Chapter 2: 2, 6, 9, 14, 21, 25, 44, 50

3. Suppose A and B are events...
   a) Both events occur: \( A \cap B \)
   b) At least one event occurs: \( A \cup B \)
   c) Neither occurs: \((\overline{A} \cap \overline{B})\) or \(A \cap \overline{B}\)
   d) Exactly one occurs: \( (A \cup B) - (A \cap B) \) or \( A \cap B \cap (A^c \cup B) \)

4. 160 students... 9 living off campus, 36 undergraduates
   3 undergraduates living off campus
   
   \[ A = \text{Undergrads} \]
   \[ B = \text{Live off Campus} \]
   a) \( A \cup B = 42 \)
   b) \( A^c \cap B^c = 33 \)
   c) \( A \cap B^c = 18 \)

5. \( \Omega = \{ E_1, E_2, E_3, E_4, E_5 \} \)
   a) \( P(E_1) = .15 \), \( P(E_2) = .4 \), \( P(E_3) = 2 \) \( P(E_5) = 1 \)
   \[ \Rightarrow \quad 1.7 + 3 \times P(E_5) = 1 \]
   \[ \Rightarrow P(E_5) = .1 \]
   b) \( P(E_1) = 3 \) \( P(E_2) = .3 \) \( \text{Rest equiprobable} \)
   \[ \Rightarrow P(E_3) = P(E_4) = P(E_5) = .2 \]

6. Volunteers in Blood Center
   \[ \frac{1}{3} O^+ \quad \frac{1}{15} O^- \quad \frac{1}{3} A^+ \quad \frac{1}{12} A^- \]
   a) \( P(O^+) = \frac{1}{3} \)
   b) \( P(O) = P(O^+) + P(O^-) = \frac{2}{5} \)
   c) \( P(A) = P(A^+) + P(A^-) = \frac{19}{48} \)
   d) \( P(\text{Neither } A \text{ nor } O) = 1 - P(O) - P(A) = 1 - \frac{2}{5} - \frac{19}{48} = \frac{49}{120} \)
21. Two jurors needed, 4 men, 2 women to choose from
a. The experiment randomly selects two applicants out of 6 (4 men, 2 women) 
   Denote the selection of 1 male and 1 female juror as \( M_1 F_2 \)  
   Order of selection is unimportant  
   {12} = \{ MMM, MMF, MFM, FFM \}  
   \[ P(FFF) = \frac{1}{15} \] 
   \[ \text{Notes: } \quad P(FFF) = \frac{(4)(3)}{(6)(5)} = \frac{12}{30} = \frac{1}{15} \]

23. Median Family Income \$35,353, 4 families surveyed
a. \( S = \{ 0, 1, 2, 3, 4 \} \) (The \# of families whose income exceeded the median)
   b. i. At least two had incomes exceeding median \( \Rightarrow 2 \text{ or } 3 \text{ or } 4 \)  
      \( \Rightarrow \{ 2, 3, 4 \} = A \)  
      ii. Exactly 2 \( \Rightarrow \{ 2 \} = B \)  
      iii. Exactly 1 had income less than median \( \Rightarrow 3 \text{ had income } > \text{ median} \) \( \Rightarrow \{ 3 \} = C \)  
   c. Assign probabilities to the sample events  
      \( \text{Note: } P(\text{less than median}) = \frac{1}{2} \)  

<table>
<thead>
<tr>
<th>Event</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<tbody>
<tr>
<td>Probability</td>
<td>( \frac{1}{6} )</td>
<td>( \frac{1}{6} )</td>
<td>( \frac{3}{8} )</td>
<td>( \frac{1}{4} )</td>
<td>( \frac{1}{6} )</td>
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<tr>
<td>( P(A) )</td>
<td>( 11/48 = \frac{1}{6} + \frac{4}{10} + \frac{3}{10} )</td>
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<tr>
<td>( P(B) )</td>
<td>( 3/8 )</td>
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<tr>
<td>( P(C) )</td>
<td>( 1/4 )</td>
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</table>

26. Study 10 problems, solve \( 6, 5 \) on Exam (Random)  
   \( P(\text{Student can solve all 5 exam questions}) = \left( \frac{6}{6} \right)^4 = \frac{1}{324} \)  

50. Balanced die tossed 6 times  
   \[ P(1, 2, 3, 4, 5, 6 \text{ in any order}) = \frac{\text{"good" outcomes}}{\text{total # outcomes}} = \frac{\frac{1}{6} \cdot \frac{1}{6}}{6} = \frac{5}{324} = .0154 \]