Ben Sottile

CS 310-01

2/15/2021

Assignment 3- Problem Set 1.3.5(In my book 1.2.2) Problems 2,3,4

Problem Two- 5-Sided Dice

Part 1- Probabilities on One Five Sided Dice

Mathematical Analysis

Outcomes possible 1,2,3,4,5(total five)

Every time you roll the dice you get one of the five discreet outcomes

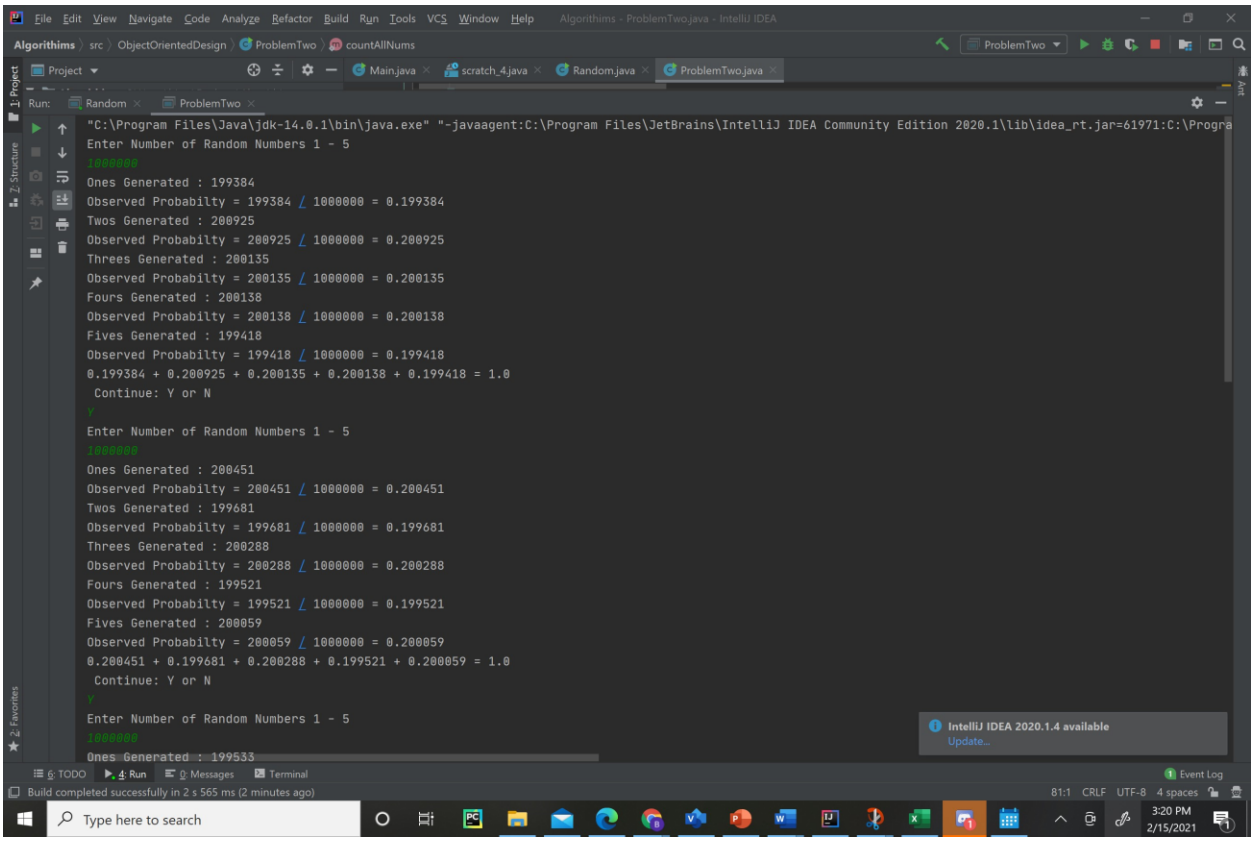
The dice is fair.

Conclusion:

1/5 or .2 is probability for any one dice roll on a fair 5 sided dice.

1 = one discreet outcome/ 5 all possibilities.

