1. Answer the following questions.
   - 1.1 Suppose Govt Multiplier is 5 and $\Delta G = 5$. Find ΔY.
   - 1.2 Suppose Tax Multiplier is -3 and $\Delta Y = -9$. Find ΔT.
   - 1.3 Suppose $\Delta Y = 10$ and $\Delta I = 2$. Find Investment Multiplier.

1.1) $\frac{\Delta Y^*}{5(5)} = 5(5)$ → $\Delta Y^* = 25$

1.2) $\frac{-9}{\Delta T} = -3$ → $\Delta T = 3$

1.3) $\frac{10}{2}$ → investment = 5 multiplier

2. From $Y = C + I + G$ where $C = C_0 + C_1(Y - T)$, find
   - 2.1 Equilibrium Output Y*
   - 2.2 $\Delta Y/\Delta I$
   - 2.3 $\Delta Y/\Delta G$
   - 2.4 $\Delta Y/\Delta T$
   - 2.5 Balanced-Budget Multiplier (BBM)
   - 2.6 Explain what the BBM is.

2.1) $Y = C_0 + C_1(Y - T) + I + G$

$Y = C_0 + C_1Y - C_1T + I + G$

$Y - C_1Y = C_0 - C_1T + I + G$

$\frac{Y(1-C_1)}{(1-C_1)} = \frac{C_0 - C_1T + I + G}{(1-C_1)}$ → $Y^* = \frac{C_0 - C_1T + I + G}{(1-C_1)}$

2.2) $\frac{\Delta Y}{\Delta I} = \frac{1}{1-MPC} = \frac{1}{1-C_1Y+C_1T}$

2.3) $\frac{\Delta Y}{\Delta G} = \frac{1}{1-\text{slope AE}} \rightarrow \frac{1}{1-C_1Y}$

2.4) $\frac{\Delta Y}{\Delta T} = \frac{-MPC}{1-\text{slope AE}} = \frac{-C_1Y+C_1T}{1-C_1Y}$

2.5) $BBM = \frac{1-MPC}{1-\text{slope AE}} = \frac{1-C_1Y+C_1T}{1-C_1Y}$

2.6) BBM is when the government increase the tax & spending by the same amount. Resulting in an increase in the Y^*. ✱

3. Assume a closed economy with government. The country has the following components of aggregate expenditure.

   C = 300 + 0.75(Yd) I = 50

   G = 50 T = 50 (lump-sum tax)

   - 3.1 Use the Y = AE (standard) approach to find the equilibrium output.
   - 3.2 Draw the Keynesian Cross, and find the intercept on the vertical axis and the slope of the AE schedule.
   - 3.3 Use the Leakage = Injection (or saving/investment) approach to find the equilibrium level of output. (Hint: the equilibrium condition is $S + T = I + G$, with $Yd = Y - T = C + S$)
   - 3.4 Draw the saving/investment curve to show the equilibrium.
   - 3.5 Suppose that the government decides to build more roads, raising government spending by 50 units, but this project is to be financed by the increase in net taxes of 50 units. Use the Y = AE (standard) approach to find the new equilibrium output.
   - 3.6 Use the Balanced-Budget Multiplier (BBM) derived from Question 2.5 to find the new equilibrium output.

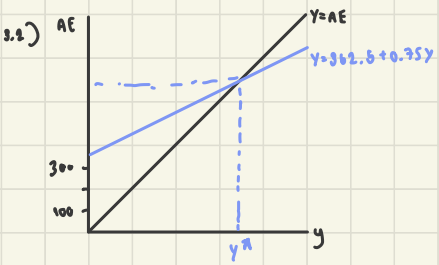
3.1) $AE = 300 + 0.75(Y - 50) + 50 + 50$

$AE = 300 + 0.75Y - 37.5 + 100$ → $AE = 362.5 + 0.75Y$

$Y = AE$ → $Y = 362.5 + 0.75Y$

$\frac{0.25Y}{0.25} = \frac{362.5}{0.25}$ → $Y^* = 1450$

3.2)



3.5) $AE = 300 + 0.75(Y - 100) + 50 + 100$

$AE = 300 + 0.75Y - 75 + 50 + 100$

$AE = 375 + 0.75Y$

$Y = 375 + 0.75Y$

$\frac{0.25Y}{0.25} = \frac{375}{0.25}$

$Y^* = 1500$

3.6) $G = T$

$BBM = \frac{1-MPC}{1-\text{slope AE}} = \frac{1-0.75}{1-0.75} = 1$

∴ when G & T ↑ 1 unit, Y^* ↑ 1 unit.

