

Home Work

Q1) Two bundle of goods Milk (M) and all other foods (F).

Daily Income of Mr. Kumare = Rs 2000.

Price of Milk (P_M) = Rs 50/unit

Price of other Food (P_F) = Rs 20/unit

Mr. Kumare can only spend 75% of his income

$$= \text{Rs } 2000 \times \frac{75}{100}$$

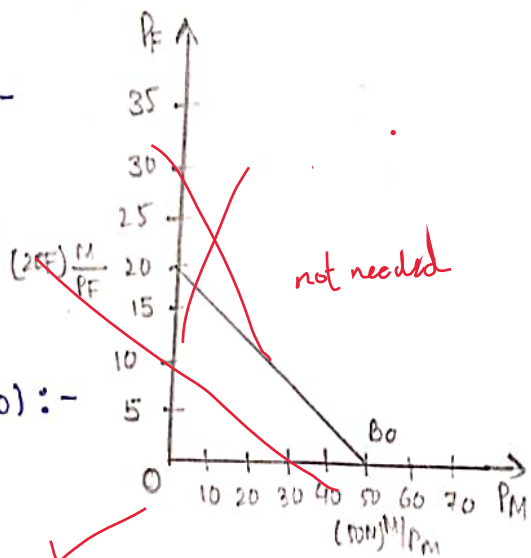
$$= \text{Rs } 1500.$$

a) Budget constraint of Mr X :-

$$P_M M + P_F F = M$$

$$50M + 20F = 1500$$

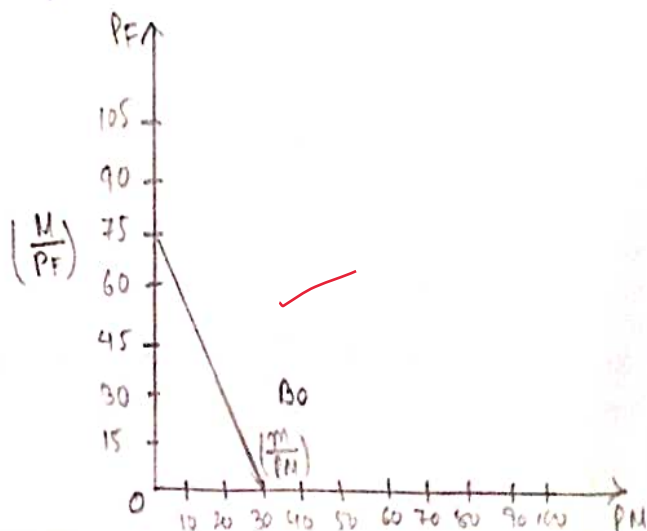
The graph of the Budget Line (B_0) :-



b) Maximum he can spend on Milk (M intercept) = $\frac{M}{P_M} = \frac{1500}{50} = \text{Rs } 30$.
(Assuming all the money spend on milk)

Maximum he can spend on other Food (F intercept) = $\frac{M}{P_F} = \frac{1500}{20} = \text{Rs } 75$.
(Assuming all the money spend on other Food)

Graphical representation of the intercept :-



c) one-time donation from Mrs. Singh for the year = Rs 3,65,000
 Donation for one day = Rs $\frac{3,65,000}{365}$
 = Rs 1000

