equals the relative price of the two goods.

2. Example 2

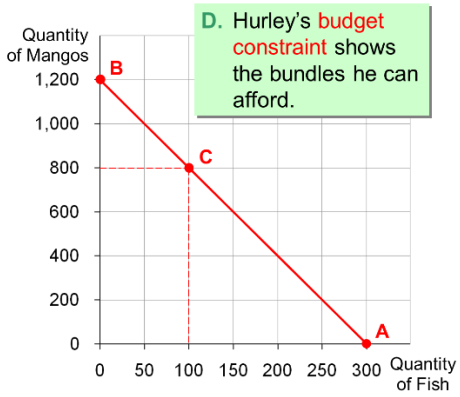
Hurley's income: $1200
Prices: P_F = $4 per fish, P_M = $1 per mango

a) If Hurley spends all his income on fish, how many fish does he buy?
300

b) If Hurley spends all his income on mangos, how many mangos does he buy?
1200

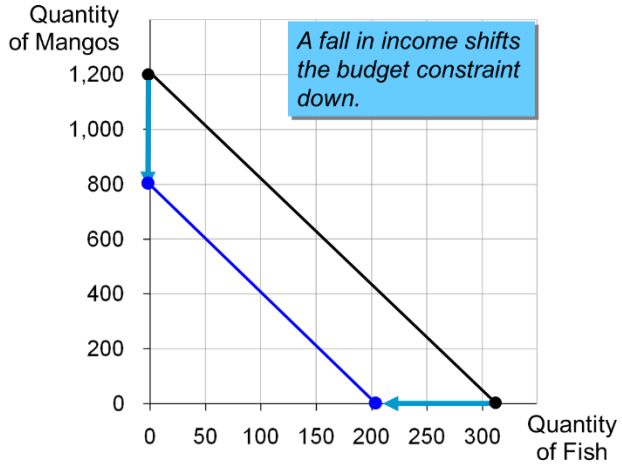
c) If Hurley buys 100 fish, how many mangos can he buy?
= (1200 – 100 x 4) / 1 = 600

d) Plot each of the bundles from parts a – c on a graph that measures fish on the horizontal axis and mangos on the vertical, connect the dots.



e) Slope of the Budget Constraint = -200/50 =-4

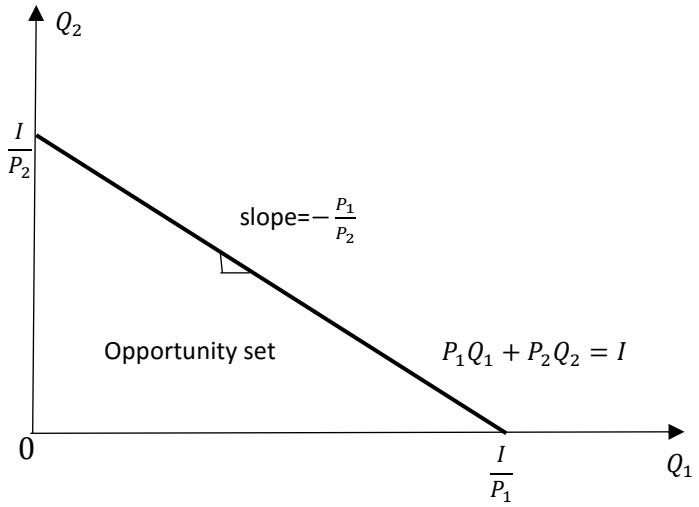
f) What happens to Hurley's budget constraint if his income falls to $800?



g) What happens to Hurley's budget constraint if the price of mangos rises to $2 per mango?

3. More General Case

Income: I
Prices: P_1 for good 1, P_2 for good 2
Quantities: Q_1 for good 1, Q_2 for good 2
Budget Constraint: $P_1Q_1 + P_2Q_2 \leq I$
Slope of $P_1Q_1 + P_2Q_2 = I$ is equal to $-\frac{P_1}{P_2}$, assuming Q_1 is on the horizontal axis.



