#1 If the price Px and Py increase 10% at the same time, with income Remaining unchanged, show that this is equivalent to a reduction in income.

#2 Demonstrate how PCC with varying price Py, (Px and Income are fixed) can give us the price elasticity of Y to be equal to, less than, or greater than 1 in absolute value

7. A college student has two options for meals: eating at the dining hall for $6 per meal, or eating a Cup O' Soup for $1.50 per meal. Her weekly food budget is $60.

   a. Draw the budget constraint showing the trade-off between dining-hall meals and Cups O' Soup. Assuming that she spends equal amounts on both goods, draw an indifference curve showing the optimum choice. Label the optimum as point A.

   b. Suppose the price of a Cup O' Soup now rises to $2. Using your diagram from part (a), show the consequences of this change in price. Assume that our student now spends only 30 percent of her income on dining-hall meals. Label the new optimum as point B.

   c. What happened to the quantity of Cups O' Soup consumed as a result of this price change? What does this result say about the income and substitution effects? Explain.

   d. Use points A and B to draw a demand curve for Cup O' Soup. What is this type of good called?

#1 If the price Px and Py increase 10% at the same time, with income Remaining unchanged, show that this is equivalent to a reduction in income.

Normally, budget line equation is $\Rightarrow \quad P_x X + P_y Y = I$

Then P_x and P_y increase 10% $\Rightarrow \quad 1.1P_x X + 1.1P_y Y = I$

$$1.1(P_x X + P_y Y) = I$$

$$P_x X + P_y Y = \frac{I}{1.1}$$

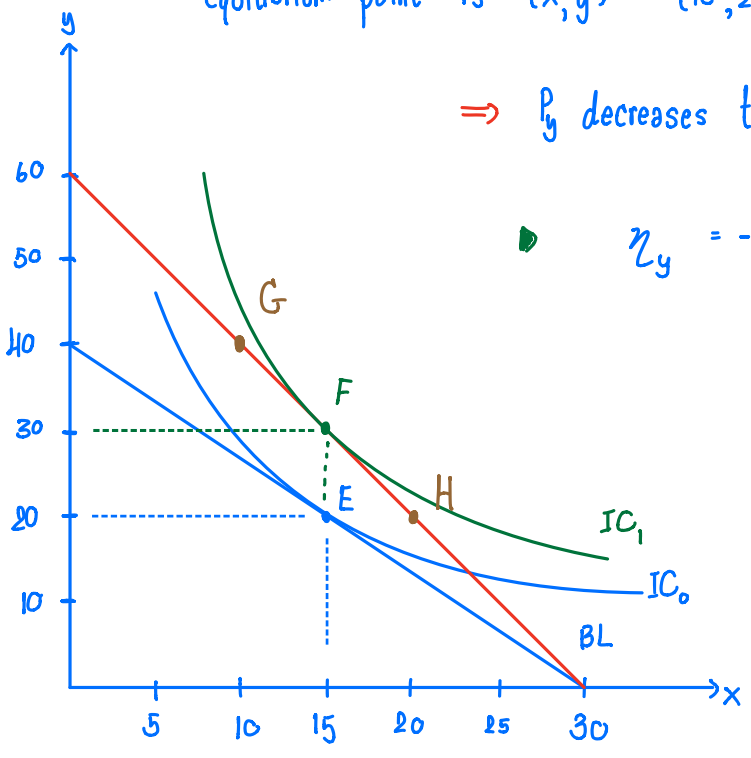
$\therefore$ It's observable that when P_x and P_y increase 10% at the same time [when income is fixed], it is eqivalent to when we have less income [P_x and P_y are fixed]

Note 10% Increase in P_x and P_y $\neq$ 10% Decrease in income.

$$P_x X + P_y Y = \frac{I}{1.1} \neq 0.9I$$

#2 Demonstrate how PCC with varying price Py, (Px and Income are fixed) can give us the price elasticity of Y to be equal to, less than, or greater than 1 in absolute value

Assume that $P_x = 4$ $P_y = 3$ $I = 120$. So, BL: $4X + 3Y = 120$ and the equilibrium point is $(X, y) = (15, 20)$



