ASSIGNMENT-5
PROBABILITY AND RANDOM VARIABLES

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QUESTION

Consider the following three events:

(a) At least I six is obtained when six dice are rolled

(b) at least 2 sixes are obtained when 12 dice are rolled

(c) at least 3 sixes are obtained when 18 dice are rolled.

Which of these events is more likely?

SOLUTION

Event(a):
Probability of getting atleast 1 six obtained when six dice are rolled in event-a;
In rolling 6 dice :
(i) Probability that no six will come out

$$Q_0 = (\frac{5}{6})^6 = 0.335 \tag{1}$$

(ii) Probability that 1 six will come out

$$P_a = 1 - Q_0 = 1 - 0.335 = 0.665 \tag{2}$$

SOLUTION

Event(b):

Probability of getting atleast 2 six obtained when 12 dice are rolled in event-b;

In rolling 12 dice :

(i) Probability that no six will come out

$$Q_0 = (\frac{5}{6})^{12} = 0.112 \tag{3}$$

(ii) Probability that exactly 1 six will come out

$$Q_1 = (\frac{1}{6})^1(\frac{5}{6})^{11} \times 12 = 0.269 \tag{4}$$

(iii) Probability that at least 2 sixes will come out

$$P_b = 1 - Q_0 - Q_1 \tag{5}$$

$$P_b = (1 - 0.112 - 0.269) = 0.619 \tag{6}$$

SOLUTION

Probability of getting atleast 3 six obtained when 18 dice are rolled in event-c;
In rolling 18 dice :
(i) Probability that no six will come out

$$Q_0 = (\frac{5}{6})^{18} = 0.038 \tag{7}$$

(ii) Probability that exactly 1 six will come out

$$Q_1 = (\frac{1}{6})^1(\frac{5}{6})^{17} \times 18 = 0.135 \tag{8}$$

(iii)Probability that exactly 2 sixes will come out

$$Q_2 = (\frac{1}{6})^2(\frac{5}{6})^{16} \times_{18} C_2 = 0.230 \tag{9}$$

SOLUTION

Probability that at least 3 sixes will come out

$$P_c = 1 - Q_0 - Q_1 - Q_2 \tag{10}$$

$$P_c = 1 - 0.38 - 0.135 - 0.230 = 0.597 \tag{11}$$

$$\mathrm{P}_a > P_b > P_c$$

$\therefore$The most likely to happen is P_a