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In [1]: ### CSCI-3080 Discrete Structure
        ### OLA 3: Chapter 3 -- Recursive Definitions, Recurrence Relations
        ### Name:
        ### Student ID:
        ### Date:
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Exercise 1: Write the first 5 values in the sequence:

$$C(1) = 5$$

$$C(n) = 2C(n - 1) + 5 \text{ for } n > 1$$

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Exercise 2: Write the first 5 values in the sequence:

$$A(1) = 2$$

$$A(n) = nA(n - 1) + n \text{ for } n > 1$$

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Exercise 3: An amount of \$500 is invested in an account paying 1.2% interest compounded annually (meaning they don't add interest until the end of the year, so the start of the next year you have the money plus interest)

(a) Please write a recursive definition for $P(n)$, the amount in the account at the beginning of the n_{th} year.

Hint: $P(1) = 500$

For $n > 1$, to calculate the amount in the n_{th} year, you need to use $(1+0.012)$ times the amount in the $(n - 1)_{th}$ year.

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(b) After how many years will the account balance exceed \$570? (You

can write a python program to calculate)

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Exercise 4: Please write the **python code of a recursive function to compute the sequence**

1, 2, 4, 7, 11, 16, 22, ...

Begin by defining the recursive definition

$$S(1) = 1$$

$$S(n) = S(n - 1) + n - 1 \text{ for } n > 1$$

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Exercise 5: Please find the **closed form solution for the recurrence relation subject to the basis step.**

Hint: Please use the linear, first-order, constant coefficient formula.

$$B(1) = 5$$

$$B(n) = 3B(n - 1) \text{ for } n > 1$$

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Exercise 6: In an account that pays 3% annually (i.e. interest is added at the end of the year to be available at the beginning of the next year), \$1000 is deposited. At the end of each year, an additional 100 dollars is deposited into the account.

A. Please write a recurrence relation for the amount in the account at the beginning of year n

Hint: $P(1) = 1000$

For $n > 1$, to calculate the amount in the n_{th} year, you need to use $(1+0.03)$ times the amount in the $(n - 1)_{th}$ year and plus additional 100 dollars.

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B. Please find the **closed-form solution of the recurrence relation (note it is linear, first order, constant coefficient)**

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C. What is the account worth at the beginning of the 8_{th} year?

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