Recitation 5

1. Growth
   a. Complete the table below using Year 1 as the base year!

	Year 1	Year 2	Year 3
P(A)	7	5	4
Q(A)	5	5	4
P(B)	2	5	6
Q(B)	8	3	5
P(C)	6	3	5
Q(C)	5	5	2
nGDP	81	55	56
rGDP	81	71	50
Growth rate	—	-12.3	-29.6

nGDP = P(A)*Q(A) + P(B)*Q(B) + P(C)*Q(C)

rGDP = 7*Q(A) + 2*Q(B) + 6*Q(C) using prices of year 1 since year 1 as base year

growth rate $= \frac{rGDP_t - rGDP_{t-1}}{rGDP_{t-1}} * 100$

2. Growth projections (The Rule of 70)
   The **Rule of 70** is used to estimate the number of years it will take for a quantity to double.

$$Doubling\ time(years) = \frac{70}{annual\ growth\ rate(\%)}$$

   a. Approximately how long will it take for a country to double its rGDP if that is subject to a constant annual growth rate of 4%?

$$\frac{\mathbf{70}}{\mathbf{4}} = \mathbf{17.5}$$

   b. If a country doubled its rGDP in 35 years, estimate its constant annual growth rate!

$$\mathbf{35} = \frac{\mathbf{70}}{\boldsymbol{annual\ growth\ rate}}$$

Annual growth rate = 2%

   c. A country's rGDP is $3.5 billion in 2021 and is $3.85 billion in 2022. Assuming a constant growth rate, in how many years will the country's rGDP reach $7 billion?

$$\boldsymbol{annual\ growth\ rate} = \frac{\mathbf{3.85 - 3.5}}{\mathbf{3.5}} = \mathbf{10\%}$$

$$\frac{\mathbf{70}}{\mathbf{10}} = \mathbf{7\ years}$$

3. The components of economic growth
   Determine how each of the following changes will impact a country's pGDP?
   a. The age for compulsory education is reduced from 18 to 16.
      pGDP decreases since human capital decreases

   b. Artificial intelligence is used to increase the level of automation in manufacturing.
      pGDP will go up.

   c. A new natural gas reserve is discovered.
      Natural resources go up, pGDP also go up.