Prof. Moore

TREND ANALYSIS

Between-groups experiment to test a method of teaching English spelling to adults who are learning English. Dependent variable is the number of errors on a standardized spelling test. Independent variable is the number of learning sessions using the method before the test. n = 10.

# of sessions	1	2	3	4	5	6	$\overline{Y}_T$
$\overline{Y}_J$ = # of errors	17.8	19.5	16.3	12.7	10.7	8.8	14.3

Source	SS	df	MS	F
Mean	12269.4	1	12269.4	1740.34
Between	890.6	5	178.12	25.27
Within	380.7	54	7.05	

Graph of the cell means:
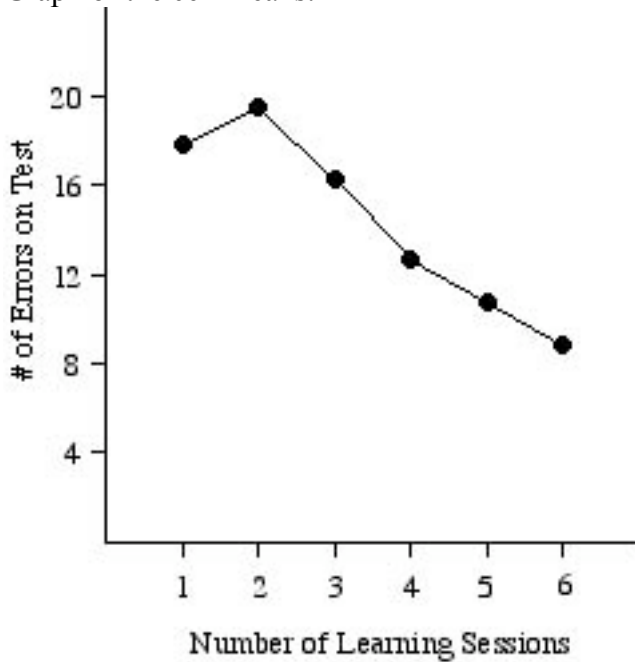
I. Is there a linear trend?

c_{jL} = -5 -3 -1 +1 +3 +5

$$SS_{Linear} = \frac{10[-5(17.8) + -3(19.5) + -1(16.3) + 1(12.7) + 3(10.7) + 5(8.8)]^2}{(70)}$$

$$= \frac{10(75)^2}{70} = 803.57$$

$$MS_{Lin} = \frac{803.57}{1} = 803.57$$

$$F_{lin} = \frac{803.57}{7.05} = 113.98 \qquad p < .05 \qquad \underline{Yes}.$$

Is there anything left over?

$$SS_{Residual} = 890.60 - 803.57 = 87.03 \qquad\qquad MS_{Res} = \frac{87.03}{4} = 21.76$$

$$F_{res} = \frac{21.76}{7.05} = 3.09 \qquad p < .05 \qquad \underline{Yes}.$$

II. Is there a quadratic trend?

c_{jQ} = 5 -1 -4 -4 -1 5

$$SS_{Quadratic} = \frac{10[5(17.8) + (-1)(19.5) + (-4)(16.3) + -4(12.7) + -1(10.7) + 5(8.8)]^2}{(84)}$$

$$= \frac{10(-13.2)^2}{84} = 20.74$$

$$MS_{Quad} = \frac{20.74}{1}$$

$$F_{quad} = \frac{20.74}{7.05} = 2.94 \quad n.s. \quad \underline{No}.$$

Is there anything left over?

