

Chapter 5 Problems

Student	H(X)	X ²	X - \bar{X}	(X - \bar{X}) ²	W(Y)	Y ²	Y - \bar{Y}	(Y - \bar{Y}) ²	(X - \bar{X})(Y - \bar{Y})	XY
1	149	22201	-16.53	273.35	54	2916	-7.13	50.88	117.94	8046
2	153	23409	-12.53	157.08	52	2704	-9.13	83.42	114.47	7956
3	167	27889	1.47	2.15	53	2809	-8.13	66.15	-11.93	8851
4	161	25921	-4.53	20.55	57	3249	-4.13	17.08	18.74	9177
5	151	22801	-14.53	211.22	47	2209	-14.13	199.75	205.40	7097
6	154	23716	-11.53	133.02	62	3844	0.87	0.75	-10.00	9548
7	177	31329	11.47	131.48	69	4761	7.87	61.88	90.20	12213
8	162	26244	-7.53	57.08	60	3600	-1.13	1.28	4.00	9720
9	172	29584	6.47	41.82	55	3025	-6.13	37.62	-39.66	9460
10	178	31684	12.47	155.42	73	5329	11.87	140.82	147.94	12994
11	173	29929	7.47	55.75	78	6084	16.87	284.48	125.94	13494
12	164	26896	-1.53	2.35	58	3364	-3.13	9.82	4.80	9512
13	181	32761	15.47	239.22	73	5329	11.87	140.82	183.54	13213
14	182	33124	16.47	271.15	68	4624	6.87	47.15	113.07	12376
15	159	25281	-6.53	42.68	58	3364	-3.13	9.82	20.47	9222
Sum	2482.00	412769.00	0.00	1749.73	917.00	57211.00	0.00	1151.73	1151.73	152879.00
Mean	165.53	27517.93	0.00	116.65	61.13	384.07	0.00	76.78	76.78	10191.93

1. a. $r = \frac{\sum [(X - \bar{X})(Y - \bar{Y})]}{\sqrt{\sum (X - \bar{X})^2 \sum (Y - \bar{Y})^2}} = \frac{1084.93}{\sqrt{(1749.73)(1151.73)}} = 0.76$
 b. $r = \frac{(\sum XY - N\bar{X}\bar{Y})}{\sqrt{[(N-1)\hat{\sigma}_x^2][N\hat{\sigma}_y^2]}} = \frac{[152879 - 15(165.53)(61.13)]}{\sqrt{[14(11.18)(9.57)]]} = 0.77$
 $r^2 = \frac{[N\sum XY - (\sum X)(\sum Y)]^2}{\{[N\sum X^2 - (\sum X)^2][N\sum Y^2 - (\sum Y)^2]\}}$
 $= \frac{[15(152879) - 2482(917)]^2}{\{[15(412769) - 2482^2][15(57211) - 917^2]\}} = .58$
 $r = \sqrt{r^2} = \sqrt{.5841} = .76$

2. $b = \frac{\sum [(X - \bar{X})(Y - \bar{Y})]}{\sum (X - \bar{X})^2} = \frac{1084.93}{1749.73} = 0.62$
 $a = \bar{Y} - b\bar{X} = 61.13 - 0.62(165.53) = -41.50$
 $Y' = -41.50 + .62X$

- a. For each 1 cm in height, there is a .62 kg increase in predicted weight.
 b. $Y' = -41.50 + .62(151) = 52.12$ kg
 c. $Y' = -41.50 + .62(165.53) = 61.13$; a student of average height is predicted to be of average weight

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Subject	Y	Y - \bar{Y}	(Y - \bar{Y}) ²	Y'	Y' - \bar{Y}'	(Y' - \bar{Y}') ²	(Y - \bar{Y})(Y' - \bar{Y}')
1	7	-7	49	8.75	-5.25	27.56	36.75
2	9	-5	25	12.25	-1.75	3.06	8.75
3	13	-1	1	15.75	1.75	3.06	-1.75
4	15	1	1	19.25	5.25	27.56	5.25
5	8	-6	36	8.75	-5.25	27.56	31.50
6	11	-3	9	12.25	-1.75	3.06	5.25
7	14	0	0	15.75	1.75	3.06	0.00
8	19	5	25	19.25	5.25	27.56	26.25
9	9	-5	25	8.75	-5.25	27.56	26.25
10	14	0	0	12.25	-1.75	3.06	0.00
11	17	3	9	15.75	1.75	3.06	5.25
12	20	6	36	19.25	5.25	27.56	31.50
13	11	-3	9	8.75	-5.25	27.56	15.75
14	15	1	1	12.25	-1.75	3.06	-1.75
15	19	5	25	15.75	1.75	3.06	8.75
16	23	9	81	19.25	5.25	27.56	47.25
Sum	224.00	0.00	332.00	224.00	0.00	245.00	245.00
Mean	14.00	0.00	20.75	14.00	0.00	15.31	15.31

3. $r = \frac{\sum [(Y - \bar{Y})(Y' - \bar{Y}')] }{\sqrt{\sum (Y - \bar{Y})^2 \sum (Y' - \bar{Y}')^2}} = \frac{245}{\sqrt{(332)(245)}} = .86$
 $r^2 = .86^2 = .74$