

1-Way ANOVA Worksheet – 1927 Yankees Runs/Game by AL Opponent

Description: 1927 New York Yankees (aka Murderer's Row), were probably most prolific offensive scoring baseball team in history. Babe Ruth and Lou Gehrig had monumental stats relative to rest of league. Playing in the 8 team American League, they played each opponent 22 times (one game with Philadelphia, which ended in a tie, and was re-played has been removed).

Summary Stats (Full Data on class website):

		Opponent	Opp#	Mean	SD	Games
f2	f23	Boston	1	7.772727	4.241875	22
f24	f45	Chicago	2	5.045455	2.819613	22
f46	f67	Cleveland	3	5.227273	3.038355	22
f68	f89	Detroit	4	6.181818	4.078239	22
f90	f111	Philadelphia	5	6.727273	4.300408	22
f112	f133	St.Louis	6	6.818182	3.911355	22
f134	f155	Washington	7	6.136364	4.713663	22
f2	f155	All opps		6.272727	3.946162	154

$$SST_{TR} = \sum_{i=1}^r n_i (\bar{Y}_{i.} - \bar{Y}_{..})^2$$

$$SSE = \sum_{i,j} (Y_{ij} - \bar{Y}_{i.})^2$$

$$= \sum_i (n_i - 1) S_i^2$$

Set-up calculations for SS(Treatments):

$$22 \left[(7.77 - 6.27)^2 + \dots + (6.14 - 6.27)^2 \right]$$

Set-up calculations for SS(Error):

$$(22-1) \left[4.24^2 + \dots + 4.71^2 \right]$$

Set-up calculations for SS(Total):

$$SST_{TR} + SSE$$

Analysis of Variance:

ANOVA					F(.95)	
Source	df	SS	MS	F	F(0.05)	P-value
Opponents	6 = r-1	118.36	19.73	6.281	2.161	0.2696
Error	147 = r-1	2264.18	15.40			
Total	153 = r-1	2382.55				

Standard Errors and confidence intervals for "true" means: (Based on pooled estimate of σ^2): $S = \sqrt{MSE} =$

Individual opponents: 95% CI for μ_i $\sqrt{15.4} =$

$$\hat{\mu}_i = \bar{Y}_{i.} \quad S\{\bar{Y}_{i.}\} = \frac{S}{\sqrt{n_i}} = \sqrt{\frac{S^2}{n_i}} = \sqrt{\frac{15.4}{22}} = .837$$

Differences between pairs of opponents

$$CI: \bar{Y}_{i.} \pm t_{.975, 147} (.837)$$

$$\mu_i - \mu_j = \bar{Y}_{i.} - \bar{Y}_{j.}$$

$$S\{\bar{Y}_{i.} - \bar{Y}_{j.}\} = \sqrt{S^2 \left(\frac{1}{n_1} + \frac{1}{n_2} \right)} = \sqrt{\frac{15.4}{11}} = 1.183$$

$$(\bar{Y}_{i.} - \bar{Y}_{j.}) \pm t_{.975, 147} (1.183)$$