II. Preferences: What the Consumer Wants

1. Assumptions on Preferences

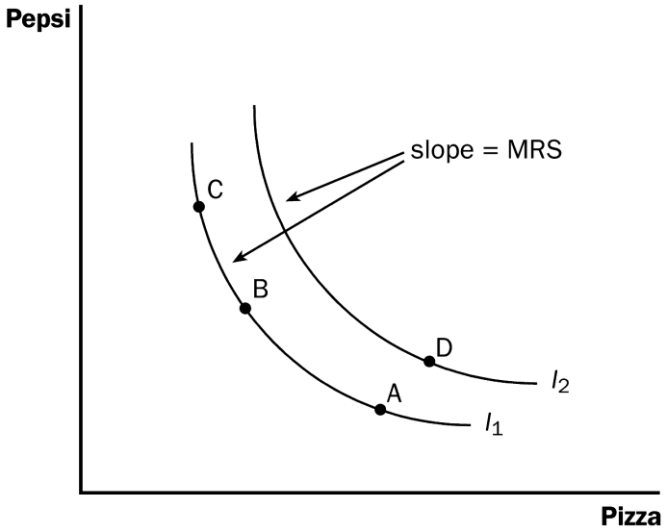
- ❖ *Completeness*: When facing any two bundles of goods, a consumer can rank them so that one and only one of the following relationships is true: The consumer prefers the first bundle to the second, prefers the second to the first, or is indifferent between them.
- ❖ *Transitivity*: If a consumer prefers Bundle x to Bundle y, and prefers Bundles y to Bundle z, then he prefers Bundle x to Bundle z.
- ❖ *Non-satiation*: More is better.
- ❖ *Diminishing Marginal Utility:* The utility a consumer gets from consuming one more unit of a good decreases in the quantity of the good he consumes.

2. Preference Maps and Indifference Curves

- ❖ A consumer is indifferent between two bundles of goods and services if the two bundles suit his tastes equally well.

- ❖ a curve that shows consumption bundles that give the consumer the same level of satisfaction is called indifference curve

- Example: the consumer is indifferent between points A, B, and C. I_1 is indifference curve.



3. Some Properties of Indifference Curves

1) Higher indifference curves are preferred to lower ones.

- ❖ Any point on indifference curve I_2 will be preferred to any point on indifference curve I_1.

  - Point D would be preferred to point A because point D contains more pizza and more Pepsi.

- We can tell, though, that point D is also preferred to point C because point D is on a higher indifference curve.

2) Indifference curves are downward sloping.

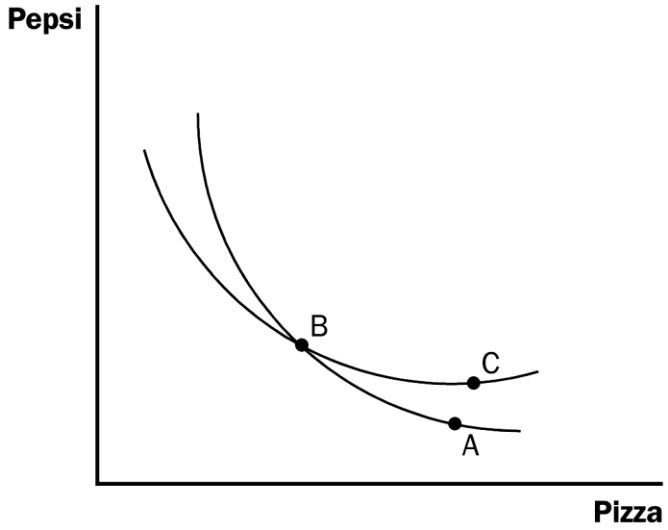
❖ What if it is upward sloping? The third assumption (More is better) is violated.

❖ Thus, for any two points on a same indifference curve, if the quantity of one good increases, the quantity of the other good must fall in order for the consumer to remain equally satisfied.

3) Indifference curves do not cross.

❖ The easiest way to prove this is by showing what would happen if they did cross.

❖ Since point A is on the same indifference curve as point B, the two bundles make the consumer equally happy.



❖ Since point C is on the same indifference curve as point B, the two bundles make the consumer equally happy.

❖ But this should imply that points A and C make the consumer equally happy, even though point C represents a bundle with more of both goods (which makes it preferred to point A).

