Biology 4605/7220 Name _____
Exam #1a 2 October 2007

1. Type I error is a potential problem when rejecting the null (chance) hypothesis, while Type II error is a potential problem when accepting the null hypothesis. Circle either I or II to indicate the potential problem with each of the following decisions. [4]

An epidemiologist concludes that mortality risk does not depend on carbon tetrachloride exposure in the workplace. I II

If this error is made, who benefits financially from no regulation?
(Circle one) the worker the company
If this error is made, who bears the risk of no regulation ?
(circle one) the worker the company

The mayor of St. John's concludes that cosmetic use of herbicides (weed free lawns) poses a risk to children and pets playing on lawns. I II

2. Hypothesis testing is carried out with frequency distributions, either observed or theoretical.

What is the principal advantage of using an observed distribution ? [1]

What is the principal disadvantage (or cost) or using an observed distribution ? [1]

What is the principal advantage of using a theoretical distribution ? [1]

3. The larger the mammalian heart, the greater the tension (T) cfreated by a pressure P on the myocardium with radius r.

$$T = P \cdot r$$

If pressure doubles, does tension double ? (Circle one) Yes No

If pressure has units of $g^1\ cm^1\ sec^{-2}\ cm^{-2}$ and r has unit of cm.

What units does tension T have ? _____ [1]

What dimensions does tension T have ? _____ [1]

4a. Complete the following computations. [2]

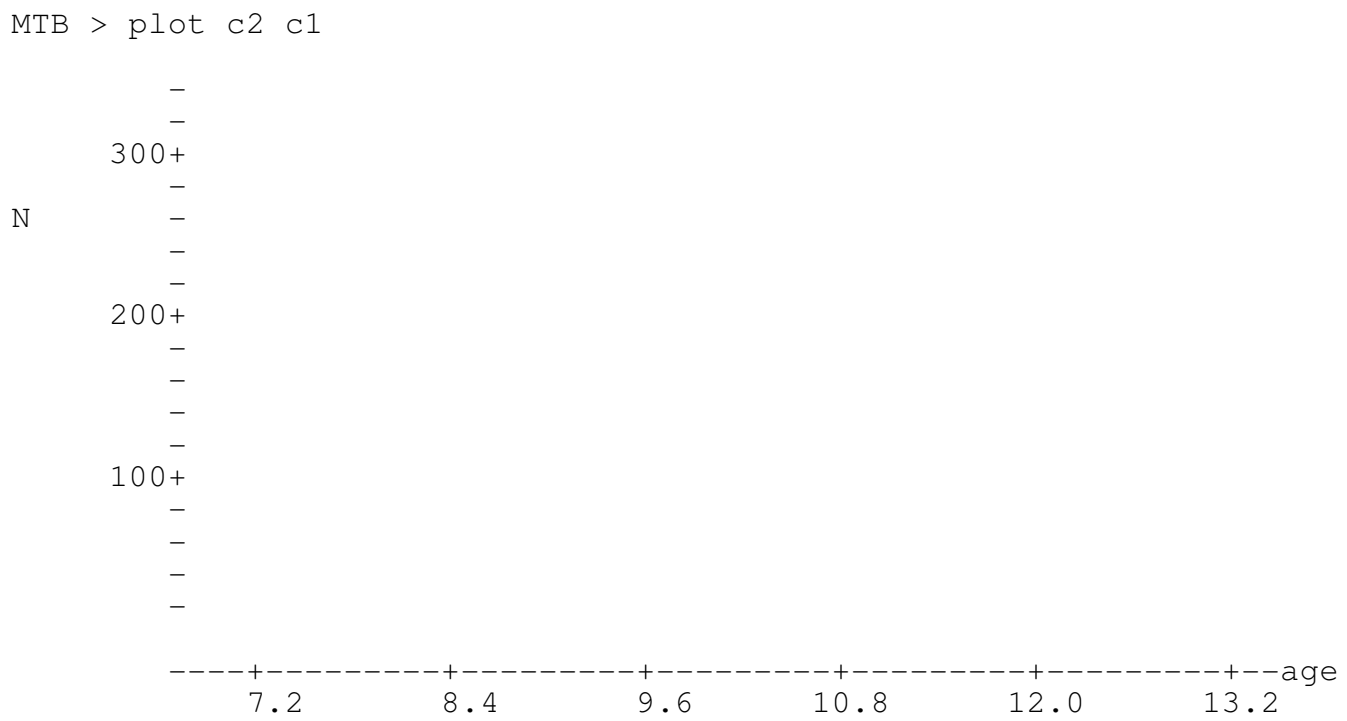
$(10\ km)^{1.2}$ = _____

$R = (1000\ kg)/kg$ $\log_{10}(R)$ = _____

4b. Convert 15 kilometres travelled in 24 hours to speed in metre/second [1]

5. List the 5 parts of a well defined biological quantity then give a five-part example [5]

6a. The sign of a residual is defined as the sign (plus or minus) of (Data − Model)




Halibut catch (N = thousands of fish) in relation to age (a = years)

Draw a straight line relation showing decrease in halibut catch with increase in age. [1]

Add 6 data points ( at ages 7.2 through 13.2 years) consistent with the following pattern of residuals + + − − − + [1]

6b. For the straight line you have drawn, estimate the slope of the line $\beta_{age}$ = _____ [1]

What units does $\beta_{age}$ have ? _____ [1]

For the data you have drawn, make a rough estimate of the mean of the 6 values of catch mean(N) = $\beta_0$ = _____[1]

6c. In words state an $H_A/H_o$ pair for testing whether catch decreases with age. [2]

Express in symbolic notation an $H_A/H_o$ pair for testing whether catch decreases with age. [2]
A convenient statistic to measure the pattern is $\beta_{age}$, the slope of the line.

7. Mendel (1865) as reprinted in *Experiments in Plant Hybridization*, Harvard University Press (1933) reported the frequency of yellow and green pea seeds in a breeding experiment.

| | Yellow | Green |
|---|---|---|
| Observed in sample | 25 | 11 |
| Expected in population | 27 | 9 |

If the proportion of yellow seeds is p, then the odds in favour of obtaining a yellow seed are defined as Odds = p/q where q = 1 − p.
Read the expression (Odds = p/q : 1) as "odds are ____ to 1."

The odds ratio, for a sample relative to a population, is defined as the odds for the sample, divided by the odds for the population.

Out of 36 seeds in the sample
what was the observed proportion of yellow seeds ? p = _____[1]

What were the odds of obtain a yellow seed in the sample ? Odds = _____[1]

What is the expected (population) proportion of yellow seeds ? p = _____[1]

What are the expected odds of obtaining yellow seeds ? Odds = _____[1]

What is the odds ratio, for the sample relative to the population ? OR = _____[1]