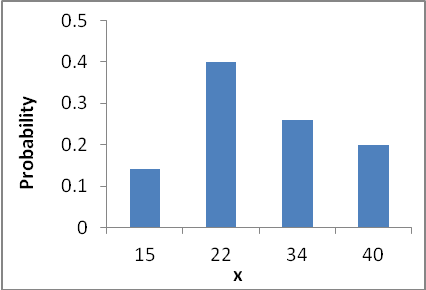
Chapter 5 Discrete Probability Distributions

Solutions

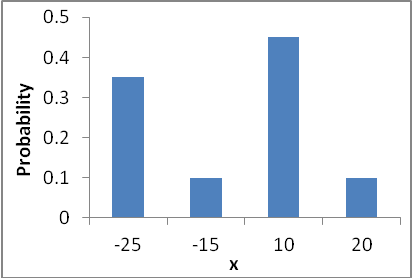
* 1. This is a valid probability distribution. It satisfies the 2 necessary conditions: each probability falls between 0 and 1, and all probabilities add up to 1.











The distribution is not symmetric.



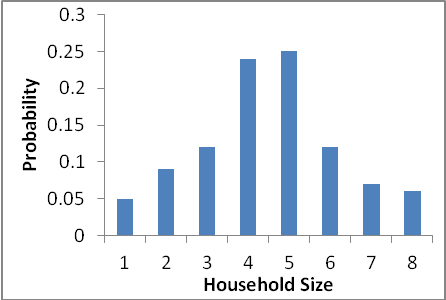




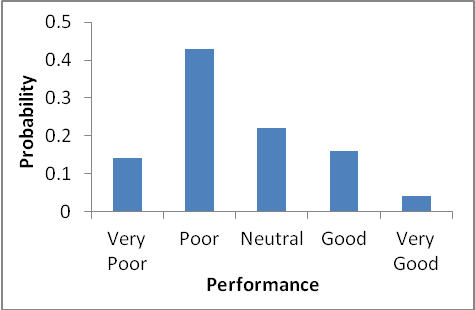
* 1. .



* 1. Yes. The distribution has a finite number of specified values, each probability is equally likely and the distribution is symmetric.



The distribution is fairly symmetric.



The analyst has a somewhat pessimistic view based on the positively skewed distribution. There is only a 21% chance that the performance will be good or very good.

* 1. Let the random variable *X* represent performance.

|  |  |
| --- | --- |
| *x* | *P*(*X* ≤ *x*) |
| 1 (Very poor) | 0.14 |
| 2 (Poor) | 0.57 |
| 3 (Neutral) | 0.79 |
| 4 (Good) | 0.95 |
| 5 (Very Good) | 1 |

* 1. *P*(*X* ≥ 4) = *P*(*X* ≤ 5) – *P*(*X*≤3) = 1 - 0.79 = 0.21. We can also compute this probability as *P*(*X* =4) + *P*(*X=5*) = 0.16 + 0.05 = 0.21.

1. Let the random variable *X* represent number of shots made.

|  |  |
| --- | --- |
| *x* | *P*(X = x) |
| 0 | 0.55 |
| 1 | 0.25 |

|  |  |
| --- | --- |
| 2 | 0.20 |



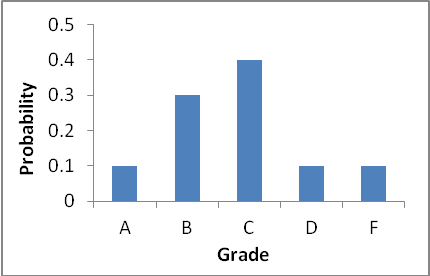
1. Yes, because there is only a 20% chance that the player will make both free throw shots and a 55% chance that he will miss them both.
2. Let the random variable *X* represent consumer confidence.
   1. The probability that the consumer confidence will stay at the current level is .



* 1. The probability that the consumer confidence will not get worse is .







The probability distribution is skewed to the left with 80% of the students getting a grade of C or better.

* 1. Let the random variable *X* represent the letter grade.

|  |  |
| --- | --- |
| *x* | *P*(*X* ≤ *x*) |
| 0 (F) | 0.10 |
| 1 (D) | 0.20 |
| 2 (C) | 0.60 |
| 3 (B) | 0.90 |
| 4 (A) | 1 |







1. Let *X* represent the repair cost if you do not buy the insurance. Therefore, . If you are risk neutral, you should buy the insurance because the expected cost of repair ($84) is greater than the cost of the insurance ($80).







