Solution 11.16.3.4

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Question 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 cards is an ace of spades.
(c) Calculate the probability that the card is (i) an ace (ii)black card.

Solution: S is a sample space of given cards ,
Let the random variables(r.v), where X,Y and Z are uniformly distributed r.v's.

TABLE 3
Random Variable and probability Table

Random independent variable	value of R.V
X(denotes colour)	1,2
Y(denotes type of card)	1,2,3,4
Z(denotes value of card chosen)	$1 \leq Z \leq 13$

PMF for Z is: (1)

$$P_Z(k) = \frac{1}{13} \qquad \text{k} = 1, 2, 3, ..., 13 \tag{2}$$

Similarly the PMF for Y and X are: (3)

$$P_Y(m) = \frac{1}{4} \qquad \text{m} = 1, 2, 3 \tag{4}$$

$$P_X(n) = \frac{1}{2} \qquad \text{n} = 1, 2 \tag{5}$$

(6)

(a) The number of sample space points is 52
(b)

$$P_{ZY}(1,1) = P_Z(1)P_Y(1) \qquad \text{as } ZY = 0 \tag{7}$$

$$= \left(\frac{1}{4}\right)\left(\frac{1}{13}\right) \tag{8}$$

$$= \frac{1}{52} \tag{9}$$

(c) The probability when the card choosen is ,
(i) an ace

$$P_Z(1) = \frac{1}{13}. \tag{10}$$

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(ii) black card

$$P_X(1) = \frac{1}{2}. \tag{11}$$