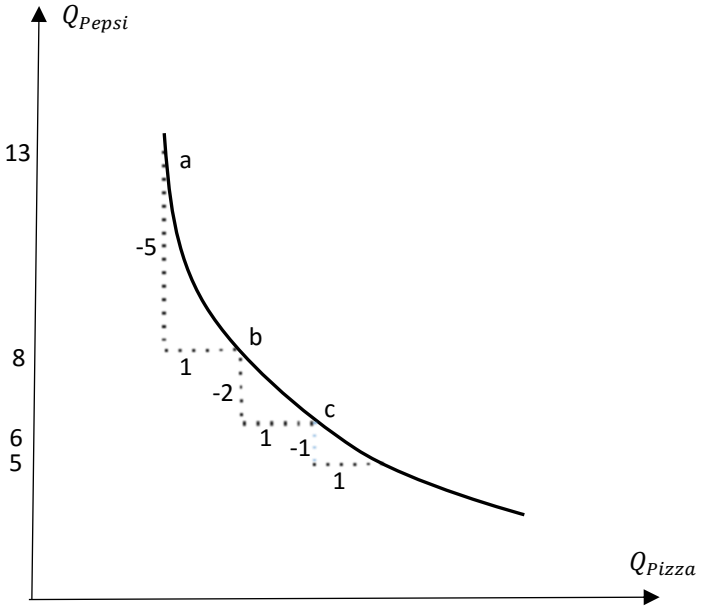
4) Indifference curves are bowed inward (convex).

❖ The slope of the indifference curve is equal to **marginal rate of substitution (MRS)**: the rate at

which the consumer is willing to trade one good for another.

$$MRS = \frac{\Delta Q_{Pepsi}}{\Delta Q_{Pizza}}$$

❖ Because people are more willing to trade away goods that they have in abundance and less willing to trade away goods of which they have little, the absolute value of the marginal rate of substitution falls as the consumer gains pizza and loses Pepsi.



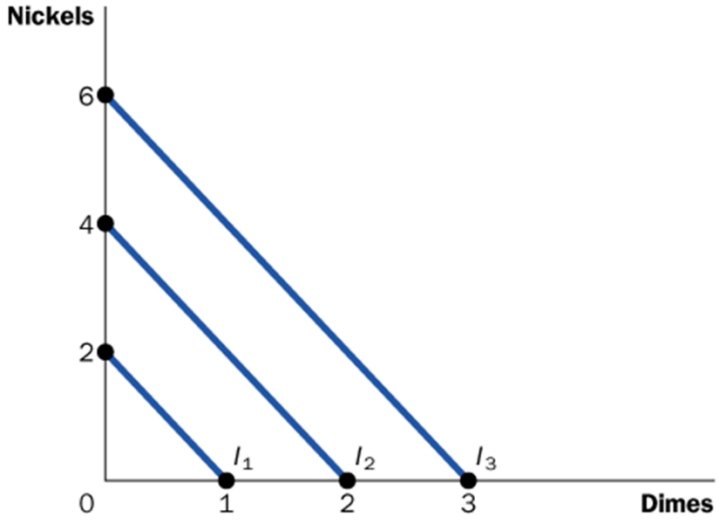
At point a, $MRS = 5$, at point b, $MRS = 2$, and at point c, $MRS = 1$.

4. Examples of Indifference Curves

1) Perfect Substitutes

❖ Two goods with straight-line indifference curves.

Examples: bundles of nickels and dimes.



❖ Since the marginal rate of substitution is the same no matter how many dimes and nickels the consumer has, the slope of the indifference curve is constant. Thus, the indifference curve is a straight line.

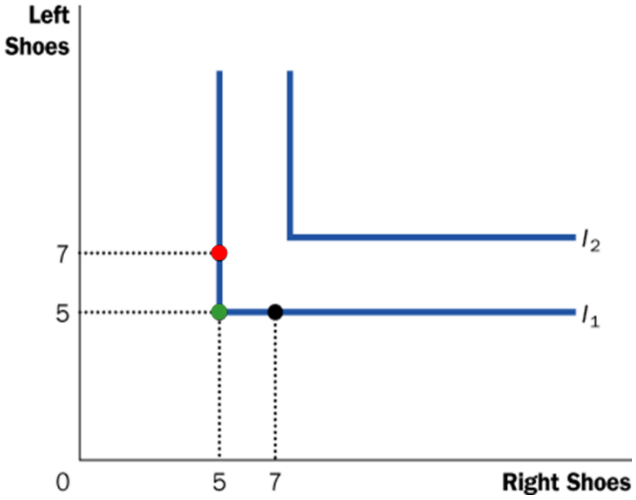
2) Perfect Complements

❖ Two goods with right-angle indifference curves.

Example: right shoes and left shoes.

- Most likely, the consumer would only care about the number of pairs of shoes.

- Thus, a bundle with 5 right shoes and 5 left shoes makes a consumers equally as happy as a bundle with 7 right shoes and 5 left shoes.