Computer Simulation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1000000
Ones Generated : 199384
Observed Probabilty = 199384 / 1000000 = 0.199384
Twos Generated : 200925
Observed Probabilty = 200925 / 1000000 = 0.200925
Threes Generated : 200135
Observed Probabilty = 200135 / 1000000 = 0.200135
Fours Generated : 200138
Observed Probabilty = 200138 / 1000000 = 0.200138
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Twos Generated : 199681
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Fours Generated : 199521
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Observed Probabilty = 200059 / 1000000 = 0.200059
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Continue: Y or N
Y
Enter Number of Random Numbers 1 - 5
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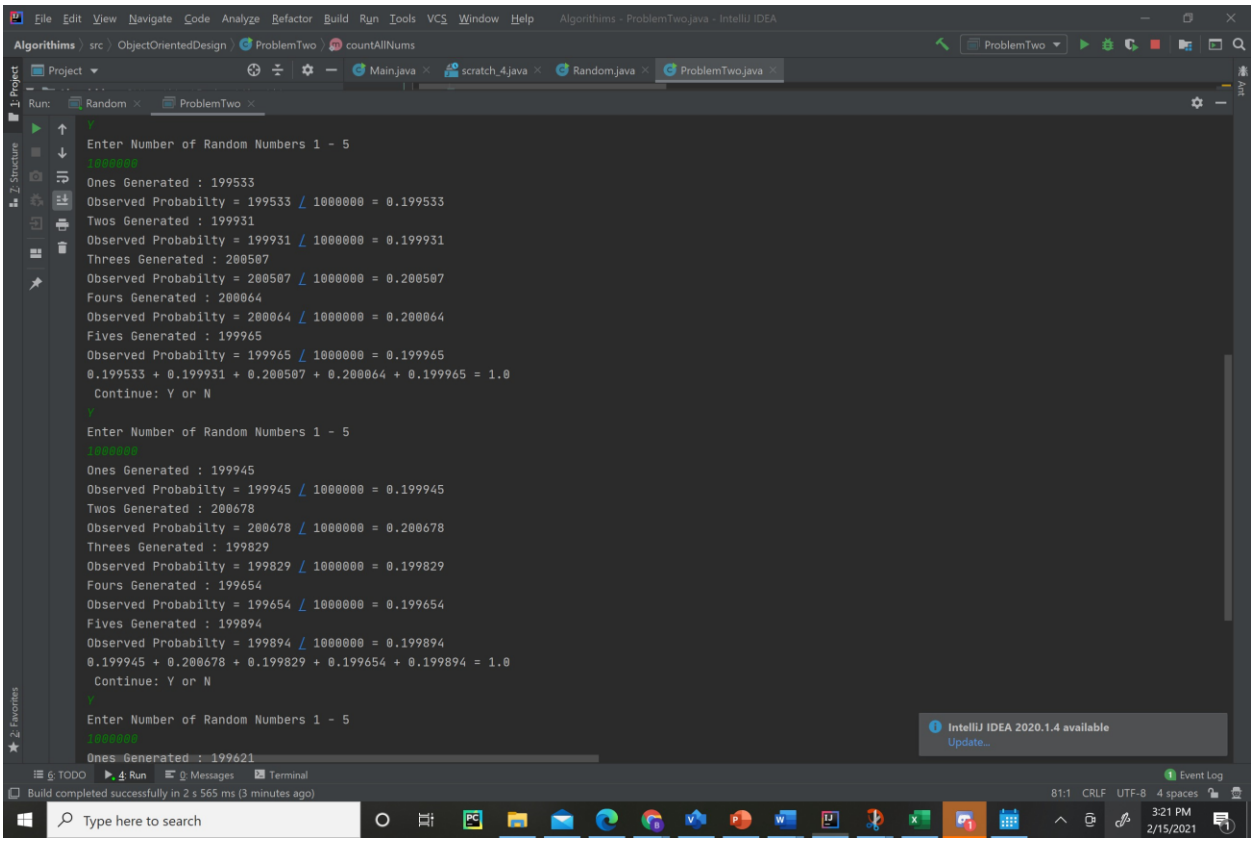
Update...
Build completed successfully in 2 s 565 ms (2 minutes ago)
Type here to search
3:20 PM
2/15/2021


