Problem # 1

The sample space for an experiment contains five simple events with probabilities is shown in the table. Find the probability of each of the following events:

<table>
<thead>
<tr>
<th>Simple events</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.05</td>
</tr>
<tr>
<td>2</td>
<td>.20</td>
</tr>
<tr>
<td>3</td>
<td>.30</td>
</tr>
<tr>
<td>4</td>
<td>.30</td>
</tr>
<tr>
<td>5</td>
<td>.15</td>
</tr>
</tbody>
</table>

a. Either 1, 2, or 3 occurs  
b. Either 1, 3, or 5 occurs  
c. 4 does not occur

Problem # 2

Compute each of the following:

a. \( P_9^0, P_2^7, P_6^5, P_3^2 \) and \( P_1^5 \)

b. \( C_4^0, C_2^7, C_0^5, C_3^3 \) and \( C_1^5 \)

Problem # 3

Two fair dice are tossed, and the face on each die is observed.

a. List the sample space of this experiment.

b. Find the probability of each of the following events:

A: {3 showing up}  
B: {sum of two numbers showing is 7}  
C: {sum of two numbers showing is even}

Problem # 4

Two marbles are drawn at random without replacement from a box containing two blue marbles and three red marbles.

a. List the sample space for this experiment.

b. Determine the probability of observing each of the following events:

A: {2 blue marbles are drawn}.  
B: {a red and blue marble are drawn}.  
C: {2 red marbles are drawn}.  

Problem # 5

Simulate the experiment described in problem 4 using any five identically shaped objects, two of which are blue and three red. Mix the objects, draw two, record the results, and then replace the objects. Repeat the experiment a large number of times (at least 100). Calculate the proportion of times events A, B, and C occur. How do these proportions compare with the probabilities you calculated in problem 4.

Problem # 6

A sample of 1000 families showed that 34 of them own no cars, 208 own one car each, 376 own two cars each, 265 own three cars each, and 117 own four or more cars each. Write the frequency distribution table for this problem. Calculate the relative frequencies for all categories. Suppose one family is randomly selected from these 1000 families. Find the probability that this family owns

a- Two cars   b- Three or more cars   c- Two or fewer cars

Problem # 7

Five hundred employees were selected from two small banks that are proposing a merger, and they were asked whether they are in favor or against the merger. Based on this information, the following two-way classification table was prepared.

<table>
<thead>
<tr>
<th></th>
<th>In favor</th>
<th>Against</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bank A</td>
<td>225</td>
<td>75</td>
</tr>
<tr>
<td>Bank B</td>
<td>150</td>
<td>50</td>
</tr>
</tbody>
</table>

a- If one employee is selected at random from these 500 employees, find the probability that
i. the employee is from “bank A”
ii. the employee is “in favor”
iii. the employee is “in favor” given the employee is from “bank A”
iv. the employee is from “bank B” given that he/she is “against” the proposal
v. the employee is from “bank B” and is “in favor”
vi. of the union of events "bank B" and "in favor"

b- Are the events "Bank A" and "In favor" mutually exclusive? What about the events "In favor" and "Against"? Why or why not?

c- Are the events "Bank B" and "In favor" independent? Why or why not?
Problem # 8

An experiment can result in one of the five equally likely simple events, \(E_1, E_2, \ldots, E_5\). Events A, B, and C are defined as follows:

A: \(E_1, E_3\)
B: \(E_1, E_2, E_3, E_4\).
C: \(E_4, E_5\)

Find the probabilities associated with the following compound events

\[ a- A^c \quad b- A \cap B \quad c- B \cap C \]
\[ d- A \cup B \quad e- B \mid C \quad f- A \mid B \]
\[ g- (A \cap B)^c \quad h- \text{Are events A and B independent?} \]
\[ i- \text{Are events A and B mutually exclusive?} \]

Problem # 9

A smoke-detector system uses two devices, A and B. If smoke is present, the probability that it will be detected by device A is .96; by device B .97; and by both devices, .94.

\[ a- \text{If smoke is present, find the probability that the smoke will be detected by device A or device B or both.} \]
\[ b- \text{Find the probability that the smoke will not be detected.} \]

Problem # 10

An experiment consists of tossing a single die and observing the number of dots that shows on the upper face. Events A, B, and C are defined as follows:

A: Observe a number less than 4
B: Observe a number less than or equal to 2
C: Observe a number greater than 3

Find the probabilities associated with these compound events

\[ a- S \quad b- A \mid B \quad c- B \]
\[ d- A \cap B \cap C \quad e- A \cap B \quad f- B \cup C \]
\[ g- B \cap C \quad h- A \cup C \]
\[ i- \text{Are events "A" and "B" independent? Mutually exclusive?} \]
\[ j- \text{Are events "A" and "C" independent? Mutually exclusive?} \]
Problem #11

A journalist submitted two different articles to a newspaper. He knows from his past experience that the newspaper will publish the first one with a probability of 0.7, and the probability of getting the second one published is 0.4. Assuming the Editor-in-Chief will publish the articles independently, what is the probability that:
   a. both articles will be published
   b. at least one article will be published
   c. none of the articles will be published
   d. The newspaper will publish the second article only

Problem #12

A survey of 1000 randomly selected married women showed that 660 of these women have one or more children, while the rest have no children. Out of these 1000 women, 360 are working women; of the women who work, 250 have one or more children. A woman is selected randomly from this survey.

a. What is the probability that this woman is
   i. a working-woman
   ii. a working-woman given that she has one or more children
   iii. either a working-woman or has no children
b. Are the events "working-woman" and "has no children" independent? Why or why not?

Problem #13

A college student is planning his weekend (i.e., Thursday night and Friday night) activities. On Thursday night, he can sleep, go to a movie theater, or read. Each of these Thursday activities has an equal probability of occurrence. On Friday night, he can visit his family or do his homework. Each of these Friday activities has an equal probability of occurrence.

   a. Construct a tree diagram that would present the sequence of all possible weekend activities.
   b. What is the probability that he will ultimately be doing his homework?