**Hypothesis Testing**

1. I have a population distribution of scores of all the students in the Maths Olympiad.  
   Histogram: Mean score = 37.72; Std Dev = 16.04; N = population size = 10000. The distribution is a right skewed distribution.

35 of these children have taken tuitions from very famous Mr. Ramesh and he claims  
that his students have an average score of 40. How do we determine whether we  
should send our child for this tuition? And how good is an average of 40?

What if we increase the sample size to 500. Why does our decision change?

1. A marketing manager has to decide whether to launch a product or not. Product will be launched if the company gets a market share of 15% or more. Product will not be launched if company gets a market share of less than 15%.

Find H0 and HA.

1. There is a learning function happening. The average engagement score of the audience is 7.47 and standard dev. is 2.1. We want to contemplate if the engagement score of the audience will increase after we introduce a lesson of songs.

What will be the null and alternate hypothesis here?

We took a sample of 30 students and introduced the lesson of songs to them and observed the engagement score has increased to 8.3 Now we need to determine if the sample average of 8.3 is significantly different from population average or not?

What is the probability of randomly selecting a sample of size 50 with a mean of 8.3 from this population?

1. Find the 95% of confidence interval of a normal distribution with mean = 50 and std dev = 10, for a 2-tail test.
2. Find the 95%, 99%, 99.9% confidence interval for a sampling distribution of size 20 with population mean = 50 and standard deviation = 10.

Also find for sample size = 100.

1. R&D department of Glenmark found a cancer drug.

H0: - Drug not effective

HA: Drug is effective

Which error is more expensive here?

1. H0: The accused is not guilty of murder

HA: The accused is guilty of murder

Which error is more expensive here?

1. The H0, HA, Type 1 error and Type 2 error for following hypothesis
2. Adding fluoride to toothpaste protects against cavities
3. A patient’s symptoms improve after treatment A more rapidly than after placebo treatment.
4. Beak width of finches has increased. We need to determine if it is due to evolution or randomly. Population average of beak width = 6.07 mm

Do finches today have different-sized beaks than before? We have a sample of 30 beak widths. Average = 6.47 and sample std dev = .4

Hint: If standard dev. of population is not given, then we use sample std dev.