

independently

Roll two fair 6-sided dice. Let X be the value of the first die, and let Y be the value of the second. Find $p_{X+Y}(9)$.

$$p_{X+Y}(9) = \sum_{(k,l)} p_{X,Y}(k,l)$$

with $k+l=9$

$$= 4 \left(\frac{1}{6} \cdot \frac{1}{6} \right)$$

$$= \frac{4}{36} = \frac{1}{9}$$

$$= \sum_{(k,l)} p_X(k) p_Y(l)$$

$$= \sum_k p_X(k) p_Y(9-k) = \sum_l p_X(9-l) p_Y(l)$$

with $p_X(k) > 0$
and $p_Y(9-k) > 0$

