Train cars of the Crandic Railway company carry 30 standard sized containers. The average container weighs 380 pounds with standard deviation of 50 pounds.

- Calculate the mean and standard deviation of the sampling distribution of the sample mean of the 30 containers. Describe the distribution
  $\bar{X} \sim N(\mu, se)$ with $se = \frac{\sigma}{\sqrt{n}} = \frac{50}{\sqrt{30}} = 9.13$
  $\bar{X} \sim N(380, 9.13)$
- Calculate the probability that the average weight of the 30 containers is less than 350 pounds
  $P(\bar{X} < 350) = 0.001$
  statdistributions.com: z=350, mean=380, stddev=9.13, LT
  http://www.statdistributions.com/normal?z=350&mean=380&sd=9.13&tail=3

Steve, the train engineer, becomes upset if a train car weighs more than 12000 pounds. There are 30 containers per train car.

- Calculate the mean and standard deviation of the sampling distribution of the sample total (total weight of the train car). Describe the distribution
  $\hat{\tau} \sim N(\tau, se)$ with $\tau = n\mu = 30(380) = 11400$
  $se = \sqrt{n}(\sigma) = \sqrt{30}(50) = 50\sqrt{30} = 273.86$
  $\hat{\tau} \sim N(11400, 273.86)$
- Calculate the probability that the total weight of the train car is more than Steve's breaking point
  $P(\hat{\tau} > 12000) = 0.014$
  statdistributions.com: z=12000, mean=11400, stddev=273.86, RT
  http://www.statdistributions.com/normal?z=12000&mean=11400&sd=273.9&tail=2

Suppose that it is known that 45% of people favor *Brand X* (it will put a smile on your face!). A random sample of 500 people was taken.

- Calculate the mean and standard deviation of the sampling distribution of the sample proportion. Describe the distribution
  $\hat{\pi} \sim N(\pi, se)$ with $se = \sqrt{\frac{\pi(1-\pi)}{n}} = \sqrt{\frac{(0.45)(1-0.45)}{500}} = 0.0222$
  $\hat{\pi} \sim N(0.45, 0.0222)$
- Calculate the probability that at least 50% of people favor *Brand X*
  $P(\hat{\pi} > 0.5) = 0.012$
  statdistributions.com: z=0.5, mean=0.45, stddev=0.0222, RT
  http://www.statdistributions.com/normal?z=0.5&mean=0.45&sd=0.022&tail=2