A Logistic Regression Model for the Challenger Data (Using Minitab)

Binary Logistic Regression: O-Ring Fail versus Temperature

```
Link Function:  Logit

Response Information

Variable  Value       Count

O-Ring F  1               7  (Event)

          0              17

          Total          24

Logistic Regression Table
```

NOTE: SAS reports Log-Likelihood (LL).
See next page for results that R reports.

					Odds	95% CI	
Predictor	Coef	SE Coef	Z	P	Ratio	Lower	Upper
Constant	10.875	5.703	1.91	0.057			
Temperat	-0.17132	0.08344	-2.05	0.040	0.84	0.72	0.99

Log-Likelihood = -11.515

$$d_i = sgn(y_i - \hat{y}_i) \sqrt{2y_i \log\left(\frac{y_i}{\hat{y}_i}\right) + 2(n_i - y_i) \log\left(\frac{n_i - y_i}{n_i - \hat{y}_i}\right)}$$

Deviance residuals

From R output for Logistic Regression on Challenger data:

```
> logistic <- glm(TD ~ Temp,data=oring,family=binomial(link='logit'))
> summary(logistic)
Call:
glm(formula = TD ~ Temp, family = binomial(link = "logit"), data = oring)

Deviance Residuals:
   Min     1Q   Median     3Q     Max
-1.2125  -0.8253  -0.4706  0.5907  2.0512

Coefficients:
         Estimate Std. Error z value Pr(>|z|)
(Intercept) 10.87535   5.70291   1.907   0.0565 .
Temp        -0.17132   0.08344  -2.053   0.0400 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

Null deviance: 28.975  on 23  degrees of freedom
Residual deviance: 23.030  on 22  degrees of freedom
AIC: 27.03
```

For Logistic Regression LL=Log-Likelihood, p=#parameters
AIC= 2*(-LL) + 2p or
27.03 = 2*(-LL) + 2*2 or
LL=-23.03/2 = -11.515 (see previous page)