**Solution 1.1:**

Symmetric Binomial: The empirical coverage probability will be equal to confidence limits for symmetric binomial even for small number of replications as the data is symmetric and the mean of the sample proportions approaches the true population proportion almost immediately.

Asymmetric Binomial: The empirical coverage probability will not meet the confidence limits for asymmetric binomial even for the large number of replications as data never approaches the normality even after 10,000 replications. So even for the larger number of replications, the mean of the sample proportions will never approach the population proportions and will never meet the confidence limits.

Chi-square: For chi-square distributions, number of replications will not much affect the empirical probability, only the sample size will affect. Hence if number of replications are large enough even as large as 10,000, and the sample size is very small, the empirical coverage probability will never meet the confidence limits. So the sample size should be large for empirical coverage probability to meet the confidence limits.

Uniform: For large repetitions, the empirical coverage probability will be equal to the confidence limits but for small number of repetitions, it will differ.

Mixture: For large repetitions, suchas 100 and larger, the empirical coverage probability will be equal to the confidence limits but for small number of repetitions, it will differ.

**Solution 1.2:**

Symmetric Binomial: For symmetric binomial distribution, the empirical coverage probability will meet the confidence limits even for the small sample size as it follows the normality and sample proportions will meet up the population proportions.

Asymmetric Binomial: for small sample sizes, i.e. less than 100, the empirical coverage probability will not meet the confidence limits as there is a asymmetry in data and it do not approaches the normality. But for large sample sizes, it will be equal as data approaches the normality.

Chi-square: for sample size such as N=15, the data seems to approach normality hence empirical coverage probability will meet the confidence limits and sample mean will be a true representative of population mean.

Uniform: for sample size, N=45, the empirical coverage probability will be equal to confidence limits. For small sample size, such as N=5 or 15, it does not seem to meet the confidence limits. Hence for large sample size, it will follow the normality and the sample mean will be the true representative of population mean.

Mixture: for mixture distribution, the data seems to follow the normality even for small sample size. Hence empirical coverage probability will meet the confidence limits for all sample sizes and sample mean will be a true representative of population mean.

**Solution 1.3**: The **alpha level** is the probability of rejecting the null hypothesis when the null hypothesis is true.It’s the probability of making a wrong decision.

The**p-value** is the probability of obtaining a result as extreme as, or more extreme than, the result actually obtained when the null hypothesis is true.

The **confidence interval** is the range of likely values for a population parameter, such as the population mean.

So if the confidence interval sits wholly above the hypothesized value then the p-value is less than alpha and it is statistically significant.

**Solution 1.4**:

Type1 Error: rejecting the null hypothesis when it is true. The null hypothesis is the hypothesis of no difference. In case of jury trial, if a person is not guilty and still considered as guilty by jury, then it will be type 1 error.

Type2 Error: accepting the null hypothesis when it is false. In case of jury trial, if a guilty person is freed by jury, then it is a type 2 error.

Of course, type 2 error is a serious error as a criminal minded person can be harm to society but a person who is not guilty and still given the punishment, this system will be more harmful for the society as the society will lose faith in jury system.

Hence, type 1 error is more dangerous in this case than the type two errors.

You can use a confidence interval for hypothesis testing. In the typical case, if the confidence interval for an effect does not span 0 then you can reject the null hypothesis. But a Confidence interval can be used for more, such as reporting whether it has been passed is the limit of the usefulness of a test.

The reason why Confidence intervalis more useful than a hypothesis test is,you can make a statement about the range of affects you believe to be likely you can't do that with just a t-test. You can also use it to make statements about the null, which you can't do with a t-test. If the t-test doesn't reject the null then you just say that you can't reject the null, which isn't saying much. But if you have a narrow confidence interval around the null then you can suggest that the null, or a value close to it, is likely the true value and suggest the effect of the treatment, or independent variable, is too small to be meaningful (or that your experiment doesn't have enough power and precision to detect an effect important to you because the Confidence interval includes both that effect and 0).