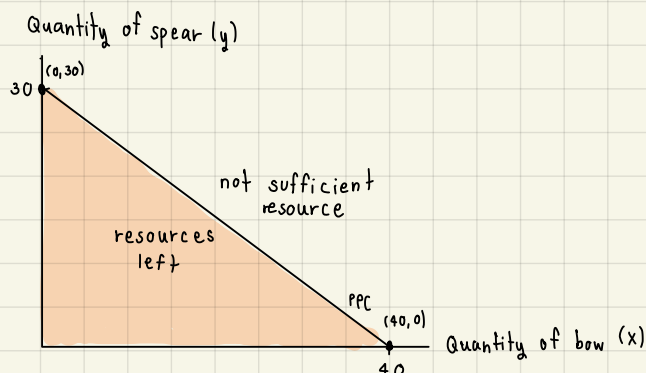


1. A human civilization finds a new wood source of total 120 units. Wood can either be used to produce spear or bow for hunting. A wood master then calculates that in order to produce a spear, it takes 4 units of wood while 3 units for a bow. Answer the following questions.

1.a) Assumed that the opportunity cost of using this 120 units of wood to produce the products is constant, draw a production possibility curve (PPC), displaying quantity of spear on the vertical axis and quantity of bow on the horizontal axis, and indicate all the essential details in the graph and explain.

1.a)



- Quantity of spear = $120/4 = 30$ spears
- Quantity of bow = $120/30 = 40$ bows

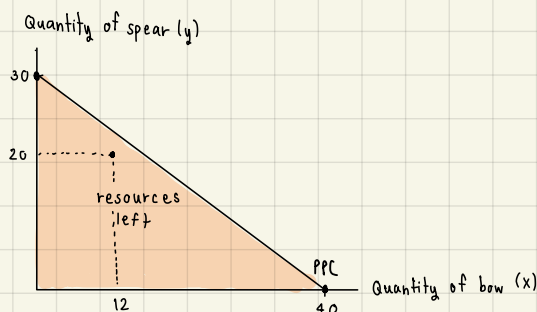
• The opportunity cost of using 120 units of wood to produce the product is constant, so it means the opportunity cost of producing two goods is equal regardless of where you are along the line.

1.b) The opportunity cost for a spear = $\frac{\Delta x}{\Delta y} = \frac{40-0}{0-30} = -\frac{40}{30} = -\frac{4}{3} \approx 1.33$
 1 bow costs = 1.33 spear

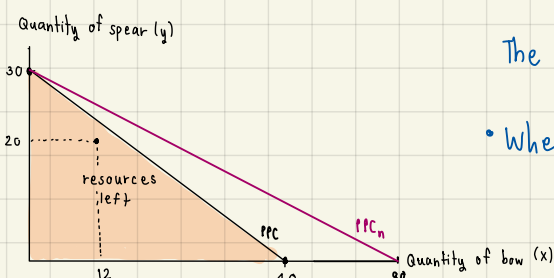
1.c) To produce 20 spears, we use $20(4) = 80$ units of wood.
 To produce 12 bows, we use $12(3) = 36$ units of wood.

Total wood = $120 - [80 + 36] = 4$ units

∴ We have 4 units of wood left which means this option is not efficient.



1.d) The new quantity of bow = $120/1.5 = 80$ bows



The new opportunity cost for a spear = $\frac{80}{30} = 2.66..$

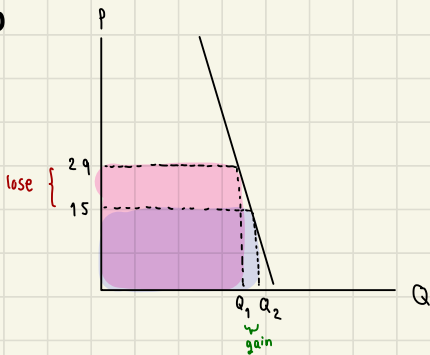
• When we produce 30 spears, we will lose 80 bows

