

Self-Diagnostic: Math

These questions check your level of mathematical preparedness for this course. Most students will be able to answer all of these questions.

Probabilistic inference: Your box of cereal may be a contest winner! It's rattling, which 100% of winning boxes do. Of course 1% of all boxes rattle and only one box in a million is a winner. What is the probability that your box is a winner?

Events: You are playing a solitaire game in which you are dealt three cards without replacement from a simplified deck of 10 (marked 1 through 10). You win if all your cards are odd or if one of them is a 10. How many winning hands are there if different orders are different hands? What is your chance of winning?

Expectations: Someone rolls a fair six-sided die and you win points equal to the number shown. What is the expected number of points after one roll? After 2 rolls? After 100 rolls?

Conditional Probabilities: Which of the following statements are true for all joint distributions over X and Y :

- (a) $P(x, y) = P(x)P(y)$,
- (b) $P(x, y) = P(x|y)P(y)$,
- (c) $P(x, y) P = P(x|y)P(y|x)$,
- (d) $P(x) = \sum_y P(x|y)$,
- (e) $P(x) = \sum_y P(x|y)$?

Linear Equations: You know that $x = (1/2)y + (1/2)(x + 1)$ and $y = (1/3)y + (1/3)(x + 2)$. What are x and y ?

Hashing: What critical operation is generally faster in a hashtable than in a linked list, and how fast is it typically in each? When will a hashtable degrade to the speed of a list?

Induction: Prove by induction that the sum of the first n odd integers is n^2 .