5. Utility Function:

❖ Utility is an abstract measure of the satisfaction or happiness that a consumer receives from a bundle of goods and services.

- Utility can be expressed as a function

  Example: For good X and Y,
  If they are perfect complement:
  U(X,Y) = min {aX, bY}

  If they are perfect substitutes,
  U(X,Y) = aX + bY

  We are going to use the following:
  U(X,Y) = $\sqrt{XY}$

  Marginal Utility of a good is the extra utility a consumer gets by consuming one more unit of that good, holding constant the consumption of other goods. For example, when U(X,Y) = $\sqrt{XY}$, marginal utility of X: $MU_x = \frac{\sqrt{Y}}{2\sqrt{X}}$, and marginal utility of Y: $MU_y = \frac{\sqrt{X}}{2\sqrt{Y}}$. When U(X,Y)=aX+bY, $MU_x = a$, and $MU_y = b$.

❖ Diminishing marginal utility is where marginal utility declines as more of a good is consumed.

❖ Indifference curves and utility are related.

- Bundles of goods in higher IC provide a higher level of utility.
- Bundles of goods on the same IC all provide the same level of utility.
- The slope of the IC reflects the marginal utility of one good compared to the marginal utility of the other good.

➔ $MRS = \frac{\Delta Q_y}{\Delta Q_x} = \frac{MU_x}{MU_y}$

Utility loss from losing ΔQ_y of good Y $= \Delta Q_y * MU_y$
Utility gain from consuming ΔQ_x of good X $= \Delta Q_x * MU_x$

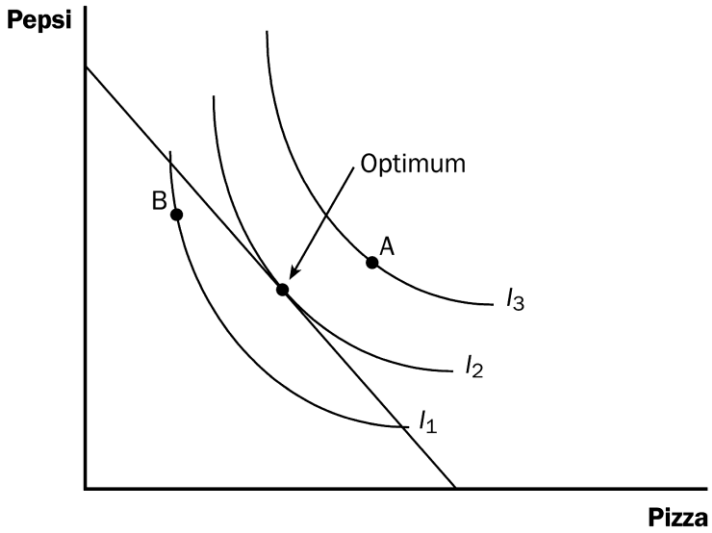
III. Optimization: What the Consumer Chooses

1. The Consumer's Optimal Choices

❖ The consumer prefers the highest possible IC, but he must also stay within his budget.

Maximize Utility Subject to Budget Constraint

❖ The highest IC the consumer can reach is the one that is tangent to the budget constraint. The point where they touch is called the **optimum** bundle.



❖ The optimum point represents the best combination of Pepsi and pizza available to the consumer.

- The consumer would prefer point A, but he cannot afford that bundle because it lies outside of his budget constraint (not feasible).
- The consumer could afford bundle B, but it lies on a lower indifference curve and therefore provides less satisfaction (feasible but not optimal).

❖ At the optimum, the slope of the budget constraint is equal to the slope of the indifference curve.

→ $\boldsymbol{MRS = \frac{P_x}{P_Y}}$

- At this point, the marginal rate of substitution is equal to the relative price of the two goods.
- Since $MRS = \frac{MU_x}{MU_y}$, optimization occurs where

$$\frac{\boldsymbol{P_x}}{\boldsymbol{P_Y}} = \frac{MU_x}{MU_y}$$

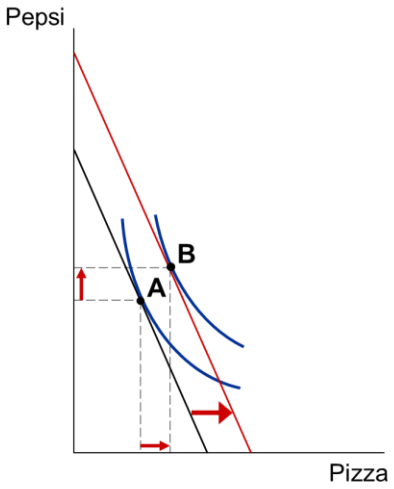
- This can be rewritten as $\frac{MU_x}{P_x} = \frac{MU_y}{P_y}$.

