Problem 1

42/44 great!

(1) False

(2) True

(3) False

-1

(4) False

(5) False

(6) False

Problem 2

(1)

A congressman will support building a dam if more than 60% of his constituents support it. A sample of 225 registered voters shows that 145 favor the dam.

Step 1: State the Hypothesis

Null Hypothesis (H_0): p = 0.60

Alternative Hypothesis (H_a): p > 0.60

Step 2: Formula for Test statistic

For proportion test, the test statistic is

z = $(phat - po) / sqrt(po(1 - po) / n)$

sample proportion

phat = 145 / 225 = 0.6444 , po = 0.60, n = 225

Step 3: Find the rejection region/ critical value/ p value

$Pr(Z > z_\alpha) = 0.10$

Using normal table we get

$z_{0.10}$ = 1.2815

Step 4: Compute the test statistic

$z = (0.6444 - 0.60) / \sqrt{0.60(1- 0.60) / 225}$

$z = 1.3594$

p - value :

p value = $Pr(Z > 1.3594)$

$Pr(Z < 1.36) = 0.9131$

p - value = 1 - 0.9131

p - value = 0.0869

Step 5: Conclusion and Interpretation

The computed test statistic value z (1.36) exceeds the test critical value (1.28), and the p-value (0.087) is less than α (0.10), we reject Null Hypothesis H_0. We can conclude that the data provides enough evidence that at alpha = 0.10 to suggest that p > 0.60 and the congressman should the dam.

(2) Two-sided 95% Confidence Interval

$phat \pm z_{\alpha/2} \sqrt{phat(1 - phat) / n}$

phat = 0.6444, n = 225 , alpha = 0.05 , alpha / 2 = 0.025, $P(Z \leq z_{\alpha/2}) = 1 - 0.025 = 0.975$

$z_{0.975} = 1.959964 = 1.96$

0.6444 ± 1.96 sqrt(0.6444 (1 - 0.6444) / 225)

The Two-sided 95% confidence interval of the proportion of his constituents
who supported the dam is: (0.5818 , 0.7069)

(3) Normal Assumption

For the normal approximation to be valid when testing proportions, both np_o and $n(1 - p_o)$ should be atleast 10

$np_o = 225 * 0.60 = 135$

$n(1 - p_o) = 225 * (1 - 0.60) = 90$

Both are well above 10, the normal approximation is satisfied here.

Problem 3

```
ph <- c(5.335, 5.345, 5.395, 5.305, 5.315, 5.380, 5.520, 5.190,
        5.455, 5.330, 5.360, 6.285, 5.350, 5.125, 5.115, 5.510,
        5.340, 5.340, 5.305, 5.265)
```

part - 2

```
t_test_one_sided <- t.test(ph, mu = 5.40, alternative = "great", conf.level = 0.95)
t_test_one_sided
```

greater

One Sample t-test

data: ph
t = -0.40957, df = 19, p-value = 0.6567
alternative hypothesis: true mean is greater than 5.4
95 percent confidence interval:
 5.286426   Inf
sample estimates:
mean of x

test statistic = -0.4095
P-value = 0.6567
95% confidence interval = [5.2864, Inf]

part - 5

```
t_test_two_sided <- t.test(ph, conf.level = 0.95)
t_test_two_sided
```

One Sample t-test

data: ph
t = 101.28, df = 19, p-value < 2.2e-16
alternative hypothesis: true mean is not equal to 0
95 percent confidence interval:
 5.267102 5.489398
sample estimates:
mean of x
  5.37825

test statistic = 101.28
P-value < 2.2e-16
95% confidence interval = [5.2671, 5.4893]

Problem 4

(1)

The bottler's claim is that less than 10% drink another brand.

Null Hypothesis (H_0): p = 0.10

Alternative Hypothesis (H_a): p < 0.10

n = 100, x = 18, p = 0.1, phat = 18/100 = 0.18

```
prop.test(x = 18, n = 100, p = 0.1, alternative = "less", correct = FALSE)

1-sample proportions test without continuity correction

data:  18 out of 100, null probability 0.1
X-squared = 7.1111, df = 1, p-value = 0.9962
alternative hypothesis: true p is less than 0.1
95 percent confidence interval:
 0.0000000 0.2513522
sample estimates:
   p
0.18
```

Chi-square Statistic: 7.1111

Z - value = sqrt(Chi-square Statistic) = sqrt(7.1111) = 2.6666

P- value = 0.9962

95% Confidence Interval: (0, 0.2513)

P value greater than alpha value. We fail to reject the null hypothesis. We conclude that the data provide insufficient evidence to support the bottler's claim that less than 10% of its customers drink another brand.

(2)

95% Confidence Interval

phat $\underline{+}$ $z_{alpha/2}$ √phat(1 - phat) / n

phat = 0.18, alpha = 0.05 , alpha / 2 = 0.025, P(Z $\leq$ $z_{\alpha/2}$) = 1 - 0.025 = 0.975, $z_{0.975}$ = 1.96, n = 100

0.18 $\underline{+}$ 1.96 (√0.18(1 - 0.18) / 100

95% Confidence Interval: (0.1047 , 0.2553)

(3)

For the normal approximation to be valid when testing proportions, both np_o and $n(1 - p_o)$ should be atleast 10

$np_o = 100 * 0.18 = 18$

$n(1 - p_o) = 100 * (1 - 0.18) = 82$

Both are well above 10, the normal approximation is satisfied here.

$p_o = 0.10$
not 0.18

-1