Y
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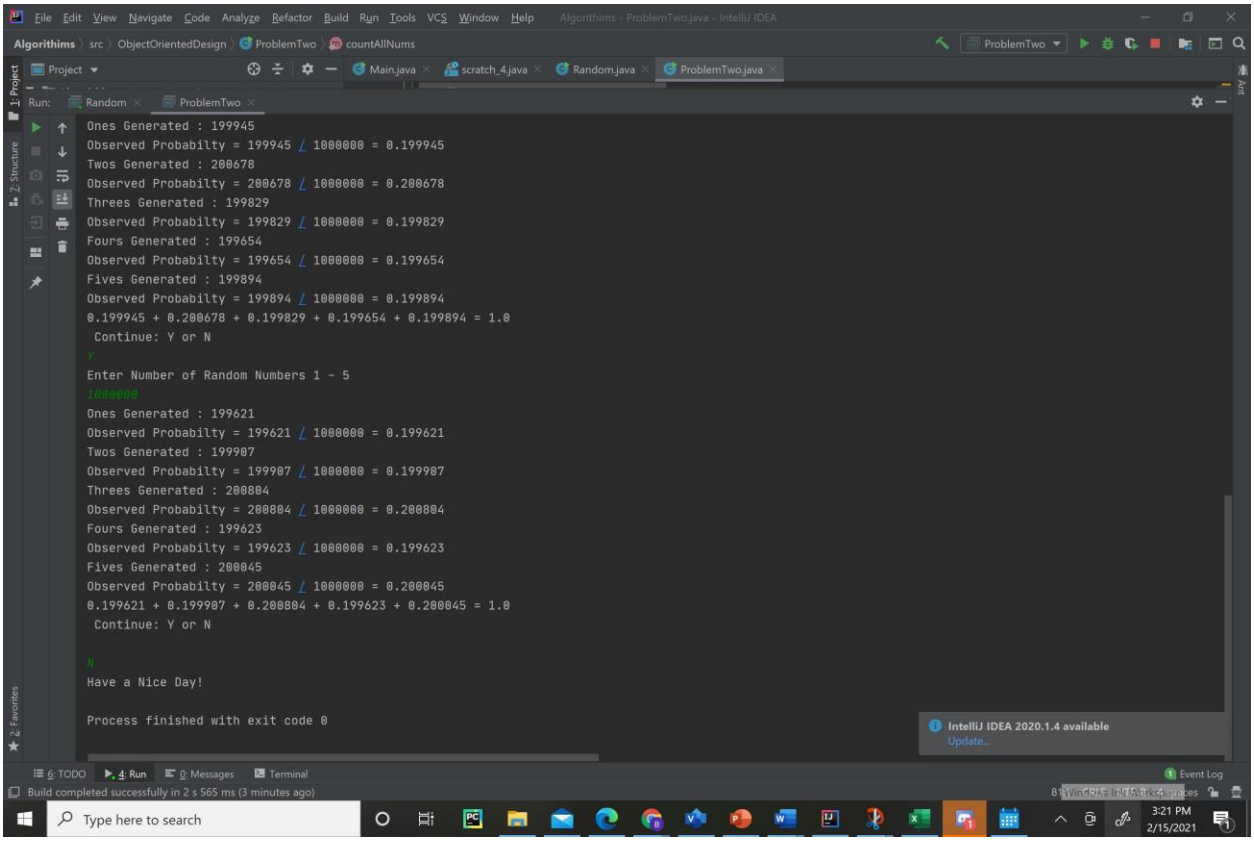
Fours Generated : 200064
Observed Probabilty = 200064 / 1000000 = 0.200064
Fives Generated : 199965
Observed Probabilty = 199965 / 1000000 = 0.199965
0.199533 + 0.199931 + 0.200507 + 0.200064 + 0.199965 = 1.0
Continue: Y or N
Y
Enter Number of Random Numbers 1 - 5
1000000
Ones Generated : 199945
Observed Probabilty = 199945 / 1000000 = 0.199945
Twos Generated : 200678
Observed Probabilty = 200678 / 1000000 = 0.200678
Threes Generated : 199829
Observed Probabilty = 199829 / 1000000 = 0.199829
Fours Generated : 199654
Observed Probabilty = 199654 / 1000000 = 0.199654
Fives Generated : 199894
Observed Probabilty = 199894 / 1000000 = 0.199894
0.199945 + 0.200678 + 0.199829 + 0.199654 + 0.199894 = 1.0
Continue: Y or N
Y
Enter Number of Random Numbers 1 - 5
1000000
Ones Generated : 199621
IntelliJ IDEA 2020.1.4 available
Update...
Build completed successfully in 2 s 565 ms (3 minutes ago)
Type here to search
3:21 PM
2/15/2021



In the five simulations with 1,000,000 numbers rolled the observed probabilities almost always centered around .2 for rolling each number.

