

Probability - part 4

date: , class: , student:

1 Exercises

- **Exercise 1:** You throw two fair dice and consider two events: A = scoring 2 with the first die, B = scoring 5 with the second die. Calculate the probabilities of the two events A and B , $p(A \cap B)$, and $p(A|B)$.
- **Exercise 2:** You throw two fair dice and consider two events: C = scoring at least 4 with the first die, D = scoring at least 3 with the second die. Calculate the probabilities of the two events C and D , $p(C \cap D)$, and $p(C|D)$.
- **Exercise 3:** You throw two fair dice and consider two events: E = scoring 2 with the first die, F = the sum of the scores of the two dice gives 6. Calculate the probabilities of the two events E and F , $p(E \cap F)$, and $p(E|F)$.
- **Exercise 4:** You flip 3 coins and consider two events: G = obtaining two heads in the first two flips, H = obtaining heads in the third flip. *Prove* that the events G and H are independent.
- **Exercise 5:** You flip 3 coins and consider two events: I = obtaining at least two heads, J = obtaining heads in the third flip. Are events I and J independent? Prove the validity of your answer.
- **Exercise 6:** You extract a card from a deck of 52 and, without putting it back in the deck, you extract a second card. Are the events K = the first card is a King, and L = the second card is a 10, independent?
- **Exercise 7:** Two events M and N have probabilities $p(M) = 50\%$ and $p(N) = 80\%$. What is the value of $p(M \cap N)$ if the two events are independent?
- **Exercise 8:** Consider two independent events O and P : the probability of O is $p(O) = 30\%$, and $p(O \cap P) = 10\%$. What is the probability of P ?

- **Exercise 9:** Consider two independent events Q and R: the conditional probability of Q given R is 60%. What is the probability of R if $p(Q \cup R) = 68\%$?
- **Exercise 10:**¹ LeBron James has a *three-pointer* percentage of 42% and a *free-throw* percentage of 75%. Does he have more chances of scoring three consecutive free-throws or a single tree-pointer?

2 Useful links

- Khan Academy: video about independent events.
<https://goo.gl/R4Mbwz>
- Khan Academy: solution of a problem about independent events.
<https://goo.gl/frpc6X>
- Khan Academy: solution of the three-pointer vs. 3 free throws problem of Exercise 10.
<https://goo.gl/mjMFmj>

3 Glossary

- three-pointer = tiro da 3 punti
- free-throw = tiro libero

¹this exercise was taken from Khan Academy: see the third video in the "Useful links" section for the solution.