

# Solution 11.16.3.4

Aditya Vikram Singh\*

**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)

$$p_Z(k) = \frac{1}{13} \quad k = 1, 2, 3, \dots, 13 \quad (2)$$

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

$$p_Y(m) = \frac{1}{4} \quad m = 1, 2, 3 \quad (4)$$

$$p_X(n) = \frac{1}{2} \quad n = 1, 2 \quad (5)$$

(6)

(a) The number of sample space points is 52

(b)

$$p_{ZY}(1, 1) = p_Z(1)p_Y(1) \quad \text{as } ZY = 0 \quad (7)$$

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

$$= \frac{1}{52} \quad (9)$$

(c) The probability when the card choosen is ,

(i) an ace

$$p_Z(1) = \frac{1}{13}. \quad (10)$$

\*The author is with the Department of Electrical Engineering, Indian Institute of Technology, Hyderabad 502285 India e-mail: gadepall@iith.ac.in. All content in this manual is released under GNU GPL. Free and open source.

(ii) black card

$$p_X(1) = \frac{1}{2}. \quad (11)$$