UNITED ARAB REPUBLIC

THE INSTITUTE OF NATIONAL PLANNING

Memo. No. 850

A Long Term Policy for Primary Education

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Aug. 1968.

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1 - Introduction

At the present time scientific planning has become a vital element. The state has taken planning as a base for building a society having social equlity. There should be a studied plan for the required remedies in education. Organized education will lead to a more qualified and productive results and it should go side by side with economic and social development.

As primary education is the base on which the educational stages are built, thus we have started studying this base as the State considers it essential for all citizens to achieve equality in educational opportunities.

This paper is mainly intended to introduce a very simple model which gives directly the total enrolment and the number of pupils in each grade after "t" years. Two main points are taken into consideration:-

(i) The number of the new coming pupils six years old.

(i i) The automatic promation from one grade to another.

In the first part of this paper, the annual rates of increase in pupils, in classes and in the number of new coming pupils are calculated by fitting regression lines for the period 1958-1965. In the second part the model is represented in two different ways. These depend upon the assumptions regarding the expected number of the new coming pupils. For the first the number follows a geometric progression. For the second the number is of an expenential form.

2 - The annual rates of increase

Regression lines are fitted where the independent variate "t" represents the years.

(i) Let y represent the total number of pupils, then we find that

$$\hat{y} = 0.19 \times 10^{7} + 0.17 \times 10^{6} \quad t$$

and the annual rate of increase is about 170000 pupils

(i i) Let y represent the total number of classes, then we find that

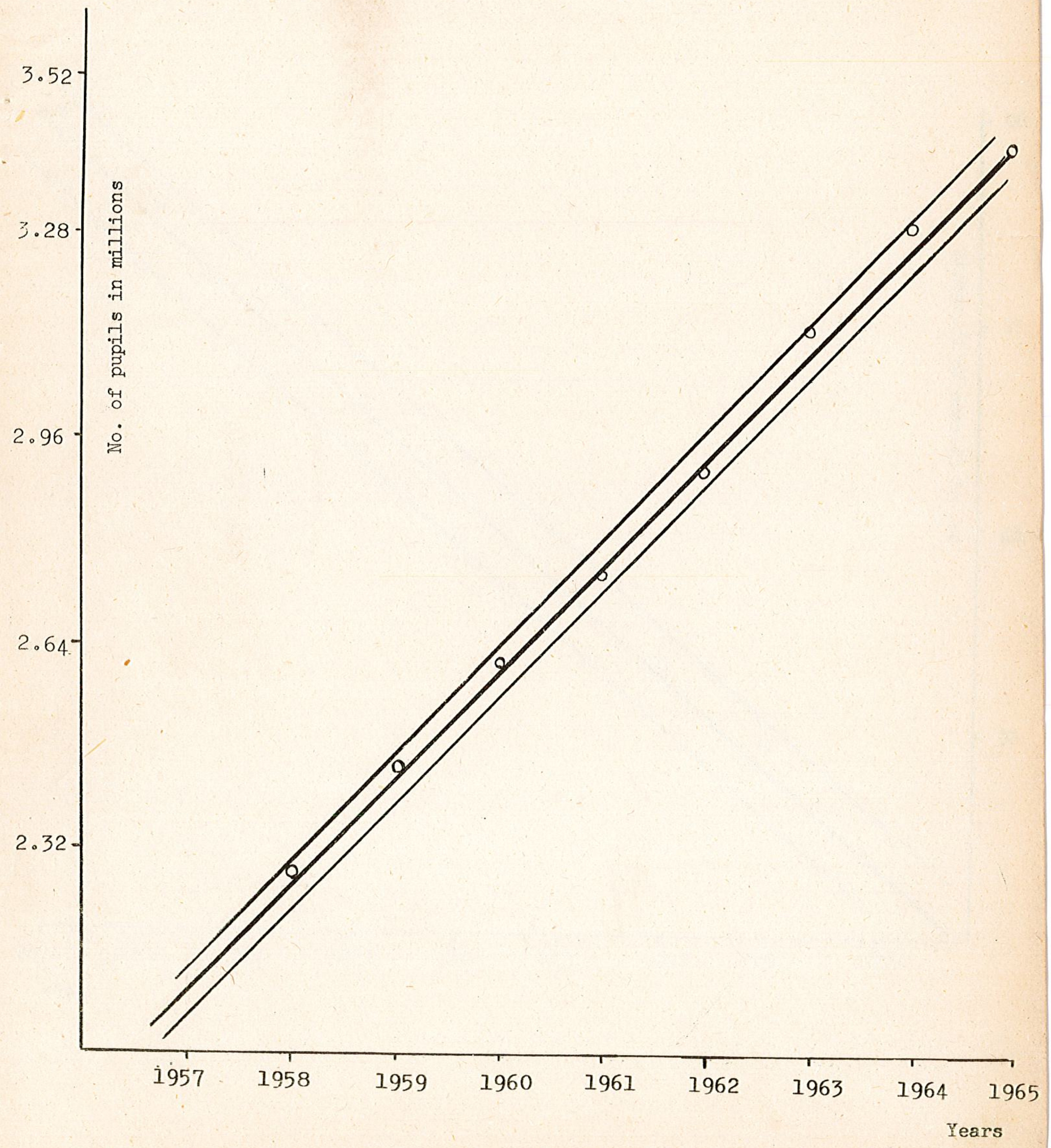
$$\hat{y} = 0.48 \times 10^{5} + 0.34 \times 10^{4} \quad t$$

