**Mathematical Statistics**

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1、The Birthday Problem

·Contents

The computer will generate birthday random. Count the matches when generate days each time.

·Results

|  |  |  |  |
| --- | --- | --- | --- |
| Days | Experiment 1 | Experiment 2 | Experiment 3 |
| 100 | 8 | 14 | 16 |
| 200 | 42 | 42 | 46 |

|  |  |  |  |
| --- | --- | --- | --- |
| Days | Experiment 1 | Experiment 2 | Experiment 3 |
| 50 | 6 | 3 | 4 |
| 100 | 18 | 10 | 10 |
| 150 | 30 | 30 | 27 |
| 200 | 52 | 47 | 49 |

|  |  |  |  |
| --- | --- | --- | --- |
| Days | Experiment 1 | Experiment 2 | Experiment 3 |
| 25 | 2 | 1 | 0 |
| 50 | 6 | 2 | 3 |
| 75 | 10 | 3 | 5 |
| 100 | 17 | 8 | 12 |
| 125 | 21 | 14 | 19 |
| 150 | 31 | 20 | 30 |
| 175 | 40 | 28 | 39 |
| 200 | 47 | 43 | 49 |

2、 Statistical games——Describing Data——Mean

·Contents

Given a series of numbers and their current mean, I can add, cancel or substitute numbers to get an aimed mean.

·Example 1

Goal: Add numbers until the mean is between 43 and 44.

Current Value: 40.84.

Minim number of addition: 2.

Add a number (0-99 in the empty box).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 21 | 47 | 16 | 53 | 29 | 15 | 80 | 83 | 30 | 11 | 89 | 12 | 26 | 35 | 10 | 62 |
| 22 | 56 | 71 | 86 | 68 | 85 | 14 | 10 | 11 | 84 | 27 | 31 | 29 | 30 | 23 | *99* |
| *75* |

Explanations

Step1: The original mean is less than 43. Since the minim number of addition is 2, it is easy to put 99 in the box at first. And then I get a new mean of 42.66.

Step 2: The new mean is 1 smaller than 43.66, which is between 43 and 44. A, there are already 32 numbers in the box, it means that the sum of the all the existed numbers is 32 less than 43.66. So I put 75=43+32 and finally get the mean of 43.64.

·Example 2

Goal: Change numbers until the mean is between 52 and 53.

Current Value: 53.72.

Minim number of deletions needed: 1

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 9 | 10 | 12 | 17 | 23 | 30 | 48 | 49 | 49 | 49 | 49 | 53 | 53 | 54 | 55 | 58 |
| 68 | 74 | 76 | 78 | 84 | 85 | 86 | 86 | 88 |
| 9 | 10 | 12 | 17 | 23 | 30 | 48 | 49 | 49 | 49 | 49 | 53 | 53 | 54 | 55 | 58 |
| 68 | 74 | 76 | 78 | 84 | 85 | 86 | 86 | *63* |

Explanations

The current value is 1 bigger than 52.72, which is between 52 and 53. Since there are 25 numbers in the box, it means that the sum of all the existed numbers is 25 bigger than 52.72. Just select the biggest number 88, substitute 63=88-25 with it and finally get the mean of 52.72.

3、Science Simulations —— Evolution

·Contents

Four amoebas are created (red, green, blue, and black), each containing a "stinger" to kill others. When an amoeba manages to kill another, then the victim dies, and the killer gives birth to a fresh amoeba. (The fresh amoeba is a randomly-mutated version of the killer.) Each amoeba has four parameters: size, speed of rotation, frequency of deployment of stinger, and span of stinger. Over time, the amoebas should evolve into beings well suited to their environment.

·Guess

The most powerful parameter is the size. For every time an amoeba is killed, its size will be smaller.