Introductory Exercise warm-up 14: Stock Dynamics by hand

This little exercise will help you understand the principle of stock-driven models. It is **essential** that you understand this principle before you start programming this type of model in Python.

1. Inflow-driven model – 4 years sharp lifetime

In this example, we will assume a lifetime of exactly 4 years.
In an input-driven model, only the past inflows and the lifetime of each cohort are given.

Task: Calculate the missing data in the table below. Assume that the lifetime of the products in the stock is 4 years. While filling out the table, reflect on the following:

- What **operations** do you conduct to calculate the different dependent variables?
- In what **sequence** do you conduct the operations to fill out the entire table (e.g., column by column, row by row, or some kind of iteration…)? column by column, startin from outflow

	Annual stock (end of the year)	**Stock change** (during the year)	**Inflow** (during the year)	**Outflow** (during the year)
Year t	**S_t [tons]**	**dS_t/dt [tons/yr]**	**I_t [tons/yr]**	**O_t [tons/yr]**
t_0=2000	0	0	0	0
2001	100	100	100	0
2002	300	200	200	0
2003	500	400	400	0
2004	1200	700	800	100
2005	1600	1400	1600	200
2006	4200	2600	3000	400
2007	7500	3200	4000	800
2008	10900	3400	5000	1600
2009	13400	2500	5500	3000
2010	15400	2000	6000	4000
2011	16400	1000	6000	5000
2012	16400	0	6000	6000

Stock-driven models

A stock-driven model is a model in which the stock (measured at the end of the accounting year) and the lifetime of each cohort are given; both as independent variables. Subsequently, the stock change, the inflow, and the outflow are calculated (dependent variables).

Task: Calculate the missing data in the table below. Assume that the lifetime of the products in the stock is 4 years. While filling out the table, reflect on the following:

- What **operations** do you conduct to calculate the different dependent variables?
- In what **sequence** do you conduct the operations to fill out the entire table (e.g., column by column, row by row, or some kind of iteration…)? col by col

	Annual stock (end of the year)	**Stock change** (during the year)	**Inflow** (during the year)	**Outflow** (during the year)
Year t	**S_t [tons]**	**dS_t/dt [tons/yr]**	**I_t [tons/yr]**	**O_t [tons/yr]**
t_0=2000	0	0	0	0
2001	100	100	100	0
2002	200	100	100	0
2003	400	200	200	0
2004	800	400	500	0
2005	1600	800	1000	100
2006	3000	1400	1900	500
2007	4000	1000		
2008	5000	1000		
2009	5500	500		
2010	6000	500		
2011	6000	0		
2012	6000	0		

Next step: how to write these algorithms in Python, using a for loop?