

5.2 Discrete Probability Distribution

(57)

The probability distribution for a random variable describes how probabilities are distributed over the values of the random variable.

* For discrete random variable x , the probability distribution is defined by a probability function $f(x)$ which provides a probability for each value of the random variable.

* Required Conditions for a discrete probability function:

$$f(x) \geq 0 \quad \text{and} \quad \sum f(x) = 1$$

Example: (Q7 page 142) Consider the probability distribution for the random variable x :

x	$f(x)$
20	0.20
25	0.15
30	0.25
35	0.40

(a) Is the probability distribution valid? Explain

$$f(x) \geq 0 \quad \forall x$$

$$\sum f(x) = 1$$

Therefore, it is a valid prob. distrib.

(b) What is the probability that $x = 30$? $f(30) = 0.25$

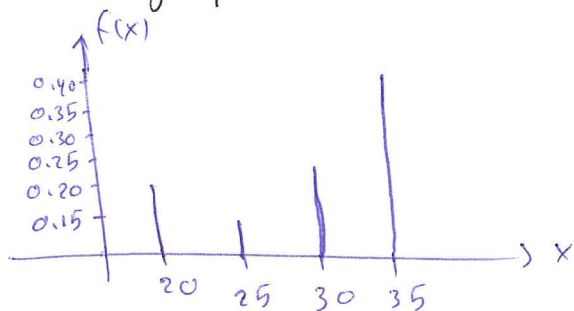
(c) What is the probability that x is less than or equal to 25?

$$f(20) + f(25) = 0.20 + 0.15 = 0.35$$

(d) What is the probability that x is greater than 30?

$$f(35) = 0.40$$

(e) Provide a graphical representation for the prob. distribution.



* The simplest example of a discrete prob. distribution (58) given by a formula is the

Discrete Uniform Prob. function $f(x) = \frac{1}{n}$, where n = the number of values the r.v may assume.

Example 1 Consider the experiment of Rolling a die. Let x be the random variable that represent the number of dots on the upward face.

$x = 1, 2, 3, 4, 5, 6$ with $f(x) = \frac{1}{6}$

$f(x)$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$
x	1	2	3	4	5	6

 formula

② Consider the random variable x with the following discrete prob. distribution.

x	$f(x)$
1	$\frac{1}{10}$
2	$\frac{2}{10}$
3	$\frac{3}{10}$
4	$\frac{4}{10}$

the formula

$$f(x) = \frac{x}{10}, \quad x = 1, 2, 3, 4$$

$$f(2) = \frac{2}{10}$$

$$f(4) = \frac{4}{10}$$