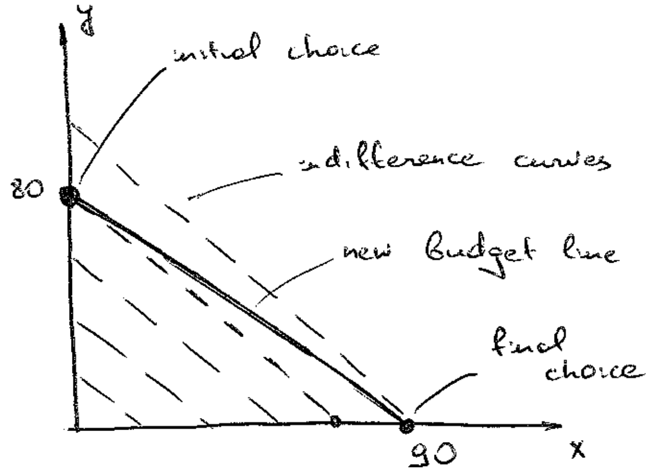
(1) perfect substitutes $\Rightarrow$ $x^* = \begin{cases} 0 & \text{if } p_x > p_y \\ \frac{m}{p_x} & \text{if } p_x \leq p_y \end{cases}$

Initially $p_x > p_y \Rightarrow x^* = 0 \, , \; y^* = \frac{720}{9} = 80$

Then $p_x < p_y \Rightarrow y^* = 0 \, , \; x^* = \frac{720}{8} = 90$

Change from 0 to 90 is due to substitution effect only $\Rightarrow$ answer c)



/In this case final budget line coincides with the budget line for new prices through old choice $\Rightarrow$ no income effect /

(2) Substitution effect is always negative. Income effect is negative for normal good and positive for inferior good.

$\Rightarrow$ answer c)

(3) $u(x_A, x_B) = x_A x_B^2 \Rightarrow \begin{cases} MU_A = x_B^2 \\ MU_B = 2 x_A x_B \end{cases}$; in optimum $\frac{p_A}{p_B} = \frac{1}{2} \cdot \frac{x_B}{x_A}$

in optimum for OLD prices $\frac{1}{2} = \frac{1}{2} \frac{x_B}{x_A} \Rightarrow x_A^* = x_B^*$

$\rightarrow$ plug it to the budget constraint $\rightarrow x_A^* + 2 x_B^* = 30$

$\rightarrow x_A^* = 10$ and $x_B^* = 10$

in optimum for NEW prices $\frac{1}{1} = \frac{1}{2} \frac{x_B}{x_A} \Rightarrow 2 x_A^* = x_B^*$

$\rightarrow$ out of the budget constraint $x_A^* = 10 \, , \; x_B^* = 20$

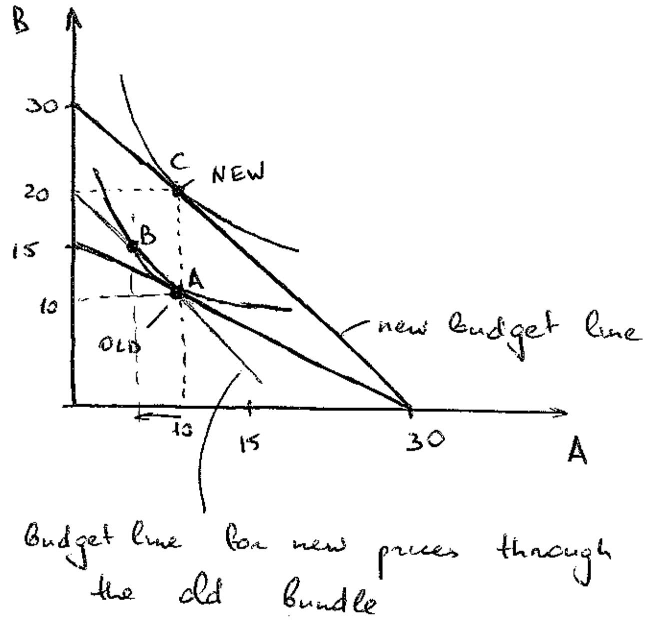
So the consumption of apples did not change but consumption of bananas increased. Clearly a) is not true. c) is not true, bc. substitution effect cannot decrease the consumption of banana. d) is not true because to the income we use to calculate the substitution effect is lower, when change of price makes consumer better of.

Only b) can be true and it is true.

See the illustration.

Jump A → B is due to substitution effect

⇒ answer b).



④ $u(x_A, x_B) = x_A x_B$, $MU_A = x_B$, $MU_B = x_A$ ⇒ in optimum $\frac{p_A}{p_B} = \frac{x_B}{x_A}$ ⇒ $p_A x_A^* = p_B x_B^*$

from budget constraint $p_A x_A^* + p_B x_B^* = m$

$$\Rightarrow x_A^* = \frac{1}{2}\frac{m}{p_A} \quad \text{and} \quad x_B^* = \frac{1}{2}\frac{m}{p_B}.$$

Initially $x_A^* = \frac{1}{2}\frac{40}{1} = 20$ and $x_B^* = \frac{1}{2}\frac{40}{2} = 10$

Now to afford this bundle Charlie needs $p_A^{New} x_A^* + p_B^{New} x_B^* =$

$$= 2.25 \cdot 20 + 1.25 \cdot 10 = 57.5$$

⇒ answer a).