= when G&T ↑ 50, Y^* ↑ 50

$Y^* = 1450 + 50$ → $Y^* = 1500$

4. From $Y = C + I + G + (X - M)$
where $C = C_0 + C_1(Y - T)$ and $M = M_0 + M_1(Y)$, find

4.1 Equilibrium Output Y*

4.2 $\Delta Y/\Delta I$

4.3 $\Delta Y/\Delta G$

4.4 $\Delta Y/\Delta T$

4.5 Balanced-Budget Multiplier (BBM)

4.1) $Y = C_0 + C_1(Y - T) + I + G + X - M_0 - M_1 Y$

$Y = C_0 + C_1 Y - C_1 T + I + G + X - M_0 - M_1 Y$

$Y - C_1 Y + M_1 Y = C_0 - C_1 T + I + G + X - M_0$

$\frac{Y(1 - C_1 + M_1)}{(1 - C_1 + M_1)} = \frac{C_0 - C_1 T + I + G + X - M_0}{(1 - C_1 + M_1)}$

$$Y^* = \frac{C_0 - C_1 T + I + G + X - M_0}{(1 - C_1 + M_1)}$$

4.2) $\frac{\Delta Y}{\Delta I} = \frac{1}{1 - MPC} = \frac{1}{1 - C_1 Y + C_1 T}$

4.3) $\frac{\Delta Y}{\Delta G} = \frac{1}{1 - \text{slope AE}} = \frac{1}{1 - C_1 Y + M_1 Y}$

4.4) $\frac{\Delta Y}{\Delta T} = \frac{-MPC}{1 - \text{slope AE}} = \frac{-C_1 Y + C_1 T}{1 - C_1 Y + M_1 Y}$

4.5) $BBM = \frac{1 - MPC}{1 - \text{slope AE}} = \frac{1 - C_1 Y + C_1 T}{1 - C_1 Y + M_1 Y}$

5. Assume an open economy with government. The country has the following components of aggregate expenditure.

$C = 200 + 0.7(Yd)$ $I = 75$ $G = 75$

$T = 50$ $X = 50$ $M = 50 + 0.1Y$

5.1 Use the Y = AE approach to find the equilibrium. Is Y = 300 an equilibrium? If it is not, explain the adjustment process towards equilibrium.

$AE = 200 + 0.7(Y - 50) + 75 + 75 + 50 - 50 - 0.1Y$

$AE = 200 + 0.7Y - 35 + 75 + 75 + 50 - 50 - 0.1Y \rightarrow AE = 315 + 0.6Y$

$Y = AE \rightarrow Y = 315 + 0.6Y$

$0.4Y = 315$

$Y^* = 787.5$

$\therefore Y = 300$ is not the equilibrium, the adjustment process is that we need to produce more supplies so that it would reach the demand. In other words, right now we are in a shortage which the inventories decline. *

agg exp > agg output

5.2 Based on what you have derived in Question 4, calculate the investment, government spending, tax, and balanced-budget multipliers.

5.3 Interpret the value of each of the multipliers.

$\frac{\Delta Y}{\Delta I} = \frac{1}{1 - \text{slope AE}} = \frac{1}{1 - 0.6} = 2.5$

when I ↑ by 1, ΔY^* ↑ by 3.33 *

$\frac{\Delta Y}{\Delta G} = \frac{1}{1 - \text{slope AE}} = \frac{1}{1 - 0.6} = 2.5$

when G ↑ by 1, ΔY^* ↑ by 2.5 *

$\frac{\Delta Y}{\Delta T} = \frac{-MPC}{1 - \text{slope AE}} = \frac{-0.7}{1 - 0.6} = -1.75$

