45. Grade Point Averages (GPAs).

Randomization Condition: Assume that the students are randomly assigned to seminars.

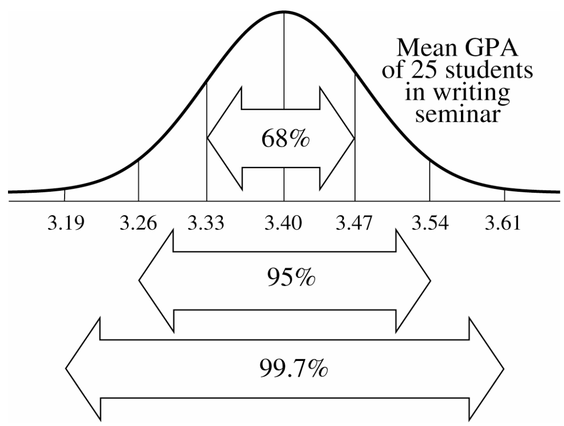
Independence Assumption: It is reasonable to think that GPAs for randomly selected students are mutually independent.

10% Condition: The 25 students in the seminar certainly represent less than 10% of the population of students.

Large Enough Sample Condition: The distribution of GPAs is roughly unimodal and symmetric, so the sample of 25 students is large enough.

The mean GPA for the freshmen was $\mu = 3.4,$ with standard deviation $\sigma = 0.35.$ Since the conditions are met, the Central Limit Theorem tells us that we can model the sampling distribution of the mean GPA with a Normal model, with $\mu_{\bar{y}} = 3.4$ and standard deviation $\sigma(\bar{y}) = \frac{0.35}{\sqrt{25}} \approx 0.07.$.

The sampling distribution model for the sample mean GPA has mean 3.4 and standard deviation 0.07.



46. The trial of the pyx.

a) The mean of 100 coins varies less from sample to sample than the individual coins.

b) $SD(\bar{y}) = \frac{\sigma}{\sqrt{n}} = \frac{0.09}{\sqrt{100}} = 0.009$

The limit on the standard deviation of the mean should have been 0.009 grains.

47. Safe cities.

The standard deviation of the sampling model for the mean is $\frac{\sigma}{\sqrt{n}}$. So, cities in which the average is based on a smaller number of drivers will have greater variation in their averages and will be more likely to be both safest and least safe.

48. Stock market.

a) The sampling distribution model is Normal, with $\hat{p} = 0.30$ and $SD(\hat{p}) \approx 0.046.$

b) The z-value that corresponds to p = 1/3 is: (0.3333 − 0.30)/0.046 = 0.724. The percent above 0.724 is approximately 23.4%.

49. Smoking.

Randomization Condition: We will assume that the 120 customers (to fill the restaurant to capacity) are representative of all customers.

10% Condition: 120 customers represent less than 10% of all potential customers.

Success/Failure Condition: $np = 72$ and $nq = 48$ are both greater than 10.

Therefore, the sampling distribution model for $\hat{p}$ is Normal, with:

$$\mu_{\hat{p}} = p = 0.60$$

$$\sigma(\hat{p}) = \sqrt{\frac{pq}{n}} = \sqrt{\frac{(0.60)(0.40)}{120}} \approx 0.0447$$

Answers may vary. We will use three standard deviations above the expected proportion of customers who demand nonsmoking seats to be "very sure."

$$\mu_{\hat{p}} + 3\left(\sqrt{\frac{pq}{n}}\right) \approx 0.60 + 3(0.0447) \approx 0.734$$

Since 120(0.734) = 88.08, the restaurant needs at least 89 seats in the nonsmoking section.

50. Steak special.

Randomization Condition: We will assume that the 180 customers are representative of all customers.

10% Condition: 180 customers represent less than 10% of all potential customers.

Success/Failure Condition: $np = 36$ and $nq = 144$ are both greater than 10.

Therefore, the sampling distribution model for $\hat{p}$ is Normal, with:

$$\mu_{\hat{p}} = p = 0.20$$

$$\sigma(\hat{p}) = \sqrt{\frac{pq}{n}} = \sqrt{\frac{(0.20)(0.80)}{180}} \approx 0.0298$$

Answers may vary. We will use two standard deviations above the expected proportion of customers who order the steak special to be "pretty sure."

$$\mu_{\hat{p}} + 2\left(\sqrt{\frac{pq}{n}}\right) \approx 0.20 + 2(0.0298) \approx 0.2596$$

Since 180(0.2596) = 46.728, the chef needs at least 47 steaks on hand.

51. Single-parent families in Canada.
(a) The mean of the sample is the same as the mean of the population:= 0.14.

The standard deviation of the sample proportion is Sqrt(p(1 − p)/n) = 0.0110.

