

Student ID:

Assignment 1: Given that X and Y are random variables for temperature and crop yields respectively listed in the table below and assume that u_i is normally and independently distributed, there are total 25 observations collected.

(1) Fill in all the information necessary for OLS estimate, only 2 decimal points is permitted.

	X	Y	$x_i - \bar{X}$	$y_i - \bar{Y}$	$(x_i - \bar{X})(y_i - \bar{Y})$	$(x_i - \bar{X})^2$
	50	122	-24.84	-44.32	1100.91	617.03
	53	118	-21.84	-48.32	1055.31	476.99
	54	128	-20.84	-38.32	798.59	434.31
	55	121	-19.84	-45.32	899.15	393.63
	56	125	-18.84	-41.32	778.47	354.95
	59	136	-15.84	-30.32	480.27	250.91
	62	144	-12.84	-22.32	286.59	164.87
	65	142	-9.84	-24.32	239.31	96.83
	67	149	-7.84	-17.32	135.79	61.47
	71	161	-3.84	-5.32	20.43	14.75
	72	167	-2.84	0.68	-1.93	8.07
	74	168	-0.84	1.68	-1.41	0.71
	75	162	0.16	-4.32	-0.69	0.03
	76	171	1.16	4.68	5.43	1.35
	79	175	4.16	8.68	36.11	17.31
	80	182	5.16	15.68	80.91	26.63
	82	180	7.16	13.68	97.95	51.27
	85	183	10.16	16.68	169.47	103.23
	87	188	12.16	21.68	263.63	147.87
	90	200	15.16	33.68	510.59	229.83
	93	194	18.16	27.68	502.67	329.79
	94	206	19.16	39.68	760.27	367.11
	95	207	20.16	40.68	820.11	406.43
	97	210	22.16	43.68	967.95	491.07
	100	219	25.16	52.68	1325.43	633.03
Sum					11331.28	5679.36
Average	1871	4158				

(2) Estimate the coefficient $\hat{\beta}_1$ and $\hat{\beta}_2$, showing your method in this blank space, round them to an integer without any decimal point.

$$-\hat{\beta}_2 = \frac{\sum_{i=1}^n (x_i - \bar{X})(y_i - \bar{Y})}{\sum_{i=1}^n (x_i - \bar{X})^2} = \frac{11,331.28}{5,679.36} = 1.995168 \approx 2$$

$$-\hat{\beta}_1 = \bar{Y} - \hat{\beta}_2 \bar{X} = 4,158 - (1.995168) \cdot 1,871 = 17.00159 \approx 17$$

(3) Fill in all the blank space provided here, also circle the correct answer in brackets.

- The estimated $\hat{Y}_i = 17 + 2x_i$

- Therefore, it means that, on average, when the temperature (increases / decreases) by 1 degree, yields will (increase / decrease) by 2 unit.

- We can expect that when the temperature is at 73 degree, the yields should be $\hat{Y}_i = 17 + 2(73) = 163$ unit.

(4) Fill in all the information necessary to calculate the coefficient of determination. You can use the information from the previous table.

	\hat{Y}_i	$\hat{Y}_i - \bar{Y}$	$(\hat{Y}_i - \bar{Y})^2$	$(y_i - \bar{Y})^2$
	116.76	-49.56	2456.19	2334.82
	122.75	-43.57	1898.74	1468.42
	124.74	-41.58	1728.84	2053.90
	126.74	-39.58	1566.90	1707.34
	128.73	-37.59	1412.93	919.30
	134.72	-31.60	998.78	498.18
	140.70	-25.62	656.28	591.46
	146.69	-19.63	385.43	299.98
	150.68	-15.64	244.68	28.30
	158.66	-7.66	58.70	0.46
	160.65	-5.67	32.11	2.82
	164.64	-1.68	2.81	18.66
	166.64	0.32	0.10	21.90
	168.63	2.31	5.36	75.34
	174.62	8.30	68.89	245.86
	176.62	10.30	105.99	187.14
	180.61	14.29	204.07	278.22
	186.59	20.27	410.91	470.02
	190.58	24.26	588.61	1134.34
	196.57	30.25	914.87	766.18
	202.55	36.23	1312.78	1574.50
	204.55	38.23	1461.34	1654.86
	206.54	40.22	1617.86	1907.94
	210.53	44.21	1954.78	2775.18
	216.52	50.20	2519.88	2334.82
Sum			22607.81	22979.44
Average				

(5) The coefficient of determination is $r^2 = \frac{\sum_{i=1}^n (\hat{Y}_i - \bar{Y})^2}{\sum_{i=1}^n (y_i - \bar{Y})^2} = \frac{22,607.81}{22,979.44} = 0.9831$