* 1. If Victor is risk neutral, he should not purchase the extended warranty because his expected cost ($3,125) without the extended warranty is less than the cost of the warranty ($3,400). The decision is not clear cut if he is risk averse; the decision will depend on his degree of risk aversion.



* 1. He should invest the $10,000.
  2. No, it depends on the degree of his risk aversion. In other words, his decision depends on how much he would like to be compensated for the risk.



* 1. You would choose Fund 1 because it is less risky (smaller standard deviation) than Fund 2, with the same expected return of 6%.



1



* 1. Janice will pick the investment in Asia because it has a higher expected return.
  2. Her decision would not be clear cut because the investment in Europe is less risky, but it offers a lower expected return. Her decision will depend on the level of her risk aversion.

1. The portfolio consists of $20 × 100 = $2,000 invested in Stock X and $12 × 200 = $2,400 invested in Stock Y. Total investment = $2,000 + $2,400 = $4,400.

and











* 1. The portfolios in parts a. and b. offer better expected returns than the bond alone, but have slightly higher variances than the bond fund with variance = (.















1. 1. 4 failures is the same as 1 success;



* 1. ; more than the expected number of failures is the same as less than or equal to the expected number of successes;



1. 1. ; Excel command: Binomdist (50, 150, 0.36, TRUE)



* 1. ; Excel command: Binomdist(40, 150, 0.36, FALSE)



* 1. ; Excel command for : Binomdist(60, 150, 0.36, TRUE)



* 1. Excel command for : Binomdist(54, 150, 0.36, TRUE)



1. 1. ; Excel command: Binomdist(150, 200, 0.77, TRUE)



* 1. Excel command for : Binomdist(160, 200, 0.77, TRUE)



Excel commands: Binomdist(165, 200, 0.77, TRUE) and Binomdist(154, 200, 0.77, TRUE)

* 1. ; Excel command: Binomdist(160, 200, 0.77, FALSE)



















* 1. Here we use *p* = 1 – 0.25 = 0.75. Therefore,



(from part b)



1. Probability of wearing a turban is 1 ‒ 0.25 = 0.75.







* 1. ; Excel command: Binomdist (4, 15, 0.40, TRUE)



* 1. ; Excel command: Binomdist (7, 15, 0.40, FALSE)



* 1. ; Excel commands: Binomdist(9, 15, 0.40, TRUE) and Binomdist(5, 15, 0.40, TRUE)



* 1. ; Excel command: Binomdist(10, 20, 0.40, FALSE)



* 1. Excel command: Binomdist(10, 20, 0.40, TRUE)



* 1. ;



Excel command for : Binomdist(14, 20, 0.40, TRUE)







Excel command: Binomdist(1, 100, 0.0131, TRUE)



Excel command: Binomdist(1, 100, 0.0087, TRUE)

* 1. These above findings are consistent with the foreclosure rates in the two areas.

In other words, there is 37.74% (100 ‒ 62.26) chance that at least 2 houses or more will go into foreclosure in the Washington, D.C. region, compared to 21.64% (100 ‒ 78.36) in the nation.











1. 1. ; Excel command: Poisson(10, 15, True)



* 1. ; Excel command: Poisson(13, 15, FALSE)



* 1. ; Excel command for : Poisson(15, 15, TRUE)



Excel commands: Poisson(18, 15, TRUE) and Poisson(11, 15, TRUE)

1. 1. ; Excel command: Poisson(13, 20, TRUE)



* 1. ; Excel command for : Poisson(19, 20, TRUE)



* 1. ; Excel command: Poisson(25, 20, FALSE)



Excel commands: Poisson(23, 20, TRUE) and Poisson(17, 20, TRUE)



1. 1. cars over a 60-minute period thus cars over a 1-minute period; so



* 1. for a 10-minute period (6 10), and



1. 1. calls per hour or 60-minute period



calls per 30-minute period



calls per 15-minute period











* 1. cars







1. 1. ; Excel command: Poisson (425, 400, TRUE)



* 1. Excel command for : Poisson(374, 400, TRUE)







