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CORE CONCEPT OF
BUSINESS MATHEMATICS & STATISTICS

1. Illustrate the Measurement of Trend.
2. Briefly describe the **Method of Least Squares**.
3. What do you mean by Method of Least Squares?

Method of Least Squares

This method is called the method of least squares because the sum of squares of deviations of various points of trend line from original data would be the least as compared to the sums of squares of the deviations obtained by using any other line.

Fitting a straight line trend by least Square Method-

Equation is $Y_c = a + b X$

To Find the value of a and b we used following two equations-

$$\Sigma Y = Na + b \Sigma X$$

$$\Sigma XY = a \Sigma X + b \Sigma X^2$$

Example-18-

Calculate trend value from the following data by least squares method-

Year	2003	2004	2005	2006	2007	2008	2009	2010	2011
Production(y)	9	12	13	14	17	18	20	22	24

Taking origin year as 2005. Estimate the production for the year 2016.

Solution-18:

Year	y	Trend Value				$[Y_c = a + bx]$
		x(year-2005)	(x) ²	xy(x*y)		
2003	9	-2	4	-18	16.56	
2004	12	-1	1	-12	18.36	



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2005	13	0	0	0	20.16
2006	14	1	1	14	21.96
2007	17	2	4	34	23.76
2008	18	3	9	54	25.56
2009	20	4	16	80	27.36
2010	22	5	25	110	29.16
2011	24	6	36	144	30.96
	149	18	96	406	

$$\Sigma Y = Na + b\Sigma X$$

$$\Sigma XY = a\Sigma X + b\Sigma X^2$$

$$149 = 9a + 18b \quad \dots(1)$$

$$406 = 18a + 96b \quad \dots(2)$$

Multiply equation (1) by 2 we get

$$298 = 18a + 36b$$

$$406 = 18a + 96b$$

$$- \quad - \quad -$$

$$-108 = -60b \quad b = -108/60, b = -1.8$$

Put the value of b in eq. 1-

$$149 = 9a + 18(-1.8)$$

$$149 = 9a - 32.4$$

$$149 + 32.4 = 9a$$

$$181.4/9 = a \quad a = 20.16$$

$$Y_c = 20.16 - 1.8x$$

$$\text{Value for 2016- } 2015 - 2005 = 10 = x$$

$$\text{Trend Value- } 20.16 + 1.8 * 10$$

$$= 20.16 + 18$$

$$= 38.16$$