$\Rightarrow$ P_y decreases to 2 $\Rightarrow$ $\%\Delta P_y = \frac{2-3}{\frac{(2+3)}{2}} \times 100 = -40\%$

$$\eta_y = -1 = \frac{\%\Delta Q_y}{\%\Delta P_y} \iff \%\Delta Q_y = 40\%$$

$$\frac{y_1 - y_0}{\frac{(y_1 + y_0)}{2}} \times 100 = 40$$

$$\frac{y_1 - 20}{(y_1 + 20)/2} = 0.4$$

$$y_1 - 20 = \frac{(y_1 + 20)}{2} \times 0.4$$

$$0.8y_1 = 24$$

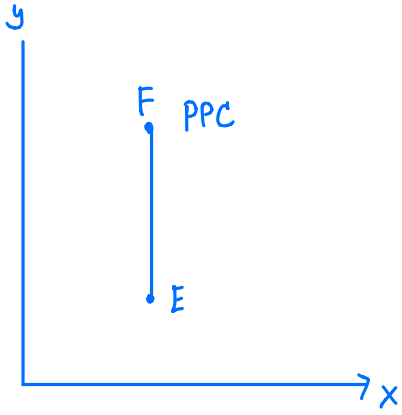
$$y_1 = 30$$

- If the new equilibrium is at F, then $|\eta_y| = 1$.

- If the new equilibrium is at G, $\%\Delta Q_y$ will be greater than 40%, then $|\eta_y| = \left|\frac{\%\Delta Q_y}{\%\Delta P_y}\right|$ will be greater than 1. ($|\eta_y| > 1 \leftrightarrow$ y is elastic)

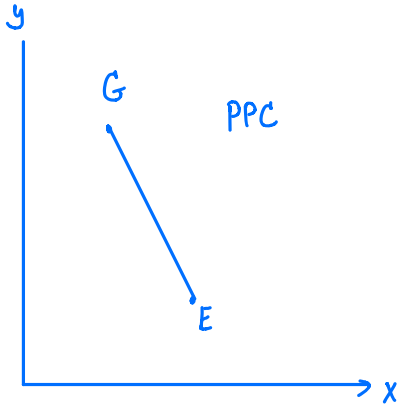
- If the new equilibrium is at H, $\%\Delta Q_y$ will be less than 40%, then $|\eta_y| = \left|\frac{\%\Delta Q_y}{\%\Delta P_y}\right|$ will be less than 1. ($|\eta_y| < 1 \leftrightarrow$ y is inelastic)

If E to F



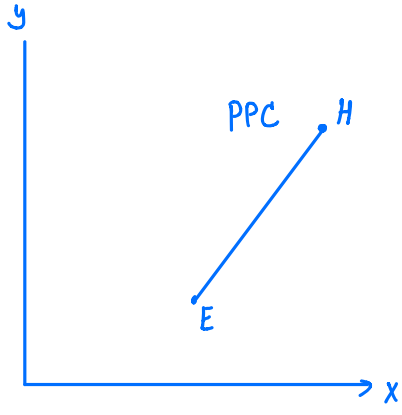
$|\eta_y| = 1$

(Unit elastic)



$|\eta_y| > 1$

(Elastic)



$|\eta_y| < 1$

(Inelastic)

Note Use Midpoint Elasticity in calculation

7. A college student has two options for meals: eating at the dining hall for $6 per meal, or eating a Cup O' Soup for $1.50 per meal. Her weekly food budget is $60.

   a. Draw the budget constraint showing the trade-off between dining-hall meals and Cups O' Soup. Assuming that she spends equal amounts on both goods, draw an indifference curve showing the optimum choice. Label the optimum as point A.

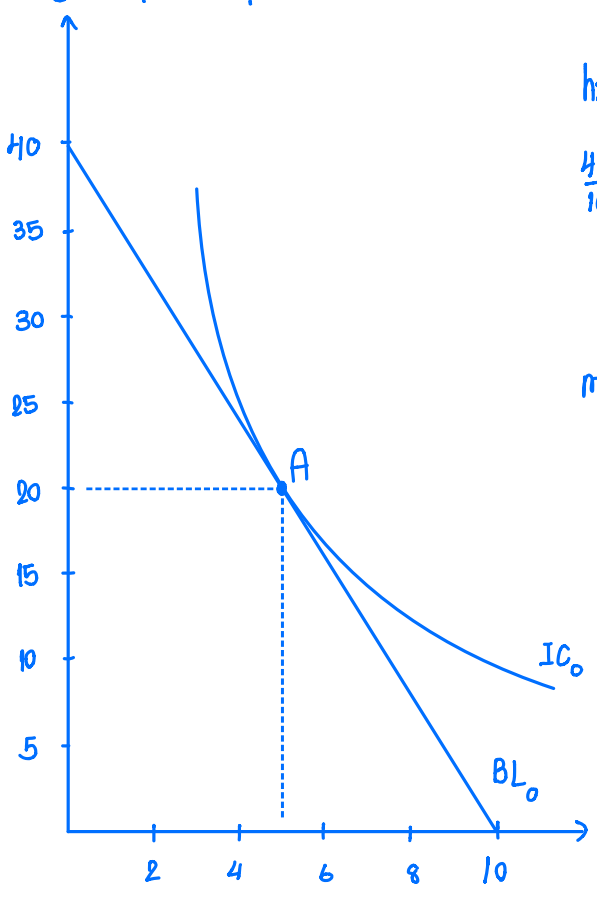
   b. Suppose the price of a Cup O' Soup now rises to $2. Using your diagram from part (a), show the consequences of this change in price. Assume that our student now spends only 30 percent of her income on dining-hall meals. Label the new optimum as point B.