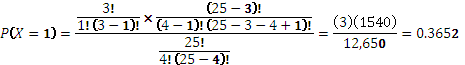
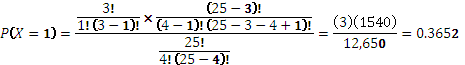
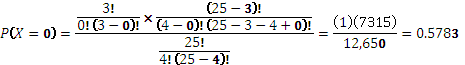
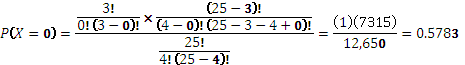
* 1. ; Excel command: Poisson(100, 94.55, FALSE)



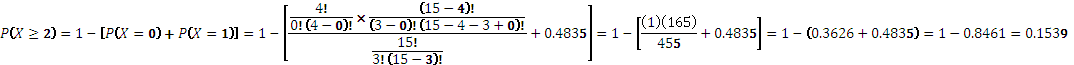
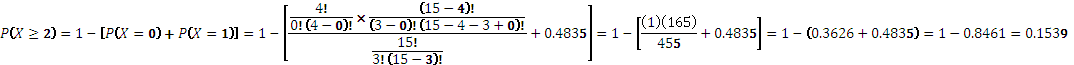
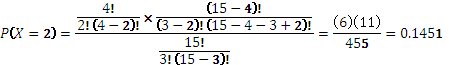
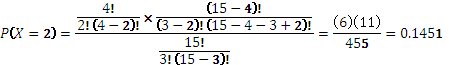
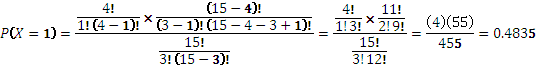
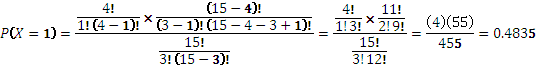
* 1. Excel command: Poisson(100, 94.55, TRUE)



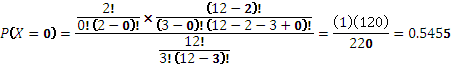
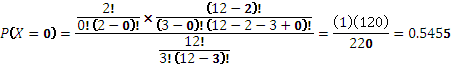












1. 1. ; Excel command: Hypgeom.dist (2, 5, 20, 50, 0)



Excel commands: Hypgeom.dist (0, 5, 20, 50, 0) and Hypgeom.dist (1, 5, 20, 50, 0)

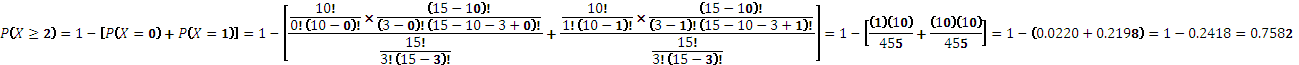
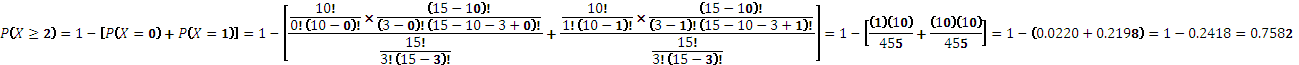
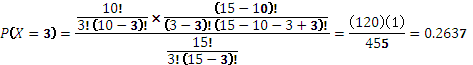
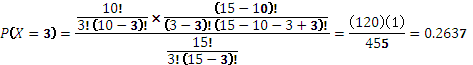
* 1. ; Excel command: Hypgeom.dist(3, 5, 20, 50, 1)



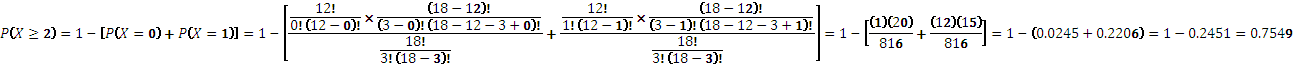
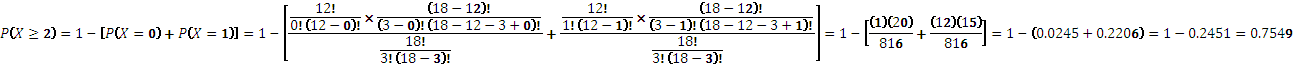
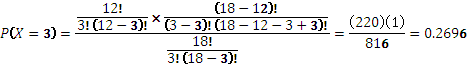
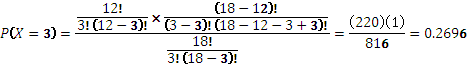
Excel command for Hypgeom.dist (7, 20, 25, 100, 1)



