RVHS H2 Mathematics Remedial Programme

Topic: Discrete Random Variables

Basic Mastery Questions

1. **CJC MYE 9758/2021//Q9 (Parts)**
A biased red die is such that the probability of any face landing upwards is proportional to the square of the number on that face. The random variable X denotes the score obtained in one throw of this die with $\mathrm{P}(X=r)=kr^2$, where $r=1$, 2, 3, 4, 5, 6, and k is a constant.

(i) Find the exact value of k. [2]

A second biased die is yellow and the random variable Y denotes the score obtained when the yellow die is thrown once. The probability distribution of Y is

y	2	4	6
$\mathrm{P}(Y=y)$	$\frac{1}{5}$	$\frac{2}{5}$	$\frac{2}{5}$

(ii) Find $\mathrm{E}(Y)$ and show that $\mathrm{Var}(Y)=\frac{56}{25}$. [3]

(iii) Given that Y_1 and Y_2 are two independent observations of Y, find $\mathrm{E}(Y_1-Y_2)$ and $\mathrm{Var}(Y_1-Y_2)$. [2]

Answer: (i) $k=\frac{1}{91}$ **(ii)** $\frac{22}{5}$ **(iii)** 0, 4.48

2. **RI MYE 9758/2021//Q10(i)**
In a game, a player tosses a fair die, whose faces are numbered from 1 to 6. If the player obtains a 6, he tosses the die a second time, and in this case, his score is the absolute difference of 6 and the second number. Otherwise, his score is the number obtained in the first toss.

Let the player's score be denoted by X.

Show that $\mathrm{P}(X=1)=\frac{7}{36}$ and tabulate the probability distribution of X. [3]

Standard Questions

1. **HCI MYE 9758/2020//Q8 (Parts)**
A bag contains 9 numbered balls of identical size. Four of the balls are numbered 3, three of the balls are numbered 4 and two of the balls are numbered 5. In a game, three balls are drawn from the bag at random, without replacement. The random variable S is the sum of the numbers on the three balls drawn.

(i) Show that $\mathrm{P}(S=12)=\dfrac{25}{84}$ and find the probability distribution of S. [4]

(ii) Show that the probability where the sum of the numbers on the three balls drawn is a multiple of 3 is given by $\dfrac{29}{84}$. [1]

2. **RVHS MYE 9758/2020//Q8**
In a funfair game, a game-master set up two boxes with each box containing four cards, numbered 1, 2, 3, 4.

A player draws one card at random from each box and his score X, is the product of the numbers on the two cards.

(i) Find the probability distribution of X. [2]

(ii) Calculate the mean score and the variance exactly. [2]

The game-master charges $$p$ for each game. If the player's score is odd, the player wins a $5 cash voucher. Otherwise, the game ends.

(iii) Find the range of values of p for the game to be in favour of the game-master. [2]

Answer: (ii) 6.25, 17.1875 **(iii)** $p>\dfrac{5}{3}$