Biology 4605/7220   Name_____

2 October 2002   Exam #1b

1. For the following quantity, construct a frequency distribution (8).

     Pulse = P = [69 75 68 71 69 67 70 68 68 67 68] ℓ beatsℓmin^{11}

     ___67-68__   _____

     _____   _____

     _____   _____

     _____   _____

     ___75-76___   _____

2. The range is defined as the difference between the largest and smallest

value of a quantity.

                              What is the range for the Pulse data ?   _____ (1)

                    What units will the range (of the Pulse rate) have ?   _____ (1)

3a. The median is defined as the observation that has an equal number of
     observations above and below it. For the pulse data, what is the median ?   _____(1)

3b. Rescale the Pulse data from a ratio scale to a nominal scale
     by scoring a value positive if it is <u>above</u> the median
     (place + or ! sign beneath each value)

     Pulse = P = [69 75 68 71 69 67 70 68 68 67 68] ℓ beatsℓmin^{11}

                                                              (2)

4. The mean is defined as the sum of the observations, divided by the number of observations.
     The median is defined as the observation that has an equal number of observations
     above and below it. The mode is defined as the most frequently occurring observation.
     Calculate these three measures of central tendency, for the pulse data.

     Mean(Pulse) = _____ (1)

     Median(Pulse) = _____ (from above)

     Mode (Pulse) = _____ (1)

Which of these three measures of central tendency is largest _____ (1)

Is the distribution symmetrical ?   (Circle one)   Yes   No (1)

Discuss how symmetry or its lack affects the 3 measures of central tendency   (2)

5. Calculate the following quantities. Be sure you report units.

4 megameters $=$ _____ km (1)

$(30 \text{ mm})^{1.1}$ $=$ _____ (Report units here as well as a value) (2)

500 m $*$ 2 km $=$ _____ km^2 (1)

2 cm $*$ (4 cm $)^{0.5}$ $=$ _____ (Report units here as well as a value) (2)

10 calories $=$ _____ Joules (1 kilocalorie $= 4.186$ kiloJoules) (1)

8. Oxygen intake scales with body size (mass) as $Mass^{0.72}$
   Hence a doubling in body mass
   will increase oxygen intake by a factor or $2^{.72} =$ _____ (1)

   If body mass increases tenfold,
   by what factor will respiration increase ? _____ (1)

9. The Poisson distribution describes the frequency of events that are random and
   rare (*i.e.*, average success rate under 5 per sampling unit). Using the cumulative
   distribution given to you for a Poisson distribution with mean of 0.5, fill in
   the 2 blank values of the probability density function (pdf). K = no events per unit,
   1 event per unit, 2 events per unit, *etc.* (2)

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MTB > cdf;
SUBC> poisson .5.

   POISSON WITH MEAN =   0.500
   K       P ( X LESS OR = K)   P (X = K)
                  cdf             pdf
   0          0.6065           _____
   1          0.9098
   2          0.9856
   3          0.9982
   4          0.9998           _____
   5          1.0000
```

10. What is the probability of 1 or fewer balsam fir trees per unit,
    if the mean number is 0.5 balsam fir trees per sampling unit ?

    _____ (1)

11. Survival percentage is defined as $e^{! : * t}$ where : is the mortality rate (% / month)
    and t is measured in months. When the mortality is 2% / month,
    what is the survival percentage after a year ?   _____ (1)

12. An ecological geneticist, P.F. Brussard, calculated heterozygosity (H_Dps = %) of the fruitfly *Drosophila persimilis*, in relation to altitude (Elev = ft), from data reported in 1948 by Theodosius Dobzhansky at mountainous locations in Yosemite Park in California.

Calculate the expected heterozygosity at an elevation of 10000 ft, assuming

H_Dps = 0.58 ! 0.000039 * Elev

Heterozygosity at 10000 ft = H_Dps(10000 ft) = _____ (1)

Write a data equation, for an observed value of H_Dps = 0.68 (68%) at 10000 ft

_____ = _____ + _____ (3)

$\$_{Elev}$ = ! 0.000039 is a parameter with units of _____ (1)

$\$_{Elev}$ = ! 0.000039 is a parameter with dimensions of _____ (1)

In words, what does $\$_{Elev}$ measure ? _____(1)

13. Set up a pair of statistical hypotheses (H_A and H_o) concerning whether heterozygosity changes with altitude. Use $\$_{Elev}$ in forming both hypotheses.

(1)

14. For the following situations would you accept or reject the null hypothesis (H_o), that the observed outcome is JUST LUCK ?   p is the probability of the observed outcome, calculated from a frequency distribution that applies when the H_o is true.

Circle one.

" = 5 %   1 ! p = 98%   Accept H_o Reject H_o (1)

" = 5 %   p = 4.7%   Accept H_o Reject H_o (1)

" = 10%   p = 13 %   Accept H_o Reject H_o (1)