

For the following tests list the number of regression (ratio scale) explanatory variables, the number of nominal scale explanatory variables (factors), and the number of interaction terms. Write a GLM with df below each term.

1. Heart rate of 30 marathon runners compared to 20 sprint runners, controlled for body size (weight)

	Regression	Factors	Interaction
	<u>1</u>	<u>1</u>	<u>1</u>

Runner

GLM: $Hr = \beta_0 + \beta_{R \cdot R} \cdot R + \beta_{Size} \cdot Size + \beta_{R \cdot Size} \cdot R \cdot Size + \epsilon$

df: $49 = 1 + 1 + 1 + 1 + 46$

2. Regression analysis of number of babies delivered per year in 17 European countries, as a function of number of storks and land area (data in Matthews 2000).

	Regression	Factors	Interaction
	<u>2</u>	<u>0</u>	<u>1 or 0</u>

GLM: $N = \beta_0 + \beta_{St} \cdot St + \beta_{Area} \cdot Area + (\beta_{St \cdot Area} \cdot St \cdot Area) + \epsilon$

df: $16 = 1 + 1 + 1 + 14$ (13)

3. With the bicycle ECG stress test, does maximum power output by male and female patients depend on whether the investigator is male or female?

	Regression	Factors	Interaction
	<u>0</u>	<u>2</u>	<u>1</u>

ntotal = 27

GLM: $PO = \beta_0 + \beta_P \cdot P + \beta_I \cdot I + \beta_{P \cdot I} \cdot P \cdot I + \epsilon$

df: $26 = 1 + 1 + 1 + 23$

$\left\{ \begin{array}{l} 2 \cdot P \cdot I \\ P \cdot Hosp \\ I \cdot Hosp \\ P \cdot I \cdot Hosp \end{array} \right.$

3-way
Not on
Exam

4. Do the results for the analysis above differ among cardiac units (different hospitals)?

	Regression	Factors	Interaction
	<u>0</u>	<u>3</u>	<u>4</u>

ntotal = 55 [challenging!]

GLM: $PO = \beta_0 + \beta_P \cdot P + \beta_I \cdot I + \beta_{Hosp} \cdot Hosp + \beta_{P \cdot I} \cdot P \cdot I + (random) + \epsilon$

df: $55 = 1 + 1 + 1 + 3 + 1 + (3+3+3) + 40$

5. Hierarchical ANOVA of wheat yield in two fields on each of 3 farms

number of observations per field: Farm1 (n=3, 3) Farm2 (n=3, 4) Farm3 (n=5, 6) $\Sigma = 24$

GLM: $Y = \beta_0 + \beta_{Fa} \cdot Farm + \beta_{Fi} \cdot Field (Farm) + \epsilon$

df: $23 = 1 + 2 + (2-1)(3) + 18$

6. Power laws are used to describe the relation of lobster egg number to size (carapace length). Compare power laws for lobsters from Virginia (n=10), Maine (n=11), Nova Scotia (n=10), and Newfoundland (n=10).

	Regression	Factors	Interaction
	<u>1</u>	<u>1</u>	<u>1</u>

GLM: $N = \beta_0 + \beta_{CL} \cdot CL + \beta_{Loc} \cdot Loc + \beta_{CL \cdot Loc} \cdot CL \cdot Loc + \epsilon$

df: $41-1 = 1 + 3 + 3 \cdot 1 + 33$

OR

$Y = \beta_0 + \beta_{Fa} \cdot Farm + \beta_{Fi(Fa)} \cdot Fi(Farm) + Obs(Field) + \epsilon$

$23 = 1 + 2 + 3 + (2+2) + (2+3) + (4+5) + 0$

Farm1 + Farm2 + Farm3