Homework 7 solution

- 7.5.13

  $\mu_1 =$ the mean of the "settler density" at 250 meters from the crest

  $\mu_2 =$ the mean of the "settler density" at 800 meters from the crest.

  We want to test $H_0 : \mu_1 = \mu_2$ vs. $H_a : \mu_1 > \mu_2$ (that is, the settler density decreased as distance from the reef crest increased)

  We do not need to check normality because the sample size is sufficient large. Code:

  ```
  > m250=c(.......)
  > m800=c(.......)
  > t.test(m250,m800,alternative="greater")

  Welch Two Sample t-test

  data:  m250 and m800
  t = 1.995, df = 89.843, p-value = 0.02454
  alternative hypothesis: true difference in means is greater than 0
  95 percent confidence interval:
   0.0317016          Inf
  sample estimates:
  mean of x mean of y
  0.8177500 0.6278125
  ```

  Since p-value$= 0.025 < 0.05$, we reject the H_0 and conclude that the settler density decreased as distance from the reef crest increased.

- 7.7.3(a)

  ```
  > power.t.test(delta=2,sd=0.8,sig.level=0.05,power=0.90,
  + type="two.sample",alternative="one.sided")

        Two-sample t test power calculation

                n = 3.678026
            delta = 2
               sd = 0.8
        sig.level = 0.05
            power = 0.9
      alternative = one.sided

  NOTE: n is number in *each* group
  ```

  So each sample we need 4 seedlings.

- 8.2.3 This is a paired design.

```
> control<-c(6.01,2.28,1.51,2.12)
> treatment<-c(5.23,1.21,1.40,1.38)
> t.test(control,treatment,paired=TRUE)

Paired t-test

data:  control and treatment
t = 3.3387, df = 3, p-value = 0.04443
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 0.0315868 1.3184132
sample estimates:
mean of the differences
                  0.675
```

p-value$= 0.04 < 0.05$. We reject H_0 and we have enough evidence to conclude that progesterone has effect on cAMP.

- 8.4.6

```
> northern=c( 0,  0,  0,  2,  0,  2,  1,  0)
> carolina=c( 9,  6,22,16,17,33,24,40)
> binom.test(0,8)

Exact binomial test

data:  0 and 8
number of successes = 0, number of trials = 8, p-value = 0.007812
alternative hypothesis: true probability of success is not equal to 0.
95 percent confidence interval:
 0.0000000 0.3694166
sample estimates:
probability of success
                     0
```

p-value$= 0.007812 < 0.005$, we reject the H_0. We have enough evidence to conclude that one bird displayed dominance over the other.