⑤ If the substitution & income effects work in different directions, then good x must be inferior. (It can be a Giffen good, but only if income effect is strong enough.)

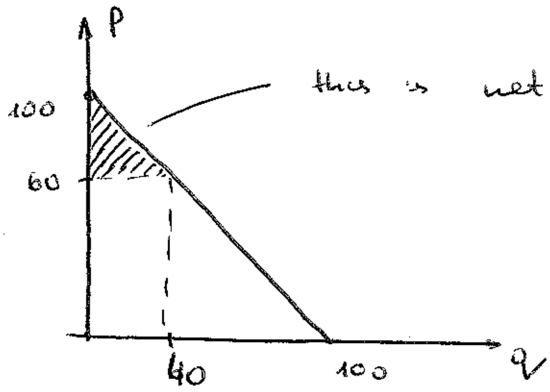
⇒ answer b).

⑥ See question ④. Originally $x_A^* = 20$, $x_B^* = 10$. It requires $20 \cdot 5 + 10 \cdot 2 = 120$ dollars for new prices. To compute substitution effect, we find optimal choice for adjusted income $M = 120$. It's: $x_A^s = \frac{1}{2}\frac{120}{5} = 12$.

Thus, substitution effect is $20 - 12 = 8$ ⇒ answer c).

7. Bundle $(10, 25)$ gives Ella utility $= \min\{5 \cdot 10, 25\} = 25$.
In her optimal choice $5x^* = y^*$. So she needs $y^* = 25$ and $x^* = 5$
which cost $10 \cdot 5 + 15 \cdot 25 = 425$

$\Rightarrow$ answer c).

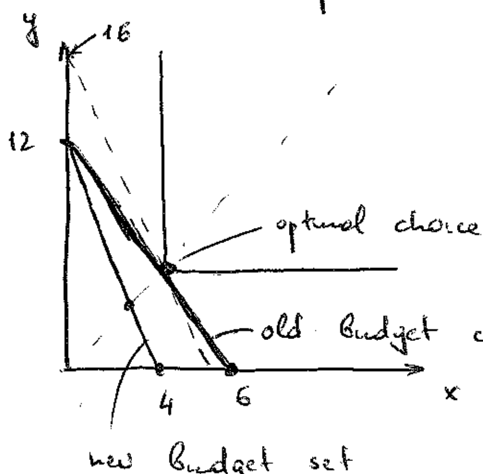
8.


this is net consumer's surplus
and it is equal to

$\frac{1}{2} \cdot 40 \cdot 40 = 800$

$\Rightarrow$ answer b).

9. Bernice optimal choice is with $x^* = y^*$.
For old prices $12 = 2 \cdot x^* + 1 \cdot y^* \Rightarrow x^* = 4$ and $y^* = 4$.



To get the same bundle for new prices Bernice needs

$3 \cdot x^* + y^* = 16$.

Therefore $16 - 12$ is a compensating variation, $CV = 4$

Optimal choice for new prices can be found from $12 = 3x^* + 1 \cdot y^* \Rightarrow x^* = 3, y^* = 3$,

which requires income $3 \cdot 2 + 3 \cdot 1 = 6 + 3 = 9$ for old prices. Thus, equivalent variation is $EV = 12 - 9 = 3$

$\Rightarrow$ answer d).

10. Elasticity is unit-free measure: it doesn't depend on the units.

$\Rightarrow$ answer a).

(11) $q = 130 - \frac{p}{5} \iff \frac{p}{5} = 130 - q \iff p = 5(130 - q)$

$\Rightarrow$ answer a)

(12) The revenue is maximised when elasticity $\varepsilon = -1$.

$$\varepsilon = \frac{dq}{dp}\,\frac{p}{q} = -95\,\frac{p}{3{,}800 - 95p}$$

$$\varepsilon = -1 \iff \frac{95p}{3{,}800 - 95p} = 1 \iff 190p = 3{,}800$$

$$\iff p = \frac{380}{19} = 20.$$

$\Rightarrow$ answer c).

(13) Inverse demand function $p = 676 - 9q$ gives demand functio $q = \frac{676 - p}{9}$.

Now we compute $\varepsilon = \frac{dq}{dp} \cdot \frac{p}{q} = -\frac{1}{9} \cdot \frac{28}{q(28)} = -\frac{28}{9 \cdot \frac{676-28}{9}} = -\frac{28}{648}$

$\Rightarrow$ answer e).

(14) For price 6 each type 1 consumer demands $10 - p = 4$

and each type 2 consumer demands $24 - 3p = 6$

Overall the demand is $4 \cdot 100 + 6 \cdot 200 = 1600$

$\Rightarrow$ answer a).

