

Three out of Five!

Here are several problems that all seem to be about "three out of five." But each problem may need a different method to solve it, and each may have a different answer. Try as many as you can! Show your work! Explain your thinking!

I. Passwords

You have to make a password that is three letters long using A, E, I, O or U. You can use a letter more than once. Possible passwords include: AAE, AEA, or UIE. How many different passwords are possible?

II. Races

Five children are running in a race. Let's say there will be no ties. In how many different ways can they come in first, second and third?

III. Videos

You want to rent five videos. Your parents say you're only allowed to rent three. How many different ways can you choose the three you want to get?

IV. Cookies

There are five trays of cookies at the party, each with a different type of cookie. You want to eat three cookies. How many different selections of three cookies can you put on your plate?

V. Dice

You're rolling five dice. What's the probability that exactly three of them will show the same number? (For example, three twos, or three sixes.) This problem may be a bit trickier than the others. Can you do some experimenting to get an estimate of the probability?

VI. Class Report

There are five problems above this one. What percent of your class worked on at least three of the five problems?

VII. Have fun!

The Adam and Eve/Grandparents Conundrum

Okay folks, I really need your help with this one! Most human beings have two biological parents, four biological grandparents, and eight biological great-grandparents. It *seems* like a pretty straightforward powers-of-two kind of thing. In each generation, going backwards, I have twice as many ancestors.

- 1) How many great-great-grandparents would a person have?
- 2) Let's say each generation is about 25 years--meaning people have children at about age twenty-five. How many ancestors would a person have had three hundred years in the past?

Maybe you see where we're getting in trouble. Were there really 4,294,967,296 ancestors of Richard Allen Fischer walking around 32 generations ago? (About eight hundred years ago?) Did the earth even have over four billion people that long ago? And how about your ancestors? And his? And hers? Did each person living today have that many ancestors eight hundred years ago??!!

And what makes it worse is that we often think of this as an example of exponential growth *in the opposite direction*. The human race may have started with a tiny group of people, maybe only two. And then the population doubled every so many years. Hey, maybe Adam and Eve had four children, and eight grandchildren, and sixteen great-grandchildren... Recent estimates suggest that the earth's population doubled in about the past forty years.

Come on, both these mathematical models can't be correct, can they? Population can't be doubling as we go into the future *and* doubling as we go back into the past! Can anybody explain this?

- 3) Explain this!

Thanks!