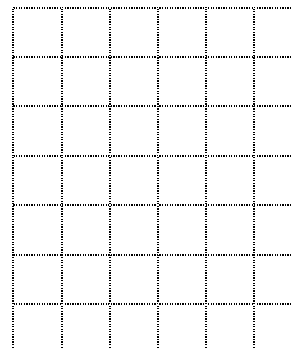


1. The probability distribution below is for the random variable  $X$  = number of mice caught in traps during a single night in small apartment building.

$X$	0	1	2	3	4	5
$P(X)$	0.12	0.20	0.31	0.14	0.16	0.07

- (a) Make a histogram of this probability distribution in the grid:



- (b) Describe  $P(X \geq 2)$  in words and find its value.

- (c) Express the event “trapping at least one mouse” in terms of  $X$  and find its probability.

2. The total sales on a randomly-selected day at Joy’s Toy Shop can be represented by the continuous random variable  $S$ , which has a Normal distribution with a mean of \$3600 and a standard deviation of \$500. Find and interpret  $P(S > \$4000)$ .

3. Joe the barber charges \$32 for a shave and haircut and \$20 for just a haircut. Based on experience, he determines that the probability that a randomly selected customer comes in for a shave and haircut is 0.85, the rest of his customers come in for just a haircut. Let  $J$  = what Joe charges a randomly-selected customer.

(a) Give the probability distribution for  $J$ .

(b) Find and interpret the mean of  $J$ ,  $\mu_J$ .

(c) Find and interpret the standard deviation of  $J$ ,  $\sigma_J$ .

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4. The manager of a children's puppet theatre has determined that the number of adult tickets he sells for a Saturday afternoon show is a random variable with a mean of 28.3 tickets and a standard deviation of 5.3 tickets. The mean number of children's tickets he sells is 42.5, with a standard deviation of 8.1.
- (a) The adult tickets sell for \$10. Let  $A$  = the money he collects from adult tickets on a random Saturday. What are the mean and standard deviation of  $A$ ?
- (b) The children's tickets sell for \$6. Let  $T$  = the money he collects from all ticket sales (adults and children) on a random Saturday. Assume (unrealistically, perhaps) that the number of tickets sold to adults is independent of the number sold to children. What are the mean and standard deviation of  $T$ ?
- (c) It costs \$300 for the manager to put on each puppet show. Let  $P$  = the profit from a random Saturday's show. What are the mean and standard deviation of  $P$ ?
5. Mr. Voss and Mr. Cull bowl every Tuesday night. Over the past few years, Mr. Voss's scores have been approximately Normally distributed with a mean of 212 and a standard deviation of 31. During the same period, Mr. Cull's scores have also been approximately Normally distributed with a mean of 230 and a standard deviation of 40. Assuming their scores are independent, what is the probability that Mr. Voss scores higher than Mr. Cull on a randomly-selected Tuesday night?

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6. Determine whether each random variable described below satisfies the conditions for a binomial setting, a geometric setting, or neither. Support your conclusion in each case.
- (a) Suppose that one of every 100 people in a large community is infected with HIV. You want to identify an HIV-positive person to include in a study of an experimental new drug. How many individuals would you expect to have to interview in order to find the first person who is HIV-positive?
- (b) Deal seven cards from a standard deck of 52 cards. Let  $H$  = the number of hearts dealt.
7. Research suggests that about 24% of 12-year-olds in the United States can pick out the state of Colorado on a map.
- (a) What is the probability that you must sample exactly 5 twelve-year-olds to find the first one who can pick out Colorado on a map?
- (b) What is the probability that you must sample 5 or more twelve-year-olds to find the first one who can pick out Colorado on a map?

8. An online poll reported that 20% of respondents subscribe to the “five-second rule.” That is, they would eat a piece of food that fell onto the kitchen floor if it was picked up within five seconds. Let’s assume this figure is accurate for the entire U.S. population, and we select 15 people at random from this population.

(a) Determine the probability that exactly 3 of the 15 people subscribe to the “five-second rule.”

(b) Find the probability that less than 4 people out of 15 subscribe to the “five-second rule.”

(c) Let  $F$  = the number of people in our sample of 15 who subscribe to the “five-second rule.” Find the mean and standard deviation for  $F$ .