$\left[\frac{P_1}{P_2} = \frac{1}{2}\right] \rightarrow$ Relative Ratio If $P_1 = 5$ $\Rightarrow [P_2 = 10]$ $\rightarrow$ Actual or Absolute value.

iv) $P_1x_1 + P_2x_2 = M$

we have

$\frac{M}{P_2} = 8$ and $\frac{M}{P_1} = 16$.

$\Rightarrow \left[P_2 = \frac{M}{8}\right]$; $\left[P_1 = \frac{M}{16}\right]$

given $\frac{P_1}{P_2} = \frac{1}{2}$

Given. when $P_1 = 1$

$\Rightarrow [P_2 = 2]$

$\therefore 2 = \frac{M}{8}$

$\Rightarrow [M = 16]$

$1 = \frac{M}{16}$

$\Rightarrow [M = 16]$

v) given $\frac{P_1}{P_2} = \frac{1}{2}$

when $P_1 = 3$

$\Rightarrow [P_2 = 6]$

$\therefore P_2 = \frac{M}{8}$

$\Rightarrow M = 8 \times 6$

$[M = 48]$

$\left\{\therefore \text{Budget line :- } [3x_1 + 6x_2 = 48]\right\}$

ii) Method (1)

$\left[-\frac{P_1}{P_2} = \frac{\Delta x_2}{\Delta x_1}\right]$ $X_2 (12, 2)$ ↓ change to $\boxed{0}$

$-\frac{1}{2} = \frac{-2}{\Delta x_1}$ i.e $(12+4, 2-2)$

$[\Delta x_1 = 4]$ $\Rightarrow (16, 0)$

$\therefore$ Max. unit of $x_1 = 12+4$

$= \boxed{16}$ units.

with $X_1 (4, 6)$ ↓ 0

$-\frac{1}{2} = \frac{-6}{\Delta x_1}$

$[\Delta x_1 = 12]$

$\therefore (12+4, 6-6)$

$= (16, 0)$

iii) $\because -\frac{1}{2} = \frac{-\cancel{12}}{\Delta x_1} \frac{\Delta x_2}{-12}$ (taken bundle $X_2 (12, 2)$ ↓ 0)

$\Rightarrow [\Delta x_1 = 8]$

$\therefore (12-12, 6+2)$

$= (0, 8)$

[$\therefore$ Max unit of good-2 = 8 units]

iv) Method (2) By change

$8x_1 = 4x_2$

$2x_1 = x_2$

$x_1 = \frac{1}{2} x_2$

$\Rightarrow [2x_1 = x_2]$

[$X_1 (12, 2)$
$X_2 (4, 6)$
change $(8, 4)$
$\therefore [8x_1 = 4x_2]$

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(*) If budget of an individual is such that he spends entire income and ~~can~~ afford either 4 units of good 1 and 6 units of good-2 or 12 - good-1 and 2 units good-2 :-

i) what is the ratio of price of good-1 to good-2?

ii) If he spends entire income on good-1 then how much g1 he could buy?

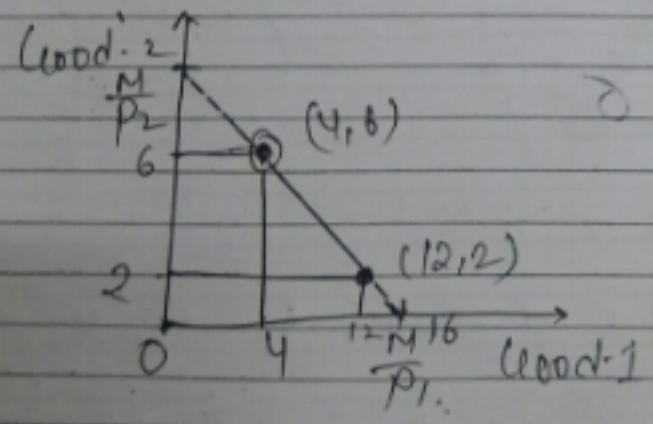
iii) If he spends entire income on good-2 then how much g-2 he could buy?

iv) write budget constraint line. If price of good-1 is $\boxed{1}$.

v) write budget constrain is price of good-1 is 3.

