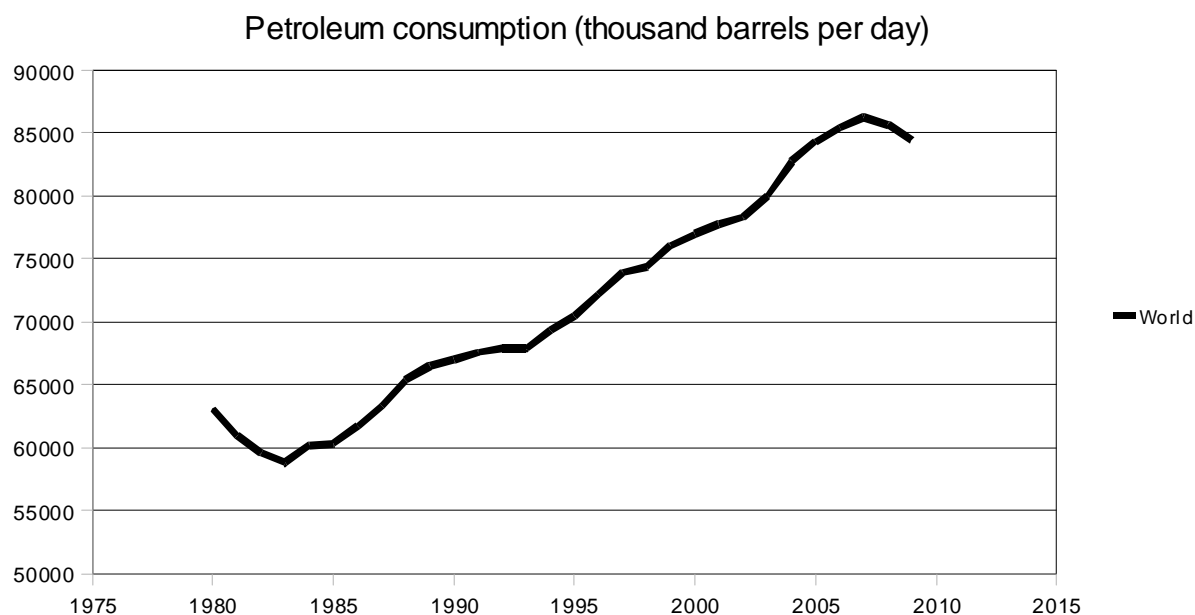


Subject 4 Sequences

Please, don't write on the exam paper.



Source <http://www.eia.doe.gov/> : US Energy Information Administration

We approximate the petroleum consumption in billions barrels per year with a sequence (c_n) , where n is the number of years after 1980.

We assume that $c_n = n \times \frac{365 \times (86 - 57)}{30} + 57 \times 365$.

- For $n = 0$ and $n = 30$, compare the values of c_n and the data given by the graph.
- What is the nature of this sequence (c_n) ?
- Prove that the total consumption (called t_n) between the years 2010 and $(1980+n)$, where $n > 30$, is given by the formula : $t_n = \frac{(c_{30} + c_n)}{2} \times (n - 29)$

- We assume that the expression of t_n in terms of n is : $t_n = \frac{2117}{12}n^2 + \frac{251777}{12}n - \frac{1513655}{2}$

We also assume that the total reserves of petroleum in the world in 2010 are about 1300 billions of barrels (source <http://www.eia.doe.gov/>).

How many years can we expect before the end of petroleum era with this approximation? (Use the table below)

n	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
$t_n/1000$	62.78	126.27	190.46	255.35	320.96	387.27	454.28	522	590.42	659.56	729.39	799.93	871.18	943.14	1015.8	1089.16	1163.23	1238.01	1313.49

Note : « barrel » = « barril » in French.