2. School athletics has taken a new instructor, and want to test the effectiveness of new type of training proposed, comparing average times of 10 runners

Before	12.9	13.5	12.8	15.6	17.2	19.2	12.6	15.3	14.4	11.3
After	12.7	13.6	12.0	15.2	16.8	20.0	12.0	15.9	16.0	11.1

T-test ?

ans

```
> before = c( All values of 'before')
> after = c(All values of 'After')
> t.test (before, after, paired = TRUE)
```

Paired T-test

data: before and after

t = -0.21331, df = 9, p-value = 0.8358

alternative hypothesis: true difference in means is not equal to zero

95 percent confidence interval:

-0.5802549 0.4802549

sample estimates:

mean of differences : -0.05

Interpretation:

P-value greater than 0.05, we do not reject H_0 of equality of averages.

4. 5 measurements of the output of 2 units. (kg/hr)
Assume both are obtained from normal populations, test at 10% significance level if 2 populations have same variance

A :	14.1	10.1	14.7	13.7	14.0
B :	14.0	14.5	13.7	12.7	14.1

$H_0 : S_1^2 = S_2^2$ $H_1 : S_1^2 \neq S_2^2$

ans
```
> A = c(14.1, 10.1, 14.7, 13.7, 14.0)
> B = c(14.0, 14.5, 13.7, 12.7, 14.1)
> var.test(A,B)

        F-test to compare two variances

data: A and B
F= 7.3304, num df = 4, denom df = 4,
        p-value = 0.07954

alternative hypothesis: true ratio of variance ≠ 1
95 percent confidence interval:
    0.7632268        70.4053799
sample estimates:
 ratio of variances: 7.330435
```

Here $p > 0.05$, no evidence to reject null hypothesis