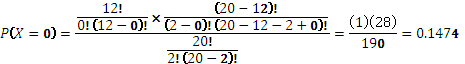
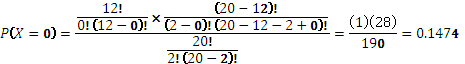
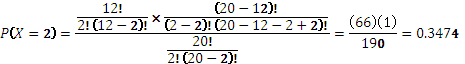
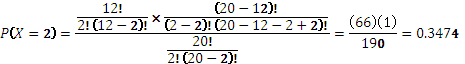




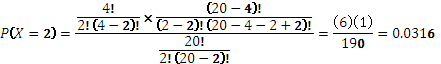
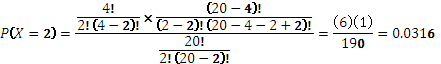
















Excel command for : Hypgeom.dist (0, 10, 16, 40, 1)



* 1. ; Excel command: Hypgeom.dist (2, 5, 5, 59, 0)



* 1. ; Excel command: Hypgeom.dist (5, 5, 5, 59, 0)



* 1. ; Excel command: Hypgeom.dist (1, 1, 1, 39, 0)



* 1. Since the two stages are independent, we multiply the above probabilities to derive the probability of winning the jackpot: 0.0000002 × 0.0256 = 0.00000000512



















1. 1. ; Excel command: Binomdist(15, 100, 0.20, FALSE)



Excel command for : Binomdist(20, 100, 0.20, TRUE)



Excel command for : Binomdist(24, 100, 0.20, TRUE)



* 1. Excel command: Binomdist(10, 30, 0.19, FALSE)



Excel commands: Binomdist(20, 30, 0.19, TRUE) and Binomdist(9, 30, 0.19, TRUE)

* 1. ; Excel command: Binomdist(8, 30, 0.19, True)



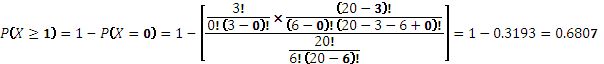
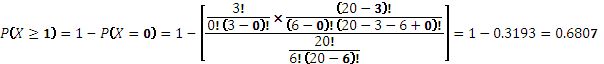
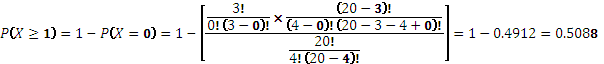
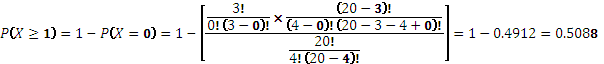




1. 1. ; Excel command for : Poisson(4, 5, TRUE)







1. 1. ; Excel command: Hypgeom.dist (6, 10, 20, 80, 0)



* 1. Excel command for : Hypgeom.dist (4, 10, 20, 80, 1)



* 1. ; Excel command: Hypgeom.dist (2, 10, 20, 80, 1)



**Case Study 1:**



* Expected Gain = $51 ‒ $74 = ‒$23 (loss)
* A risk neutral consumer will not purchase this extended warranty because the expected repair cost of $51 is less than the $74 cost of the extended warranty; there is an expected loss of $23. The decision is not clear cut if the consumer is risk averse; the decision will depend on his degree of the consumer's risk aversion.

**Case Study 2:**











* In a sample of ten teens, the above probabilities suggest that at least 92.67 % were smokers in 1997 versus 85.57% in 2001 and 58.87 % in 2007. These results suggest that the teen smoking rate has been consistently declining in New York City.

**Case Study 3:**



Using Excel Poisson function, with *x* =



|  |  |
| --- | --- |
| *x* | *P(X=x)* |
| 0 | 0.0646 |
| 1 | 0.1769 |
| 2 | 0.2424 |

|  |  |
| --- | --- |
| 3 | 0.2214 |
| 4 | 0.1516 |
| 5 | 0.0831 |
| 6 | 0.0379 |
| 7 | 0.0149 |
| 8 | 0.0051 |
| 9 | 0.0015 |
| 10 | 0.0004 |