Soln:- Bundle - $X_1 (4, 6)$ $X = (x_1, x_2)$

$X_2 (12, 2)$



i) Slope of Budget line $= \left(\frac{\Delta x_2}{\Delta x_1} = \frac{-P_2}{P_1}\right)$

$= \frac{-4}{+8} = \left(\frac{-1}{2}\right)$

$\boxed{\therefore \text{Price Ratio} = \frac{1}{2} = \frac{P_1}{P_2}}$

Note:- The budget line expressed by:-
$p_1x_1 + p_2x_2 = m$
is exactly equal/same as

i) $\left[x_1 + \frac{p_2}{p_1}x_2 = \frac{M}{p_1}\right]$

ii) $\left[\frac{p_1}{p_2}x_1 + x_2 = \frac{M}{p_2}\right]$

iii) $\left[\frac{p_1}{M}x_1 + x_2\frac{p_2}{m} = 1\right]$

① Note: Pegging (fixing) the prices of one of the goods or income to 1 and adjusting the other price and income doesn't change the budget set at all.

② Note:- It will be convenient to think one of the good as numeraire since there will be one less price to worry about

③ Note:- Numeraire is basis of pricing and the importance of Numeraire is that it reduces no of variable

④ Note:- Numeraire price is always equal to 1

(Numeraire price / Numeraire good.)

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Numeraire :- In the Equation of Budget Constraint we peg one of the Price or the Income to some (fix) fixed value and adjust the other variable so as to discribe exactly the same budget Constraint.

$$\boxed{P_1x_1 + P_2x_2 = M}$$

when price of good-1 is Numeraire,

$$\Rightarrow \left(\frac{P_1x_1}{P_1} + \frac{P_2x_2}{P_1} = \frac{M}{P_2}\right)$$

$$\Rightarrow \left(x_1 + P_2/P_1\, x_2 = M/P_2\right)$$

when income numeraire

$$\Rightarrow \left(\frac{P_1x_1}{m} + \frac{P_2x_2}{m} = 1\right)$$

→ Numeraire making Cal. Easy
→ Reduce No. of variable
→ In terms of price of g1 / g2 / M

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(8) what happens to BL when we change price of good-1 and good 2 at the same time.

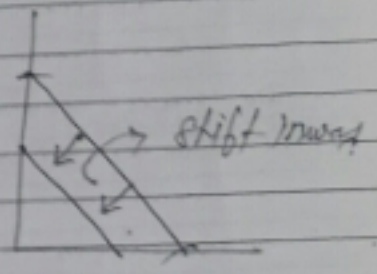
case (1) Double both the prices.
case (2) Reducing both the prices to half of its original prices.

Soln:→ $P_1x_1 + P_2x_2 = M$

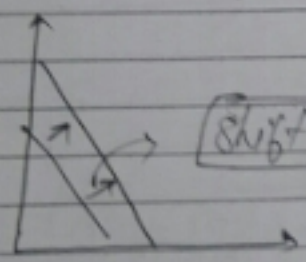
By doubling price

$\Rightarrow 2P_1x_1 + 2P_2x_2 = M$

$\Rightarrow P_1x_1 + P_2x_2 = \frac{M}{2}$



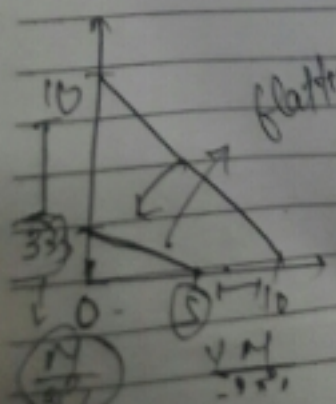
Case (2)

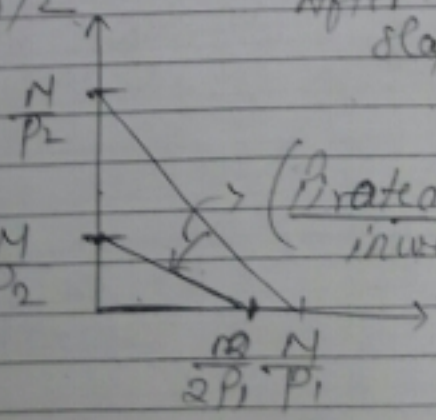


Case (3) $P_1' = 2P_1$, $P_2' = 3P_2$ $\Rightarrow$ Slope $= -\frac{P_1}{P_2}$

After slope $= \left(-\frac{2P_1}{3P_2}\right)$ slope reduces

$M = 10$
$P_1 = P_2 = 1$





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Soln: (a) B.L.