Part 2 and 3 Range and Probability for rolling 2 five sided dice.

Mathematical Analysis

If we have 2 5-sided dice each with a high outcome of five and a low outcome of one on each- the high and low range can be found by summing the highest out come on each dice(5 + 5 = 10) and summing the lowest outcomes on each dice(1 + 1 = 2). Thus, we know the highest outcome is 10 and the lowest is 2. We can sum up different outcomes to find the discreet/distinct. outcomes.

Outcome Range Analysis

Sum of 2 (1 Total Possible outcome)

Outcome 1 to get a Sum of 2

D1 Rolls 1

D2 Rolls 1

Sum of Three(2 Total Possible outcomes)

Outcome 1 to get a Sum of 3

D1 Rolls 2

D2 Rolls 1

Outcome 2 to get a Sum of 3

D1 Rolls 1

D2 Rolls 2

Sum of Four (3 Total Possible outcomes)

Outcome 1 to get a Sum of 4

D1 Rolls 2

D2 Rolls 2

Outcome 2 to get a Sum of 4

D1 Rolls 3

D2 Rolls 1

Outcome 3 to get a Sum of 4

D1 Rolls 1

D2 Rolls 3

Sum of Five (4 Total Possible outcomes)

Outcome 1 to get a Sum of 5

D1 Rolls 3

D2 Rolls 2

Outcome 2 to get a Sum of 5

D1 Rolls 2

D2 Rolls 3

Outcome 3 to get a Sum of 5

D1 Rolls 4

D2 Rolls 1

Outcome 4 to get a Sum of 5

D1 Rolls 1

D2 Rolls 4

Sum of Six (5 Total Possible outcomes)

Outcome 1 to get a Sum of 6

D1 Rolls 3

D2 Rolls 3

Outcome 2 to get a Sum of 6

D1 Rolls 4

D2 Rolls 2

Outcome 3 to get a Sum of 6

D1 Rolls 2

D2 Rolls 4

Outcome 4 to get a Sum of 6

D1 Rolls 5

D2 Rolls 1

Outcome 5 to get a Sum of 6

D1 Rolls 1

D2 Rolls 5

Sum of 7 (4 Total Possible outcomes)

Outcome 1 to get a Sum of 7

D1 Rolls 4

D2 Rolls 3

Outcome 2 to get a Sum of 7

D1 Rolls 3

D2 Rolls 4

Outcome 3 to get a Sum of 7

D1 Rolls 5

D2 Rolls 2

Outcome 4 to get a Sum of 7

D1 Rolls 2

D2 Rolls 5

Sum of 8 (3 Total Possible outcomes)

Outcome 1 to get a Sum of 8

D1 Rolls 4

D2 Rolls 4

Outcome 2 to get a Sum of 8

D1 Rolls 5

D2 Rolls 3

Outcome 3 to get a Sum of 8

D1 Rolls 3

D2 Rolls 5

Sum of 9 (2 Total Possible outcomes)

Outcome 1 to get a Sum of 9

D1 Rolls 5

D2 Rolls 4

Outcome 2 to get a Sum of 9

D1 Rolls 4

D2 Rolls 5

Sum of 10

Outcome 1 to get a Sum of 10 (1 Total Possible outcome)

D1 Rolls 5

D2 Rolls 5

Total Discreet/Distinct ways to get Numbers 2-10 with two 5 sided dice: 1 + 2 + 3 + 4 + 5+ 4 + 3 + 2 + 1(25 Possibilities)

Conclusion:

Using the Total Number of Possibilities to Get Numbers 2-10(25) and the number of possibilities that correspond to each result(Results being the Sums (Numbers 2-10)) we can find the probability.