when T ↑ by 1, ΔY^* ↓ by 1.75 *

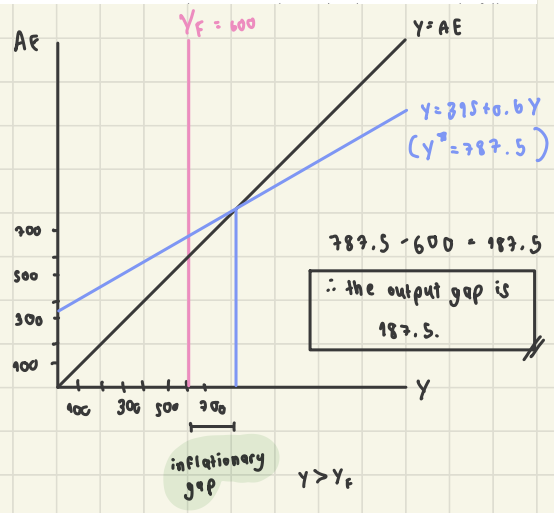
$BBM = \frac{1 - MPC}{1 - \text{slope AE}} = \frac{1 - 0.7}{1 - 0.6} = 0.75$

when G & T ↑ by 1, ΔY^* ↑ by 0.75 *

Suppose that the full-employment output (Y_F) is 600;

5.4 What type of output gap is the economy currently experiencing?

5.5 Draw the Keynesian Cross. Identify its slope and intercept. Also, illustrate the output gap.



∴ We are currently experiencing an inflationary gap, meaning that the unemployment rate is lower than the natural rate of unemployment. Some of the factors of production are overemployed. So, we need to use contractionary fiscal policy (increase tax & lower spending) to slow down the economy by reducing the aggregate expenditure. ✱

Now, government wants to correct the output gap by moving the economy to the full-employment level, and is considering different policies.
(Hint: use the multipliers from Question 5.2 to answer the following questions)

5.6 If the government wants to adjust **only its spending (G)**, how much G should be changed?

5.7 If the government wants to adjust **only its net taxes (T)**, how much T should be changed?

5.8 If the government wants to boost **only investment (I)**, how much I should be changed?

5.9 If the government wants to implement a balanced-budget policy, what should the government do with G and T?

5.6) $\frac{\Delta Y^*}{\Delta G} = 2.5 \rightarrow \frac{187.5}{2.5} = 75$ ∴ reduce G by 75

5.7) $\frac{\Delta Y^*}{\Delta T} = -1.75 \rightarrow \frac{187.5}{-1.75} = -107.14$ ∴ increase T by 107.14

5.8) $\frac{\Delta Y^*}{\Delta I} = 2.5 \rightarrow \frac{187.5}{2.5} = 75$ ∴ reduce investment by 75

5.9) $\frac{\Delta Y^*}{\Delta G} + \frac{\Delta Y^*}{\Delta T} = 0.75 \rightarrow \frac{187.5}{0.75} = 250$

∴ reduce both the G & T by 250.

7. Let S = -200 + 0.5Y and I = 50, be the saving function and investment.

7.1 Use the saving/investment approach to find the equilibrium output.

$S = I$

$-200 + 0.5Y = 50 + 200$

$\frac{0.5Y}{0.5} = \frac{250}{0.5}$ $\quad \boxed{Y^* = 500}$

7.2 Find the equilibrium saving. (Hint: substitute Y* into S)

$S = -200 + 0.5(500)$

$\boxed{S = 50}$

Suppose people decide to save more, increasing autonomous saving by 100.

7.3 Use the saving/investment approach to find the new equilibrium output.

7.4 Find the new equilibrium saving. (Hint: substitute new Y* into S)

7.5 Comment on your result.

$S = I$

$-200 + 0.5Y = 50 + 100$

$\frac{0.5Y}{0.5} = \frac{150}{0.5}$ $\quad \boxed{Y^*_{new} = 300}$

$S = -200 + 0.5(300)$

$\boxed{S = -50}$

∴ when we save more, there will be less money going into the circular flow. So, there would be less output created, making the aggregate output and income in the economy falls. To conclude, as you can see from the equilibrium saving function, by saving more actually reduces your saving and in the end you can save less. This is like the theory paradox of thrift. ✱