This implies that, at the consumer's optimum, the marginal utility per dollar spent on good X equals the marginal utility per dollar spent on good Y.

Question: Can you find out the optimal bundles using a graph if the indifference curves are bowed outward (concave), or are straight lines (linear)?

2. How Changes in Income Affect the Consumer's Choices

1) A change in income shifts the budget constraint.



- Because the relative price of the two goods has not changed, the slope of the budget constraint remains the same. An increase in income means that the consumer can now reach a higher indifference curve.

2) A good for which an increase in income raises the quantity demanded is a **normal** good.
Example:

3) A good for which an increase in income reduces the quantity demanded is called **inferior** good.
Example: junk food

4) Income Elasticity of Demand

$$\epsilon_I = \frac{percentage\ change\ in\ quantity\ demanded}{percentage\ change\ in\ income} = \frac{\Delta Q/Q}{\Delta I/I}$$

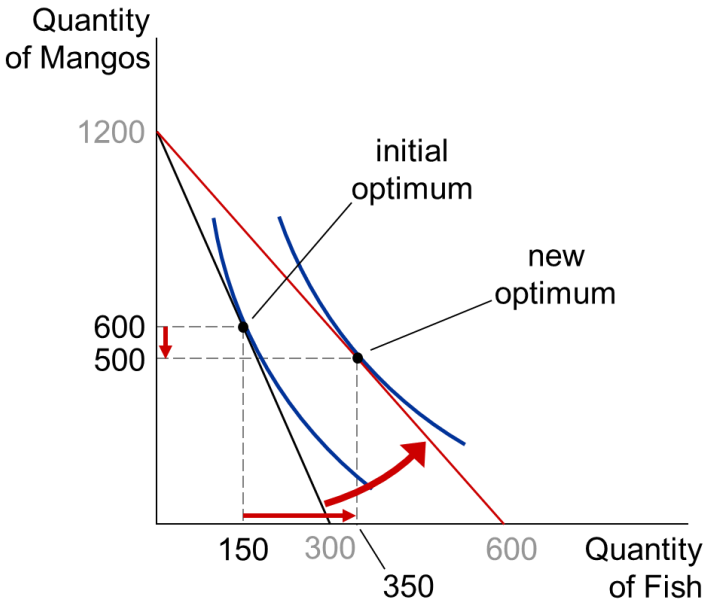
Question: What's the relationship between Price Elasticity and Income Elasticity of demand?

3. How Changes in Prices Affect the Consumer's Choices

1) If the price of only one good changes, the budget constraint will tilt.

Example:
Initially, Hurley only consumes mangos and fish.
Income = $1,200
P_f = $4 → max fish consumption = 1200/4=300
P_m = $1 → max mango consumption = 1200/1=1200

Now, suppose P_f = $2 (decrease).
→ max fish consumption = 1200/2=600
→ max mango consumption stays the same



- The slope of the budget constraint changes as well.

  Old: $P_f / P_m = 4/1 = 4$
  New: $P_f / P_m = 2/1 = 2$

  The budget constraint has become flatter.

4. Income and Substitution Effects

A fall in the price of fish has two effects on Hurley's optimal consumption of both goods.

- **Income effect** (parallel shift of BC)
  A fall in P_f boosts the purchasing power of Hurley's income, allows him to buy more mangos and more fish (i.e. change in purchasing power).

- **Substitution effect (movement along the IC curve)**
  A fall in P_f makes mangos more expensive relative to fish, causes Hurley to buy fewer mangos and more fish (i.e. change in relative prices).

- Substitution effect is always negative, which means that when the price of mangos increases, a consumer always consumes less mangos. Income

effect may be positive or negative, which means when the price of mangos increases, the consumer may consume more or less mangos. The net effect on mangos is ambiguous.

❖ How such a change in the price of one good alters the consumption of both goods depends on the consumer's preferences.

