Section 4.3: Discrete Random Variables

Thursday, November 14, 2019 9:44 AM

a variable x is a random variable if the value it assumes in the outcome of an experiment is a chance or random event

examples: result of a coin flip
(note: coin does not have to be fair)

the sum of two dice when rolled

the first card dealt in a card game

discrete random variable:

quantitative (has a numerical value)

discrete - can only take on certain values
(a 6-sided die can roll a value of 3 or 4 but not 3.75 or π)

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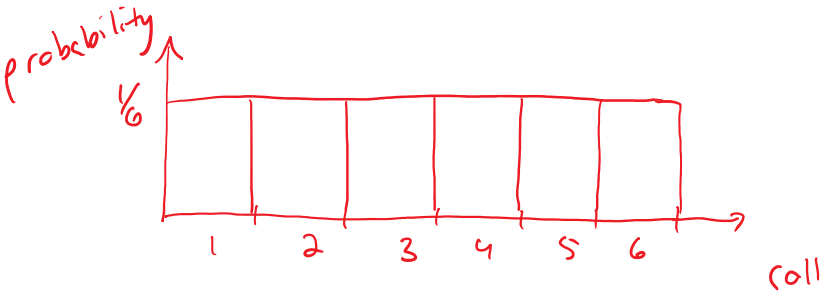
probability distribution:

example: when you roll a fair 6-sided die, what is the probability of each roll?

roll	probability
	1/6

roll	probability
1	1/6
2	1/6
3	1/6
4	1/6
5	1/6
6	1/6

sum = 1



example: what is the probability of each outcome for rolling an unfair six-sided die if the probability of rolling a 2, 3, 4, or 5 is still 1/6, but the probability of rolling a 1 is zero?

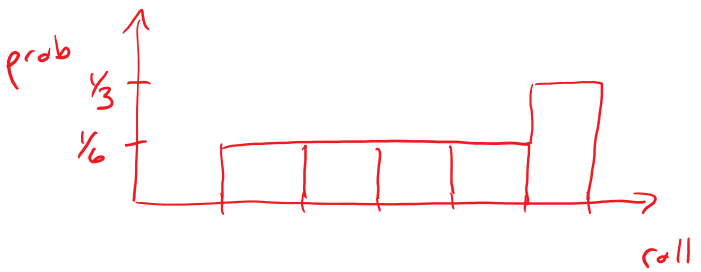
table

roll	probability
1	0
2	1/6
3	1/6
4	1/6
5	1/6
6	2/6 = 1/3

sum = 1

so that the sum is equal to one

graph



probability distribution for a discrete random variable is a formula, graph, or table that gives the possible

outcomes of x and their associated probabilities $p(x)$

note: the sum of the probabilities must equal one

$$\sum p(x) = 1$$

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example: complete the following probability distribution

x	$p(x)$
0	$1/10$
1	
2	$3/10$

← fill in the missing value, which is $\frac{6}{10} = \frac{3}{5}$

experiment: rolling two fair 4-sided dice

result of single rolls

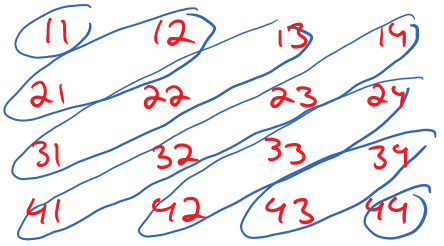
roll	tally
1	𝍸 𝍸 𝍸 𝍸
2	𝍸
3	𝍸 𝍸
4	𝍸 𝍸 𝍸

result for the sum

sum	tally
2	1
3	1
4	𝍸
5	𝍸 1
6	𝍸 1
7	𝍸
8	11

but what does this look like in theory?

sample space:



how many ways can you roll a sum of 2? 1
5? 4

how many outcomes in total in sample space? 16

sum	probability
2	1/16
3	2/16 = 1/8
4	3/16
5	4/16 = 1/4
6	3/16
7	2/16 = 1/8
8	1/16

sum = 1 ✓