

Exam P Problem 16

N_1 = Number of claims received in week 1

N_2 = Number of claims received in week 2

$$\Pr[N_1 + N_2 = 7]$$

N_1	N_2
0	7
1	6
2	5
3	4
4	3
5	2
6	1
7	0

$$\Pr[N_1 + N_2 = 7] = \Pr[N_1 = 0] \Pr[N_2 = 7] + \Pr[N_1 = 1] \Pr[N_2 = 6] + \dots + \Pr[N_1 = 7] \Pr[N_2 = 0]$$

$$\Pr[N = n] = \frac{1}{2^{n+1}} \quad n \geq 0$$

$$\Pr[N_1 + N_2 = 7] = \sum_{n=0}^7 \Pr[N_1 = n] \Pr[N_2 = 7-n]$$

$$= \sum_{n=0}^7 \left(\frac{1}{2^{n+1}} \right) \left(\frac{1}{2^{(7-n)+1}} \right)$$

$$= \sum_{n=0}^7 \left(\frac{1}{2} \right)^{n+1} \left(\frac{1}{2} \right)^{8-n}$$

$$= \sum_{n=0}^7 \left(\frac{1}{2^9} \right)$$

$$= \frac{8}{2^9} = \frac{1}{64}$$

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