Biology 4605/7220
6 November 2002

Name	
	Exam #2b

For each of the following situations (1 and 2):

(A) Define variables in a tabular format, as follows.

name symbol scale

scale = nominal, ordinal, or cardinal cardinal = interval or ratio scale.

nv = number of variables

nt = number of terms

A. score = 3nv

B. score = nt

C. score = 2nv + 2

D. score = 1

- (B) Using the symbols, write a general linear model relating the response variable to explanatory variable(s) and interaction terms (if appropriate).
- (C) Complete the first two columns of the ANOVA table <u>source df</u>
- (D) State the name of the analysis, from the following list.

  t-test, one-way ANOVA, two-way ANOVA, three-way ANOVA
  paired comparisons, randomized blocks,
  hierarchical (nested) ANOVA
  regression, multiple regression,
  ANCOVA (at least 1 nominal and at least 1 cardinal scale explanatory variable)
  none of the above.
- 1. Height is frequently named as a good predictor variable of weight among people of the same age and gender. Roberts (*American Journal of Clinical Nutrition* 54:499) measured the heights (cm) and weights (kg) of 14 males between the ages of 19 and 26 years of age. Does weight depend on height?

  A=6 B=3 C=6 D=1

A. <u>name symbol scale</u>	C. source df

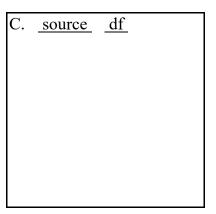
B. 
$$\underline{\hspace{1cm}} = \underline{\hspace{1cm}} + \varepsilon \hspace{1cm} [3]$$

D. [1]

2. Skinner and Allison (*J. Agric. Res.* 23:433-445) studied the effect of date of planting and amount of fertilizer (borax) on cotton growth, measured in pounds. Amount of borax was 0, 5, or 10 pounds. Three methods of borax application were (borax in drill & seed planted immediately, borax in drill & seed planted one week later, or borax broadcast). The experiment was carried out on 3 dates. When the analysis is carried out, all of the interaction terms were found to be non significant, with p-values of 0.173 or more. Write the model with no interaction terms.

A=12 B=5 C=10 D=1

A. name	symbol sca	<u>le</u>



B. 
$$\underline{\hspace{1cm}} = \underline{\hspace{1cm}} + \varepsilon \hspace{1cm} [3]$$

1995, p 21	0), then defi	ine a sy	mbol for the	ınits of μm) e observed (:	sample) me	an and th	ne true (p	opulation)
	e data on sc served mea		vidth (8 val	ues below) v	write	— (Sy	= mbol) =	[1] (Value)
	_	•		e 95% confi				[2]
MTB > : 0.0 0.0 0.0 0.0 0.0 0.0	invcdf c1 0100 -2 0250 -2 0500 -1 1000 -1 9000 1 9500 1	; S	UBC> t 7	uld you use	for the 95%	% limits \$	?	[1]
-		confic	lence limits			•••••		[2]
MTB > 1	print c2							
ScWid	th 380	376	360	368	372	366	374	382
MTB > 0	describe	c2						
	ScWidth	N 8	MEAN 372.25	MEDIAN 373.00	TRMEAN 372.25		DEV :	SEMEAN 2.60

	e for which the total Sum of Squares is 100, 15% of this and the sample size is 10. Be sure to compute MS and F-
ratio	[12]
Ab Evolain how you would so	mpute a p-value for the F-ratio in the table you have
•	re heterogeneous and non normal[2]
constructed, if the residuals we	[2]
· ·	ecrease) of <u>doubling</u> the sample size, in the ANOVA table A table for regression)[3]
	. 16
increase decrease	in MS error
increase decrease	in F-ratio
increase decrease	in p-value

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(A) Define variables in a tabular format, as follows.

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scale = nominal, ordinal, or cardinal cardinal = interval or ratio scale.

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- (B) Using the symbols, write a general linear model relating the response variable to explanatory variable(s) and interaction terms (if appropriate).
- (C) Complete the first two columns of the ANOVA table <u>source</u> <u>df</u>
- (D) State the name of the analysis, from the following list.
  t-test, one-way ANOVA, two-way ANOVA, three-way ANOVA
  paired comparisons, randomized blocks,
  hierarchical (nested) ANOVA
  regression, multiple regression,
  ANCOVA (at least 1 nominal and at least 1 cardinal scale explanatory variable)
  none of the above.
- 1. Daniel (*Biostatistics* 1995, p234) reported cell diameters (µm) of 40 lymphocytes and 50 tumor cells obtained from biopsies of tissue from patients with melanoma. Do cancerous and non-cancerous cells differ in diameter?

  A=6 B=3 C=6 D=1

A.	name	symbol	scale	

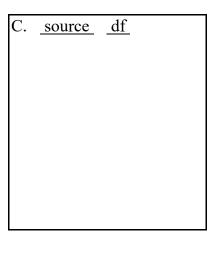
C.	source	df	

B.  $\underline{\hspace{1cm}} = \underline{\hspace{1cm}} + \varepsilon \hspace{1cm} [3]$ 

D. [1]

2. Does birth weight depend on maternal smoking, controlled for gestation period and maternal weight? Selvin (*Practical Biostatistical Methods*, 1995, Duxbury Press) reported birth weights of first infants (grams), gestation period (weeks), maternal smoking (0, 10-20, or  $\geq$ 40 cigarettes per day), and maternal weight (kg) for 48 women over 40 years old. (Assume no interactive effects of explanatory variables on the response variable, as in multiple regression).

A. <u>name</u>	symbol	scale



B. 
$$\underline{\hspace{1cm}} = \underline{\hspace{1cm}} + \varepsilon \hspace{1cm} [3]$$

of this variabilit	y is due to treatme	a table for which the total Sum of Squares is 100, 15% ent effects (control vs one treatment), and the sample IS and F-ratio
_	-	oute a p-value for the F-ratio in the table you have normal and independent, with fixed variance[2]
	,	rease) of <u>halving</u> the sample size, in the ANOVA table table with the same model structure)[3]
	decrease	in MS error
increase	decrease	in F-ratio
increase	decrease	in p-value

Rohl	lf, 1995,	p 208), tl	nen de	fine a symb	ol for the ob	served (samp	on rabbit #4 ole) mean and	the true
	For the d			width (6 val	ues below)	write	=_ (Symbol) =	[1] = (Value)
	_		-			dence limits	, ,	, , , , ,
	B > inv 0.01(	7cdf c1 00 -3 50 -2 00 -2 00 -1 00 1 00 2	0; .3649	SUBC> t	·	for the 95%	limits ?	[1]
4e. (	Compute	the 95%	confid	dence limits	·			[2]
C6 MTI	376 B > des	344 scribe	342 c6	2 372	374	360		
C6		cWidth	N 6	MEAN 361.33	MEDIAN 366.00	TRMEAN 361.33	STDEV 15.27	SEMEAN 6.23