

Describe how  $\delta$  and  $n$  affect the PMF. Describe how close the different PMF is to the true sampling distribution of the mean and your  $E[\bar{X}]$  to the population mean with respect to different  $\delta$  and  $n$ :

When width of a bin is too large, the data will be grouped very close, and we cannot see enough differentiation, the error between sampling distribution of mean and population mean will be very large since the variation between the random grouping is very large.

When width of a bin is too small, the mean of the sampling will be very distinct and cannot be grouped together, the error between sampling distribution of mean and population mean will also be very large since the samplings mean are too varies.

As the dotplots shows, the possible sample means cluster more closely around the population mean as the sample size increases. Thus, the possible sampling error decreases as sample size increases.

Give the clear explanation of why the result would be like that.

By Central Limit Theorem, the sampling distribution of the mean approaches a normal distribution when the sample size increase. Therefore when the sample size is increase, the sampling PMF will be more close to the normal distribution which is also closer to the population mean, as the PMF of population is in normal distribution.