

Assignment

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Question : Three dice are thrown at the sametime. Find the probability of getting three two's, if it is known that the sum of the numbers on the dice was six.

Solution: Let X be an bernoulli rv defined as in Table I, We

RV	Value	Description
X	0,1,2,3	Number of twos obtained in 3 throws
Y	3,4, ...,18	The sum of the numbers on the dice

TABLE I
RANDOM VARIABLE X DECLARATION.

need to find the value of

$$\Pr(X = 3|Y = 6) \quad (1)$$

The pmf's of the random variables are as follows:

$$p_X(k) = \frac{5^{(3-k)}}{216} \quad (2)$$

$$p_Y(k) = \frac{d^k}{dx^k} \frac{M_Y(z^{-1})}{k!} \Big|_{z=0} \quad (3)$$

where,

$$M_Y(z) = \prod_{i=1}^3 \left(\sum_{-\infty}^{\infty} \frac{z^{-k}}{6} \right) \quad (4)$$

From (2) and (3),

$$p_X(3) = \frac{1}{216} \quad (5)$$

$$p_Y(6) = \frac{10}{216} \quad (6)$$

When all the three die's roll 2, then thier sum will be 6. So,

$$\Pr(X = 3, Y = 6) = p_X(3) = \frac{1}{216} \quad (7)$$

Therefore, the probability of getting three two's, if it is known that the sum of the numbers on the dice was six will be

$$\Pr(X = 3|Y = 6) = \frac{\Pr(X = 3, Y = 6)}{p_Y(6)} \quad (8)$$

$$= \frac{\frac{1}{216}}{\frac{10}{216}} = \frac{1}{10} \quad (9)$$