$[P_1x_1 + P_2x_2 = M]$

Sub. P_1 and P_2 we get following expression

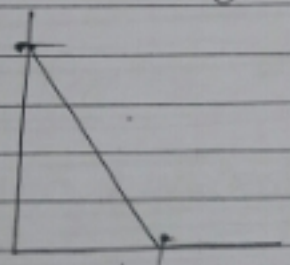
$\boxed{10x_1 + 5x_2 = 100}$

(b) Price ratio $\frac{P_1}{P_2} = \frac{10}{5} = \boxed{2}$

(c) Slope $= \left(\frac{\Delta y}{\Delta x}\right) = \left(\frac{dy}{dx}\right) = \left(\frac{dx_2}{dx_1}\right)$ → when change small

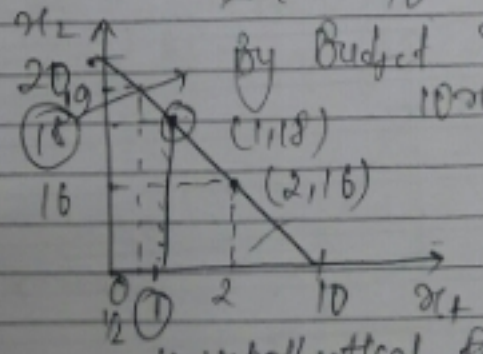
→ Big change.

$\left(\frac{M}{P_2}\right) = \left(\frac{100}{5}\right) = 20$



$\left(\frac{M}{P_1}\right) = \left(\frac{100}{10}\right) = 10$

$\therefore$ Slope $= \frac{\Delta Y}{\Delta x} = \frac{20}{10} = \boxed{2}$



By Budget Eq:-

$10x_1 + 5x_2 = 100$

↳ hypothetical form

{ opp. Cost of Adj. unit of good-1 = 2
opp " " " " " good-2 = 1/2 }

Market allows for trading

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(*) B.C. formal Def:- Budget Constraint rep. different combinations of goods that a consumer can purchase with his given Money income and given prices of the two goods.

(*) → Economic interpretation of Budget Constraint :- It measures the rate at which Market is willing to Exchange or substitute good 1 for good 2. → slope of

Exp:-

$M = 10$ when $m = 20$

$P_1 = 10 \Rightarrow x_1 = 1$, $P_2 = 5 \Rightarrow x_2 = 2$ $\left(\frac{1}{2}\right)$ $x_1 = 2$, $x_2 = 4$ $\left(\frac{1}{2}\right)$

Now, → Keeping Price Constant.

$$\left(\frac{P_1}{P_2}\right) = \frac{\Delta x_2}{\Delta x_1}$$

$$\Rightarrow \left[\frac{10}{5} = \frac{2}{1}\right] \Rightarrow \left[\frac{2}{1} = \frac{2}{1}\right]$$

i.e Consumer can substitute one unit of x_1 with two units of x_2. This is the rate at which market allows him to exchange the two goods.

Eg:- $M = 100$
$P_1 = 10$
$P_2 = 5$

(a) eq. of B.L / Budget Constraint
(b) find price ratio
(c) slope of B.L.

(d.2). Budget

$$P_1x_1 + P_2x_2 = M$$

Slope of B.L $= \frac{-P_1}{P_2}$

$P_1x_1 + P_2x_2 = m$

$(P_1 + 0.1P_1)x_1 + (P_2 + 0.1P_2)x_2 = m$

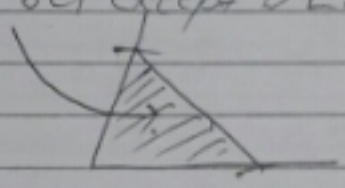
$(-do-)$

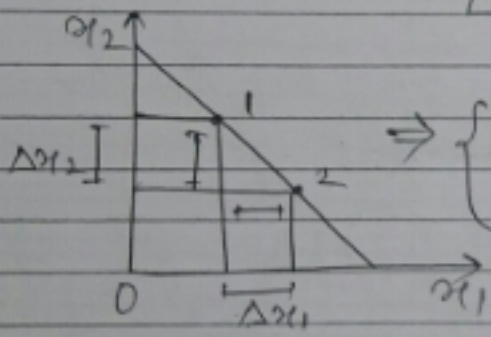
→ Slope of B.L is opportunity cost of purchasing or consuming good-1 in ~~term~~ of good 2.

$\boxed{P_1x_1 + P_2x_2 = M}$

(only holding on budget line not on budget set except B.L.)

$\boxed{P_1x_1 + P_2x_2 < M}$





$\Rightarrow \{P_1(x_1\uparrow) + P_2(x_2\downarrow) = \bar{M}\}$

Slope $= \frac{2}{3}$. Another interpretation.

Also ~~three~~ of slope of budget constraint. budget line.

is opportunity cost of purchasing good-2 i.e to consume an additional unit of good-2, consumer will have to give up $\left(\frac{1}{P_1/P_2}\right)$ or $\left(\frac{P_2}{P_1}\right)$ of good-1.