SUCESIONES Y ARITMÉTICA MERCANTIL

(1) $a_4 = a_1 + 3d \Rightarrow 40 = 5 + 3d \Rightarrow d = \frac{35}{3}$

$a_2 = a_1 + d = 5 + \frac{35}{3} = \frac{50}{3}$

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(2) a) $u_3 = u_1 + 2d \Rightarrow 8 = 2 + 2d \Rightarrow d = 3$

b) $u_{20} = u_1 + 19d \Rightarrow u_{20} = 2 + 19 \cdot 3 = 59$

c) $S_{20} = \frac{1}{2} \cdot 20 \cdot (2 + 59) = 10 \cdot 61 = 610$

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(3) a) $a_4 = a_1 + 3d \Rightarrow 16 = -2 + 3d \Rightarrow d = 6$

b) $11998 = -2 + (n-1) \cdot 6 \Rightarrow 12000 = 6n - 6 \Rightarrow n = 2001.$

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(4) $3750 = 3 + (n-1) \cdot 3 \Rightarrow 3747 = 3n - 3 \Rightarrow n = 1250$

Luego: $S = \frac{1}{2} \cdot 1250 \cdot (3 + 3750) = 2.345.625$

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(5) $d = -4$; $S_n = \frac{1}{2} n (a_1 + a_n) = 1036 \Rightarrow \frac{1}{2} n \left(100 + 100 + (n-1) \cdot (-4)\right) = 1036$

$\Rightarrow n(204 - 4n) = 2072 \Rightarrow 4n^2 - 204n + 2072 = 0 \Rightarrow n^2 - 51n + 518 = 0 \Rightarrow$

$\Rightarrow n = \begin{cases} 14 \\ 37 \end{cases}$

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(6) $a_1 = -7$

$S_{20} = 620$

a) $S_{20} = \frac{1}{2} \cdot 20 \cdot (a_1 + a_{20}) \Rightarrow 620 = 10 \cdot (-7 - 7 + 19d)$

$\Rightarrow 62 = -14 + 19d \Rightarrow 19d = 76 \Rightarrow d = 4$

b) $a_{78} = a_1 + 77d = -7 + 77 \cdot 4 = 301$

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(7) $S_{40} = \frac{1}{2} \cdot 40 \cdot (u_1 + u_{40}) \Rightarrow 1900 = 20 \cdot (u_1 + u_1 + 39d) \Rightarrow$

$\Rightarrow 95 = 2u_1 + 39d$ (*)

$u_{40} = u_1 + 39d \Rightarrow 106 = u_1 + 39d$ (**)

$$\begin{array}{rl} 2u_1 + 39d &= 95 \\ -\quad u_1 + 39d &= 106 \\ \hline u_1 \qquad &= -11 \end{array}$$

$\boxed{u_1 = -11}$

$-11 + 39d = 106 \Rightarrow 39d = 117 \Rightarrow \boxed{d = 3}$

———— o ————

8) a) $S_1 = u_1 = 7$

b) $S_2 = u_1 + u_2 \Rightarrow 18 = 7 + u_2 \Rightarrow u_2 = 11$, luego: $d = u_2 - u_1 = 11 - 7 = 4$

c) $u_4 = u_1 + 3d = 7 + 3 \cdot 4 = 19$.

———— o ————

9) $a_n = 3 - 2n \begin{cases} a_1 = 1 \\ a_{20} = -37 \end{cases}$ $\quad \sum_{n=1}^{20} (3-2n) = S_{20} = \frac{1}{2} \cdot 20\,(1 - 37) = -360$.

———— o ————

10) a) $u_n = 3n \Rightarrow u_1 = 3;\ u_2 = 6;\ u_3 = 9$.

b) i) $u_{20} = 60$; $\sum_{n=1}^{20} 3n = S_{20} = \frac{1}{2} \cdot 20 \cdot (3 + 60) = 10 \cdot 63 = 630$.

ii) $u_{100} = 300$; $\sum_{n=21}^{100} 3n = \sum_{n=1}^{100} 3n - \sum_{n=1}^{20} 3n = S_{100} - S_{20} =$

$= \frac{1}{2} \cdot 100 \cdot (3 + 300) - 630 = 50 \cdot 303 - 630 = 14520$

———— o ————

11) $a_1 = 1000$
$d = 250$

a) $a_n = 10.000 \Rightarrow 10.000 = 1000 + (n-1) \cdot 250 \Rightarrow$

$\Rightarrow 9000 = 250n - 250 \Rightarrow 9250 = 250n \Rightarrow n = 37$.

b) $S_{37} = \frac{1}{2} \cdot 37 \cdot (1000 + 10.000) = 203.500$ m $= 203'5$ Km

———— o ————

12) a) $a_1 = 1$; $a_{20} = 20$; $d = 1$; $S_{20} = 210$?

