

Math 310 Winter 2021 Test 1 Due Sunday Feb. 28th at midnight.

Your work should be typed and submitted through Canvas.

1. Oompa-Loompas are known to have dangerously high levels of cotton candy in their bloodstream. Employees in certain areas of the chocolate factory have even higher levels. The attached data shows the cotton candy levels (mg/mL) of Oompa-Loompas in 4 different regions of the factory. Is there one area more dangerous than the others for cotton candy levels?
2. The paper “Quantitative Assessment of Glenohumeral Translation in Baseball Players” considered various aspects of shoulder motion for a sample of pitchers and another sample of position players [glenohumeral refers to the articulation between the humerus (ball) and the glenoid (socket)]. The attached data gives the anteroposterior translation (mm), a measure of the extent of anterior and posterior motion, both for the dominant arm and the nondominant arm.
  - (a) Estimate the true average difference in translation between dominant and nondominant arms for pitchers and give a 95% confidence interval.
  - (b) Repeat part (a) for position players
  - (c) The authors assert that “pitchers have greater difference in side-to-side anteroposterior translation of their shoulders compared with position players.” Do you agree? Explain.
3. Can the right diet help us cope with diseases associated with aging such as Alzheimer’s disease? A study investigated the effects of fruit and vegetable supplements in the diet of rats. The rats were 19 months old, which is aged by rat standards. The 40 rats were randomly assigned to four diets, of which we will just consider the blueberry diet and the control diet. We give the data for just one of the tests, which measured how many seconds they could walk on a rod. Here are the times for the ten control (C) and then blueberry (B) rats:  
C: 15.00, 7.00, 2.44, 5.60, 3.63, 6.24, 4.12, 8.21, 3.90, 0.95  
B: 5.12, 9.38, 18.77, 15.03, 6.67, 7.91, 7.38, 15.09, 11.57, 8.98
4. Derive a formula for the confidence interval for  $\frac{\sigma_2^2}{\sigma_1^2}$  based on the probability statement

$$P(F_{1-\alpha/2, \nu_2, \nu_1} < F < F_{\alpha/2, \nu_2, \nu_1}) = 1 - \alpha$$