1. In a certain city, there are 100000 persons age 18 to 24. A simple random sample of 500 such persons is drawn , of whom 194 turn out to be currently enrolled in college. Estimate the percentage of all persons age 18 to 24 in that city who are currently enrolled in college. Put a give-or-take number on the estimate.

2. In a simple random sample of 100 graduates from a certain college, 48 were earning $50000 a year or more. Estimate the percentage of all graduates of that college earning $50000 a year or more. Put a give-or-take number on the estimate.

3. A simple random sample of of size 400 was taken from the population of all manufacturing establishments in a certain state: 11 establishments in the sample had 100 employees or more. Estimate the percentage of manufacturing establishments with 100 employees or more. Attach a standard error to the estimate.

4. In the same state, a simple random sample of size 400 was taken from the population of all persons employed by manufacturing establishments: 187 people in the sample worked for establishments with 100 employees or more. Estimate the percentage of people who worked for establishments with 100 employees or more. Attach a standard error to the estimate.

5. Suppose there is a box of tickets each marked 0 or 1. Suppose that in fact 20% of the tickets in the box are 1's. Calculate the standard error for the percentage of 1's in 400 draws from the box.

6. Three different people take take simple random samples of size 400 from the box above, without knowing its contents. The number of 1's in the first sample is 72. In the second, it is 84. In the third, it is 98.

   (a) The first person estimates the percentage of 1's in the box as ____________, and figures this estimate is likely to be off by ____________ or so.

   (b) The second person estimates the percentage of 1's in the box as ____________, and figures this estimate is likely to be off by ____________ or so.

   (c) The third person estimates the percentage of 1's in the box as ____________, and figures this estimate is likely to be off by ____________ or so.

7. A box contains 1 red marble and 99 blues; 100 marbles are drawn at random with replacement.

   (a) Find the expected value of red marbles among the draws, and the standard error.

   (b) What is the chance of drawing fewer than 0 red marbles?

   (c) Use the normal curve to estimate this chance.

(d) Does the probability histogram for the number of red marbles among the draws look like the normal curve?

8. A box contains 10000 marbles of which some are red and the others are blue. To estimate the percentage of red marbles in the box, 100 are drawn at random without replacement. Among the draws, 1 turns out to be red. The percentage of red marbles in the box is estimated as 1%, with a standard error of 1%. True or false: a 95%-confidence interval for the percentage of red marbles in the box is $[-1\%, 3\%]$.

9. Probabilities are used when reasoning from the ___________ to the ___________; confidence intervals are used when reasoning from the ___________ to the ___________. Options: box, draws.

10. (a) The chance error is in the ___________ value. Options: observed, expected.

    (b) The confidence interval is for the ___________ percentage. Options: sample, population.

11. A box contains a large number of red and blue marble; the proportion of red marbles is known to be 50%. A simple random sample of 100 marbles is drawn from the box. Say whether each of the following statements is true or false, and explain briefly.

    (a) The percentage of red marbles in the sample has an expected value of 50%, and a standard error of 5%.

    (b) The 5% measures the likely size of the chance error in the 50%.

    (c) The percentage of reds in the sample will be around 50%, give or take 5% or so.

    (d) An approximate 95%-confidence interval for the percentage of reds in the sample is 40% to 60%.

    (e) There is a 95% chance that the percentage of reds in the sample will be in the range from 40% to 60%.

12. A box contains a large number of red and blue marbles, but the proportions are unknown; 100 marbles are drawn at random, and 53 turn out to be red. Say whether each of the following statements is true or false, and explain briefly.

    (a) The percentage of red marbles in the box can be estimated as 53%; the standard error is 5%.

    (b) The 5% measures the likely size of the chance error in the 53%.

    (c) The 53% is likely to be off the percentage of red marbles in the box, by 5% or so.

    (d) A 95%-confidence interval for the percentage of red marbles in the box is 43% to 63%.

(e) A 95%-confidence interval for the percentage of red marbles in the sample is 43% to 63%.

13. A simple random sample of 1000 persons is taken to estimate the percentage of Democrats in a large population. It turns out that 543 of the people in the sample are Democrats. True or false, and explain.

    (a) The sample percentage is 54.3%; the standard error for the sample percentage is 1.6%.

    (b) $54.3\% \pm 3.2\%$ is a 95%-confidence interval for the population percentage.

    (c) $54.3\% \pm 3.2\%$ is a 95%-confidence interval for the sample percentage.

    (d) There is about a 95% chance for the percentage of Democrats in the population to be in the range $54.3\% \pm 3.2\%$.

    (e) If another survey organization takes a simple random sample of 1000 persons, there is about a 95% chance that the percentage of Democrats in their sample will be in the range $54.3\% \pm 3.2\%$.

14. At a large university, 54.3% of the students are female and 45.7% are male. A simple random sample of 1000 persons is drawn from the population. The standard error for the sample percentage of females is figured as 1.6%. True or false: There is about a 95% chance for the percentage of females in the sample to be in the range $54.3\% \pm 3.2\%$. Explain.