$S_{20} = \frac{1}{2} \cdot 20 \cdot (1 + 20) = 10 \cdot 21 = 210$ latas.

b) $S_n = 3240 \Rightarrow 3240 = \frac{1}{2} \cdot n\,(1 + 1 + (n-1) \cdot 1) \Rightarrow$

$\Rightarrow 6480 = n\,(2 + n - 1) \Rightarrow 6480 = n + n^2 \Rightarrow n^2 + n - 6480 = 0 \Rightarrow$

$\Rightarrow n = \begin{cases} 80 \\ -81 \text{ (no válida)} \end{cases}$ $\Rightarrow$ 80 filas, luego la fila inferior tiene 80 latas.

c) i) $S=\frac{1}{2}n\left(1+1+(n-1)\right) \Rightarrow 2S=n\left(2+n-1\right) \Rightarrow 2S=n+n^2$

$\Rightarrow n^2+n-2S=0$

ii) $S=2100 \Rightarrow n^2+n-2\cdot 2100=0 \Rightarrow n^2+n-4200=0 \Rightarrow$

$\Rightarrow n=\begin{cases} 64'31 \\ -65'31 \end{cases}$ No es posible, porque n no es un nº entero.

———— o ————

13 a) i) $d=4$; ii) $u_8=u_1+7d=36+7\cdot 4=64$

b) i) $S_n=\frac{1}{2}n\left(36+a_n\right)=\frac{1}{2}n\left(36+36+(n-1)\cdot 4\right)=\frac{1}{2}n\left(72+4n-4\right)=$

$=\frac{1}{2}n\left(68+4n\right)=2n^2+34n$

ii) $S_{14}=2\cdot 14^2+34\cdot 14=868$

———— o ————

14 $\begin{matrix} a_2=a_1\cdot r \\ a_5=a_1\cdot r^4 \end{matrix} \Rightarrow \frac{a_5}{a_2}=\frac{\cancel{a_1}\cdot r^4}{\cancel{a_1}\cdot r}=r^3 \Rightarrow r^3=\frac{16}{243}:\frac{2}{9}=\frac{8}{27} \Rightarrow r=\frac{2}{3}$

$a_1=\frac{a_2}{r}=\frac{2}{9}:\frac{2}{3}=\frac{6}{18}=\frac{1}{3}$

$S_{10}=\frac{a_1\left(r^{10}-1\right)}{r-1}=\frac{\frac{1}{3}\cdot\left(\left(\frac{2}{3}\right)^{10}-1\right)}{\frac{2}{3}-1}=\frac{\frac{1}{3}\cdot\left(\frac{1024}{59049}-1\right)}{-\frac{1}{3}}=1-\frac{1024}{59049}=$

$=\frac{58025}{59049}$

———— o ————

15 $r=\frac{-4/9}{2/3}=\frac{-2}{3}$; $S=\frac{a_1}{1-r}=\frac{\frac{2}{3}}{1+\frac{2}{3}}=\frac{\frac{2}{3}}{\frac{5}{3}}=\frac{2}{5}$

———— o ————

16 a) $\frac{54}{18}=\frac{162}{54}=\frac{486}{162}=3=r$

b) i) $a_n=a_1\cdot r^{n-1}=18\cdot 3^{n-1}=6\cdot 3^n$

ii) $1062882 = 6 \cdot 3^n \rightsquigarrow 3^n = 177147 \rightsquigarrow n \log 3 = \log 177147$