2.a) Price elasticity of demand for MRT purple line

$$\begin{aligned} \hookrightarrow &= \left[\frac{Q_2 - Q_1}{P_2 - P_1} \right] \left[\frac{P_2 + P_1}{Q_2 + Q_1} \right] = \left[\frac{21000 - 20000}{29 - 42} \right] \left[\frac{29 + 42}{21000 + 20000} \right] \\ &= \left[- \frac{1000}{13} \right] \left[\frac{71}{41000} \right] \\ &= - \frac{71}{533} \approx -0.13 \end{aligned}$$

∴ When price elasticity of demand is less than 1, it is inelastic
 $|E_d| < 1 = \text{inelastic}$

2.b



when it is inelastic demand, it means price doesn't change the quantity demanded that much because MRT is necessary for our daily lives.

$$\begin{aligned}
 3.a) \text{ Price elasticity of demand} &= \left[\frac{Q_2 - Q_1}{P_2 - P_1} \right] \left[\frac{P_1}{Q_1} \right] \\
 &= \left[\frac{40 - 80}{25 - 20} \right] \left[\frac{20}{80} \right] \\
 &= \left[\frac{-40}{5} \right] \left[\frac{2}{8} \right] = -2
 \end{aligned}$$

$$\begin{aligned}
 \text{Price elasticity of supply} &= \left[\frac{Q_2 - Q_1}{P_2 - P_1} \right] \left[\frac{P_1}{Q_1} \right] \\
 &= \left[\frac{100 - 80}{25 - 20} \right] \left[\frac{20}{80} \right] \\
 &= \left[\frac{20}{5} \right] \left[\frac{2}{8} \right] = \frac{40}{40} = 1
 \end{aligned}$$

$$\begin{aligned}
 3.b) \text{ Consumer surplus} &= \frac{1}{2} \times 80 \times 10 = 400 \\
 \text{Producer surplus} &= \frac{1}{2} \times 80 \times 20 = 800
 \end{aligned}
 \left. \vphantom{\begin{aligned} \text{Consumer surplus} \\ \text{Producer surplus} \end{aligned}} \right\} TR = 1200$$

$$3.c) \text{ Consumer surplus} = \frac{1}{2} \times 40 \times 5 = 100$$

$$\text{Producer surplus} = [15 \times 40] + \left[\frac{1}{2} \times 40 \times 10 \right] = 600 + 200 = 800$$

$$TR = 100 + 800 = 900$$

$\therefore$ When they charge price at \$25, the consumer surplus and total surplus will decrease while the producer surplus will remain the same.

$$3d) \text{ Deadweight loss} = \frac{1}{2} \times 40 \times 15 = 300$$

4a) Consumer equilibrium: $MRS = \frac{P_x}{P_y}$

$$\frac{9}{2} = \frac{P_x}{10}$$

$$45 = P_x$$

4b.) Consumer equilibrium on point B: $MRS = \frac{P_x}{P_y}$

$$\frac{9}{2} = \frac{180}{P_y}$$

$$P_y = \frac{180 \cdot 2}{9} = 40$$

Consumer budget that achieve the equilibrium on point B

- At point B: (4, 9)
- Budget = $P_x \cdot x + P_y \cdot y$
 $= (180 \cdot 4) + (40 \cdot 9)$
 $= 720 + 360$
 $= 1080 \text{ ₺}$

4.C) Marginal utility per unit of avocado = $\frac{\Delta U}{\Delta X}$

- Consumer yields 8 utils on IC₁
- Consumer yields 12 utils on IC₂

$$MU_C = \frac{12 - 8}{4 - 2} = \frac{4}{2} = 2$$

$$MU_D = \frac{12 - 8}{8 - 4} = \frac{4}{4} = 1$$

4d.) The law of diminishing marginal utility is the marginal utility from each additional unit decreases as consumption increases.

• Point C : $X = 4$, $MU_C = 2$

Point D : $X = 8$, $MU_D = 1$

∴ When this consumers consume more avocado ($x \uparrow$), the consumer's utility from consuming avocado decreases ($MU \downarrow$)

• Point A : $X = 2$, $MU_A = 2$

Point B : $X = 4$, $MU_B = 1$

∴ Consuming more avocado makes the consumer's utility received from consuming avocado decrease.