(15) $\varepsilon = -2$ but by definition $\varepsilon = \frac{\Delta q}{\Delta p}\,\frac{p^{OLD}}{q^{OLD}} = \frac{(q^{New} - 100)}{60 - 50} \cdot \frac{50}{100}$

Therefore $-2 = \frac{q^{New} - 100}{20} \Rightarrow q^{New} = 100 - 40 = 60$

$\Rightarrow$ answer c).

(16) the same as in question (10).

$\Rightarrow$ answer e).

(17) Income elasticity

$$\varepsilon_I = \frac{dQ}{dI} \cdot \frac{I}{Q} = 20 \cdot \frac{900}{1.000 - 150 \cdot 40 + 20 \cdot 900} = 20 \cdot \frac{9}{10 - 60 + 180} = \frac{18}{13}$$

This is approximately 1,38.

$\Rightarrow$ answer e).

(18) $p^D = 131 - 2q$

$p^S = 5 + 7q$

In the equilibrium $p^D = p^S \Leftrightarrow$

$\Leftrightarrow 131 - 2q = 5 + 7q \Leftrightarrow 126 = 9q$

$\Rightarrow q^* = \frac{126}{9} = 14$

$\Rightarrow$ answer b)

(19) Demand function ~~as~~ is: $p^d = 160 - 6q$ $\quad \cancel{q^D = \frac{160 - p^d}{6}}$

Supply function is: $p^s = 61 + 3q$ $\quad \cancel{q^s = \frac{p^s - 61}{3}}$

Before taxes prices were the same $\Rightarrow 160 - 6q = 61 + 3q$

$\Rightarrow 9q = 99 \Rightarrow q^* = 11$. with $p^* = 94$

After taxes $p^d = p^s + 27 \Rightarrow 160 - 6q = 61 + 3q + 27$

$\Rightarrow 9q = 99 - 27 = 72 \Rightarrow q^* = 8$ with $p^d =$

$= 160 - 6 \cdot 8 = 112$

Therefore, p^d increased on $112 - 94 = \underline{18}$.

$\Rightarrow$ answer c)

(20) With highest price $p = 35$ demand is $q^d = 960 - 7 \cdot 35 = 715$ and

supply is $q^s = 160 + 3 \cdot 35 = 265$.

Excess demand is $715 - 265 = 450$

$\Rightarrow$ answer b)

(21) This is simply a definition

$\Rightarrow$ answer b)

(22) Slope of isoquant is

$$MTS = -\frac{MP_1}{MP_2} = -\frac{60 \cdot \frac{4}{5} x^{-\frac{1}{5}} y^{\frac{1}{5}}}{60 \; \frac{1}{5} x^{\frac{4}{5}} y^{-\frac{4}{5}}} = -4\frac{y}{x}$$

At point (40, 80) it is equal to -8.

$\Rightarrow$ answer d)

(23) $x^{\alpha} y^{\beta}$ with $\alpha = 1.4$ and $\beta = 1$.

Since $\alpha + \beta > 1$ this firm has increasing return to scale

Since $\alpha > 1$ it has increasing MP_x $\left(MP_x = 1.4\, x^{0.4} y\right)$

$\Rightarrow$ answer e).

(24)

$$f(tx, ty) = 1.8\left((tx)^{0.8} + (ty)^{0.8}\right)^2 = 1.8\left(t^{0.8} x^{0.8} + t^{0.8} y^{0.8}\right)^2 =$$

$$= 1.8\left(t^{0.8}\left(x^{0.8} + y^{0.8}\right)\right)^2 = 1.8\, t^{1.6}\left(x^{0.8} + y^{0.8}\right)^2 = t^{1.6} f(x, y)$$

Obviously $f(tx, ty) > t \cdot f(x, y)$ for any $t > 1$.

Thus, this firm has an increasing return to scale

$\Rightarrow$ answer d).

(25) We use condition $w_x = p \cdot MP_x$, i.e., $8 = 2 \cdot (154 - 10x)$

$\Rightarrow 20x^* = 2 \cdot 154 - 8 = 300 \Rightarrow x^* = 15$

$\Rightarrow$ answer a).

(26) In the same way as in (25) we have: $3 = 12 \cdot 4\, \frac{1}{2} x^{-1/2}$

$\Rightarrow 24x^{-1/2} = 3 \iff x^{1/2} = 8 \Rightarrow x^* = 64$

$\Rightarrow$ answer d).

(27) Once again $w_x = p_e \cdot MP_x \iff 10 = 60 \cdot 4\, \frac{1}{2} x^{-1/2} \Rightarrow x^* = 144$

$\Rightarrow \text{profit} = 60 \cdot \left(4\sqrt{144}\right) - 10 \cdot 144 = 12 \cdot 12 \cdot 10 = 1440$

$\Rightarrow$ answer d).

(28) business economic profit is $\underbrace{1000}_{\text{earning}} - \underbrace{400}_{\text{interest}} - \underbrace{700}_{\text{opportunity cost}} = -100$ $\Rightarrow$ answer e)