Chapter 5 Problems and Solutions (6th and 7th Ed) - Discrete Probability Distributions

7. The probability distribution for the random variable *x* follows.

x	$f(x)$
20	.20
25	.15
30	.25
35	.40

a. Is this probability distribution valid? Explain.
b. What is the probability that $x = 30$?
c. What is the probability that x is less than or equal to 25?
d. What is the probability that x is greater than 30?

8. The following data were collected by counting the number of operating rooms in use at Tampa General Hospital over a 20-day period: On three of the days only one operating room was used, on five of the days two were used, on eight of the days three were used, and on four days all four of the hospital's operating rooms were used.

a. Use the relative frequency approach to construct a probability distribution for the number of operating rooms in use on any given day.
b. Draw a graph of the probability distribution.
c. Show that your probability distribution satisfies the required conditions for a valid discrete probability distribution.

16. The following table provides a probability distribution for the random variable *y*.

y	$f(y)$
2	.20
4	.30
7	.40
8	.10

a. Compute $E(y)$. b. Compute $\text{Var}(y)$ and σ.

20. The probability distribution for damage claims paid by the Newton Automobile Insurance Company on collision insurance follows.

Payment ($)	Probability
0	.85
500	.04
1000	.04
3000	.03
5000	.02
8000	.01
10000	.01

a. Use the expected collision payment to determine the collision insurance premium that would enable the company to break even.
b. The insurance company charges an annual rate of $520 for the collision coverage. What is the expected value of the collision policy for a policyholder? (*Hint:* It is the expected payments from the company minus the cost of coverage.) Why does the policyholder purchase a collision policy with this expected value?

Chapter 5 Solutions

7. a. $f(x) \geq 0$ for all values of x.

$\Sigma f(x) = 1$ Therefore, it is a proper probability distribution.

b. Probability $x = 30$ is $f(30) = .25$

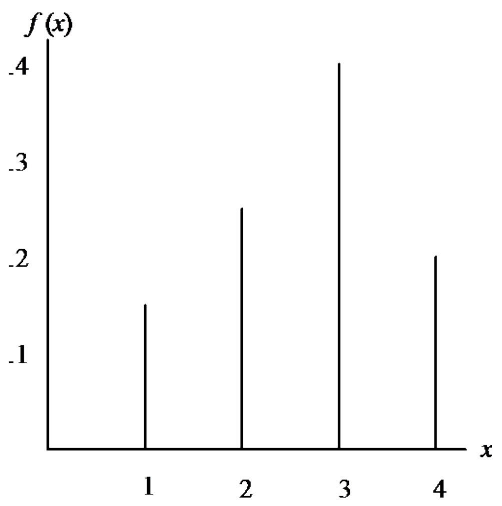
c. Probability $x \leq 25$ is $f(20) + f(25) = .20 + .15 = .35$

d. Probability $x > 30$ is $f(35) = .40$

8. a.

x	$f(x)$	
1	3/20 =	.15
2	5/20 =	.25
3	8/20 =	.40
4	4/20 =	.20
	Total	1.00

b.



c. $f(x) \geq 0$ for $x = 1,2,3,4$.

$\Sigma f(x) = 1$

16. a.

y	$f(y)$	$y f(y)$
2	.2	.4
4	.3	1.2
7	.4	2.8
8	.1	.8
	1.0	5.2

$E(y) = \mu = 5.2$

b.

y	$y - \mu$	$(y - \mu)^2$	$f(y)$	$(y - \mu)^2 f(y)$
2	-3.20	10.24	.20	2.048
4	-1.20	1.44	.30	.432
7	1.80	3.24	.40	1.296
8	2.80	7.84	.10	.784
				4.560

$\text{Var}(y) = 4.56$

$\sigma = \sqrt{4.56} = 2.14$

20. a.

x	$f(x)$	$xf(x)$
0	.85	0
500	.04	20
1000	.04	40
3000	.03	90
5000	.02	100
8000	.01	80
10000	.01	100
Total	1.00	430

The expected value of the insurance claim is $430. If the company charges $430 for this type of collision coverage, it would break even.

b. From the point of view of the policyholder, the expected gain is as follows:

Expected Gain = Expected claim payout – Cost of insurance coverage
= $430 - $520 = -$90

The policyholder is concerned that an accident will result in a big repair bill if there is no insurance coverage. So even though the policyholder has an expected annual loss of $90, the insurance is protecting against a large loss.