EXER 6 DISCRETE PROBABILITY

SOLUTIONS

1. While waiting for the her mom Lori to fetch him from school, Carl flips four distinguishable and fair coins. List the members of the sample space.

E = {HHHH, HHHT, HHTH, HHTT, HTHH, HTHT, HTTH, HTTT, TTTT, TTTH, TTHT, TTHH, THTT, THTH, THHT, THHH}

2. It's already 5:30 pm and his mom is really late, so to avoid more boredom, Carl flips six identical and fair coins. List the members of the event "one coin shows up heads".

E = {HTTTTT, HHTTTT, HHHTTT, HHHHTT, HHHHHT, HHHHHH}

3. It's getting really really late and his mom has not yet arrived, Carl got tired of flipping coins and rolled two distinguishable and fair dice instead. What is the probability that the sum of the numbers on the dice is even?

E = the sum of the numbers on the dice is even

= { (1,1), (1,3), (1,5), (2,2), (2,4), (2,6), (3,1), (3,3), (3,5), (4,2), (4,4), (4,6), (5,1), (5,3), (5,5), (6,2), (6,4), (6,6) }

|E| = 18 *|S| = S(6,2) = 36*

P(E) = 18 / 36 = 1 / 2

4. After few more minutes, Lori finally arrived and saw Carl playing with three identical and fair dice. What is the probability that the sum of the numbers on the dice is odd?

E = the sum on the dice is odd

= { (1,1,1), (1,1,3), (1,1,5), (1,2,2), (1,2,4), (1,2,6), (1,3,3), (1,3,5), (1,4,4), (1,4,6), (1,5,5), (1,6,6), (2,2,3), (2,2,5), (2,3,4), (2,3,6), (2,4,5), (2,5,6), (3,3,3), (3,3,5), (3,4,4), (3,4,6), (3,5,5), (3,6,6), (4,4,5), (4,5,5), (5,5,5), (5,6,6) }

|E| = 28 *|S| = M(6,3) = C(8,3) = 56* *P(E) = 28 /56*

5. While on their way home, Carl showed his 12-question multiple choice long quiz to his mom and asked her to guess the answer to every question. If each has four (4) choices, what is the probability that Lori answers exactly 5 questions correctly?

Ways to answer exactly five questions correctly

Select which five questions are answered correctly = C(12,5)

Ways to answer these 5 questions correctly = 1^5

Ways to answer the other 7 questions incorrectly = 3^7

*By product rule = C(12,5) * 1^5 * 3^7*

Ways to answer the quiz = 4^{12}

*P(answer exactly 5 questions correctly) = (C(12,5) * 1^5 * 3^7) / 4^{12}*

6. As they drive through the city, they witnessed panicking and restless people. They decided to meet Rick, Carl's father, at the Police Station. For safety purposes, they were asked 14 true or false questions about health issues. What is the probability that Lori answers at least one question correctly?

Ways to answer all questions incorrectly = $1^{14} = 1$

Ways to answer the quiz = 2^{14}

P(answer at least one question correctly) = $1 – 1 / 2^{14}$

7. After answering the 14 true of false questions, another set of questions were given to them consisting of 25 psychological questions. If each questions has six(6) choices each, what is the probability that:

a. Lori answers exactly fifteen(15) questions correctly?

Ways to answer exactly 15 questions correctly

Select which 15 questions are answered correctly = C(25,15)

Ways to answer these 15 questions correctly = 1^{15}

Ways to answer the other 10 questions incorrectly = 5^{10}

*By product rule = C(25,15) * 1^{15} * 5^{10}*

Ways to answer the questions = 6^{25}

*P(answer 5 questions correctly) = (C(25,15) * 1^{15} * 5^{10}) / 6^{25}*

b. Lori got at least one correct answer?

Ways to answer all questions incorrectly = 5^{25}

Ways to answer the questions = 6^{25}

P(answer at least one question correctly) = $1 – 5^{25} / 6^{25}$

8. At last! Rick found them and they headed south of the city asap. They stopped by a pharmacy to get a fever medicine for Carl. They saw 50 different medicines scattered around. Of those medicines, 25 are antibiotics, 5 are antihistamines, 8 are fever medicines, 10 are pain relievers and 2 are antidepressants. If they will pick a medicine at random, what is the probability that a medicine chosen is: a. A fever medicine or a pain reliever? b. a fever medicine, antidepressant, or pain reliever?

A. 8/50 + 10/50

B. 8/50 + 2/50+ 10/50