Show All Solutions

Rosen, Discrete Mathematics and Its Applications, 8th edition
Extra Examples
Section 7.1—An Introduction to Discrete Probability

Extra Examples — *Page references correspond to locations of Extra Examples icons in the textbook.*

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p.470, icon at Example 1
#1. A computer password consists of five lower case letters, with repeated letters allowed. Find $p(E)$ where E is the event that the password begins with c.

See Solution

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p.470, icon at Example 1
#2. A computer password consists of five lower case letters, with repeated letters allowed.

(a) Find $p(F_1)$, where F_1 is the event that the password contains no vowels.
(b) Find $p(F_2)$, where F_2 is the event that the password contains only vowels.

See Solution

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p.470, icon at Example 1

#3. A professor teaches two sections of a calculus course and gave a quiz to the students in each section. In Section 1, 8 students out of 35 got a score of 90 or higher. In Section 2, 11 students out of 28 got a score of 90 or higher.

Find the probability that the student:

(a) is in Section 1, if the student is chosen at random from among all 63 students.
(b) is not in Section 1, if the student is chosen at random from among all 63 students.
(c) scored at least 90 on the quiz, if the student is chosen at random from those in Section 1.
(d) is in Section 1 and scored at least 90 on the quiz, if the student is chosen at random.
(e) is in Section 1, if the student is chosen at random from those who scored at least 90 on the quiz.

See Solution

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p.470, icon at Example 1

#4. You flip a coin twice. Find the following:

(a) $p(E)$ where E is the event of getting heads on the first flip and tails on the second flip.
(b) $p(F)$ where F is the event of getting one head and one tail in the two flips.

See Solution

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p.470, icon at Example 1

#5. A tetrahedral die is a regular polyhedron consisting of 4 equilateral triangles, with the four faces numbered 1,2,3,4. You roll the pair of tetrahedral dice. Find the probability that the sum is: (a) 2, (b) 3, (c) 4, (d) 5, (e) 6, (f) 7, (g) 8.

See Solution

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p.470, icon at Example 1

#6. You pick five numbers, without replacement, from the set $\{1, 2, 3, \dots, 24, 25\}$. What is the probability that the product of the numbers chosen is odd?

See Solution

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p.470, icon at Example 1

#7. Suppose $S = \{1, 2, \ldots, 20\}$. You select a subset $T \subseteq S$ of size three. Find the probability that T consists of two odd numbers and one even number.

See Solution

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p.470, icon at Example 1

#8. Suppose $S = \{1, 2, \ldots, 20\}$. You select a subset $T \subseteq S$ of size three. Find the probability that T consists of three prime numbers.

See Solution

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p.470, icon at Example 1

#9. Suppose $S = \{1, 2, \ldots, 20\}$. You select a subset $T \subseteq S$ of size three. Find the probability that the three numbers in T have a sum that is less than nine.

See Solution

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p.470, icon at Example 1

#10. A class has 20 women and 13 men. A committee of five is chosen at random. Find

(a) p(the committee consists of all women).
(b) p(the committee consists of all men)
(c) p(the committee consists of all of the same sex)

See Solution

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p.470, icon at Example 1

#11. What is the probability of getting more heads than tails, if you toss a fair coin

(a) nine times?

(b) ten times?

See Solution

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p.470, icon at Example 1

#12. A family has two children. They are not twins. You ring the doorbell of the house they live in and a girl answers the door. What is the probability that the other child in the family is a girl? Assume that in the births of two children the probability of the birth of a girl or a boy are independent events and that the probability of the birth of a child of either sex is $1/2$.

See Solution

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p.474, icon at Example 9

#1. Suppose $S = \{1, 2, \ldots, 20\}$. You select a subset $T \subseteq S$ of size three. Find the probability that T has at least one even number in it.

See Solution

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p.474, icon at Example 9

#2. Suppose $S = \{1, 2, \ldots, 20\}$. You select a subset $T \subseteq S$ of size three. Find the probability that T contains the numbers 10 or 20.

See Solution

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p.474, icon at Example 9

#3. A true/false quiz has 10 questions. If you randomly answer each question, what is the probability that you score at least 70%?

See Solution

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p.474, icon at Example 9

#4. In a lottery game, a winning set of five numbers is chosen from the set $\{1, 2, \ldots, 44\}$. To play, you pick a set of five numbers. If your five numbers match the five winning numbers, you win first prize. If exactly four match, you win second prize. If exactly three match, you win third prize. If two or fewer numbers match, you win nothing. Find

(a) p(win first prize).
(b) p(win second prize).
(c) p(win third prize).
(d) p(win no prize).

See Solution

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p.474, icon at Example 9

#5. Several states play a lottery game call Mega Millions. A Mega Millions lottery game ticket has two halves: you pick a set of five numbers from the numbers 1 through 56 on the top half of the ticket, and one number (the Mega Ball number) from 1 through 46 on the bottom half of the ticket. (The Mega Ball number can be the same as one of the five numbers picked on the top half of the ticket.) Six winning numbers are chosen: five numbers from 1 through 56 and one Mega Ball number from the numbers 1 through 46. You win a prize if your choices match some or all of the winning numbers, as follows: five and Mega Ball, five and no Mega Ball, four and Mega Ball, four and no Mega Ball, three and Mega Ball, three and no Mega Ball, two and Mega Ball, one and Mega Ball, only the Mega Ball.

