Quiz 9.1B AP Statistics Name:

1. For each of the following settings, define the parameter of interest and write the appropriate null and alternative hypotheses for the test that is described.

   (a) The mean time needed for college students to complete a certain paper-and-pencil maze is 30 seconds. You wish to see if this is changed by vigorous exercise, so you have a randomly selected group of 25 students from a particular college exercise vigorously for 30 minutes and then complete the maze.

   (b) Lumber companies dry freshly-cut wood in kilns before selling it. As a result of the drying process a certain percentage of the boards become "checked," which means that cracks develop at the ends of the boards. The current drying procedure for 1" x 4" red oak boards is known to produce cracks in 16% of the boards. The drying supervisor at a lumber company wants to test a new method to determine if fewer boards crack.

2. Consider the lumber problem in question 1(b). Suppose the drying supervisor uses the new method on an SRS of boards and finds that the sample proportion of checked boards is 0.11, which produces a *P*-value of 0.027.

   (a) Interpret the *P*-value in the context of the problem.

   (b) What conclusion would you draw at the α 0.05 level? At the $\alpha = 0.01$ level?

3. As a construction engineer for a city, you are responsible for ensuring that the company that is providing gravel for a new road puts as much gravel in each truckload as they claim to. It has been estimated that it will take 500 truckloads of gravel to complete this road, so you plan to measure the volume of gravel in an SRS of 25 trucks to make sure that the company isn't delivering less gravel per truckload than they claim. Each truckload is supposed to have 20 m^3 of gravel, so you will test the hypotheses $H_0 : \mu = 20$ *versus* $H_a : \mu < 20$ at the $\alpha = 0.05$ level.

(a) Describe what a Type I error would be in this context.

(b) What is the probability of making a Type I error when performing this test?

(c) Describe what a Type II error would be in this context.

(d) Which error—Type I or Type II—is a more serious problem for the city? Explain.