Serie 2

1 P1	El n-ésimo término de una progresión aritmética viene dado por $u_n = 15 - 3n$. (a) Indique el valor del primer término (u_1). (b) Sabiendo que el n-ésimo término de esta progresión es -33, halle el valor de n. (c) Halle la diferencia común (d).
2 P2	Sea una progresión geométrica donde el primer término es 50 y el cuarto término es $86{,}4$. Sea S_n la suma de los n primeros términos de la progresión. Halle el valor más pequeño de n para el cual $S_n > 33\,500$.
3	In a geometric series, $u_1 = \frac{1}{81}$ and $u_4 = \frac{1}{3}$. (a) Find the value of r. **(3)** (b) Find the smallest value of n for which $S_n > 40$. **(4)** **(Total 7 marks)**

4

P1

Considere la progresión aritmética $a, p, q \ldots$, donde $a, p, q \neq 0$.

(a) Muestre que $2p - q = a$. [2]

Considere la progresión geométrica $a, s, t \ldots$, donde $a, s, t \neq 0$.

(b) Muestre que $s^2 = at$. [2]

El primer término de las dos progresiones es a.

Se sabe que $q = t = 1$.

(c) Muestre que $p > \frac{1}{2}$. [2]

Considere el caso en el que $a = 9$, $s > 0$ y $q = t = 1$.

(d) Escriba los cuatro primeros términos de:

(i) La progresión aritmética

(ii) La progresión geométrica [4]

La progresión aritmética y la geométrica se utilizan para formar una nueva progresión aritmética u_n.

Los tres primeros términos de u_n son $u_1 = 9 + \ln 9$, $u_2 = 5 + \ln 3$, y $u_3 = 1 + \ln 1$.

(e) (i) Halle la diferencia común de la nueva progresión, dándola en función de $\ln 3$.

(ii) Muestre que $\sum_{i=1}^{10} u_i = -90 - 25\ln 3$. [6]

5

A sum of \$ 5000 is invested at a compound interest rate of 6.3 % per annum.

(a) Write down an expression for the value of the investment after n full years.

(1)

(b) What will be the value of the investment at the end of five years?

(1)

(c) The value of the investment will exceed \$ 10 000 after n full years.

(i) Write down an inequality to represent this information.

(ii) Calculate the minimum value of n.

(4)

(Total 6 marks)

6

(a) Consider the geometric sequence $-3, 6, -12, 24, \ldots$.

(i) Write down the common ratio.

(ii) Find the 15^{th} term.

Consider the sequence $x - 3, x + 1, 2x + 8, \ldots$.

(3)

(b) When $x = 5$, the sequence is geometric.

(i) Write down the first three terms.

(ii) Find the common ratio.

(2)

(c) Find the other value of x for which the sequence is geometric.

(4)

(d) For this value of x, find

(i) the common ratio;

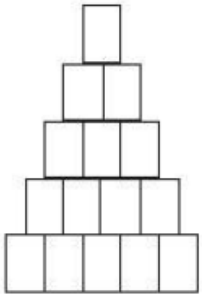
(ii) the sum of the infinite sequence.

(3)

(Total 12 marks)

7

24.) Clara organizes cans in triangular piles, where each row has one less can than the row below. For example, the pile of 15 cans shown has 5 cans in the bottom row and 4 cans in the row above it.



(a) A pile has 20 cans in the bottom row. Show that the pile contains 210 cans.

(4)

(b) There are 3240 cans in a pile. How many cans are in the bottom row?

(4)

(c) (i) There are S cans and they are organized in a triangular pile with n cans in the bottom row. Show that $n^2 + n - 2S = 0$.

(ii) Clara has 2100 cans. Explain why she cannot organize them in a triangular pile.

(6)

(Total 14 marks)

8

A company offers its employees a choice of two salary schemes A and B over a period of 10 years.

Scheme A offers a starting salary of \$11000 in the first year and then an annual increase of \$400 per year.

(a) (i) Write down the salary paid in the second year and in the third year.

(ii) Calculate the **total** (amount of) salary paid over ten years.

(3)

Scheme B offers a starting salary of \$10000 dollars in the first year and then an annual increase of 7% of the previous year's salary.

(b) (i) Write down the salary paid in the second year and in the third year.

(ii) Calculate the salary paid in the tenth year.

(4)

(c) Arturo works for n complete years under scheme A. Bill works for n complete years under scheme B. Find the minimum number of years so that the total earned by Bill exceeds the total earned by Arturo.

(4)

(Total 11 marks)

9

<u>Simplifica:</u>

a) $\dfrac{x^2 - 5x + 6}{x^2 - 2x} =$ b) $\dfrac{x^3 + 3x^2 + 3x + 1}{x^3 + 2x^2 + x} =$

	Suma y resta: a) $\frac{-3x+1}{x+1}-\frac{5x+1}{x^2+x}=$ b) $\frac{x}{x^2-3x-4}-\frac{2x}{x^2-1}+\frac{x^2-6x-4}{x^3-4x^2-x+4}=$ Multiplica: a) $\frac{2x+4}{x^2-9}\cdot\frac{x+3}{x+2}=$ b) $\left(\frac{1}{x}-\frac{2}{x-1}\right)\cdot\frac{x^2}{x+1}=$ Divide: a) $\frac{4x^2}{x+1}:\frac{x^2-x}{x^2-2x+1}=$ b) $\frac{-x+7}{x^2-1}:\frac{-x^2+5x+14}{x^2+3x+2}=$ Efectúa: a) $\left(\frac{-3x^2}{x^2-1}+4\right)\cdot\left(\frac{x+1}{x^2-4}\right)=$ b) $\left(\frac{2x^2+21}{(x-3)^2}+\frac{7}{x-3}\right):\frac{2x+7}{x^2-9}=$
10 P2	Considere el desarrollo de $\frac{(ax+1)^9}{21x^2}$, donde $a\neq 0$. El coeficiente del término en x^4 es $\frac{8}{7}a^5$. Halle el valor de a.