   c. What happened to the quantity of Cups O' Soup consumed as a result of this price change? What does this result say about the income and substitution effects? Explain.

   d. Use points A and B to draw a demand curve for Cup O' Soup. What is this type of good called?

Let eating at dining hall = x and eating at Cup O' Soup = y

BL_0 : $6x + 1.5y = 60$



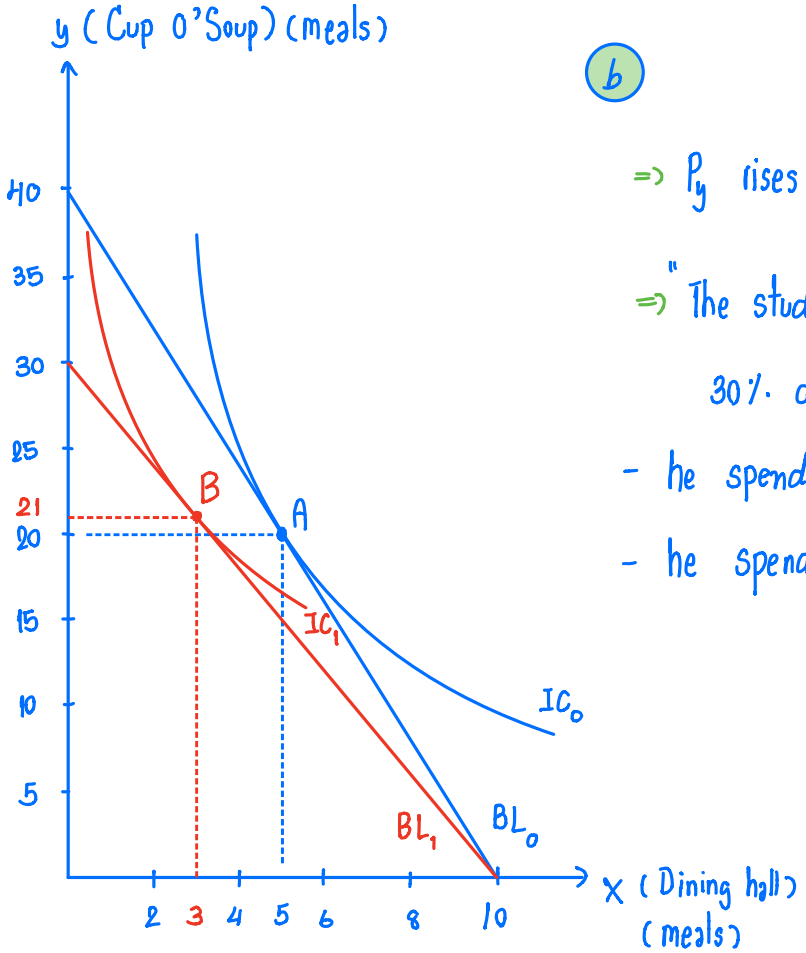
(a) ⇒ From the budget line (BL_0), if he chooses to have 1 meal at dining hall, he has to trade off $\frac{40}{10} = 4$ meals of Cup O' Soup in exchange.

⇒ "He is spending equal amounts on both goods" means that he spends $30 on both goods.

for x ⇒ $6x = 30$ ⇒ $x = 5$

for y ⇒ $1.5y = 30$ ⇒ $y = 20$

Point A illustrates where he spends equal amounts on both x and y



(b)

