

# Biometry, Math 2520

February 16, 2007

## Midterm 1

**YOUR NAME:**

**Show all your work!**

*After you get the test back, if you consider that something was incorrectly graded,*

**DO NOT WRITE ON YOUR TEST!**

As clearly as possible write down your version of the story on a clean sheet of paper, attach it to your test, and give it back to your instructor for further consideration.

<b>problem</b>	<b>points</b>	<b>score</b>
<b>1</b>	20 pts	
<b>2</b>	20 pts	
<b>3</b>	20 pts	
<b>4</b>	20 pts	
<b>5</b>	20 pts	
<b>TOTAL</b>	100 pts	

1. Disease  $X$  is found in .1 of a population of termites. If you take 325 samples of size 6, how many samples do you expect to have exactly 3 termites with disease  $X$ ?

2. Disease  $Y$  has prevalence .08, and a new diagnostic test for it is proposed. Studies find that the specificity of the new test is .94 and its sensitivity is .88. What is this test's positive predictive value? Is this a worthwhile test?

3. Calculate the arithmetic mean, standard deviation, geometric mean, harmonic mean, skewness ( $g_1$ ), and kurtosis ( $g_2$ ) of the following data:

4 2 1  
5 3 4  
3 2 3

$$\begin{aligned}\bar{Y} &= \boxed{\phantom{000}} \\ s &= \boxed{\phantom{000}} \\ GM_Y &= \boxed{\phantom{000}} \\ HM_Y &= \boxed{\phantom{000}} \\ g_1 &= \boxed{\phantom{000}} \\ g_2 &= \boxed{\phantom{000}}\end{aligned}$$

4. Tyrannosaurus Rex skulls so far identified have average length  $1.13m$  with a standard deviation of  $.11$ . Assume that these lengths are normally distributed.

(a) What proportion of T. Rex skulls are between  $1.02m$  and  $1.20m$  long?

(b) What proportion of T. Rex skulls are more than  $1.50m$  long?

(c) A new skull is unearthed, measuring  $.65m$  in length. How likely is it that this is a T. Rex skull?

5. In the U.S., over the 18 years from 1987-2004, there were 67 amusement ride fatalities, occurring with the following frequencies (Source: U.S. Consumer Product Safety Commission, DTHS and IPII):

Number of fatalities ( $Y$ )	Number of years ( $f$ )	$fY$	$y$	$fy^2$	Expected Poisson frequencies	Deviation from expectation
0	1	0	-3.72	13.85		
1	1	1	-2.72	7.41		
2	3	6	-1.72	8.90		
3	3	9	-0.72	1.56		
4	5	20	0.28	0.39		
5	2	10	1.28	3.27		
6	1	6	2.28	5.19		
7	1	7	3.28	10.74		
8	1	8	4.28	18.30		

$$\bar{Y} = 3.722 \quad s^2 = \boxed{\phantom{000}} \quad CD = \boxed{\phantom{000}}$$

Fill in the last two columns of this table and calculate  $s^2$  and the coefficient of dispersion. Does this data fit a Poisson distribution?