Answer on Question #57299-Math-Statistics and Probability

Student enrolment at a university over the past six years is given below.

Year (t) Enrolment (in 1000s)

1 6.3

2 7.7

3 8

4 8.2

5 8.8

6 8.0

a. What is the linear trend expression for the above time series?

b. Based on the model you determined in the question above, what is the forecast enrollment for year 10?

Solution

a. Let student enrolment at a university over the past six years is Y.

$$\sum x = 6.3 + 7.7 + 8 + 8.2 + 8.8 + 8.0 = 47$$

$$\sum t = 1 + 2 + 3 + 4 + 5 + 6 = 21$$

$$\sum t^2 = 1^2 + 2^2 + 3^2 + 4^2 + 5^2 + 6^2 = 91$$

$$\sum xt = 6.3 \cdot 1 + 7.7 \cdot 2 + 8 \cdot 3 + 8.2 \cdot 4 + 8.8 \cdot 5 + 8.0 \cdot 6 = 170.5$$

The slope is

$$b = \frac{n \sum xt - (\sum x)(\sum t)}{n \sum t^2 - (\sum t)^2} = \frac{6 \cdot 170.5 - (47)(21)}{6 \cdot 91 - (21)^2} = 0.342857.$$

The intercept is

$$a = \frac{\sum x - b \sum t}{n} = \frac{47 - 0.342857 \cdot 21}{6} = 6.633.$$

The linear trend expression for the above time series is

$$\hat{x} = 6.63 + 0.342857 \cdot \hat{t}$$

b. The forecast enrollment for year 10 is

$$\hat{x}(10) = 6.633 + 0.342857 \cdot 10 = 10.062 \ (1000s) = 10062 \ s.$$