For each problem, you need to choose a correct answer among 5 given answers. Note that during exam you have 60 minutes to solve 10 problems, so keeping track of time is useful. Another remark: you need to solve correctly (about) 7 problems to get a ”pass” so try, during your first run, choose problems that you can solve quickly (for less than 6 minutes) and skip those that will take more than 6 minutes.

1. An actuary studying the insurance preferences of car owners makes the following conclusions:
   (i) A car owner is twice as likely to purchase collision coverage as disability coverage.
   (ii) The event that an owner purchases collision coverage is independent of the event that disability coverage is purchased.
   (iii) The probability that an owner purchases both collision and disability coverages is 0.15. What is the probability that an owner purchases neither collision nor disability coverage?

   [A] 0.18  [B] 0.33  [C] 0.48  [D] 0.67  [E] 0.82

2. An insurance company examines its pool of auto insurance customers and gathers the following information:
   (i) All customers insure at least one car.
   (ii) 70% of the customers insure more than 1 car.
   (iii) 20% of customers insure a sport car.
   (iv) Of those customers who insure more than 1 car, 15% insure a sport car.
   Calculate the probability that a randomly selected customer insures exactly one car and that car is not a sport car.

   [A] 0.13  [B] 0.21  [C] 0.24  [D] 0.25  [E] 0.30

3. An insurance company pays hospital claims. The number of claims that include emergency room or operating room charge is 85% of the total number of claims. The number if claims that do not include emergency room charges is 25% of the total number of claims. The occurrence of emergency room charges is independent of the occurrence of operating room charges on hospital claims. Calculate the probability that a claim submitted to the insurance company includes operating room charges.

   [A] 0.1  [B] 0.2  [C] 0.25  [D] 0.4  [E] 0.8

4. A health study tracked a group of persons for five years. At the beginning of the study, 20% were classified as heavy smokers, 30% as light smokers, and 50% as nonsmokers. Results of the study showed that light smokers were twice as likely as nonsmokers to die during the five-year study, but only half as likely as heavy smokers. A randomly selected participant from the study died over the five-year period. Calculate the probability that the participant was a heavy smoker.

5. A public health researcher examines the medical records of a group of 937 men who died in 1999 and discovers that 210 of the men died from causes related to heart disease. Moreover, 312 of the 937 men had at least 1 parent who suffered from heart disease, and, of these 312 men, 102 died from causes related to heart disease. Determine the probability that a man randomly selected from this group died of causes related to heart disease, given that neither of his parents suffered from heart disease.

[A] 0.115  [B] 0.173  [C] 0.224  [D] 0.327  [E] 0.514

6. A doctor is studying the relationship between blood pressure and heartbeat abnormalities in her patients. She tests a random sample of her patients and notes their blood pressures (high, low, or normal) and their heartbeats (regular or irregular). She finds that:
(i) 14% have high blood pressure
(ii) 22% have low blood pressure
(iii) 15% have an irregular heartbeat
(iv) Of those with an irregular heartbeat, one-third have high blood pressure
(v) Of those with normal blood pressure, one-eighth have an irregular heartbeat.

What portion of the patients selected have a regular heartbeat and low blood pressure?

[A] 2%  [B] 5%  [C] 8%  [D] 9%  [E] 20%

7. An insurance company issues life insurance policies in three separate categories: standard, preferred, and ultra-preferred. Of the companies policyholders, 50% are standard and 40% are preferred. Each standard, preferred and ultra-preferred policyholder has probability 0.01, 0.005 and 0.001 of dying in the next year, respectively. A policyholder dies next year. What is the probability that the deceased policyholder was ultra-preferred?

[A] 0.0001  [B] 0.001  [C] 0.0071  [D] 0.0141  [E] 0.2817

8. The probability that a randomly chosen male has a circulation problem is 0.25. Males who have a circulation problem are twice as likely to be smokers as those who do not have a circulation problem. What is the conditional probability that a male has a circulation problem?


9. A study of automobile accidents produced the following data:

<table>
<thead>
<tr>
<th>Model Year</th>
<th>Proportion of cars</th>
<th>Probability of accident</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>.16</td>
<td>.05</td>
</tr>
<tr>
<td>2008</td>
<td>.18</td>
<td>.02</td>
</tr>
<tr>
<td>2009</td>
<td>.20</td>
<td>.03</td>
</tr>
<tr>
<td>Other</td>
<td>.46</td>
<td>.04</td>
</tr>
</tbody>
</table>

A car from one of the models 2007, 2008, and 2009 was involved in an accident. Determine the probability that the model year of this car is 2007.

[A] 0.22  [B] 0.3  [C] 0.33  [D] 0.45  [E] 0.5
10. Upon arrival at a hospital’s emergency room, patients are categorized according to their condition as critical, serious, or stable. In the past year:
1) 10% were critical
2) 30% were critical
3) 40% of the critical patients died
4) 10% of serious patients died
5) 1% of stable patients died.
Given that a patient survived, what is the probability that the patient was categorized as serious upon arrival?

[A] .06  [B] .29  [C] .30  [D] .39  [E] .64