Experiment 12

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2. Aim: To test whether population mean is equal to $10 at 5% level of significance.

Define

$$H_0 : \mu = 10$$

$$H_1 : \mu \neq 10$$

```
n = 64
sig = 6
xbar = 12

Z = (xbar - 10)/(sig/sqrt(n))  # Z Statistic
Z
```

```
## [1] 2.666667
```

```
# Critical Values two sided
c(qnorm(0.05/2),qnorm(0.05/2,lower.tail = F))
```

```
## [1] -1.959964  1.959964
```

```
# 95% confidence interval
c(xbar- qnorm(0.05/2,lower.tail = F)*(sig/sqrt(n)),
xbar+ qnorm(0.05/2,lower.tail = F)*(sig/sqrt(n)))
```

```
## [1] 10.53003 13.46997
```

Here

$$|Z| > z_{\alpha/2}$$

$\therefore H_0$ is rejected.

3. Aim: To test the difference of two population means at 1% level of significance.

Define

$$H_0 : \mu_1 = \mu_2$$

$$H_1 : \mu_1 \neq \mu_2$$

```
n1 = 400
n2 = 400
x1bar = 250
x2bar = 220
sig1 = 40
sig2 = 55
SE = sqrt(sig1^2/n1 + sig2^2/n2)  # Standard Error

Z1 = ((x1bar - x2bar)-0) /SE  # Z Statistic
Z1
```

```
## [1] 8.822575
```

```
# two sided
# Critical Value at 5% level of significance
c(qnorm(0.01/2),qnorm(0.01/2,lower.tail = F))
```

```
## [1] -2.575829  2.575829
```

```
# 99% confidence interval
c((x1bar - x2bar)- qnorm(0.01/2,lower.tail = F)*SE,
(x1bar - x2bar)+ qnorm(0.01/2,lower.tail = F)*SE)
```

```
## [1] 21.24123 38.75877
```

Here

$$|Z| > z_{\alpha/2}$$

$\therefore H_0$ is rejected.

4. Aim: To test whether population proportion is more than 80% at 5% level of significance

Define

$$H_0 : P = 0.80$$

$$H_1 : P > 0.80$$

```
P = 0.80
Q = 1-P
X = 18
n3 = 20
p = X/n3
Z2 = (p-P)/sqrt(P*Q/n3)    # Z Statistic
Z2
```

```
## [1] 1.118034
```

```
# right tailed
# Critical Values at 5% level of significance
qnorm(0.05, lower.tail = F)
```

```
## [1] 1.644854
```

Here

$$Z < z_\alpha$$

$\therefore H_0$ is accepted.

5. Aim: To test whether the difference between two proportions is significant

Define

$$H_0 : P_1 = P_2$$

$$H_0 : P_1 \neq P_2$$

```
n3 = 900
n4 = 1600
p1 = 0.30
p2 = 0.18
P_hat = (n3*p1+n4*p2)/(n3+n4)
Q_hat = 1- P_hat
se = sqrt(P_hat*Q_hat*(1/n3 + 1/n4))

Z3 = (p1-p2)/se  # Z Statistic
Z3
```

```
## [1] 6.91657
```

```
# two sided
# Critical Value at 5% level of significance
c(qnorm(0.05/2), qnorm(0.05/2, lower.tail = F))
```

```
## [1] -1.959964  1.959964
```

```
# 95% Confidence Interval
c((p1 - p2) - qnorm(0.05/2, lower.tail = F)*se,
(p1 - p2) + qnorm(0.05/2, lower.tail = F)*se)
```

```
## [1] 0.08599533 0.15400467
```

Here

$$|Z| > z_{\alpha/2}$$

$\therefore H_0$ is rejected.