Suppose you purchase one ticket. Find the probability that you win each of these prizes.

See Solution

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p.474, icon at Example 9

#6. Six cards, numbered $1, 2, 3, 4, 5, 6$, are placed in a row. Let E be the event that 1 and 2 are next to each other or 3 and 4 are next to each other. Which is more likely: E or $\overline{E}$?

See Solution

p.474, icon at Example 9

#7. You pick five numbers, without replacement, from the set $\{1, 2, 3, \ldots, 24, 25\}$. What is the probability that the sum of the numbers chosen is odd?

See Solution

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Extra Examples
Section 7.2—Probability Theory

Extra Examples — *Page references correspond to locations of Extra Examples icons in the textbook.*

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p.481, icon at Example 3

#1. You draw 2 cards, one at a time without replacement, at random from a deck of 52 cards. Find

(a) p(second card is a Jack | first card is a Jack)
(b) p(second card is red | first card is black)

See Solution

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p.482, icon at Example 5

#1. You write a string of letters of length 3 from the usual alphabet, with no repeated letters allowed. Let E_1 be the event that the string begins with a vowel and E_2 be the event that the string ends with a vowel. Determine whether E_1 and E_2 are independent.

See Solution

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p.485, icon at Example 9

#1. A fair coin is flipped five times. Find the probability of obtaining exactly four heads.

See Solution

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p.485, icon at Example 9
#2. A die is rolled six times in a row. Find

(a) p(exactly four 1's are rolled).
(b) p(no 6's are rolled).

See Solution

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p.485, icon at Example 9
#3. A quiz consists of 20 true/false questions. You need to have a score of at least 65% in order to pass the quiz. What is the probability that you pass the quiz if you guess at random at each answer?

See Solution

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Extra Examples
Section 7.3—Bayes' Theorem

Extra Examples — *Page references correspond to locations of Extra Examples icons in the textbook.*

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p.494, icon at Example 1

#1. It is estimated that a certain disease occurs in 0.1% of the U.S. population. A test that attempts to detect the disease has been developed with the following results: 99.7% of people with the disease test positive for the disease and 0.2% of people without the disease test positive for the disease. (A result that says that a person has the disease when in reality the person does not have the disease is called a "false positive".)
Find the probability that a person actually has the disease, given that the person tests positive for the disease.

See Solution

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Rosen, Discrete Mathematics and Its Applications, 8th edition
Extra Examples
Section 7.4—Expected Value and Variance

Extra Examples — *Page references correspond to locations of Extra Examples icons in the textbook.*

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p.504, icon at Example 2
#1. You roll a die. If a 5 or 6 shows, you win three points. If a 1, 2, 3, or 4 shows, you lose one point. Set up a random variable X that measures the number of points you win, and find the expected value of X.

See Solution

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p.504, icon at Example 2
#2. You roll a die four times. Let X be the random variable that counts the sum of the numbers rolled. Find $E(X)$.

See Solution

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p.504, icon at Example 2
#3. A 6-sided die has its sides labeled $1, 1, 2, 2, 2, 3$. If you roll the die once, what is the expected value of the number that shows?

See Solution

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p.504, icon at Example 2

#4. A multiple-choice exam consists of a series of questions, each with four possible responses. If you answer a question correctly, you receive 1 point. If you answer a question incorrectly, you lose $1/3$ point. If you do not answer a question, you neither lose not gain any points. What is the expected value of the number of points you receive on a question

(a) if you randomly choose an answer?
(b) if you can eliminate one of the four choices and randomly choose one of the other three choices?

See Solution

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p.511, icon at Example 11

#1. A fair coin is flipped three times. Let X be the random variable that counts the number of heads and let Y be the random variable that counts the number of tails. Then

$$p(X = 0) = \tfrac{1}{8}, p(X = 1) = \tfrac{3}{8}, p(X = 2) = \tfrac{3}{8}, p(X = 3) = \tfrac{1}{8}.$$
$$p(Y = 0) = \tfrac{1}{8}, p(Y = 1) = \tfrac{3}{8}, p(Y = 2) = \tfrac{3}{8}, p(Y = 3) = \tfrac{1}{8}.$$

Determine whether X and Y are independent random variables.

See Solution

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p.511, icon at Example 11

#2. A coin is flipped and a die rolled. The sample space

$$S = \{(H,1),(H,2),(H,3),(H,4),(H,5),(H,6),(T,1),(T,2),(T,3),(T,4),(T,5),(T,6)\}.$$

Let X be the random variable defined as follows: $X = 1$ if H is obtained on the coin and 0 if T is obtained on the coin. Let Y be the random variable that counts the number of spots showing on the die. Determine whether X and Y are independent random variables.

See Solution

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p.514, icon at Example 14

#1. Two tetrahedral dice are rolled. (A tetrahedral die is a die with four faces, which are numbered $1, 2, 3, 4$. Let $X(i, j) = i + j$, where the first die shows i and the second die shows j. Find $E(X)$ and $V(X)$.

See Solution
