Grade 12 GS

Probability ex 19

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Exercise 19:

Consider an urn U containing three dice:

Two red dice where the faces of each of them are numbered from 1 to 6.

One black die where two of its faces are numbered 6 and four are numbered 2.

A player selects randomly and simultaneously two dice from U, then he rolls them only once.

Consider the following events:

A: "the two dice are red"

L: "out of the two dice , only one shows number 6"

1) Calculate *P(A)*.

- $P(A) = \frac{C_2^2}{C_3^2} = \frac{1}{3}$

2) a) Verify that $P(L/A) = \frac{5}{18}$ and calculate $P(L \cap A)$.

- $P(L/A) = P(6\,\bar{6}/both\ \text{red})) = \frac{1}{6} \times \frac{5}{6} \times 2! = \frac{5}{18}$
- $P(L \cap A) = P\left(\frac{L}{A}\right) \times \mathrm{P(A)} = \frac{5}{18} \times \frac{1}{3} = \frac{5}{54}$

b) Calculate $P(L \cap \bar{A})$ and verify that $P(L) = \frac{19}{54}$.

- $P(L/\bar{A}) = P(6\,\bar{6}/1r1b)) = \frac{1}{6} \times \frac{4}{6} + \frac{2}{6} \times \frac{5}{6} = \frac{7}{18}$
- $P(L \cap \bar{A}) = P\left(\frac{L}{\bar{A}}\right) \times P(\bar{A}) = \frac{7}{18} \times \frac{2}{3} = \frac{7}{27}$
- $P(L) = P(L \cap A) + P(L \cap \bar{A}) = \frac{5}{54} + \frac{14}{54} = \frac{19}{54}$

2) Knowing that only one of the two dice shows the number 6 , calculate the probability that the two selected dice are red.

- $P(A/L) = \frac{P(A \cap L)}{P(L)} = \frac{\frac{5}{54}}{\frac{19}{54}} = \frac{5}{19}$

3) Calculate the probability that at least one die shows the number 6.

- $P(at\ least\ one\ 6) = 1 - P(\bar{6}\bar{6}) = 1 - [P(\bar{6}\bar{6} \cap A) + P(\bar{6}\bar{6} \cap \bar{A})] = 1 - [\frac{5}{6} \times \frac{5}{6} \times \frac{1}{3} + \frac{5}{6} \times \frac{4}{6} \times \frac{2}{3}]$

$$= \frac{43}{108}$$