MA155

Project 3: General Probability and Discrete Probability Distribution Applications

Scenario:

A health insurance policy covers visits to a doctor's office. Each visit costs $230. The annual deductible on the policy is $300. For a policy, the number of visits per year has the following probability distribution.

Number of Visits	0	1	2	3	4	5	6
Probability	0.6	0.15	0.1	0.08	0.04	0.02	0.01

1. Use Microsoft Excel to create a table with the following column headings: Visit, Probability, Annual Deductible, Cost, and Payment.
   Note: Cost = Visits x Cost per Visit; Payment = MAX(0, Cost – Annual Deductible)

Visits	Probability	Annual Deductible	Cost	Payment
0	0.60	300.00	0	0.00
1	0.15	300.00	230	0.00
2	0.10	300.00	460	160.00
3	0.08	300.00	690	390.00
4	0.04	300.00	920	620.00
5	0.02	300.00	1150	850.00
6	0.01	300.00	1380	1080.00

2. A policy is selected at random from those where costs exceed the deductible.
   i. Calculate the probability that this policyholder had exactly 3 office visits (Round your answer to three decimal places).

$$\frac{0.08}{0.10+0.08+0.04+0.02+0.01}=\frac{0.08}{0.25}=\frac{8}{25}=0.320=32\%$$

   ii. Calculate the probability that this policyholder had exactly 5 office visits (Round your answer to three decimal places).

$$\frac{0.02}{0.10+0.08+0.04+0.02+0.01}=\frac{0.02}{0.25}=\frac{2}{25}=0.08=8\%$$

iii. Briefly comment (no more than two sentences) on your results from parts 2.i) and 2.ii).

Given that a policy is randomly selected from those where costs exceed deductible, the policyholder is more likely to have exactly 3 visits to a doctor's office compared to exactly 5 visits.

3. Use the Table in part 1 to answer respond to the following questions:
   i. Find the expected payment for visits to a doctor on this policy.

$$Expected\ Payment = \sum Payment\ \times Probability = \$99.80.$$

   ii. Find the standard deviation of payments for visits to a doctor on this policy.

$$Standard\ Deviation = \sqrt{(Payment - \ Expected\ Payment)^2 \times Probability} = \$215.08$$

   iii. Briefly comment (no more than two sentences) on your results from parts 3.i) and 3.ii).

   The expected payment for visits to a doctor's office under this health insurance policy is $99.08 and the variability or standard deviation corresponding to this estimate (expected payment) is $215.08. It is obvious that the standard deviation is larger than the expected payment by more than two folds.