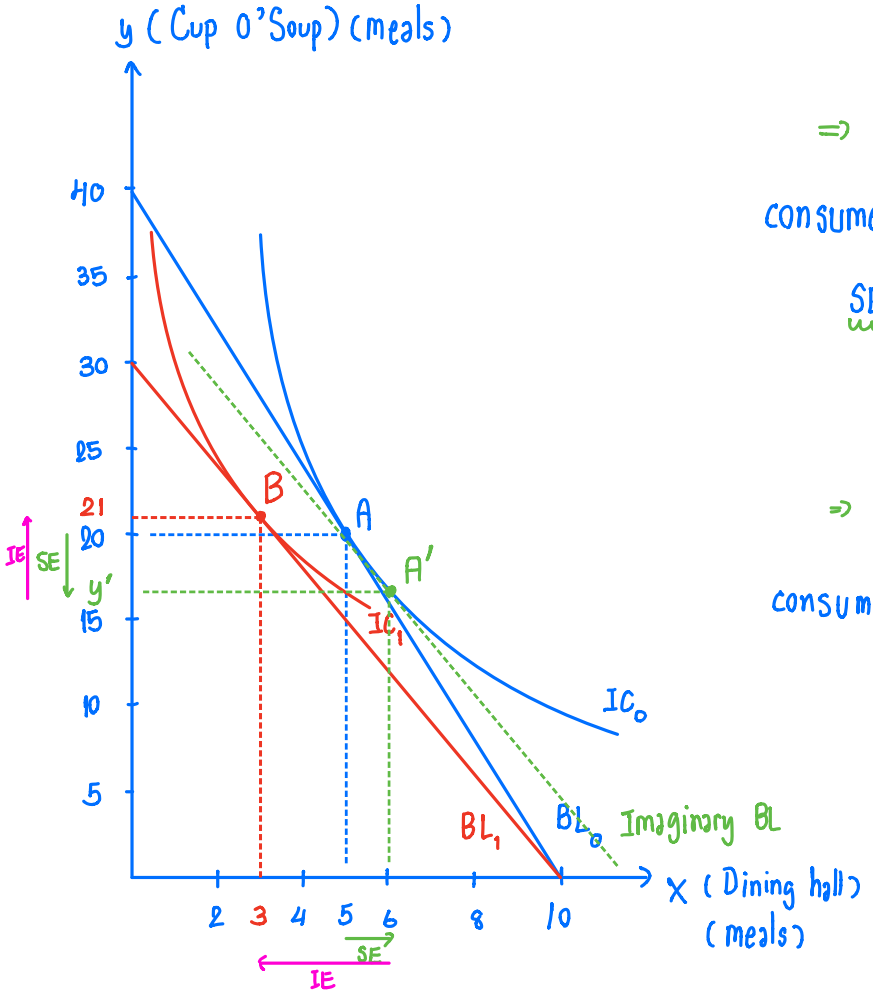
⇒ P_y rises from 1.5 to 2, so BL_1 : $6X + 2y = 60$

⇒ "The student spends only 30% of income on x"

30% of Income = (0.3)(60) = 18

- he spends \$18 on x ⇒ $6X = 18$ ⇒ $X = 3$
- he spends \$(60-18) on y ⇒ $2y = 42$ ⇒ $y = 21$.

(c) When P_y rises to \$2, he now consumes 21 units of y.



⇒ When P_y increases, by substitution effect, consumer will buy less of y but more of x.

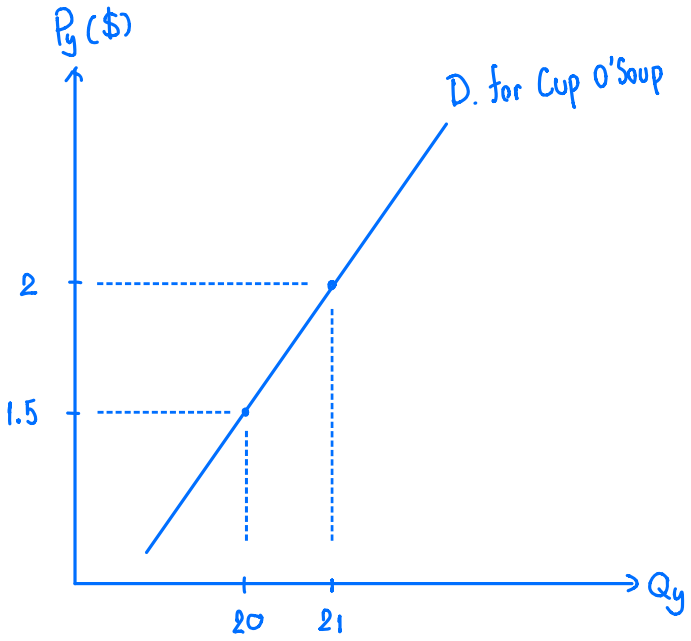
SE for x : $6 - 5 > 0$

for y : $y' - 20 < 0$

⇒ When P_y increases, purchasing power of consumer drops as well. This is income effect.

IE for x : $9 - 6 < 0$

for y : $21 - y' > 0$



(d)

This type of good is called "Giffen good". It violates law of demand.