(b) The mean of the sample is the same as the mean of the population:= 0.17.

The standard deviation of the sample proportion is Sqrt(p(1 − p)/n) = 0.0119.

(c) P(A>N) = P(A-N>0)

57. Cod farming in Atlantic Canada.
(a) The SD of the sample mean is 1/sqrt(52) = 0.139 months.

$z = (y-\mu)/\sigma$ = (25.6-26)/0.139 = -2.88, corresponding to a probability of 0.00196.

(b) The SD of the sample mean is 0.38/sqrt(52) = 0.0527 Kg.

$z = (y-\mu)/\sigma$ = (3.9-3.75)/0.0527 = 2.846, corresponding to a probability of 0.00221.

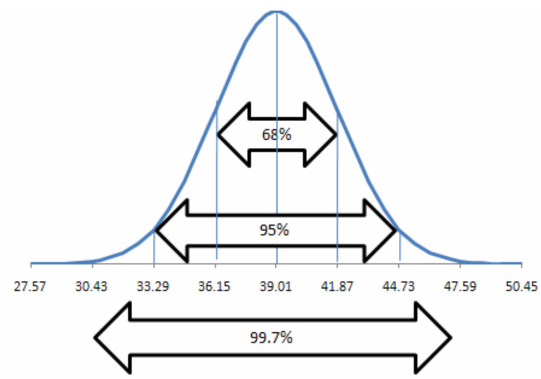
(c) The probability of exceeding 4.25 kg is obtained from:

$z = (y-\mu)/\sigma$ = (4.25-3.75)/0.38 = 1.316, corresponding to a probability of 0.0941.

The standard deviation of the sample proportion in a sample of 250 is Sqrt(p(1-p)/n) = 0.0185

$z = (y-\mu)/\sigma$ = (20/250-0.0941)/0.0185 = -0.765, corresponding to a probability of 0.778

58. Fidelity funds. About 68% of the time, the fund is expected to have an average monthly closing price between \$36.15 and \$41.87; about 95% of the time, the fund is expected to have an average monthly closing price between \$33.29 and \$44.73; and about 99.7% of the time, the fund is expected to have an average monthly closing price between \$30.43 and \$47.59.



59. At work.

a) Some people work much longer than the mean plus two or three standard deviations. In addition, there are many people who stay a short time before moving on. Finally, the left tail cannot be very long, because a person cannot work at a job for less than zero years (or work less than zero hours). These characteristics would create a right-skewed distribution.

b) The Central Limit Theorem guarantees that the distribution of the mean time is Normally distributed for large sample sizes, as long as the assumptions and conditions are satisfied. The CLT doesn't help us with the distribution of individual times.

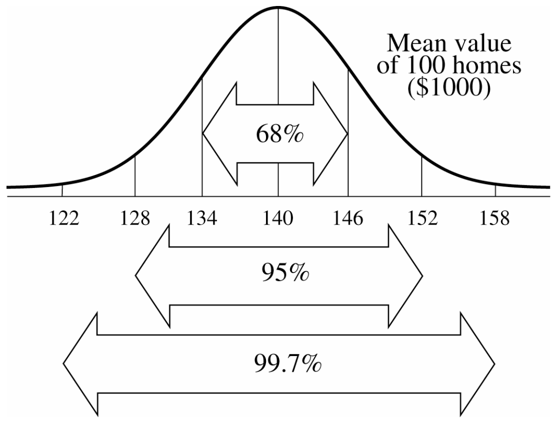
60. Store receipts.

a) The distribution is skewed right and is not Normal. Therefore, we cannot use a Normal model to estimate probabilities.

b) It is unlikely that you could estimate the probability because 10 is not a large sample. It would depend on the amount of skewness seen in the distribution.

c) No, with 50 customers, the Normal distribution model has a mean of 32 and a standard deviation of 2.83, and the resulting probability is only 0.0024. This is only 0.24% and is highly unlikely.

63. Home values. The sampling distribution model for the sample mean home values is approximately Normal, with a mean of \$140,000 and a standard deviation of \$60,000.



64. Canadian Real Estate Association (CREA).

n=36; population average = 339100; sample average = 368533; population SD = 134216.

$$SD(\text{sample mean}) = \frac{134216}{\sqrt{36}} = 22369$$

$$z = \frac{368533 - 339100}{22369} = 1.316$$

P=0.0941

65. A popular tax in B.C.

n=1023; sample proportion=0.54; population proportion=0.48.

$$SD(\text{sample proportion}) = \sqrt{\frac{0.48 * 0.52}{1023}} = 0.01562$$

$$z = \frac{0.52 - 0.48}{0.01562} = 3.841$$

P=0.00006122