

- You are given two identical jars and 50 balls, which are identical except for colour with 25 green and 25 yellow. The balls will be distributed into the jars, after which a jar will be chosen at random and then a ball drawn at random from that jar. How should one distribute the balls into the jars to have the greatest possible chance that the ball drawn from the chosen jar is yellow?
- A certain university class is made up of 11 freshman, 19 sophomores, 14 juniors and 6 seniors. One student is selected at random.
  - What is the sample space of this experiment?
  - Let  $X$  represent chosen student's year of study. Write the range of  $X$ .
  - Write the probability distribution for  $X$ .
- The UTF-8 binary coding system encodes written characters with an 8-bit number. The conversion for Upper case letters in the English alphabet is shown in the table below.

A: 010000001	B: 010000010	C: 010000011	D: 01000100	E: 01000101	F: 01000110
G: 01000111	H: 01001000	I: 01001001	J: 01001010	K: 01001011	L: 01001100
M: 01001101	N: 01001110	O: 01001111	P: 01010000	Q: 01010001	R: 01010010
S: 01010010	T: 01010010	U: 01010101	V: 01010110	W: 01010111	X: 01011000
Y: 01011001	Z: 01011010				

A letter is selected at random from a book. Let  $X$  be the random variable which gives the number of 1's in an 8-bit code for a letter from A to Z.

- Write the range of  $X$ .
- The relative frequency of use in texts for each letter in the English alphabet is given in the following table.

A: 8.1%	B: 1.5%	C: 2.78%	D: 4.3%	E: 12.9%	F: 2.2%
G: 2%	H: 6.1%	I: 7%	J: 0.15%	K: 0.77%	L: 4%
M: 2.4%	N: 6.7%	O: 7.4%	P: 1.9%	Q: 0.095%	R: 6%
S: 6.25%	T: 9.05%	U: 2.8%	V: 0.98%	W: 2.4%	X: 0.15%
Y: 2%	Z: 0.075%				

Give the probability distribution for  $X$ .

- A box contains 5 colored balls, 2 black and 3 white. Balls are drawn successively without replacement. If the random variable  $X$  is the number of draws until the last black ball is obtained, find the probability distribution of  $X$ .
- Let  $X$  be a random variable whose range is the whole numbers from 1 to 12. Show that the following is a valid probability distribution for  $X$ , then give the cumulative distribution function for  $X$ .

$$P(X = x) = \frac{2x - 1}{144}$$

6. The cumulative distribution function for a discrete random variable  $X$  is given by

$$F(x) = \begin{cases} 0 & \text{for } x < -1 \\ 0.25 & \text{for } -1 \leq x < 1 \\ 0.35 & \text{for } 1 \leq x < 3 \\ 0.71 & \text{for } 3 \leq x < 5 \\ 1 & \text{for } x \geq 5 \end{cases}$$

- (a) Write the range of  $X$ .
- (b) Find  $P(X \leq 3)$  and  $P(X = 3)$ .
- (c) Give the probability distribution for  $X$ .
- (d) Find  $P(X < 3)$ , and  $P(X \geq 1)$ .