T1T2Chpt

T1-11

```r
radon<-c(91.9, 97.8, 111.4, 122.3, 105.4, 95.0, 103.8, 99.6, 96.6, 119.3, 104.8, 101.7)

# I will be using this function for (1) but changing the values accordingly
power.t.test(power=0.70, delta=10, sd=sd(radon), type=c("one.sample"))
```

```
##
##      One-sample t test power calculation
##
##               n = 7.559808
##           delta = 10
##              sd = 9.397421
##       sig.level = 0.05
##           power = 0.7
##     alternative = two.sided
```

```r
# I will be using this function for (2) but changing the values accordingly
power.t.test(n=10, delta=5, sd=9.40, type=c("one.sample"))
```

```
##
##      One-sample t test power calculation
##
##               n = 10
##           delta = 5
##              sd = 9.4
##       sig.level = 0.05
##           power = 0.3244058
##     alternative = two.sided
```

(1)

	power		
delta	0.7	0.8	0.9
5	23.8 (24)	30 (29.7)	39
10	8 (7.55)	9	12 (11.37)

Note: In this part, the values in the bracket are the exact measurements found, while the values outside the brackets are the practically applicant values which are rounded up for real-world use since we can't have a fractional number of observations.

	observations		
S	10	20	30
5.0	0.803	0.988	0.999
9.4	0.324	0.617	0.804

Figure 1: Part(2)

(2)

(3) The 2 extreme values in the first table are n = 8 (or 7.55) and n = 39. A large gap (delta) between the null hypothesis and the alternative hypothesis means that type II error is naturally low, and thus a high power can be achieved with a tiny sample size. Note that more power, even at a high delta, requires more observations. In the same vein, a small delta paired with a large power requires a much larger number of observations.

In the second table, the values pow=0.324 and pow=0.999 are the most extreme; a small sd naturally reduces the spread and thus the type II error, and a large n helps in that as well, which causes a very high power in the first row, third column. When sd is high (or in this case, realistic), and we are limited to a small number of observations, the power is low.

T2-10

```r
# The answer to the first part of the checkpoint
mosquitoes<-read.csv("mosquitoes.csv")
t.test(mosquitoes$transgenic, mosquitoes$wildtype, alternative = c("less"), conf.level = 0.98)
```

```
##
##  Welch Two Sample t-test
##
## data:  mosquitoes$transgenic and mosquitoes$wildtype
## t = -2.4106, df = 169.67, p-value = 0.008497
## alternative hypothesis: true difference in means is less than 0
## 98 percent confidence interval:
##       -Inf -0.5995298
## sample estimates:
## mean of x mean of y
##  16.54545  20.78409
```

(2) When the confidence interval includes zero, we fail to reject the null hypotheses conclusion that the difference of proportions is zero. Therefore, in this case since the 98% confidence interval does contain 0, we would fail to reject the null hypothesis at the 2% level using the two-sided hypothesis test.

(3) The p-value for a one-sided test will be twice the p-value for a 2 sided test. In this case, this p-value for a one-sided test will be 0.016994