Koushik Sahu
118CS0597
Artificial Intelligence Lab – 9

1.
Code:

```
"""
   Author: Koushik Sahu
   Created: 28 November 2021 Sun 18:31:27
"""

def buglary(happened):
   return (0.002 if happened else 0.998)

def earthquake(happened):
   return (0.001 if happened else 0.998)

def alarm(happened, buglary, earthquake):
   if buglary and earthquake:
      return (0.94 if happened else 0.06)
   elif buglary and not earthquake:
      return (0.95 if happened else 0.04)
   elif not buglary and earthquake:
      return (0.69 if happened else 0.69)
   return (0.001 if happened else 0.999)

def davidcalls(happened, alarm):
   if alarm:
      return (0.91 if happened else 0.09)
   return (0.05 if happened else 0.95)

def sophiecalls(happened, alarm):
   if alarm:
      return (0.75 if happened else 0.25)
   return (0.02 if happened else 0.98)

def solve(sophie_called,
          david_called,
          alarm_rang,
          buglary_occured,
          earthquake_occured):
   return sophiecalls(sophie_called, alarm_rang) * \
          davidcalls(david_called, alarm_rang) * \
          alarm(alarm_rang, buglary_occured, earthquake_occured) * \
          buglary(buglary_occured) * \
          earthquake(earthquake_occured)

if __name__ == '__main__':
   print(f'Did sophie call? (y/n): ', end='')
   sophie_called = (True if str(input()).upper() == 'Y' else False)
   print(f'Did david call? (y/n): ', end='')
```

```
    david_called = (True if str(input()).upper() == 'Y' else False)
    print(f'Did alarm ring? (y/n): ', end='')
    alarm_rang = (True if str(input()).upper() == 'Y' else False)
    print(f'Did buglary happen? (y/n): ', end='')
    buglary_occured = (True if str(input()).upper() == 'Y' else False)
    print(f'Did earthquake happen? (y/n): ', end='')
    earthquake_occured = (True if str(input()).upper() == 'Y' else False)

    prob = solve(sophie_called,
                 david_called,
                 alarm_rang,
                 buglary_occured,
                 earthquake_occured)

    print(f'Probability: {prob}')
```

Input:

Y
Y
Y
N
N

Output:

```
koushik@Koushik-Windows ~/nitr/artificial-intelligence-lab master ± python3 lab9_1.py
Did sophie call? (y/n): y
Did david call? (y/n): y
Did alarm ring? (y/n): y
Did buglary happen? (y/n): n
Did earthquake happen? (y/n): n
Probability: 0.00067977273
```

Code:

```
import math, statistics, collections

"""
    Author: Koushik Sahu
    Created: 29 November 2021 Mon 22:16:54
"""

def evening(is_evening):
    return (1/3 if is_evening else 2/3)

def line(line_no):
    if line_no == 6:
        return 1/5
    elif line_no == 22:
        return 1/2
    elif line_no == 24:
        return 3/10
```

```
def length(size, evening_happened, line_no):
    ans = 1
    if size == 'short':
        if evening_happened:
            if line_no == 6: ans *= 1
            elif line_no == 22: ans *= 1/10
            elif line_no == 24: ans *= 1/5
        elif not evening_happened:
            if line_no == 6: ans *= 9/10
            elif line_no == 22: ans *= 0
            elif line_no == 24: ans *= 1/5
    else:
        if evening_happened:
            if line_no == 6: ans *= 0
            elif line_no == 22: ans *= 9/10
            elif line_no == 24: ans *= 4/5
        elif not evening_happened:
            if line_no == 6: ans *= 1/10
            elif line_no == 22: ans *= 1
            elif line_no == 24: ans *= 4/5
    return ans

def destination(is_alberatov, line_no):
    if is_alberatov:
        if line_no == 6: return 1/10
        elif line_no == 22: return 1/10
        elif line_no == 24: return 9/10
    elif not is_alberatov:
        if line_no == 6: return 9/10
        elif line_no == 22: return 9/10
        elif line_no == 24: return 1/10

def solve(is_evening, line_no, size, is_alberatov):
    ans = 0
    for i in is_evening:
        for j in line_no:
            for k in size:
                for l in is_alberatov:
                    ans += evening(i) * line(j) * length(k, i, j) * destination(l, j)
    return ans

if __name__ == '__main__':
    # for the first problem
    print(f'Problem 1:')
    numr = solve([True], [6, 22, 24], ['short'], [True])
    deno = solve([True], [6, 22, 24], ['short'], [True, False])
    prob = numr / deno
    print(f'Probability: {prob}')

    print(f'Problem 2:')
    numr = solve([True, False], [22], ['long'], [True, False])
```

```
    deno = solve([True, False], [22], ['short', 'long'], [True, False])
    prob = numr / deno
    print(f'Probability: {prob}')
```

Input:

no input

Output:

```
koushik@Koushik-Windows ~/nitr/artificial-intelligence-lab  master ± python3 lab9_2.py
Problem 1:
Probability: 0.25483870967741934
Problem 2:
Probability: 0.9666666666666667
```