

10:05 - 11:35 Sat

Q. From the following table, estimate the  
no. of students who obtained marks b/w  
70 & 75.

Marks	<u>30-40</u>	<u>40-50</u>	<u>50-60</u>	<u>60-70</u>	<u>70-80</u>
No. of students	31	42	51	35	31

Sol<sup>n</sup>: First we will convert the intervalwise/segmentwise data in pointwise data:

Marks less than	$x_0$ 40	$x_1$ 50	$x_2$ 60	$x_3$ 70	$x_4$ 80
No. of students	31 $f(x_0)$	73 $f(x_1)$	124 $f(x_2)$	159 $f(x_3)$	190 $f(x_4)$

No. of students b/w 70 & 75

$$= \text{No. of students less than 75} - \text{No. of students less than 70} - \textcircled{1}$$

To calculate  $\textcircled{1}$ , we have to calculate no. of students who less marks less than 75

$$\begin{array}{l} x = 75 \\ x_4 = 80 \\ h = 10 \end{array} \left\{ \begin{array}{l} \text{We know that} \\ x = x_n + ph \\ \Rightarrow 75 = 80 + p \times 10 \Rightarrow p = -0.5 \end{array} \right.$$

By Newton's backward interpolation formula,  
we know that

$$f(u) = \underbrace{f(x_4)}_1 + p \nabla f(x_4) + \frac{p(p+1)}{2} \nabla^2 f(x_4) + \frac{p(p+1)(p+2)}{6} \nabla^3 f(x_4) + \frac{p(p+1)(p+2)(p+3)}{24} \nabla^4 f(x_4)$$

Now we will construct backward difference

table

$x$	$y$
$x_0 = 40$	31
$x_1 = 50$	73
$x_2 = 60$	124
$x_3 = 70$	159
$x_4 = 80$	190

$f(75) = \text{No. of students scoring less than 75 marks}$