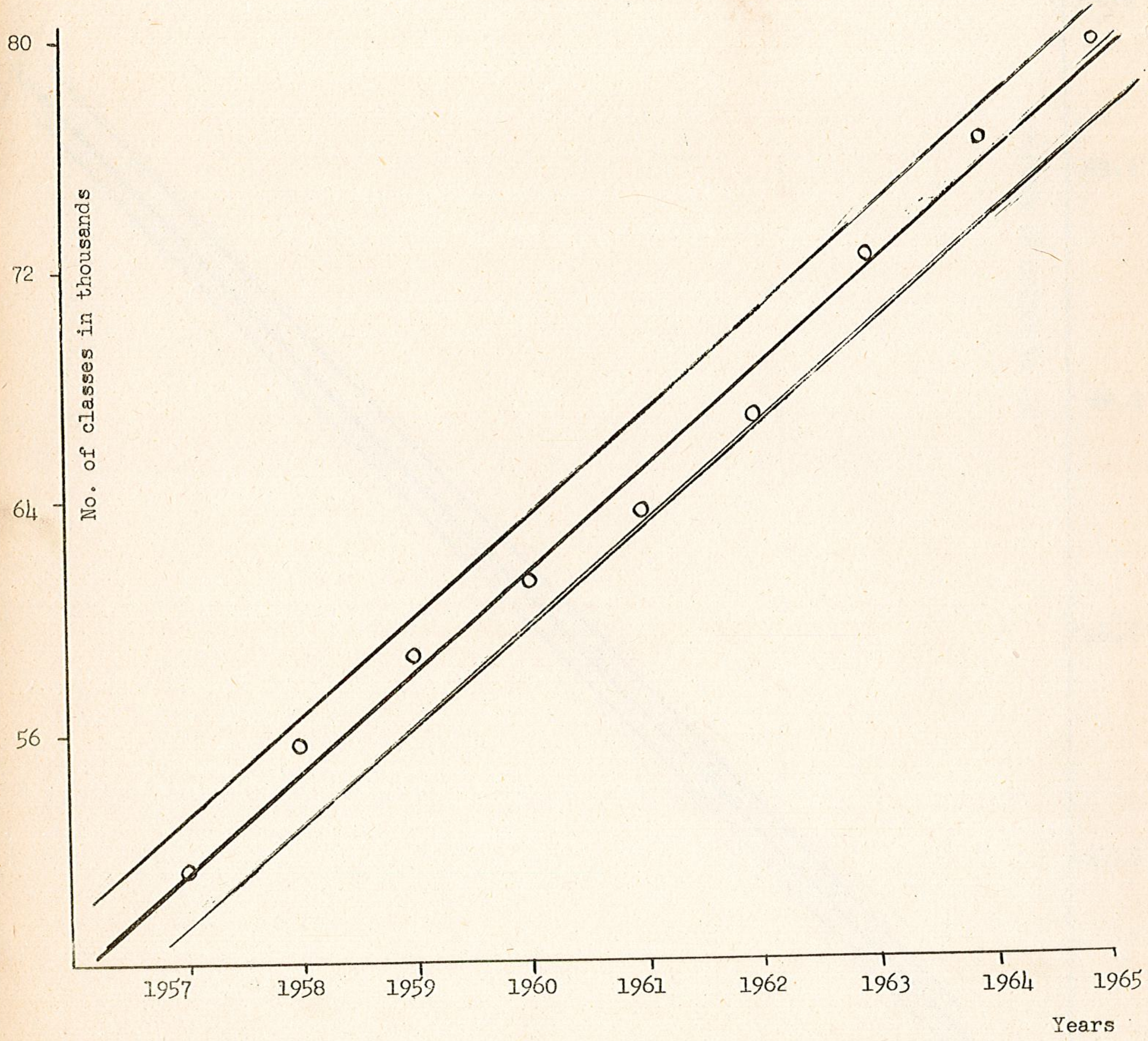
and the annual rate of increase is about 3400 classes.

