

Answer on Question #80525 – Math – Statistics and Probability

Question

The number of laptops per quarter sold by computer outlet, for 3 consecutive years

	Q1	Q2	Q3	Q4
2011	195	216	232	300
2012	158	228	183	298
2013	180	198	200	307

1. Determine the adjusted seasonal indices

2. Show that the linear regression equation is given by $y = 210.3788 + 2.1853x$

Hint: Use 1,2,3... for Q1 of 2011, Q2 of 2011, Q3 of 2011, ...

3. Use the results of 3.1 and 3.2 above to estimate the number of laptops sold by outlet in Q3 of 2014

Solution

1. Q1 average: $\frac{195+158+180}{3} = 177.67.$

Q2 average: $\frac{216+228+198}{3} = 214.$

Q3 average: $\frac{232+183+200}{3} = 205.$

Q4 average: $\frac{300+298+307}{3} = 301.67.$

Overall average: $\frac{177.67+214+205+301.67}{4} = 224.58.$

Quarter	SI	Adjusted SI
1	$\frac{177.67}{224.58} = 0.7911$	$\frac{79.11 * 4}{4.0001} = 0.791080$
2	$\frac{214}{224.58} = 0.9529$	$\frac{95.29 * 4}{4.0001} = 0.952876$

3	$\frac{205}{224.58} = 0.9128$	$\frac{91.28 * 4}{4.0001} = 0.912777$
4	$\frac{301.67}{224.58} = 1.3433$	$\frac{134.33 * 4}{4.0001} = 1.343266$
Sum	4.0001	4

2.

	x	y	x^2	xy
	1	195	1	195
	2	216	4	432
	3	232	9	696
	4	300	16	1200
	5	158	25	790
	6	228	36	1368
	7	183	49	1281
	8	298	64	2384
	9	180	81	1620
	10	198	100	1980
	11	200	121	2200
	12	307	144	3684
Sum	78	2695	650	17830

Regression equation: $y = a + bx$.

$$\text{Here } a = \frac{n \sum xy - \sum x \sum y}{n \sum x^2 - (\sum x)^2} = \frac{12 * 17830 - 78 * 2695}{12 * 650 - 78^2} = 210.3778.$$

$$b = \frac{\sum y - b \sum x}{n} = \frac{2695 - 210.3778 * 78}{12} = 2.1853.$$

So, the regression equation: $y = 210.3778 + 2.1853x$.

3. $y(15) = 210.3778 + 2.1853 * 15 = 243.1573$.

$$y(15) * SI = 243.1573 * 0.912777 \approx 221.95.$$