Assignment 1

AI1110: Probability and Random Variables

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11.16.3.4: A card is selected from a pack of 52 cards.

(a) How many points are there in the sample space?
(b) Calculate the probability that the card is an ace of spades.
(c) Calculate the probability that the card is (i) an ace and (ii) black card.

Solution:

S is a sample space of given cards ,
Let the random variables X,Y and Z denote colour,type and value of the card choosen, where X,Y and Z are uniformly distributed r.v's.
X,Y and Z are independent random variables.

TABLE 3
Random Variable and probability Table

Random variable	value of R.V	Probability
X	1,2	1/2
Y	1,2,3,4	1/4
Z	1 to 13	1/13

(a) Since no.of cards in the pack is 52 ,

$$n(S) = 52. \tag{1}$$

(b) The probability when the card choosen is an ace($Z = 1$) of spades($Y = 1$) ,

$$\Pr((Y = 1)(Z = 1)) = \Pr(Y = 1)\Pr(Z = 1) \tag{2}$$

$$= \left(\frac{1}{4}\right)\left(\frac{1}{13}\right) \tag{3}$$

$$= \frac{1}{52}. \tag{4}$$

(c) The probability when the card choosen is ,
   (a) an ace($Z = 1$)

$$\Pr(Z = 1) = \frac{1}{13}. \tag{5}$$

   (b) black card($X = 1$)

$$\Pr(X = 1) = \frac{1}{2}. \tag{6}$$