

Student ID	SAT	GPA
103	400	1.5
107	500	2.0
110	600	2.2
101	600	3.4
106	800	2.4
111	900	2.7
105	900	1.5
109	1000	3.0
108	1000	3.9
104	1100	2.5
102	1500	4.0

SAT X	GPA Y	XY	X²	Y²
400	1.50	600	160000	2.25
500	2.00	1000	250000	4.00
600	2.20	1320	360000	4.84
600	3.40	2040	360000	11.56
800	2.40	1920	640000	5.76
900	2.70	2430	810000	7.29
900	1.50	1350	810000	2.25
1000	3.00	3000	1000000	9.00
1000	3.90	3900	1000000	15.21
1100	2.50	2750	1210000	6.25
1500	4.00	6000	2250000	16.00
9300	29.1	26310	8850000	84.41

SAT & GPA

$$r = \frac{n \sum XY - \sum X \sum Y}{\sqrt{[n \sum X^2 - (\sum X)^2][n \sum Y^2 - (\sum Y)^2]}}$$

$$r = \frac{11(26310) - (9300)(29.1)}{\sqrt{[11(8850000) - (9300)^2][11(84.41) - (29.1)^2]}}$$

$$r = \frac{18780}{\sqrt{[10860000 - 86490000][81.7]}} = \frac{18780}{29787} = 0.63$$

Is r significant? — See PAGE 4

$$B_1 = \frac{n \sum XY - \sum X \sum Y}{n \sum X^2 - (\sum X)^2} = \frac{18780}{10860000} = 0.00173$$

$$B_0 = \bar{Y} - B_1 \bar{X} = \frac{29.1}{11} - 0.00173 \left(\frac{9300}{11} \right)$$

$$B_0 = 2.645 - 1.463 = 1.182$$

$$\hat{Y} = B_0 + B_1 X = 1.18 + 0.00173 X$$

$$\text{For } X = 1050 \quad Y = 1.18 + 0.00173(1050) = 3.00$$

SAT & GPA

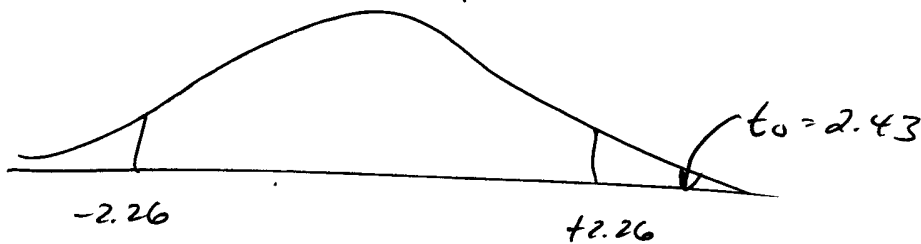
$$H_0: \rho = 0$$

$$t_{\text{test}} = t_0 = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}} = \frac{0.63\sqrt{11-2}}{\sqrt{1-0.63^2}}$$

$$t_0 = \frac{1.89}{0.7766} = 2.43$$

$$t_{\text{CV}} = t_{\alpha/2, n-2} = t_{0.025, 9} = \pm 2.26$$

(p-value = 0.0376)



Reject $H_0: \rho = 0$ Conclude $\rho \neq 0$

that is to say, there is significant correlation.

Therefore we can use the prediction equation!

SAT and GPA - Continued

S_{XX}	S_{YY}	S_{XY}
987273	7.427	1707.3

SSR	SST
2.95	7.43

SAT vs GPA

$$r = \frac{S_{xy}}{\sqrt{S_{xx} S_{yy}}} = \frac{1707.3}{\sqrt{987273(7.427)}} = \frac{1707.3}{2707.9} = 0.63$$

$$B_1 = \frac{S_{xy}}{S_{xx}} = \frac{1707.3}{987273} = 0.00173$$

$$B_0 = \bar{y} - B_1 \bar{x} = 2.645 - 1.463 = 1.182$$

$$\hat{y} = B_0 + B_1 x = 1.182 + 0.00173x$$

SAT GPA Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	p- Value
Model (Regression)	1	2.95	2.95	5.93	0.0376
Error	9	4.47	0.497		
Total	10	7.42			