$$SS_{Res} = 87.03 - 20.74 = 66.29 \qquad MS_{Res} = \frac{66.29}{3} = 22.10$$

$$F_{res} = \frac{22.10}{7.05} = 3.13 \qquad p < .05 \qquad \underline{Yes}.$$

III. Is there a cubic trend?

$$c_{j\ cubic} = -5 \quad 7 \quad 4 \quad -4 \quad -7 \quad 5$$

$$SS_{Cubic} = \frac{10[-5(17.8) + 7\ (19.5) + 4(16.3) + -4(12.7) + -7(10.7) + 5(8.8)]^2}{(180)}$$

$$= \frac{10(-31.0)^2}{180} = 53.39$$

$$MS_{Cub} = \frac{53.39}{1}$$

$$F_{cub} = \frac{53.39}{7.05} = 7.57 \qquad p < .05 \qquad \underline{Yes}.$$
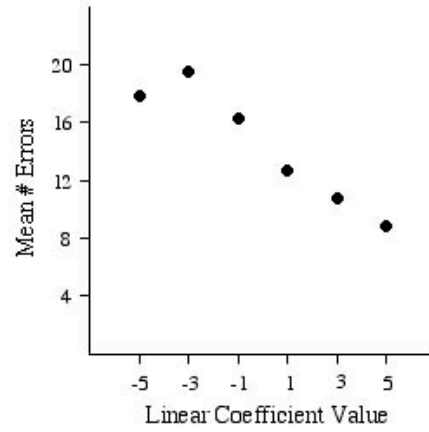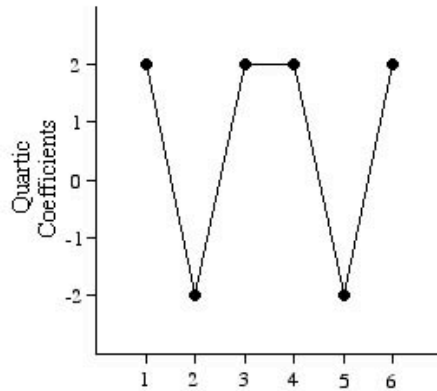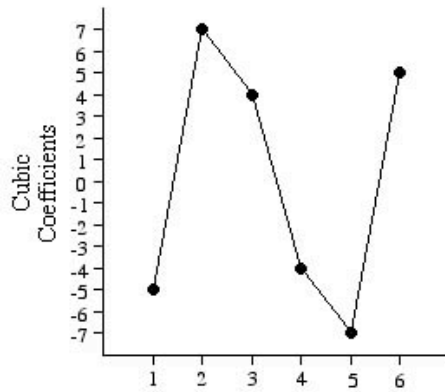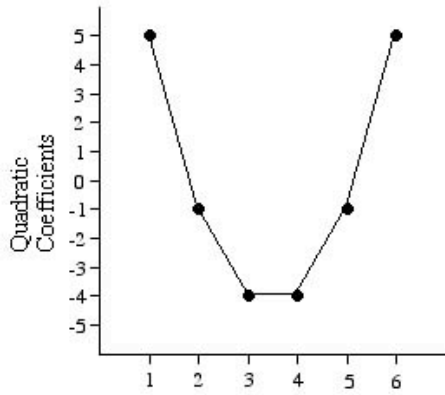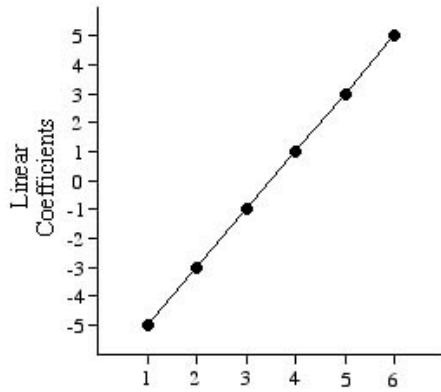
Is there anything left over?

$$SS_{Res} = 66.29 - 53.39 = 12.90 \qquad\qquad MS_{Res} = \frac{12.90}{2} = 6.45$$

$$F_{res} = \frac{6.45}{7.05} = .91 \qquad n.s.$$

Stop extracting trends here <u>unless</u> you have <u>planned comparisons</u> (that is, questions of a priori theoretical importance) which involve the higher order trends.

IV. Examining the pattern of trend coefficients tells us what they test, but in the effects (alpha j), not in the raw means.

Above: Patterns of data that the first four trend tests "look for."