New Income after donation = $m + \Delta m = 11500 + 1000$
 = Rs 2500. ✓

New Budget constraint: -

$$P_M M + P_F F = m'$$

$$50M + 20F = 2500 \quad (B_1)$$

M - intercept = $\frac{m'}{P_M} = \frac{2500}{50} = \text{Rs } 50$ ✓

F - intercept = $\frac{m'}{P_F} = \frac{2500}{20} = \text{Rs } 125$. ✓

Graph of new budget line: -

Slope of Budget line: -

$$B_0 = \left| \frac{P_M}{P_F} \right|$$

$$= \frac{50}{20} = \frac{5}{2}$$

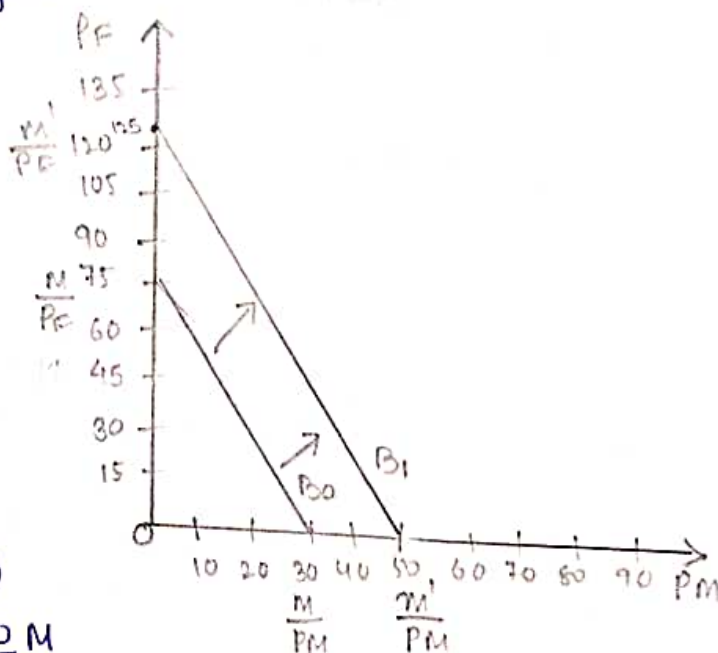
$$B_1 = \left| \frac{P_M}{P_F} \right| = \frac{50}{20} = \frac{5}{2}$$

As, $50M + 20F = 1500 \quad (B_0)$

$$F = \frac{1500}{20} - \frac{50}{20} M$$

$$50M + 20F = 2500$$

$$F = \frac{2500}{20} - \frac{50}{20} M$$



No, there is no change in the slope of the new budget constraint. Increase in income will increase the vertical intercept and not affect the slope of line. Thus, an increase in income will shift the budget line parallel to the outward from B_0 to B_1 . ✓

d) utility Function $U = U(M, F) = MF$

condition of optimality is :-

|slope of IC| = |slope of Budget constraint|

$$MRS_{MF} = \frac{P_M}{P_F}$$

$$\frac{MU_M}{MU_F} = \frac{P_M}{P_F}$$

$$\therefore U = MF$$

After taking partial derivative

$$MU_M = \frac{\partial U}{\partial M} = F$$

$$MU_F = \frac{\partial U}{\partial F} = M$$

$$\therefore MRS_{MF} = \frac{P_M}{P_F} = \frac{50}{20}$$

$$\frac{F}{M} = \frac{50}{20}$$

$$F = \frac{50}{20}M \quad \text{--- (1)}$$

Substituting the value of F in the budget constraint :-

Before donation :-

$$50M + 20F = 1500$$

$$(50M + 20 \times \frac{50}{20}M) = 1500$$

$$100M^* = 1500$$

$$M^* = 15$$

Now, putting the value of M^* in above eqn (1)

$$F = \frac{50}{20} \times 15 = 37.5$$

$$E_0^* = (15, 37.5)$$

After donation, the optimum bundle: -

$$50M + 20F = 2500$$

Substitute the value of F from eqn (1)

$$50M + 20 \times \frac{50}{20} M = 2500$$

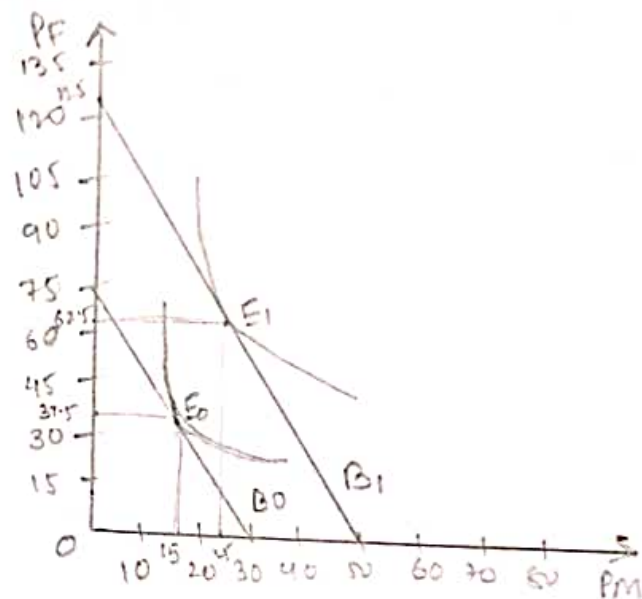
$$100M = 2500$$

$$M_1^* = 25$$

Now, putting the value of M^* in eqn (1)

