

Assignment 5

Santoshi Gayatri Mavuru

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Question

Consider the following three events:

- (i) At least 1 six is obtained when six dice are rolled.
- (ii) At least 2 sixes are obtained when 12 dice are rolled.
- (iii) At least 3 sixes are obtained when 18 dice are rolled.

Which of these events is more likely?

Solution

Let X be a random variable representing our required outcomes.

Event	Description
$X=0$	At least 1 six is obtained when 6 dice are rolled.
$X=1$	At least 2 sixes are obtained when 12 dice are rolled.
$X=2$	At least 3 sixes are obtained when 18 dice are rolled.

Table

Solution

$$\Pr(X = 0) = 1 - (\text{No dice shows six}) \quad (1)$$

$$= 1 - \left(\frac{5}{6}\right)^6 \quad (2)$$

$$= 0.665 \quad (3)$$

$$\Pr(X = 1) = 1 - (\text{No dice shows six} + \text{One die shows six}) \quad (4)$$

$$= 1 - \left(\left(\frac{5}{6}\right)^{12} + {}^{12}C_1 \times \frac{1}{6} \left(\frac{5}{6}\right)^{11} \right) \quad (5)$$

$$= 0.61866 \quad (6)$$

$$(7)$$

Solution

$$\Pr(X = 2) = 1 - (\text{No dice shows 6} + \text{One die shows 6} + \text{Two dice show 6}) \quad (8)$$

$$= 1 - \left(\left(\frac{5}{6}\right)^{18} + {}^{18}C_1 \times \left(\frac{1}{6}\right) \left(\frac{5}{6}\right)^{17} + {}^{18}C_2 \times \left(\frac{1}{6}\right)^2 \left(\frac{5}{6}\right)^{16} \right) \quad (9)$$

$$= 0.5973 \quad (10)$$

Hence obtaining one six when 6 dice are rolled is more likely to occur than the other cases.