18. Exercise: Using countable additivity

Exercises due Feb 5, 2020 05:29 IST *Completed*

Exercise: Using countable additivity

1/1 point (graded)

Let the sample space be the set of positive integers and suppose that $\mathbf{P}(n) = 1/2^n$, for $n = 1, 2, \ldots$. Find the probability of the set $\{3, 6, 9, \ldots\}$, that is, of the set of of positive integers that are multiples of 3.

1/7

✔ **Answer:** 0.14286

Solution:

Using countable additivity, and with $\alpha = 2^{-3} = 1/8$, the desired probability is

$$\frac{1}{2^3} + \frac{1}{2^6} + \frac{1}{2^9} + \cdots = \alpha + \alpha^2 + \alpha^3 + \cdots = \frac{\alpha}{1-\alpha} = \frac{1/8}{1-(1/8)} = \frac{1}{7}.$$

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You have used 1 of 3 attempts

Answers are displayed within the problem

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- Alternative solution — 1
- Confused on P(outcome is even)
  Hi there, So I understand the P(outcome is even) = P({2, 4, 6, ...}) = 1/3 However, if you do P(outcome is o... — 2
- why sum of probabilities?
  Hi all, I've got how to solve the problem, but I think I don't have deep understanding. In the problem is a... — 3
- Grader question for 18. Exercise: Using countable additivity
  With some changes (taking a factor) to the sum of probabilities, it will be a series for which we know wh... — 6 new
- Useful tip
  You will need the formula for the sum (S) of infinite geometric series used in the previous video: S= 1/(1-... — 1
- Finally getting it!
  Though, remembering geometric sequences from so many years ago was not pleasant. — 1
- Syntax
  I seem to be using the wrong syntax, no commas or letters? what do I use? Thanks! — 1
- countability
  This YouTube video sheds some light on what it means to be uncountable, using Cantors diagonalization... — 2
- Good explanation for geometric series
  I happened to find this explanation on geometric series, which should be in the mathematical backgroun... — 1
- List of number types
  I found this list (from Wikipedia) helpful, learned some things about numbers I thought I knew but didn't ... — 1