

1. The lifetimes of projector bulbs of a particular type are normally distributed with a mean of 470 hours and a standard deviation of 15 hours.
  - (a) [5 points] What percentage of projector bulbs have a lifetime of between 440 and 500 hours? Justify your answer.

- (b) [5 points] What percentage of projector bulbs have a lifetime of more than 500 hours? Justify your answer.

2. [15 points] Automated manufacturing operations are quite precise but still vary, often with distributions that are close to normal. The width in inches of slots cut by a milling machine are normally distributed with a mean of 0.8750 inches and a standard deviation of 0.0012 inches. The specifications allow slot widths between 0.8720 and 0.8780 inches. What proportion of slots meet these specifications?

3. A bag contains 5 red candies, 15 blue candies, and 10 yellow candies.

(a) [5 points] What is the probability of drawing a red candy?

(b) [5 points] What is the probability of drawing a red or yellow candy?

(c) [5 points] What is the probability of drawing something besides a yellow candy?

4. The reading speed of second grade students is approximately normal, with a mean of 90 words per minute and a standard deviation of 10 words per minute.

(a) [15 points] What is the probability that a student randomly selected from the population of all second grade students will read less than 85 words per minute?

(b) [15 points] 24 students are selected at random from the population of all second grade students. Let  $\bar{x}$  be the average words per minute of these 24 students. What is the probability that  $\bar{x}$  is less than 85 words per minute?

5. A battery company wants to determine the mean lifetime of its AAA batteries. 25 AAA batteries are chosen at random and tested. The average lifespan of these 25 batteries is 8 hours with a standard deviation of 1 hour.
- (a) [5 points] What number should be used to estimate  $\mu$ , the true population mean lifespan of all AAA batteries?
- (b) [5 points] What number should be used to estimate  $\sigma$ , the true population standard deviation lifespan of all AAA batteries?
- (c) [5 points] What is the standard deviation of  $\bar{x}$ , the mean lifespan of a random sample of 25 AAA batteries?
- (d) [5 points] What is the margin of error  $E$  of the 95% confidence interval for  $\mu$ ?
- (e) [5 points] What is the 95% confidence interval for  $\mu$ ?
- (f) [5 points] Give an interpretation for this 95% confidence interval?