$\rightsquigarrow n = \dfrac{\log 177147}{\log 3} = 11.$

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17 a) $r = \dfrac{270}{405} = \dfrac{2}{3}$

b) $a_{15} = a_1 \cdot r^{14} = 405 \cdot \left(\dfrac{2}{3}\right)^{14} = \dfrac{81920}{59049}$

c) $S = \dfrac{a_1}{1-r} = \dfrac{405}{1-\frac{2}{3}} = \dfrac{405}{\frac{1}{3}} = 1215.$

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18 a) i) $2, 6, 18 \ldots$ ii) $r = 3$

b) $\dfrac{x+1}{x-3} = \dfrac{2x+8}{x+1} \rightsquigarrow (x+1)^2 = (x-3)(2x+8) \rightsquigarrow x^2 + 2x + 1 = 2x^2 + 8x - 6x - 24$

$\rightsquigarrow x^2 - 25 = 0 \rightsquigarrow x^2 = 25 \rightsquigarrow x = \pm 5$; el otro valor es $x = -5$.

c) Si $x = -5$: i) $-8, -4, -2, \ldots$ $r = \dfrac{1}{2}$

ii) $S = \dfrac{a_1}{1-r} = \dfrac{-8}{1-\frac{1}{2}} = \dfrac{-8}{\frac{1}{2}} = -16$

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19 a) $r = \dfrac{5}{25} = \dfrac{1}{5}$

b) i) $a_{10} = a_1 \cdot r^9 = 25 \left(\dfrac{1}{5}\right)^9 = \dfrac{25}{5^9} = \dfrac{5^2}{5^9} = \dfrac{1}{5^7} = \dfrac{1}{78125}$

ii) $a_n = a_1 \cdot r^{n-1} = 25 \cdot \left(\dfrac{1}{5}\right)^{n-1} = 5^2 \cdot \dfrac{1}{5^{n-1}} = \dfrac{5^2}{5^{n-1}} = 5^{3-n}$

c) $S = \dfrac{a_1}{1-r} = \dfrac{25}{1-\frac{1}{5}} = \dfrac{25}{\frac{4}{5}} = \dfrac{125}{4}$

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20 a) $r = -\dfrac{1800}{3000} = \dfrac{-3}{5}$

b) $a_{10} = a_1 \cdot r^9 = 3000 \cdot \left(\dfrac{-3}{5}\right)^9 = -\dfrac{472392}{15625}$

c) $S = \dfrac{a_1}{1-r} = \dfrac{3000}{1+\frac{3}{5}} = \dfrac{3000}{\frac{8}{5}} = 1875$

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21 a) $u_4 = u_1 \cdot r^3 \Rightarrow \dfrac{1}{3} = \dfrac{1}{81} \cdot r^3 \Rightarrow r^3 = \dfrac{81}{3} = 27 \Rightarrow r = \sqrt[3]{27} = 3$

b) $S_n = \dfrac{a_1 \cdot (r^n - 1)}{r-1} = \dfrac{\frac{1}{81}(3^n - 1)}{3-1} > 40 \Rightarrow \dfrac{3^n - 1}{81 \cdot 2} > 40 \Rightarrow 3^n - 1 > 6480$

$\Rightarrow 3^n > 6481 \Rightarrow \log 3^n > \log 6481 \Rightarrow n \log 3 > \log 6481 \Rightarrow$

$\Rightarrow n > \dfrac{\log 6481}{\log 3} \Rightarrow n > 7'99 \Rightarrow n \geq 8$

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22 $a_3 = a_1 \cdot r^2 \Rightarrow r^2 = \dfrac{a_3}{a_1} = \dfrac{8}{18} = \dfrac{4}{9} \Rightarrow r = \pm\sqrt{\dfrac{4}{9}} = \pm \dfrac{2}{3}$

· Si $r = \dfrac{2}{3}$, la sucesión es: 18, 12, 8, ...

$S = \dfrac{a_1}{1-r} = \dfrac{18}{1-\frac{2}{3}} = \dfrac{18}{\frac{1}{3}} = 54$

· Si $r = -\dfrac{2}{3}$, la sucesión es: 18, −12, 8, ...

$S = \dfrac{18}{1+\frac{2}{3}} = \dfrac{18}{\frac{5}{3}} = \dfrac{54}{5} = 10'8$.

