Review Problem 3.1 Suppose a gambler plays roulette, betting on his favorite four numbers. If his number comes up (with probability 4/38), then he wins $8. However, if his number doesn’t come up, he loses $1.

1. Let $X$ be the winnings on one play. Find $E(X)$ and $SD(X)$.
2. Suppose he plays 2500 times; let $Y$ denote his total winnings. Find $E(Y)$ and $SD(Y)$.
3. If he plays 2500 times, find the probability that he has a positive net gain.

Review Problem 3.2 A chemist made eight independent measurements of the melting point of tungsten. She obtained a sample mean of 3410.14°C and a sample standard deviation of 1.018°C. Find a 98% confidence interval for the melting point of tungsten.

Review Problem 3.3 A certain type of battery has a population mean lifetime of 40 hours with standard deviation 5 hours. Find the probability that the average lifetime of 100 such batteries is less than 38 hours.

Review Problem 3.4 For a population with mean $\mu = 50$ and standard deviation $\sigma = 30$, what should the sample size $n$ be in order to give you a standard error $\sigma_{\bar{X}}$ less than 3?

Review Problem 3.5 A sample of six replicates of sludge from a wastewater plant have a mean pH of 6.68 with a standard deviation of 0.20. Is this consistent with the sludge having a mean pH of 7.0? Use a two-sided alternative.

Review Problem 3.6 Five measurements are taken of the octane rating of a high-grade gasoline: 90.1, 88.8, 89.5, 91.0, 92.1. Can you conclude that the mean octane rating is less than its advertised value of 91?

Review Problem 3.7 A shipment of fibers is acceptable if the mean breaking strength of the fibers is 50 N. On the other hand, the shipment is not acceptable if the mean breaking strength is less than 50 N. A sample of 80 fibers is tested from this shipment; the sample breaking strength is found to be 49.1 N with a standard deviation of 5.2 N. Since the sample is large, you can assume that the population standard deviation is equal to the sample standard deviation.

1. Determine if the shipment is acceptable at the $\alpha = 0.01$ level of significance.
2. Find the power of the test if the mean breaking strength is actually 48 N.

Review Problem 3.8 A bank deems its credit-rating system to be satisfactory if it correctly assesses the worthiness of at least 80% of the bank’s customers. In a random sample of 1000 clients, 740 were correctly assessed. Is this enough evidence to think that the credit-rating system is satisfactory?
**Review Problem 3.9** The sample mean and standard deviation for the fill weights of 100 boxes are $\bar{X} = 12.05$ and $S = 0.1$. Find a 85% confidence interval for the mean fill weight of the boxes.

**Review Problem 3.10** Find a 99% confidence interval for the previous problem.

**Review Problem 3.11** Vats labeled 30 L are filled with solution. The amount of solution put into each vat is random with mean 30.01 L and standard deviation 0.1 L. What is the probability that the total amount of solution contained in the 50 vats is more than 1500 L?

**Review Problem 3.12** A soft-drink manufacturer purchases cans from an outside vendor. Of a random sample of 70 cans, 52 meet the specification for puncture resistance. Find a 95% confidence interval for the proportion of cans that meet the specification.

**Review Problem 3.13** In the previous problem, find the sample size necessary for a 90% confidence interval to specify the proportion within ±0.05.

**Review Problem 3.14** Eight vehicles are chosen at random from a fleet, and their emissions were measured under both highway driving and stop-and-go driving conditions. The results follow. Can we conclude that the mean level of emissions is less for highway driving than for stop-and-go driving?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stop-and-go</td>
<td>1500</td>
<td>870</td>
<td>1120</td>
<td>1250</td>
<td>3460</td>
<td>1110</td>
<td>1120</td>
<td>880</td>
</tr>
<tr>
<td>Highway</td>
<td>941</td>
<td>456</td>
<td>893</td>
<td>1060</td>
<td>3107</td>
<td>1339</td>
<td>1346</td>
<td>644</td>
</tr>
</tbody>
</table>