$$F_1^* = \frac{50}{20} \times 25 = 62.5$$

$$E_1^* = (25, 62.5)$$



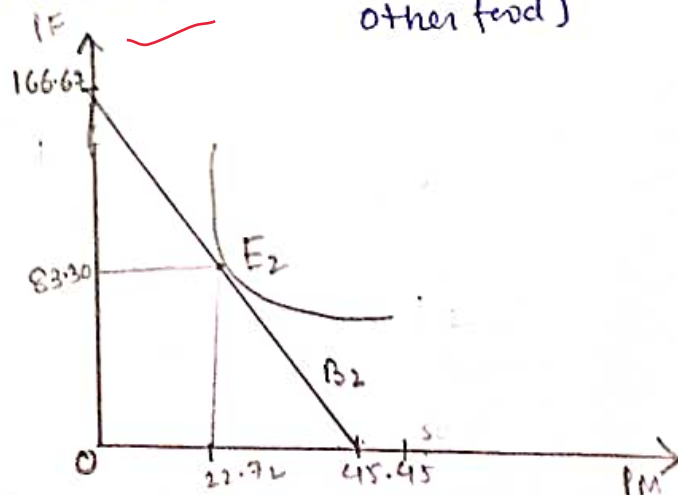
e) New price of milk = Rs 55/unit
New price of Food = Rs 15/unit
New Budget constraint (B_2): -
 $55M + 15F = 2500$

$$M \text{ intercept} = \frac{m}{P_M} = \frac{2500}{55} = \text{Rs } 45.45 \text{ (maximum spend on milk)}$$

$$F \text{ intercept} = \frac{m}{P_F} = \frac{2500}{15} = \text{Rs } 166.67 \text{ (maximum spend on other food)}$$

~~yes, the consumption~~

The new Budget constraint (B_2): -



After donation, with B_2 Budget constraint,
we use the condition of optimality,

$$\frac{U_M}{U_F} = \frac{P_M}{P_F}$$

$$\text{or } \frac{F}{M} = \frac{55}{15} = \frac{11}{3}$$

$$F = \frac{11}{3} M \quad \text{--- (2)}$$

Substituting the value of F in B_2 :-

$$55M + 15F = 2500$$

$$55M + 15 \times \frac{11}{3} M = 2500$$

$$110M = 2500$$

$$M^* = \frac{2500}{110} = 22.72 \quad \checkmark$$

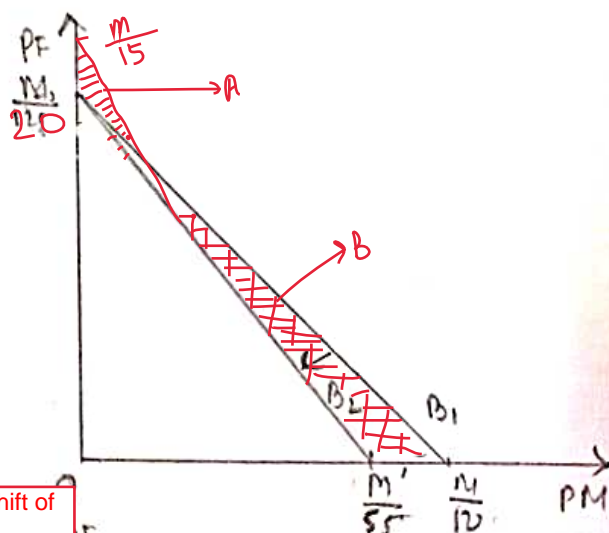
putting the value of M^* in eqⁿ (2) :-

$$F^* = \frac{11}{3} \times 22.72$$

$$= 83.30$$

$$E_2 = (22.72, 83.30) \quad \checkmark$$

~~Yes~~ As the price of milk rises from 50 to 55 so, the consumption milk decreases from 25 to 22.72 and the price of other food falls from 20 to 15 so the consumption of other food increases from 62.5 to 83.30. There is ~~inward rotation of B.L from B_1 to B_2~~ for the milk & upward shift of B_1 to B_2 for the consumption of other food.



The consumption possibilities of food (F) increases due to the fall in Food price from Rs 20 to Rs 15. All the bundles in the area A which contain higher amounts of Food compared to initial BL (B_1) are now affordable to the consumer. Similarly, the consumption possibilities of milk (M) decreases due to the rise in Milk price from Rs 50 to Rs 55. All the bundles in the area B which contain higher amounts of Milk compared to final BL (B_2) are now un-affordable to the consumer.