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23 a) $a_1 = 200$; $S_4 = \dfrac{200 \cdot (r^4 - 1)}{r-1} = 324'8 \Rightarrow$

$\Rightarrow 200r^4 - 200 = 324'8\,r - 324'8 \Rightarrow 200r^4 - 324'8\,r + 124'8 = 0$

$\Rightarrow$ con GDC: $r = \begin{cases} 1 \Rightarrow \text{No tiene sentido.} \\ \boxed{0'4} \end{cases}$

b) $a_{10} = a_1 \cdot r^9 = 200 \cdot 0'4^9 = 0'0524$

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(24) $S_3 = \frac{a_1(r^3-1)}{r-1} \Rightarrow 62'755 = \frac{a_1(r^3-1)}{r-1}$

$S_\infty = \frac{a_1}{1-r} \Rightarrow 440 = \frac{a_1}{1-r} \Rightarrow a_1 = 440\cdot(1-r) \Rightarrow$

$\Rightarrow 62'755 = \frac{440(\cancel{1-r})\cdot(r^3-1)}{\cancel{r-1}} \Rightarrow \frac{62'755}{440} = 1-r^3 \Rightarrow r^3 = 0'857375$

$\Rightarrow r = 0'95$

——— o ———

(25) a) $\sum_{r=4}^{7} 2^r = 2^4 + 2^5 + 2^6 + 2^7.$

b) i) $\sum_{r=4}^{30} 2^r = 2^4 + 2^5 + \dots + 2^{30} = S_{27} = \frac{a_1(r^{27}-1)}{r-1} = \frac{2^4\cdot(2^{27}-1)}{2-1} =$

$= 2.147.483.632$

ii) Porque la razón de la sucesión geométrica es $r = 2 > 1$, luego se trata de una serie divergente.

——— o ———

(26) $a_1 = 80$; $a_2 = 80\cdot 0'9$; $a_3 = 80\cdot 0'9^2$, ... $r = 0'9$

$S_n = 660 \Rightarrow S_{15} = \frac{a_1\cdot(r^{15}-1)}{r-1} = \frac{80\cdot(0'9^{15}-1)}{0'9-1} = 635'29$ m

En 15 minutos no le da tiempo a recorrer los 660 m.

——— o ———

(27) a) i) Ni aritmética ni geométrica.

ii) Geométrica, con $r = \frac{3}{4}$

iii) Aritmética, con $d = -0'025$

iv) Ni aritmética ni geométrica: $a_n = \frac{n}{n+1}$

b) $S = \frac{a_1}{1-r} = \frac{1}{1-\frac{3}{4}} = \frac{1}{\frac{1}{4}} = 4.$

——— o ———

28 a) 20, 23, 26, ... sucesión aritmética, $d=3$

$S_{12} = \frac{1}{2} \cdot 12 \cdot (20 + (20 + 11 \cdot 3)) = 6 \cdot (40+33) = 438$ coches.

b) $1000 = \frac{1}{2} n (20 + 20 + (n-1) \cdot 3) \Rightarrow 200 = n(40 + 3n - 3) \Rightarrow$

$\Rightarrow 2000 = 37n + 3n^2 \Rightarrow 3n^2 + 37n - 2000 = 0 \Rightarrow n = \begin{cases} -32'71 \text{ (no válido)} \\ 20'38 \Rightarrow \text{durante el } 21^{\circ} \text{ mes.} \end{cases}$

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29 $20;\ 20 \cdot 1'05;\ 20 \cdot 1'05^2, \ldots$ sucesión geométrica, $r = 1'05$.

a) $S_{12} = \dfrac{20(1'05^{12} - 1)}{1'05 - 1} = 318'34 \simeq 318$ coches.

b) $1000 = \dfrac{20(1'05^n - 1)}{1'05 - 1} \Rightarrow 2'5 = 1'05^n - 1 \Rightarrow 1'05^n = 3'5 \Rightarrow$

$\Rightarrow n \log 1'05 = \log 3'5 \Rightarrow n = \dfrac{\log 3'5}{\log 1'05} = 25'68 \Rightarrow$ durante el 26° mes.

