

PROBABILITY & STOCHASTIC
DISCRETE RANDOM VARIABLES

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A STUDENT TAKES TWO COURSES. IN EACH COURSE, THE STUDENT WILL EARN EITHER A B OR A C. TO CALCULATE A GPA, A B IS WORTH 3 POINTS & A C IS WORTH 2 POINTS. THE STUDENT'S GPA G_2 IS THE SUM OF THE POINTS EARNED FOR EACH COURSE DIVIDED BY 2. MAKE A TABLE OF THE SAMPLE SPACE OF THE EXPERIMENT AND THE CORRESPONDING VALUES OF THE GPA, G_2 .

THE SAMPLE SPACE, PROBABILITIES & CORRESPONDING GRADES FOR THE EXPERIMENT ARE

OUTCOMES	BB	BC	CB	CC
G_2	3.0	2.5	2.5	2.0

A RANDOM VARIABLE CONSISTS OF AN EXPERIMENT WITH A PROBABILITY MEASURE $P[\cdot]$ DEFINED ON A SAMPLE SPACE Ω & A FUNCTION THAT ASSIGNS A REAL NUMBER TO EACH OUTCOME IN THE SAMPLE SPACE OF THE EXPERIMENT.

THE RANDOM VARIABLE N HAS PMF

$$P_N(N) = \begin{cases} \frac{c}{N} & , \quad N=1, 2, 3 \\ 0 & , \quad \text{OTHERWISE} \end{cases}$$

FIND,

- (A) THE VALUE OF THE CONSTANT c
- (B) $P[N=1]$
- (C) $P[N \geq 2]$
- (D) $P[N > 3]$

THE VALUE OF THE CONSTANT c

$$1 = \sum_{n=1}^3 P_N(n) = c \left(\frac{1}{1} + \frac{1}{2} + \frac{1}{3} \right)$$

$$1 = c \left(\frac{6}{6} + \frac{3}{6} + \frac{2}{6} \right)$$

$$1 = c \left(\frac{11}{6} \right)$$

$$c = \frac{6}{11}$$

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$$P[N=1] = \frac{6}{11}$$

$$P[N \geq 2] = P_N(2) + P_N(3) = \frac{c}{2} + \frac{c}{3} = \frac{6/11}{2} + \frac{6/11}{3} = \frac{6}{22} + \frac{6}{33} = \frac{12}{55} = \frac{5}{11}$$