TOPIC : 2.9.NEWTON'S FORWARD INTERPOLATION FORMULA

$y(1.30) = 0.4695$

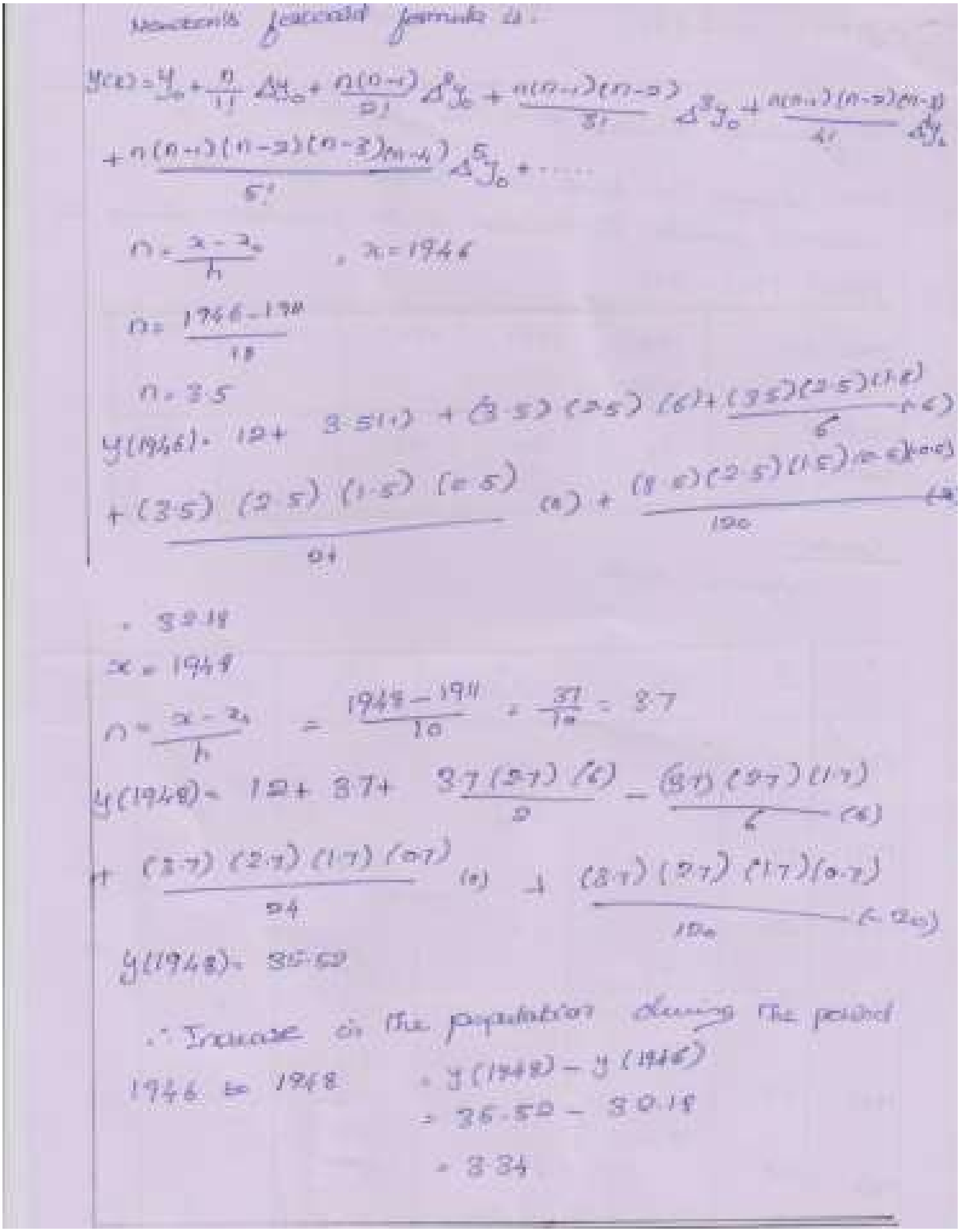
2. The following table gives the population y in lakhs for the last six censuses. Estimate using Newton's formula the increase in the population during the period 1946 – 1948.

Year : 1911	1921	1931	1941	1951	1961
Population in Thousands : 12	15	20	27	39	52

Solution:

Difference table

x	y	Δy_0	$\Delta^2 y_0$	$\Delta^3 y_0$	$\Delta^4 y_0$	$\Delta^5 y_0$
1911	12					
		1				
1921	15		6			
		7		−6		
1931	20		0		11	
		7		5		−2
1941	27		5		−9	
		12		4		
1951	39		1			
		13				
1961	52					



Newton's forward formula is:

$$y(x) = y_0 + \frac{n}{1!}\Delta y_0 + \frac{n(n-1)}{2!}\Delta^2 y_0 + \frac{n(n-1)(n-2)}{3!}\Delta^3 y_0 + \frac{n(n-1)(n-2)(n-3)}{4!}\Delta^4 y_0 + \frac{n(n-1)(n-2)(n-3)(n-4)}{5!}\Delta^5 y_0 + \cdots$$

$n = \frac{x - x_0}{h}$, $x = 1946$

$n = \frac{1946 - 1941}{10}$

$n = 3.5$

$y(1946) = 12 + 3.5(1) + \frac{(3.5)(2.5)(1.5)}{6} + \frac{(3.5)(2.5)(1.5)(0.5)}{24}(0) + \frac{(3.5)(2.5)(1.5)(0.5)(-0.5)}{120}$ (4)

$= 30.18$

$x = 1948$

$n = \frac{x - x_0}{h} = \frac{1948 - 1941}{10} = \frac{37}{10} = 3.7$

$y(1948) = 12 + 3.7 + \frac{3.7(2.7)}{2}(6) - \frac{(3.7)(2.7)(1.7)}{6}$ (6)

$+ \frac{(3.7)(2.7)(1.7)(0.7)}{24}(0) + \frac{(3.7)(2.7)(1.7)(0.7)}{120}$ (-0.2)

$y(1948) = 35.52$

∴ Increase in the population during the period

$1946 - 1948 = y(1948) - y(1946)$

$= 35.52 - 30.18$

$= 3.34$