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30 a) i) $r = \dfrac{6}{m-1} = \dfrac{m+4}{6}$ ii) $36 = m^2 + 4m - m - 4 \Rightarrow$

$\rightarrow m^2 + 3m - 40 = 0$

b) i) $m = \dfrac{-3 \pm \sqrt{9 + 4 \cdot 40}}{2} = \dfrac{-3 \pm \sqrt{169}}{2} = \dfrac{-3 \pm 13}{2} = \begin{cases} 5 \\ -8 \end{cases}$

ii) Si $m = 5 \Rightarrow r = \dfrac{6}{5-1} = \dfrac{6}{4} = \dfrac{3}{2}$.

Si $m = -8 \Rightarrow r = \dfrac{6}{-8-1} = \dfrac{6}{-9} = -\dfrac{2}{3}$

c) i) $r = \frac{-2}{3}$ ya que $-1 < r < 1$ y la serie es convergente

ii) $S = \dfrac{a_1}{1-r} = \dfrac{-9}{1 + \frac{2}{3}} = \dfrac{-9}{\frac{5}{3}} = -\dfrac{27}{5}$

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(31) a) i) $u_4 = u_1 \cdot r^3 = 40\left(\frac{1}{2}\right)^3 = 40 \cdot \frac{1}{8} = 5$

ii) $S_\infty = \frac{a_1}{1-r} = \frac{40}{1-\frac{1}{2}} = \frac{40}{\frac{1}{2}} = 80$

b) $a_1 = -36$; $a_8 = -8 \Rightarrow$ i) $a_8 = a_1 + 7d \Rightarrow -8 = -36 + 7d \Rightarrow$

$\Rightarrow 7d = 28 \Rightarrow d = 4$

ii) $S_n = \frac{1}{2} n (a_1 + a_n) = \frac{1}{2} n \left(-36 + (-36) + (n-1) \cdot 4\right) = \frac{1}{2} n \left(-72 + 4n - 4\right) =$

$= \frac{1}{2} n \left(-76 + 4n\right) = 2n^2 - 38n.$

c) $80 = 2 \cdot (2n^2 - 38n) \Rightarrow 80 = 4n^2 - 76n \Rightarrow 4n^2 - 76n - 80 = 0$

$\Rightarrow n^2 - 19n - 20 = 0 \Rightarrow n = \begin{cases} -1 & \text{(no válido)} \\ \boxed{20} \end{cases}$

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(32) a) $u_1 = S_1 = 1 + K.$

$S_2 = u_1 + u_2 \Rightarrow u_2 = S_2 - u_1 = 5 + 3K - (1 + K) = 4 + 2K.$

$S_3 = S_2 + u_3 \Rightarrow u_3 = S_3 - S_2 = 12 + 7K - (5 + 3K) = 7 + 4K.$

$S_4 = S_3 + u_4 \Rightarrow u_4 = S_4 - S_3 = 22 + 15K - (12 + 7K) = 10 + 8K$

b) $1, 4, 7, 10, \ldots \quad d = 3 \Rightarrow a_n = 1 + (n-1) \cdot 3 = 1 + 3n - 3 = 3n - 2$

$1, 2, 4, 8, \ldots \quad r = 2 \Rightarrow b_n = 1 \cdot 2^{n-1} = 2^{n-1}$

Luego: $u_n = 3n - 2 + 2^{n-1} \cdot K.$

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(33) a) $12, 14, 16, \ldots \quad d = 2$

$S_{15} = \frac{1}{2} \cdot 15 \left(12 + 12 + 14 \cdot 2\right) = \frac{15}{2} \cdot (24 + 28) = 390$ horas.

b) $12,\ 12\cdot 1'1,\ 12\cdot 1'1^2, \dots$, suc. geométrica, $r = 1'1$.

3ª semana: $a_3 = 12\cdot 1'1^2 = 14'52$ horas.

$$S_{15} = \frac{12(1'1^{15}-1)}{1'1-1} = 381'27 \text{ h.}$$

c) $50 = \dfrac{12(1'1^n - 1)}{1'1-1} \Rightarrow 5 = 12(1'1^n - 1) \Rightarrow \dfrac{5}{12} = 1'1^n - 1 \Rightarrow$

$\Rightarrow 1'1^n = \dfrac{17}{12} \Rightarrow n \log 1'1 = \log \dfrac{17}{12} \Rightarrow n = \dfrac{\log 17/12}{\log 1'1} = 3'65 \Rightarrow$ durante la 4ª semana

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(34) Nicole: $10, 11, 12, \dots \quad a_n = 10 + (n-1)\cdot 1 = n+9$.

