

# Chapter 1

## What Is statistics?

- 1.1** a. Total calories and standard error for medium apple and bran muffin:

$$\text{Lunch} = A + B = 80+400 \pm \sqrt{10^2 + 40^2} = 480 \pm \sqrt{1700} = 480 \pm 41.231 \text{ calories.}$$

- b. Total calories and error for the apple, muffin, and a cup of yogurt:

$$\text{Lunch} + \text{yogurt} = 480+220 \pm \sqrt{41.231^2 + 15^2} = 700 \pm \sqrt{1925} = 700 \pm 43.875 \text{ calories.}$$

- 1.7** a. Solve  $\frac{1}{2\sqrt{n}} < .05$

$$1/.05 < 2\sqrt{n}$$

$$10 < \sqrt{n}, \text{ or } n > 100; \text{ so } n \text{ should be at least } 101.$$

- b. For 95% confidence, multiply by 1.96.

$$\text{Solve } \frac{1.96}{2\sqrt{n}} < .05; \text{ } n > 384.16; \text{ so } n \text{ should be at least } 385.$$

- c. For 99.7% confidence, multiply by 3.

$$\text{Solve } \frac{3}{2\sqrt{n}} < .05; \text{ } n > 900.$$

- 1.9**  $p = 57/939 = 6.07\%$ ,

$$SE_p = \sqrt{\frac{\pi(1-\pi)}{939}} \leq \frac{1}{2\sqrt{939}} = 0.0163 = 1.63\%$$

- 1.11** The number 56% is a **statistic**. The number 98 million is an estimate of a **parameter**.

- 1.15** a. The total of two runs would be approximately  $20 + 20 = 40$  seconds, give or take

$$\sqrt{5^2 + 5^2} = 7.071 \text{ seconds or so.}$$

- b. The total of four runs would be approximately  $20 + 20 + 20 + 20 = 80$  seconds, give or take

$$\sqrt{5^2 + 5^2 + 5^2 + 5^2} = \sqrt{4}(5) = 10 \text{ seconds or so.}$$

- 1.17** a. Packaging error for 2 packages is approximately  $\sqrt{1^2 + 1^2} = 1.414$  ounces.  
b. Packaging error for 16 packages is approximately  $\sqrt{1^2 + 1^2 + \dots + 1^2} = \sqrt{16} = 4$  ounces.
- 1.19** Even though polio was a frightening disease, it was not common. In order to make a meaningful and convincing judgment of whether the vaccine worked, you had to make sure to use a sample large enough to get several cases of polio. If you ended up with fewer than 5 cases of polio in the control group, it would be hard to present convincing evidence that the vaccine works. For example, if you used only 100 children in each group, and none of the 200 got polio, the study would show nothing.