EVOLUTION USING DICE

Purpose

Mathematically it is inconceivable that anything as complex as a protein let alone a cell or creature could arise by chance alone. Natural selection preserves those aspects which are desirable and eliminates those which are undesirable. This activity attempts to show how unlikely it is that animals/cells were formed complete by chance and how much more likely that they formed by evolution. Each dice represents one aspect of the creature or cell. In the first activity you are calculating the chance of developing all ten aspects at once. In the second you are simulating the development and retention of successful aspects.

Instructions

1 Think of a number ten digits long but containing only the numbers one to six and calculate the chance of throwing all ten dice at once so that they come up with your number. It is 1 in 6^{10}.

2 Draw a table like this with 20 lines

Dice number	1	2	3	4	5	6	7	8	9	10
Your number										
Number of throws 1										
2										

3 First throw. Take the dice number 1 and throw it. Write down the number.

4 Repeat with each of the remaining dice, writing the number down in the same row. If any of the numbers match the digit of your number at the top of the column, underline it and do not throw that dice again.

5 Second throw. Repeat instruction 4 by shaking each dice in turn except those that have come up with the correct number.

6 Repeat until the correct number has come up for each column.

7 Compare the total number of throws with the 6^{10} throws needed on average to get the number you though of in a single throw.

Teacher's Section

Requirements

Ten dice

Beaker to shake dice in (or use hand)

Tray to shake dice onto (helps prevent them rolling on the floor)

Notes

This can be done with one dice but it is not as visually effective.

Results

Chance of throwing a ten digit number is 1 in 60,466,176 whereas to get that number by the second method requires on average 60 throws.

Time

15 minutes