Penélope: $5,\ 5\cdot 1'2;\ 5\cdot 1'2^2, \dots \quad a'_n = 5\cdot 1'2^{n-1}$

a) $5\cdot 1'2^{n-1} > n+9 \Rightarrow$ generando términos con la GDC:

$a_7 = 16 \quad ; \quad a'_7 = 14'93$
$a_8 = 17 \quad ; \quad a'_8 = 17'916$

} Durante la 8ª semana.

b) Distancia total:

Nicole: $S_n = \frac{1}{2} n\left(10 + 10 + (n-1)\cdot 1\right) = \frac{1}{2} n\,(19+n) = \dfrac{n^2+19n}{2}$

Penélope: $S'_n = \dfrac{5(1'2^n - 1)}{1'2-1} = 25\,(1'2^n - 1)$

$25(1'2^n - 1) > \dfrac{n^2+19n}{2} \Rightarrow$ generando términos con la calculadora:

$S_{11} = 165 \quad ; \quad S'_{11} = 160'75$
$S_{12} = 186 \quad ; \quad S'_{12} = 197'9$

} Durante la 12ª semana.

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(35) Inicial: V_0

Al cabo de un año: $0'7\,V_0$

Al cabo de dos años: $0'7^2\,V_0$

Al cabo de tres años: $0'7^3 \cdot V_0$

$\vdots$

Al cabo de n años: $V_n = 0'7^n \cdot V_0$

b) 10% del valor original: $0'1 \cdot V_0$

$0'1 V_0 = 0'7^n V_0 \Rightarrow 0'7^n = 0'1 \rightarrow n \log 0'7 = \log 0'1 \rightarrow n = \dfrac{\log 0'1}{\log 0'7} = 6'46$.

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(36) a) 1.er mes: 1000 \$

2.º mes: $1000 \cdot 1'06 = 1060$ \$

3.º mes: $1000 \cdot 1'06^2 = 1123'6$ \$

b) Plan A: sucesión aritmética, con $a_1 = 1000$, $d = 80$.

luego: $a_{12} = a_1 + 11d = 1000 + 11 \cdot 80 = 1880$ \$

Plan B: sucesión geométrica, con $a_1 = 1000$, $r = 1'06$.

$a_{12} = a_1 \cdot r^{11} = 1000 \cdot 1'06^{11} = 1898$ \$.

c) Plan A: $S_{12} = \dfrac{1}{2} \cdot 12 (a_1 + a_{12}) = 6 (1000 + 1880) = 17280$ \$

Plan B: $S_{12} = \dfrac{a_1 (r^{12} - 1)}{r - 1} = \dfrac{1000 (1'06^{12} - 1)}{1'06 - 1} = 16.870$ \$.

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(37) $P = 24000 (1 + 0'035)^{12} = 36265'65\ m^3$

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(38) $\left.\begin{array}{l} 2530 = C_0 (1+i)^n \\ 2789'33 = C_0 (1+i)^{n+2} \end{array}\right\} \dfrac{C_0 (1+i)^{n+2}}{C_0 (1+i)^n} = \dfrac{2789'33}{2530} \Rightarrow$

$\rightarrow (1+i)^2 = \dfrac{2789'33}{2530} \Rightarrow 1 + i = \sqrt{\dfrac{2789'33}{2530}} \Rightarrow i = \sqrt{\dfrac{2789'33}{2530}} - 1 = 0'05$

$\Rightarrow r = 5\%$

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39 1º banco: $I = \dfrac{5000 \cdot 4'75 \cdot 5}{100} = 1187'50$ €.

2º banco: $I = \dfrac{5000 \cdot 6 \cdot 3}{100} = 900$ € $\Rightarrow 900 + 580 = 1480$ €.

El segundo depósito es más ventajoso.

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40 a) $C_n = 5000\,(1 + 0'063)^n = 5000 \cdot 1'063^n$.

b) $C_5 = 5000 \cdot 1'063^5 = 6786'35$ $

c) $5000 \cdot 1'063^n > 10.000 \Rightarrow 1'063^n > 2 \Rightarrow n \log 1'063 > \log 2$

$\Rightarrow n > \dfrac{\log 2}{\log 1'063} = 11'35 \Rightarrow$ luego, después de 12 años completos.

