9. (14 points) Write

$$\binom{600}{0}\binom{1100}{700}+\binom{600}{1}\binom{1100}{699}+\binom{600}{2}\binom{1100}{698}+\binom{600}{3}\binom{1100}{697}+\cdots$$
$$\cdots+\binom{600}{597}\binom{1100}{103}+\binom{600}{598}\binom{1100}{102}+\binom{600}{599}\binom{1100}{101}+\binom{600}{600}\binom{1100}{100}$$

as one binomial coefficient. Explain your work.

$$\binom{1700}{700}$$

Both numbers count the number of 700 member subcommittee which can be formed from a committee which consists of 600 men and 1100 women.

garbled but there
plausible but error ~> 5

(*)

10. (14 points) Solve the recurrence relation $\boxed{a_n - 5a_{n-1} + 8a_{n-2} - 4a_{n-3} = 3}$, with $a_0 = 0$, $a_1 = 3$, and $a_2 = 13$.

$x^3 - 5x^2 + 8x - 4 = (x-1)(x-2)^2$

so the gen. sol of

$a_n - 5a_{n-1} + 8a_{n-2} - 4a_{n-3} = 0$ is

$a_n = c_1 + c_2 2^n + c_3 n 2^n$ ✓ 5

Look for a particular solution of (*) of the form

$a_n = An$

$An - 5A(n-1) + 8A(n-2) - 4A(n-3) = 3$

$A(5 - 16 + 12) = 3$

$A(1) = 3$

$A = 3$

So the general solution of (*) is

$a_n = c_1 + c_2 2^n + c_3 n 2^n + 3n$

$0 = c_1 + c_2$

$3 = c_1 + 2c_2 + 2c_3 + 3$

$13 = c_1 + 4c_2 + 8c_3 + 6$

$\therefore\ c_1 = +7 \quad c_2 = -7 \quad c_3 = \frac{7}{2}$

$$a_n = +7 - 7(2^n) + 7n 2^{n-1} + 3n$$

$a_n = \cdots \frac{3}{7}$