

Answer on Question #75301-Math-Statistics and Probability

From the following table, find the number of students who obtained less than 45 marks.

Marks No. of Students

30-40 31

40-50 42

50-60 51

60-70 35

70-80 31

Solution

The cumulative frequency table:

Marks less than (x)	Number of students (y_x)
40	31
50	73
60	124
70	159
80	190

The difference table is

x	y	Δy_x	$\Delta^2 y_x$	$\Delta^3 y_x$	$\Delta^4 y_x$
40	31	42	9	-25	37
50	73	51	-16	12	
60	124	35	-4		
70	159	31			
80	190				

Using Newton's forward difference interpolation formula we get:

$$x_0 = 40, x = 45$$

$$p = \frac{x - x_0}{h} = \frac{5}{10} = 0.5$$

$$y_{45} = y_{40} + p\Delta y_{40} + \frac{p(p-2)}{2!}\Delta^2 y_x + \frac{p(p-2)(p-3)}{3!}\Delta^3 y_x + \frac{p(p-2)(p-3)(p-4)}{4!}\Delta^4 y_x$$

$$y_{45} = 31 + 0.5(42) + \frac{0.5(-0.5)}{2}9 + \frac{0.5(-0.5)(-1.5)}{6}(-25) + \frac{0.5(-0.5)(-1.5)(-2.5)}{24}(37)$$

$$y_{45} = 47.8671875$$

The number of students who obtained less than 45 marks is 47.8671875, i.e. 48.

Answer: 48.

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