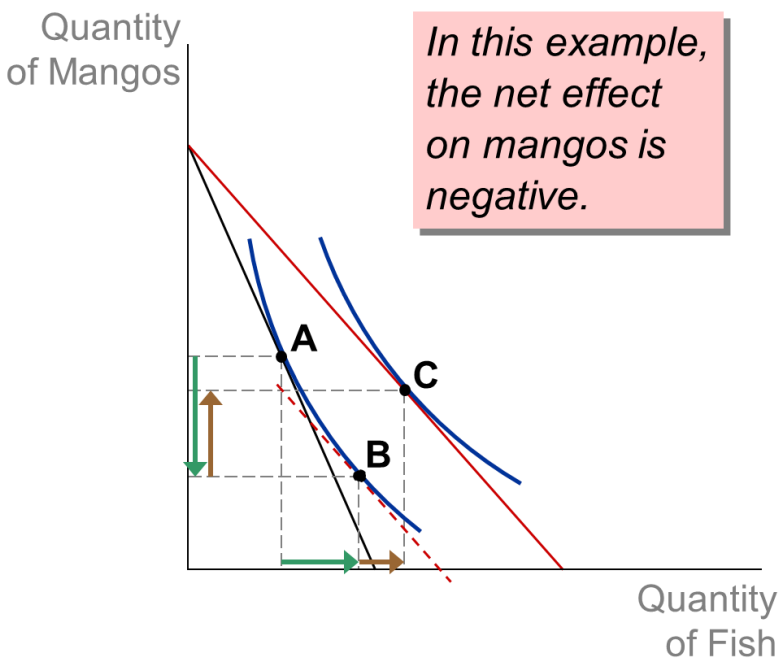
Example:

Initial optimum at A.

P_f falls.

- Substitution effect: from A to B
  buy more fish and fewer mangos due to relative price change, holding constant the consumer's level of well-being.

- Income effect: from B to C
  buy more of both goods due to the increase in the purchasing power of the consumer's income, holding relative prices constant.

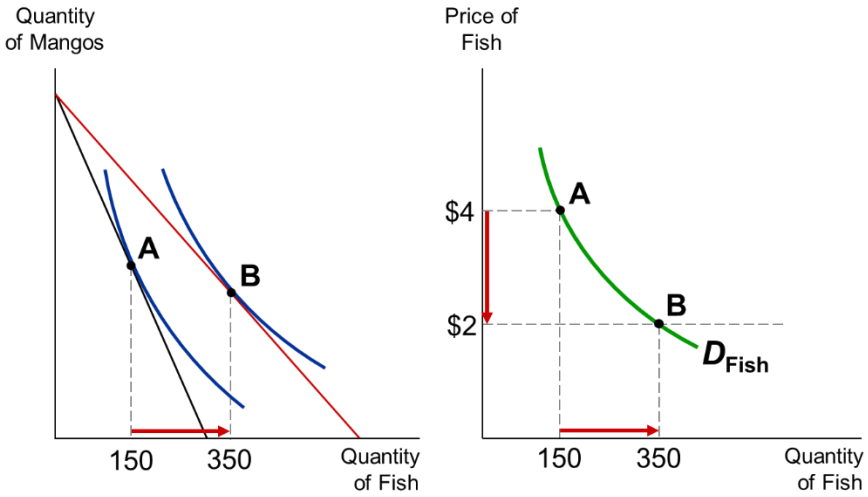


IV. Deriving the Individual Demand Curve

- A demand curve shows how the price of a good affects the quantity demanded.

- We can view a consumer's demand curve as a summary of the optimal decisions that arise from his budget constraint and indifference curves.

  Example:
  A: When P_f = \$4, Hurley demands 150 fish.
  B: When P_f = \$2, Hurley demands 350 fish



V. Summary

- A consumer's budget constraint shows the possible combinations of different goods he can buy given his income and the prices of the goods. The slope of the budget constraint equals the relative price of the goods.

- The consumer's indifference curves represent his preferences. An indifference curve shows the various bundles of goods that make the consumer equally happy. Points on higher indifference curves are preferred to points on lower indifference curves. The slope of an indifference curve at any point is the marginal rate of substitution—the rate at which the consumer is willing to trade one good for the other.

- The consumer optimizes by choosing the point on his budget constraint that lies on the highest indifference curve. At this point, the slope of the indifference curve (the marginal rate of substitution between the goods) equals the slope of the budget constraint (the relative price of the goods).

- When the price of a good falls, the impact on the consumer's choices can be broken down into an income effect and a substitution effect. The income effect is the change in consumption that arises because a lower price makes the consumer better off. The substitution effect is the change in consumption that arises because a price change encourages greater consumption of the good that has become relatively cheaper.