SAT Scores Again

- Verbal: t-test and Confidence Interval

```r
> mean(verbal)
[1] 598.49
> t.test(verbal,mu=600)

One Sample t-test

data: verbal
t = -0.1986, df = 99, p-value = 0.843
alternative hypothesis: true mean is not equal to 600
95 percent confidence interval:
  583.4042 613.5758
sample estimates:
mean of x
  598.49
```

- Verbal: Two-sided Versus One-sided Tests

```r
> t.test(verbal,mu=600,alternative="two.sided")

One Sample t-test

data: verbal
t = -0.1986, df = 99, p-value = 0.843
alternative hypothesis: true mean is not equal to 600
95 percent confidence interval:
  583.4042 613.5758
sample estimates:
mean of x
  598.49

> t.test(verbal,mu=600,alternative="less")

One Sample t-test

data: verbal
t = -0.1986, df = 99, p-value = 0.843
alternative hypothesis: true mean is less than 600
95 percent confidence interval:
  583.4042
lower bound cannot be estimated
sample estimates:
mean of x
  598.49
```
data: verbal
$ t = -0.1986, \text{df} = 99, \text{p-value} = 0.4215$
alternative hypothesis: true mean is less than 600
95 percent confidence interval:
-Inf 611.1138
sample estimates:
mean of x
598.49

> t.test(verbal,mu=600,alternative="greater")

One Sample t-test

data: verbal
$ t = -0.1986, \text{df} = 99, \text{p-value} = 0.5785$
alternative hypothesis: true mean is greater than 600
95 percent confidence interval:
585.8662 Inf
sample estimates:
mean of x
598.49

• Verbal: Changing $\mu$

> t.test(verbal,mu=620)

One Sample t-test

data: verbal
$ t = -2.8292, \text{df} = 99, \text{p-value} = 0.00565$
alternative hypothesis: true mean is not equal to 620
95 percent confidence interval:
583.4042 613.5758
sample estimates:
mean of x
598.49

> t.test(verbal,mu=620,alternative="less")

One Sample t-test
data: verbal
  t = -2.8292, df = 99, p-value = 0.002825
alternative hypothesis: true mean is less than 620
95 percent confidence interval:
  -Inf 611.1138
sample estimates:
  mean of x
  598.49

> t.test(verbal,mu=620,alternative="greater")

One Sample t-test

data: verbal
  t = -2.8292, df = 99, p-value = 0.9972
alternative hypothesis: true mean is greater than 620

• Math: Confidence Interval and t-test

> t.test(math)

One Sample t-test

data: math
  t = 99.6647, df = 99, p-value = < 2.2e-16
alternative hypothesis: true mean is not equal to 0
95 percent confidence interval:
  641.0874 667.1326
sample estimates:
  mean of x
  654.11

• Two-sample t-test for Math and Verbal

> t.test(math,verbal,mu=0)

Welch Two Sample t-test

data: math and verbal
t = 5.5377, df = 193.867, p-value = 9.88e-08
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
  35.81078  75.42922
sample estimates:
mean of x  mean of y
    654.11    598.49

> t.test(math, verbal, mu=0, alternative="greater")

    Welch Two Sample t-test

    data:  math and verbal
t = 5.5377, df = 193.867, p-value = 4.94e-08
alternative hypothesis: true difference in means is greater than 0
95 percent confidence interval:
     39.02003      Inf
sample estimates:
mean of x  mean of y
    654.11    598.49

> t.test(math, verbal, mu=0, alternative="less")

    Welch Two Sample t-test

    data:  math and verbal
t = 5.5377, df = 193.867, p-value = 1
alternative hypothesis: true difference in means is less than 0
95 percent confidence interval:
-Inf      72.21997
sample estimates:
mean of x  mean of y
    654.11    598.49

> t.test(math, verbal, mu=50)

    Welch Two Sample t-test

    data:  math and verbal
t = 0.5595, df = 193.867, p-value = 0.5764
alternative hypothesis: true difference in means is not equal to 50
95 percent confidence interval:
   35.81078  75.42922
sample estimates:
mean of x  mean of y
     654.11     598.49