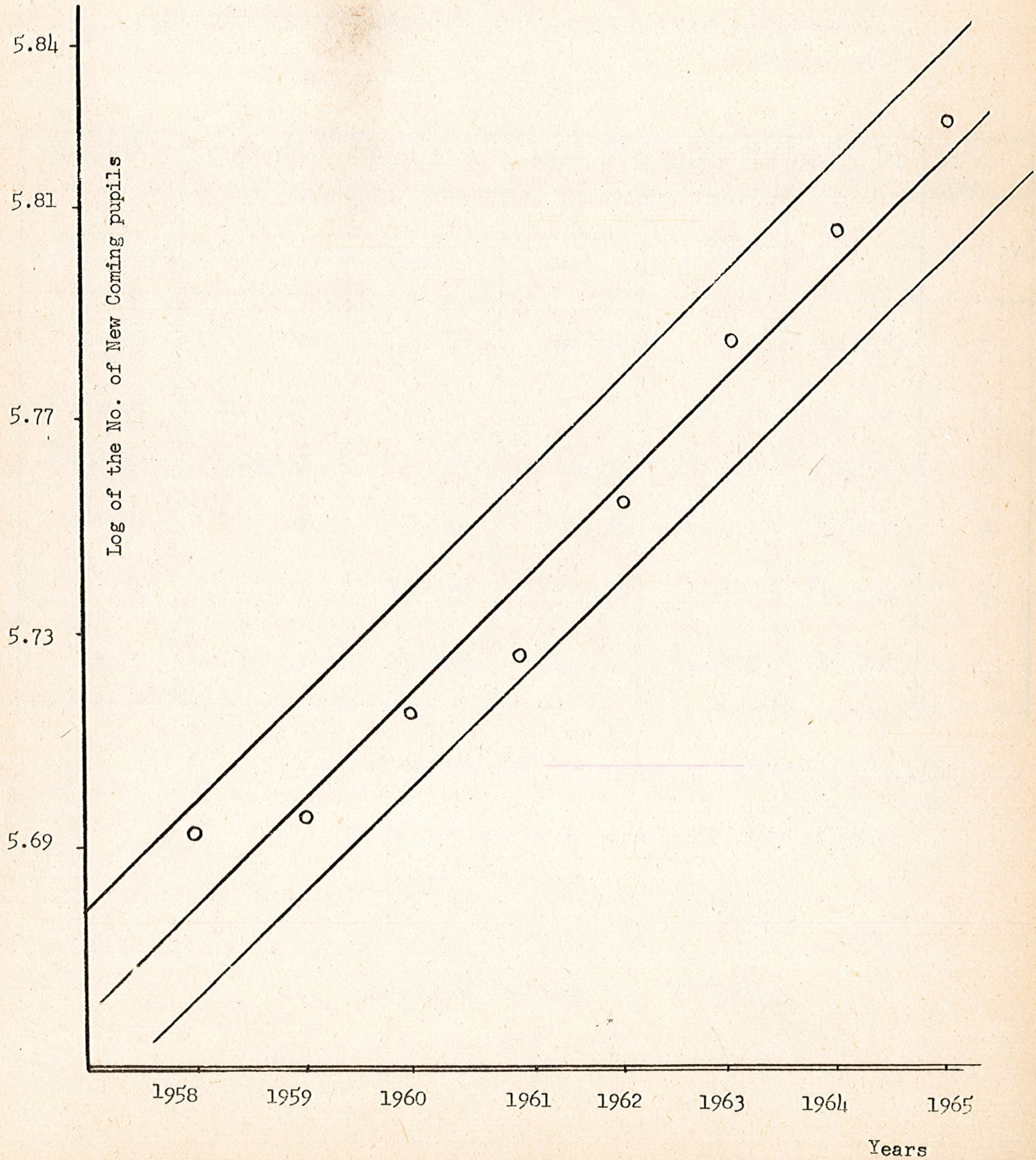
(iii) Let y represent the number of the new coming pupils, then we find that

$$y = \exp. \left\{ 0.04 \ t + 12.89 \right\}$$

and the relative increase per year is $e^{0.04} - 1$


3.52
3.28
2.96
2.64
2.32
No. of pupils in millions
1957
1958
1959
1960
1961
1962
1963
1964
1965
Years


80
72
64
56
No. of classes in thousands
1957
1958
1959
1960
1961
1962
1963
1964
1965
Years


