**Q1. **

> n = 10

> x1 = c(12.9, 13.5, 12.8, 15.6, 17.2, 19.2, 12.6, 15.3, 14.4, 11.3)

> x2 = c(12.7, 13.6, 12.0, 15.2, 16.8, 20.0, 12.0, 15.9, 16.0, 11.1)

>

> t.test(x1, x2, paired=TRUE)

Paired t-test

data: x1 and x2

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

alternative hypothesis: true difference in means is not equal to 0

95 percent confidence interval:

-0.5802549 0.4802549

sample estimates:

mean of the differences

-0.05

**P-value is greater than 0.05, thus Null Hypothesis of equality of averages is not rejected and the training has not made any significant improvement in the performance**

**Q2.**

****

> mean = 25

> sd = 5

> x = c(24, 20, 30, 20, 20, 18)

> n = 6

>

> t.test(x, mu=mean, alt='less')

One Sample t-test

data: x

t = -1.6771, df = 5, p-value = 0.07719

alternative hypothesis: true mean is less than 25

95 percent confidence interval:

-Inf 25.60463

sample estimates:

mean of x

22

> qt(1-0.01, 5)

[1] 3.36493

**Since t-value is smaller than qt value and p-value is slightly greater than 0.05, Null hypothesis is accepted and the claims are correct**

**Q3.** ****

> x = c(237, 289, 257, 228, 303, 275, 262, 304, 244, 233)

> y = c(194, 240, 230, 186, 265, 222, 242, 281, 240, 212)

> n = 10

>

> t.test(x, y, paired=TRUE, alt='less')

Paired t-test

data: x and y

t = 6.5594, df = 9, p-value = 0.9999

alternative hypothesis: true difference in means is less than 0

95 percent confidence interval:

-Inf 40.94289

sample estimates:

mean of the differences

32

> qt(1-0.05, 9)

[1] 1.833113

**Since p-value is more than 0.05, the null hypothesis is rejected**

**Since t-value is more than qt value, null hypothesis is rejected. The drug does not lower cholestrol.**

**Q4.**

**28**

> r = c(16, 20, 21, 22, 23, 22, 27, 25, 27, 28)

> p = c(19, 22, 24, 24, 25, 25, 26, 26, 28, 28)

>

> t.test(r, p, paired=TRUE, alt='greater')

Paired t-test

data: r and p

t = -3.7482, df = 9, p-value = 0.9977

alternative hypothesis: true difference in means is greater than 0

95 percent confidence interval:

-2.38251 Inf

sample estimates:

mean of the differences

-1.6

> qt(1-0.05, 9)

[1] 1.833113

**Since p-value is greater than 0.05 and t-value is greater than qt value, The null hypothesis is rejected and the car gets significant better mileage on the premium fuel.**

**Q5.** ****

> a = c(14.1, 10.1, 14.7, 13.7, 14.0)

> b = c(14.0, 14.5, 13.7, 12.7, 14.1)

> t.test(a, b)

Welch Two Sample t-test

data: a and b

t = -0.54829, df = 5.0714, p-value = 0.6068

alternative hypothesis: true difference in means is not equal to 0

95 percent confidence interval:

-2.720901 1.760901

sample estimates:

mean of x mean of y

13.32 13.80

> qt(1-0.1/2, 8)

[1] 1.859548

**p-value is more than 0.05 and t value is less than qt value. Thus null hypothesis is accepted and machines have equal variance**