What is the coefficient of $x^{12}y^{13}$ in the expansion of $(2x - 3y)^{25}$?

What is the coefficient of $x^{101}y^{99}$ in the expansion of $(2x - 3y)^{200}$?

A vending machine dispensing books of stamps accepts only **one-dollar coins**, **$1 bills**, and **$5 bills**.
A) Find a recurrence relation for the number of ways to deposit *n* dollars in the vending machine, where the order in which the coins and bills are deposited matters.

B) What are the initial conditions

C) How many ways are there to deposit $10 for a book of stamps?

Find a recurrence relation for the number of bit strings of length *n* that contain a pair of consecutive 0s.

Determine which of these are **linear homogeneous** recurrence relations with constant coefficients. Also, find the **degree of those** that are.
a) $a_n = 3a_{n-1} + 4a_{n-2} + 5a_{n-3}$
b) $a_n = 2n \bullet a_{n-1} + a_{n-2}$
c) $a_n = a_{n-1} + a_{n-4}$
d) $a_n = a_{n-1} + 2$
e) $a_n = (a_{n-1})^2 + a_{n-2}$
f) $a_n = a_{n-2}$

Solve the recurrence relation together with the initial conditions given. ***$a_n = 5a_{n-1} - 6a_{n-2}$ for $n \geq 2$, $a_0 = 1$, $a_1 = 0$***

Solve the recurrence relation together with the initial conditions given. ***$a_n = 4a_{n-1} - 4a_{n-2}$ for $n \geq 2$, $a_0 = 6$, $a_1 = 8$***

Messages are transmitted over a communications channel using two signals. The transmittal of one signal requires 1 microsecond, and the transmittal of the other signal requires 2 microseconds.

How many different messages can be transmitted in *n* microseconds?