

SI Assignment 2

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Question 1:

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Given: 70% or more of mother's generation would have names with "xo" at the end, the proportion has dropped among the peers
 $n=70$ $\hat{p}=0.48$ $\alpha=0.05$

Hypothesis to be tested:

$$H_0: p \geq 0.7$$

$$H_a: p < 0.7$$

Assumptions:

$$np = (90) \times (0.7) = 63 > 5$$

$$nq = (90) \times (1 - (0.7)) = 27 > 5$$

Sample is a random sample

We have fixed number of independent trials i.e 90 and constant success probability

There are 2 outcomes. Therefore, conditions of binomial dist. are satisfied:-

Test-statistics:

$$Z = \frac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}}$$

Z statistics

If it is less than z critical value then reject else accept

Values in R:

```
> cat('Names ending with KO: ',countKO)
Names ending with KO:  50
> cat('Names not ending with KO: ',countNotKO)
Names not ending with KO:  40
> cat('Z-satistics: ',z)
Z-satistics:  -2.990284
> cat('Z critical value: ',z2)
Z critical value:  -1.645
> cat('Z P-value: ',p3)
Z P-value:  0.00139359
> |
```

Inference:

One can claim that friend's names ending with 'ko' are less than 70% as P-value is less than alpha which is 0.05 and Z statistics is also less than Z Critical Value. It lies in rejection region hence H_0 hypothesis is rejected.

Question 2:

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Given:

Dataset with size ~~data~~ 10
of work hours with breakfast and
work hours without breakfast
 $\alpha = 0.05$

Hypothesis to be tested:

$$H_0: \mu_d \leq 2$$

$$H_a: \mu_d > 2$$

Assumptions:

Sample data is dependent and simple random.

Test Statistics:

$$t = \frac{\bar{x} - \mu_0}{s/\sqrt{n}}$$

T-distribution test stat

If T-statistic < T critical value

→ reject null hypothesis
else accept

If $\alpha > P\text{-value}$

→ reject null hypothesis
else accept

Values in R:

```
> cat('T Critical value: ',Tcritical)
T Critical value:  1.833113
> cat('T Statistics: ',Tstat)
T Statistics:  0.2457696
> cat('T P-value: ',Tpvalue)
T P-value:  0.4056868
> |
```

Inference:

From our testing, we can claim that when workers have eaten breakfast the work is better than when workers have not eaten breakfast as T P-value is less than alpha which is 0.05 and T statistics is less than T critical value. It lies in rejection region therefore H_0 hypothesis is rejected.