

STAT 6602 CHAPTER 1 PROBLEMS

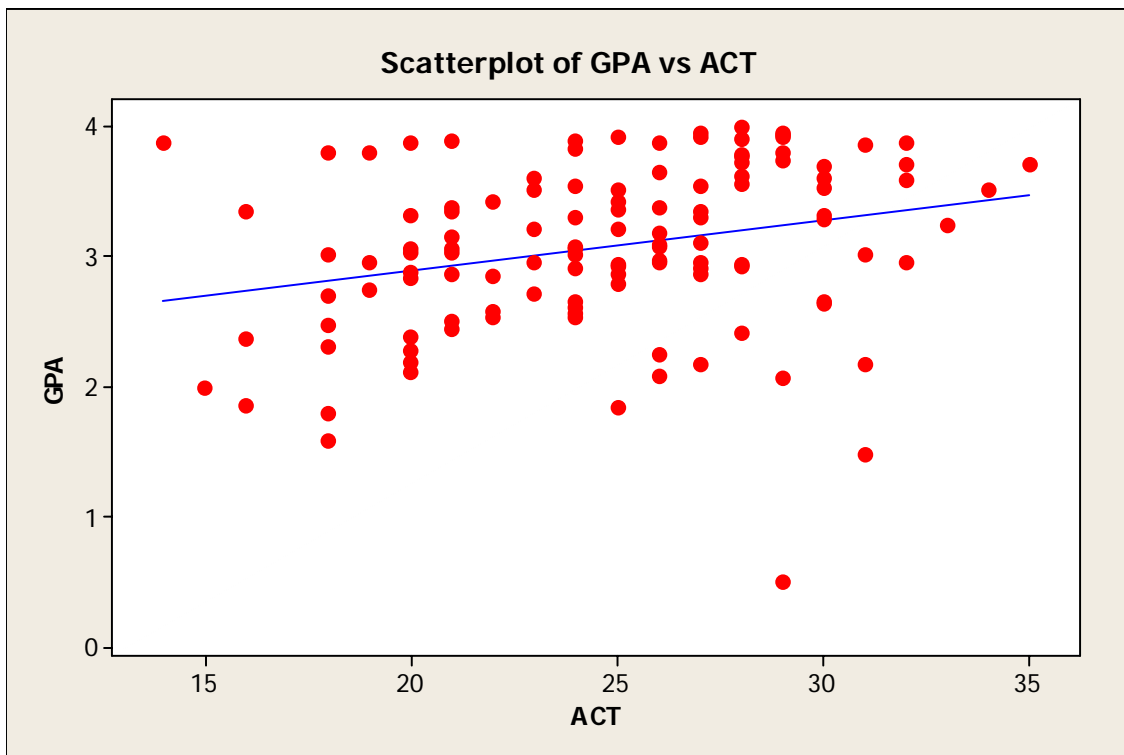
1.19. (a) Using MINITAB, we obtain the following output upon regressing GPA on ACT score.

Regression Analysis: GPA versus ACT

The regression equation is
GPA = 2.11 + 0.0388 ACT

Therefore, $\hat{\beta}_0 = 2.1140$ and $\hat{\beta}_1 = .03883$, giving us the estimated regression function $\hat{Y} = 2.1140 + .03883X$.

(b)



The estimated regression function fits the data somewhat, but not necessarily well.

(c) $E(\text{GPA}|\text{ACT} = 30) = 2.1140 + .03883(30) = 3.2789$

(d) $\hat{\beta}_1 = .03883 =$ estimated change in mean GPA for one unit increase in ACT score.

1.23 (a) The residuals $e_i = Y_i - \hat{Y}_i$ can be obtained using MINITAB.
MINITAB output:

Obs	ACT	GPA	Fit	SE Fit	Residual	St Resid
1	21.0	3.8970	2.9294	0.0742	0.9676	1.56
2	14.0	3.8850	2.6576	0.1483	1.2274	2.03RX
3	28.0	3.7780	3.2012	0.0706	0.5768	0.93
⋮				⋮		
119	16.0	1.8600	2.7353	0.1251	-0.8753	-1.43
120	28.0	2.9480	3.2012	0.0706	-0.2532	-0.41

i	1	2	3	⋯	119	120
Y_i	3.8970	3.8850	3.7780	⋯		
\hat{Y}_i	2.9294	2.6576	3.2012	⋯		
e_i	0.9676	1.2274	0.0706	⋯	-0.8753	-0.2532

The residuals do sum to zero: $\sum_{i=1}^{120} e_i = 0$

(b) An estimate of σ^2 is $MSE = 0.3883$. (See output below.)

An estimate of σ is $\sqrt{MSE} = 0.623125$. (See output below.)

The units for σ are “grade points”. [The units for σ^2 are “grade points” squared.]

MINITAB output: Regression Analysis: GPA versus ACT

The regression equation is

$$GPA = 2.11 + 0.0388 \text{ ACT}$$

Predictor	Coef	SE Coef	T	P
Constant	2.1140	0.3209	6.59	0.000
ACT	0.03883	0.01277	3.04	0.003

S = 0.623125 R-Sq = 7.3% R-Sq(adj) = 6.5%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	3.5878	3.5878	9.24	0.003
Residual Error	118	45.8176	0.3883		
Total	119	49.4055			