1. (a) \( X \sim N(110, 11): P[105 < X < 115] = P[(105 - 110)/11 < Z = (X - \mu)/\sigma < (115 - 110)/11] \)
\[ = P[-.45 < Z < .45] = .6735 - .3264 = .3471, \] using values from Table A. [See Exmp 9.9 p237]

(b) \( \bar{X} \sim N(110, 11/\sqrt{25}) = N(100, 11/5) = N(11, 2.2): P[105 < \bar{X} < 110] \)
\[ = P[-2.27 < Z < 2.27] = .9884 - .0116 = .9768. \] [See Exmp 10.5 p257, Prob 10.9]

(c) The Central Limit Theorem says that \( \bar{X} \) is approximately \( N(110, 11/\sqrt{100}) = N(110, 1.1): P[108 < \bar{X} < 112] \)
\[ = P[-1.82 < Z < 1.82] = .9656 - .0344 = 0.9312. \] [See Exmp 10.7 p260, Prob 10.11]

(d) A 95% CI for \( \mu \): \( \bar{X} \pm z^* \sigma/\sqrt{n} \Rightarrow 113.22 \pm 1.96(1.1) \Rightarrow 113.22 \pm 2.156. \) [See Exmp 13.3 p327, Prob 13.11]

(e) \( n = (z^* \sigma/M)^2 = [1.96(11)/2]^2 = 10.782 = 116.2 \uparrow 117 \) (116 is acceptable; technically one should round up to 117 as shown in the text). [See Exmp 13.5 p332, Prob 13.11]

2. (a,b) \( P(Ace) = P(King) = 4/52 = 1/13 = .077. \)
(c) \( P(Ace \text{ or } King) = 4/52 + 4/52 = 8/52, \) by the addition rule because 'Ace' and 'King' are disjoint events. [See pp 230-234.]
(d) \( P(OK) = 1 - P(Burn \text{ out}) = 1 - .03 = .97 \) by the Complement rule.
(e) \( P(\text{all 12 OK}) = P(1\text{st OK})P(2\text{nd OK})\cdots P(12\text{th OK}) = (.97)^{12} = .6938 \) by the multiplication rule, assuming independence. [See Exmp 11.4; very similar to Prob 11.5]

3. (a) A 99% CI for \( \mu: \bar{X} \pm z^*\sigma/\sqrt{n} \Rightarrow 105.6 \pm 2.576(15/\sqrt{40}) \Rightarrow 105.6 \pm 2.576(2.372) \Rightarrow 105.6 \pm 6.11. \)
\( z^* = 2.576 \) from the bottom of page 326 or the bottom rows of Table C; \( M = 5.46. \) The endpoints of the CI are 105.60 - 5.46 = 100.14 and 105.60 + 5.46 = 111.06, so the CI can also be written as (99.49, 111.71). (b) NO: The CI is an interval of "believable values" for the unknown population mean \( \mu. \) The value 100 lies in the CI. So based on (a), as instructed, one could not conclude that \( \mu > 100. \)

4. [See probability rules on p231, Figure 9.3, Prob 9.14 done in class]

<table>
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<th>Color of Candy Drawn</th>
<th>Yellow</th>
<th>Orange</th>
<th>Red</th>
<th>Purple</th>
<th>Blue</th>
<th>Green</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
<td>1/8</td>
<td>2/8</td>
<td>2/8</td>
<td>1/8</td>
<td>1/8</td>
<td>1/8</td>
</tr>
<tr>
<td>(b)</td>
<td>1/5</td>
<td>-1/5</td>
<td>1/5</td>
<td>-1/5</td>
<td>1/5</td>
<td>X</td>
</tr>
<tr>
<td>(c)</td>
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<td>3/10</td>
<td>4/10</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>(d)</td>
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<tr>
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<td>3/20</td>
<td>7/20</td>
<td>3/20</td>
<td>1/20</td>
<td>5/20</td>
</tr>
</tbody>
</table>

5. [See Chapter 8]
(a) Experiment because we give different kinds of pills to control results.
(b) Target population is probably adult males.
(c) Male physicians are the subjects.
(d) Factor is kind of pill given.
(e) Two levels: aspirin and placebo
(f) Response is categorical variable: Heart attack or not.
(g) Placebo is substance that looks like aspirin but has no biological effect.
(h) Parameters: proportion of aspirin-treated population who have heart attacks, and proportion of untreated population who have heart attacks. Could also regard the difference in heart attack rates as a parameter.
(i) At random (according to a completely randomized design, unless some unmentioned scheme for pairing is introduced, in which case assignments within pairs would be random).
(j) The person determining the value of the categorical variable (heart attack or not) should not know which level of the treatment Dr. Smith receives; some diagnoses of heart problems may be "borderline," subject to biased interpretation. Also, Dr. Smith should not know which kind of pills he is taking. ("Double-blind" experiment.)