5.84
5.81
5.77
5.73
5.69
Log of the No. of New Coming pupils
1958
1959
1960
1961
1962
1963
1964
1965
Years

3 - The mathematical model

(3-1) Let a denote the annual rate of increase in the number of new coming pupils 6-7 years old. Assuming no one will leave school in this stage, then the model can be represented as follows :-

Table (1)

years (t)	1^{st} grade	2^{nd} grade	3^{rd} grade	4^{th} grade	5^{th} grade	6^{th} grade
0	M	$\frac{M}{1+a}$	$\frac{M}{(1+a)^2}$	$\frac{M}{(1+a)^3}$	$\frac{M}{(1+a)^4}$	$\frac{M}{(1+a)^5}$
1	$M(1+a)$	M	$M/(1+a)$	$M/(1+a)^2$	$M/(1+a)^3$	$M/(1+a)^4$
2	$M(1+a)^2$	$M(1+a)$	M	$M/(1+a)$	$M/(1+a)^2$	$M/(1+a)^3$
3	$M(1+a)^3$	$M(1+a)^2$	$M(1+a)$	M	$M/(1+a)$	$M/(1+a)^2$
4	$M(1+a)^4$	$M(1+a)^3$	$M(1+a)^2$	$M(1+a)$	M	$M/(1+a)$
5	$M(1+a)^5$	$M(1+a)^4$	$M(1+a)^3$	$M(1+a)^2$	$M(1+a)$	M
6	$M(1+a)^6$	$M(1+a)^5$	$M(1+a)^4$	$M(1+a)^3$	$M(1+a)^2$	$M(1+a)$

Where M = number of pupils in 1^{st} grade in the base year t = 0

After t years the number of pupils becomes :-

$M(1+a)^t$ for the 1^{st} grade

$M(1+a)^{t-1}$ for the 2^{nd} grade

⋮ ⋮

$M(1+a)^{t-5}$ for the 6^{th} grade

In general for grade "g" and after "t" years, the number of the pupils will be

$$M_t^{(g)} = M\ (1 + a)^{t-g+1} \qquad (1)$$

Also the total enrolment becomes

$$T_t = \frac{(1+a)^{t-1} - (1+a)^{t-5}}{a}\ M \qquad (2)$$

(3-2) Making use of the result we get in section 2(iii), i.e. the number of the new coming pupils will follow an exponential form $y = \exp.\left\{a + b\ t\right\}$, then their number in year t = 0 becomes $M = e^a$, in year t = 1 becomes $M\ e^b$ and so on. Under the assumption that some will leave school, the model can be represented as follows

Table (2)

Grades

years	1^{st}	2^{nd}	3^{rd}	4^{th}	5^{th}	6^{th}
t=0	M	M/e^b	M/e^{2b}	M/e^{3b}	M/e^{4b}	M/e^{5b}
1	Me^b	M	M/e^b	M/e^{2b}	M/e^{3b}	M/e^{4b}
2	Me^{2b}	Me^b	M	M/e^b	M/e^{2b}	M/e^{3b}
3	Me^{3b}	Me^{2b}	Me^b	M	M/e^b	M/e^{2b}
4	Me^{4b}	Me^{3b}	Me^{2b}	Me^b	M	M/e^b
5	Me^{5b}	Me^{4b}	Me^{3b}	Me^{2b}	Me^b	M
6	Me^{6b}	Me^{5b}	Me^{4b}	Me^{3b}	Me^{2b}	Me^b

In general the number of pupils in grade "g" after "t" years becomes

$$M_t^{(g)} = M\ e^{(t-g+1)b} \qquad (3)$$

Also the total enrolment after "t" years becomes

$$T_t = \frac{e^{(t-1)b} - e^{(t-5)b}}{e^b - 1}\ M \qquad (4)$$

(3-3) The above two models can be modified by introducing the percentage of pupils who left school when promoted from one grade to another. If q denotes the proportion of those who left school (assuming that it is nearly equal for all grades) then p = 1-q is the proportion of those who will be present in each grade. The results of the above two models become as follows

<u>1st model</u>

$$M_t^{'(g)} = M\ p^{g-1}\ (1+a)^{t-g+1} \qquad (1')$$

$$\&\qquad T_t^{'} = \frac{k^{t+1} - k^{t-5}}{k-1}\ M\ P^t \qquad (2')$$

Where $k = \frac{1 + a}{P}$

<u>2nd model</u>

$$M_t^{'(g)} = M\ p^{g-1}\ e^{(t-g+1)\,b} \qquad (3')$$

$$\&\qquad T_t^{'} = \frac{k^{t+1} - k^{t-5}}{k-1}$$

Where $k = e^b / P$