**Activity 20170429**

1. The biweekly work hours of a startup company is normally distributed with a mean of 90 and standard deviation of 15. What proportion of employees are expected to work in the range of 80 and 110 hours.

   a. Calculate the probability of employees in this given range.

   b. Calculate the probability (as in 1a) in R.

   c. Randomly generate 1000 points in normal distribution with mean of 90 and standard deviation of 15

   d. Find the probalility density values for the above randomly generated points

   e. Calculate the probability density of having works hours=50 hours

   f. What is the 50th percentile of the distribution of work hours

2. For a particular examination, the scores are normally distributes with mean of 30 and standard deviation of 20.

   a. What proportion of students are expected to receive score greater than 60.

   b. What is the proportion of students who score less than 40.

3. Every year due to snow fall, a university in US gives 3 days holidays.

   a. What is the probability that it gives 4 days holidays next year .

   b. What is the probability that the university can give a maximum of 4 days

4. Considering an examination to be MCQ type with 4 options for each questions. Out of 15 questions, a student attempted every question.

a. What is the probability that he answers more than 10 questions

5. Messi scores about 28% of his shots.
What is the probability that he hits on his 8th shot?

b. What is the probability that his goal occurs in first 5 shots

6. Suppose that the mean checkout time for a supermarket cashier is 3 minutes. Find the probability that he checks out a customer in less than 2 minutes.

**Demo for Calculation of Probability for the normal distribution**

```
mean=90; sd=15
dnorm(50,90,15)
# Generating sample of random numbers with given mean and SD
x <- round(sort(rnorm(1000,mean,sd)),2)
lb=min(x); ub=60
# dnorm gives the probability values for each x
y <- dnorm(sort(x),mean,sd)
#Plotting distribution curve
plot(x, y, type="l", xlab="Work Hours", ylab="",main="Normal Distribution", axes=FALSE)
i <- x >= lb & x <= ub
lines(x, y)
polygon(c(lb,x[i],ub), c(0,y[i],0), col="red")
area <- pnorm(ub, mean, sd) - pnorm(lb, mean, sd) #pnorm gives the cumulative probability upto x
mtext(paste("P(",lb,"< Work Hours <",ub,") =", signif(area, digits=3)),3)
axis(1, at=seq(min(x), max(x), sd), pos=0)
```

**Hypothesis Testing**

**Two tailed test**

The CEO of a large coffee chain claims that 90 percent of his 2,000,000 customers are very satisfied with the taste of their coffee. To test this claim, the local newspaper surveyed 144 customers, using simple random sampling. Among the sampled customers, 84 percent say they are very satisfied. Based on these

findings, can we reject the CEO's hypothesis that 80% of the customers are very satisfied? Use a 0.05 level of significance(α).

**One tailed test**

Let suppose that he claimed that more than 80% customers are satisfied. Surveyed 100 people, of which 75 are satisfied. Can we reject the null hypothesis?

In a confidential meeting, the unsatisfied manager claims that the customer satisfied are less than 80%. A new analyst wants to test this claim. What would be his null and alternative hypotheses? If he surveyed 100 people of which 84 people were satisfied. With 0.05 significance level, what is his finding.