**Problem1 (1)**

**50 dice , each with 6 sides**

========================

Number of sides = 6

Number of dice = 50

-----Simulation(S)-----

Initializatin

[0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]

After trial

[2, 6, 4, 3, 2, 5, 1, 2, 4, 1, 2, 1, 2, 4, 5, 3, 6, 3, 2, 1, 2, 3, 1, 3, 1, 5, 1, 3, 6, 5, 2, 1, 1, 2, 3, 4, 6, 6, 1, 1, 2, 5, 3, 2, 1, 5, 3, 6, 4, 4]

-----Simulation(E)-----

-----Analysis(S)-------

Sum(simulation) , mean(simulation) , variance(simulation) , deviation(simulation)

151 3.02 2.8596000000000004 1.6910351859142376

mean(theory) , variance(theory) , deviation(theory)

3.5 2.9166666666666665 1.707825127659933

deviation from theory

0.48 0.057066666666666155 0.01678994174569537

deviation from theory(%)

13.714285714285715 1.956571428571411 0.983118322465544

-----Analysis(E)-------

========================

**Problem1 (2)**

**2 dice , each wih 10 sides**

========================

Number of sides = 10

Number of dice = 2

-----Simulation(S)-----

Initializatin

[0, 0]

After trial

[4, 10]

-----Simulation(E)-----

-----Analysis(S)-------

Sum(simulation) , mean(simulation) , variance(simulation) , deviation(simulation)

14 7.0 9.0 3.0

mean(theory) , variance(theory) , deviation(theory)

5.5 8.25 2.8722813232690143

deviation from theory

-1.5 -0.75 -0.1277186767309857

deviation from theory(%)

-27.27272727272727 -9.090909090909092 -4.446593573418704

-----Analysis(E)-------

========================

**10 dice, each with 20 sides**

========================

Number of sides = 10

Number of dice = 20

-----Simulation(S)-----

Initializatin

[0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]

After trial

[5, 3, 5, 10, 4, 5, 1, 2, 8, 8, 3, 8, 10, 3, 10, 5, 2, 2, 9, 2]

-----Simulation(E)-----

-----Analysis(S)-------

Sum(simulation) , mean(simulation) , variance(simulation) , deviation(simulation)

105 5.25 9.087499999999999 3.0145480589965716

mean(theory) , variance(theory) , deviation(theory)

5.5 8.25 2.8722813232690143

deviation from theory

0.25 -0.8374999999999986 -0.14226673572755733

deviation from theory(%)

4.545454545454546 -10.151515151515135 -4.953091975184383

-----Analysis(E)-------

========================

**Problem1 (3)**

5 dice , each with 2 sides

|  |  |
| --- | --- |
| 5 dice |  |
| Sum | number of events |
| 5 | 3 |
| 6 | 5 |
| 7 | 14 |
| 8 | 14 |
| 9 | 4 |

10 dice , each with 2 sides

|  |  |
| --- | --- |
| 10 dice |  |
| Sum | number of events |
| 12 | 0 |
| 13 | 7 |
| 14 | 10 |
| 15 | 7 |
| 16 | 7 |
| 17 | 7 |
| 18 | 2 |
| 19 | 0 |
| 20 | 0 |

From the computation result ,the width of the distribution increase with increasing numbers of dice as the distribution of binomial model becomes wider when the number of trial increases.