

Quiz #10

Please, write clearly and justify all your steps, to get proper credit for your work. If you use R, you must report the commands you use with all relevant parameters.

(1) [5 Pts] A rubber compound was tested for tensile strength and the following values were found

33, 30, 29, 31, 32, 31, 30, 34, 29, 31, 33

(a) Assuming that the population is normally distributed, test the hypothesis that the average tensile strength is less than 32. Use $\alpha = 0.05$. You must state the hypothesis testing problem and report your conclusion.

(b) Calculate the p -value of the test and state the meaning of the p -value.

(a) We test the hypothesis

$$H_0 : \mu \geq 32;$$

$$H_1 : \mu < 32.$$

R solution

```
> x <-c(33, 30, 29, 31, 32, 31, 30, 34, 29, 31, 33)
> t.test(x,mu=32,alternative = "less")
```

We find

$$t = -1.6323, df = 10, p - value = 0.06683$$

Since $p - value > 0.05$, **we do not reject H_0** .

(b) The p -value is the smallest value of the type I error α at which we can reject H_0 .

(2) [5 Pts] State DMV records indicate that of all vehicles undergoing emissions testing during the previous year, 74% passed on the first try. A random sample of 200 cars tested in a particular county during the current year yields 158 that passed on the initial test. Does this suggest that the true proportion for this county during the current year is greater than the previous statewide proportion? Test the relevant hypotheses using $\alpha = 0.05$. You must state the hypothesis testing problem and report your conclusion.

We test the hypothesis

$$H_0 : p \leq 0.74;$$

$$H_1 : p > 0.74.$$

We use R: `prop.test(158,200,p=0.74,alternative = "greater",correct = FALSE)`

and we find

```
X-squared = 2.5988, df = 1, p-value = 0.05347
```

```
sample estimates: p =0.79
```

Since the p -value is larger than $\alpha = 0.05$, **we do not reject H_0** .