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41 a) Banco A: $C = 30000\,(1 + 0'078)^5 = 43.673'21$ €.

b) Banco B: $C = 30.000\left(1 + \dfrac{0'077}{4}\right)^{5 \cdot 4} = 43927'42$ €.

c) Banco C: $C = 30000\left(1 + \dfrac{0'0765}{12}\right)^{5 \cdot 12} = 43924'98$ €.

Interesa más el banco B.

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42 a) $15'2 = P_0\,(1 + 0'027) \Rightarrow P_0 = 14'80$ millones.

b) $15'2 = P_0\,(1 + 0'027)^5 \rightarrow P_0 = \dfrac{15'2}{1'027^5} = 13'3$ millones.

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43 a) $P = 250.000 \cdot 1'013 = 253.250$ habitantes.

b) $P = 250.000 \cdot 1'013^{30} = 368\,318'36 \simeq 368318$ habitantes.

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44 $1000 \cdot \left(1 + \dfrac{0'15}{12}\right)^{12 \cdot n} > 3000 \Rightarrow (1 + 0'0125)^{12 \cdot n} > 3 \Rightarrow$

$1'0125^{12n} > 3 \Rightarrow 12n \log 1'0125 > \log 3 \Rightarrow 12n > \dfrac{\log 3}{\log 1'0125}$

$\Rightarrow 12n > 88'44$ $\Rightarrow$ como n es el nº de años, $12n$ es el nº de meses, por tanto, el mínimo nº de meses es 89 meses.

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(45) a) La 1ª cuota se convierte en: $1000 \cdot (1+0'075)^{10} = 2061'03$ \$

b) La 2ª cuota se convierte en: $1000(1+0'075)^9$; etc.

La última cuota se convierte en: $1000(1+0'075)^1$.

Se trata de un caso de anualidades de capitalización:

$$C = 1000(1+0'075) \cdot \frac{(1+0'075)^{10} - 1}{0'075} = 15.208'12 \text{ \$}.$$

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(46) a) $C = 1500(1+0'0525)^3 \simeq 1749$ F.

b) $C_F = 2C_0 \Rightarrow 2C_0 = C_0(1+i)^n \Rightarrow 2 = (1+0'0525)^n \Rightarrow$

$\Rightarrow n \log 1'0525 = \log 2 \Rightarrow n = \dfrac{\log 2}{\log 1'0525} = 13'5$ años.

c) $C_F = 2C_0 \rightarrow 2C_0 = C_0(1+i)^{10} \Rightarrow (1+i)^{10} = 2 \Rightarrow$

$\Rightarrow 1+i = \sqrt[10]{2} \Rightarrow i = \sqrt[10]{2} - 1 = 0'07177 \rightarrow r = 7'18\%$.

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(47) a) $C_F = 960(1+0'03) \cdot \dfrac{(1+0'03)^{12} - 1}{0'03} = 14033'08$ €.

b) $C_F = 960(1+0'03) \cdot \dfrac{(1+0'03)^{17} - 1}{0'03} = 21517'86$ €.

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(48) $220.000 = C_0 \cdot \frac{(1+0'05)^{20}-1}{0'05\cdot(1+0'05)^{20}} \Rightarrow C_0 = 17653'37$ €.

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(49) $90.000 = 3000\,(1+0'04)\cdot\frac{(1+0'04)^n-1}{0'04} \Rightarrow 30 = 1'04\cdot\frac{1'04^n-1}{0'04}$

$\Rightarrow 1'04^n - 1 = 1'154 \Rightarrow 1'04^n = 2'154 \Rightarrow n\log 1'04 = \log 2'154 \Rightarrow$

$\Rightarrow n = \frac{\log 2'154}{\log 1'04} = 19'56$ años.

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(51) $C = 1\cdot\left(1+\frac{0'0475}{4}\right)^{1\cdot 4} = 1'04835 \Rightarrow$ Luego 1 € se convierte en $1'04835$, el aumento es de $0'04835$, por tanto:

TAE = 4'84 %