Probability of Rolling a 2

1 possibility

/25 total possibilities = 0.04

Probability of Rolling a 3

2 possibilities

/25 total possibilities = 0.08

Probability of Rolling a 4

3 possibilities

/25 total possibilities = 0.12

Probability of Rolling a 5

4 possibilities

/25 total possibilities = 0.16

Probability of Rolling a 6

5 possibilities

/25 total possibilities = .2

Probability of Rolling a 7

4 possibilities

/25 total possibilities = .16

Probability of Rolling a 8

3 possibilities

/25 total possibilities = .12

Probability of Rolling a 9

2 possibilities

/25 total possibilities = .08

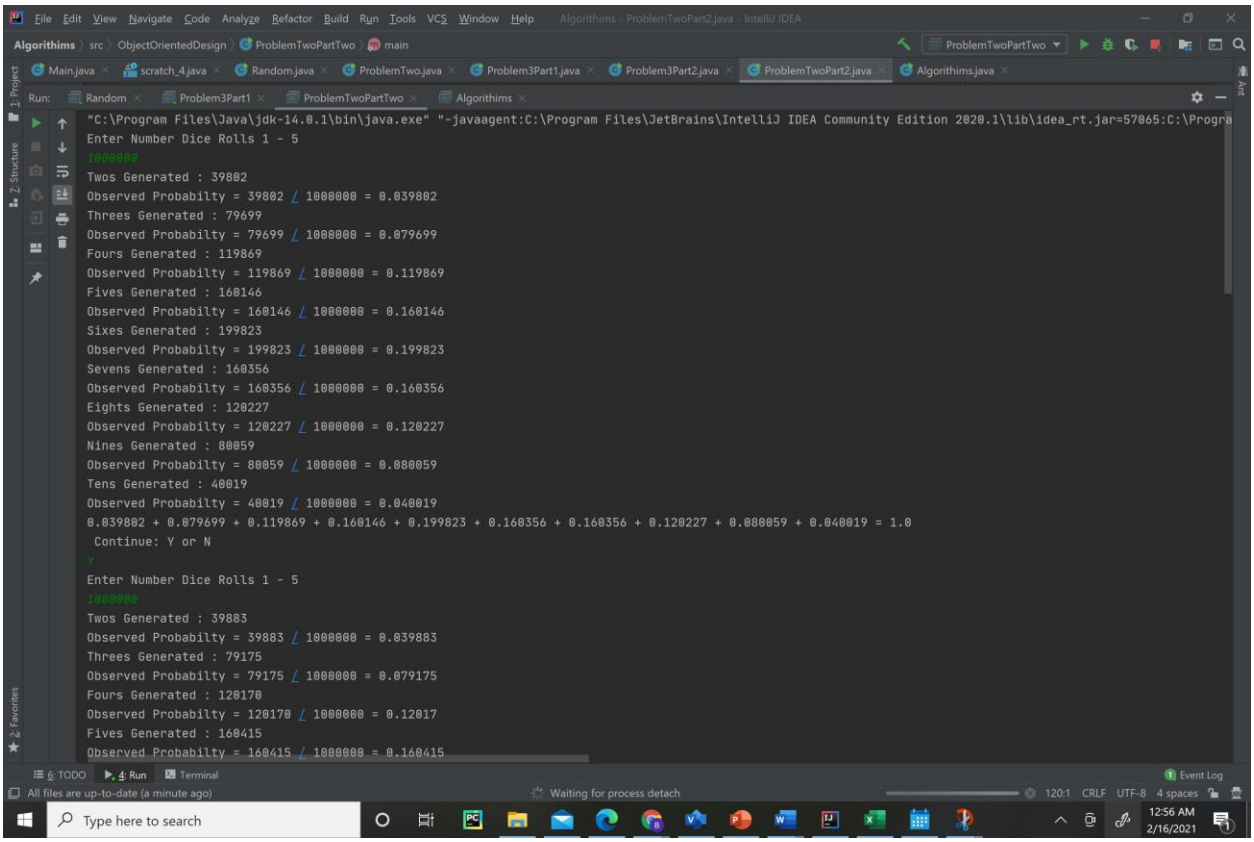
Probability of Rolling a 10

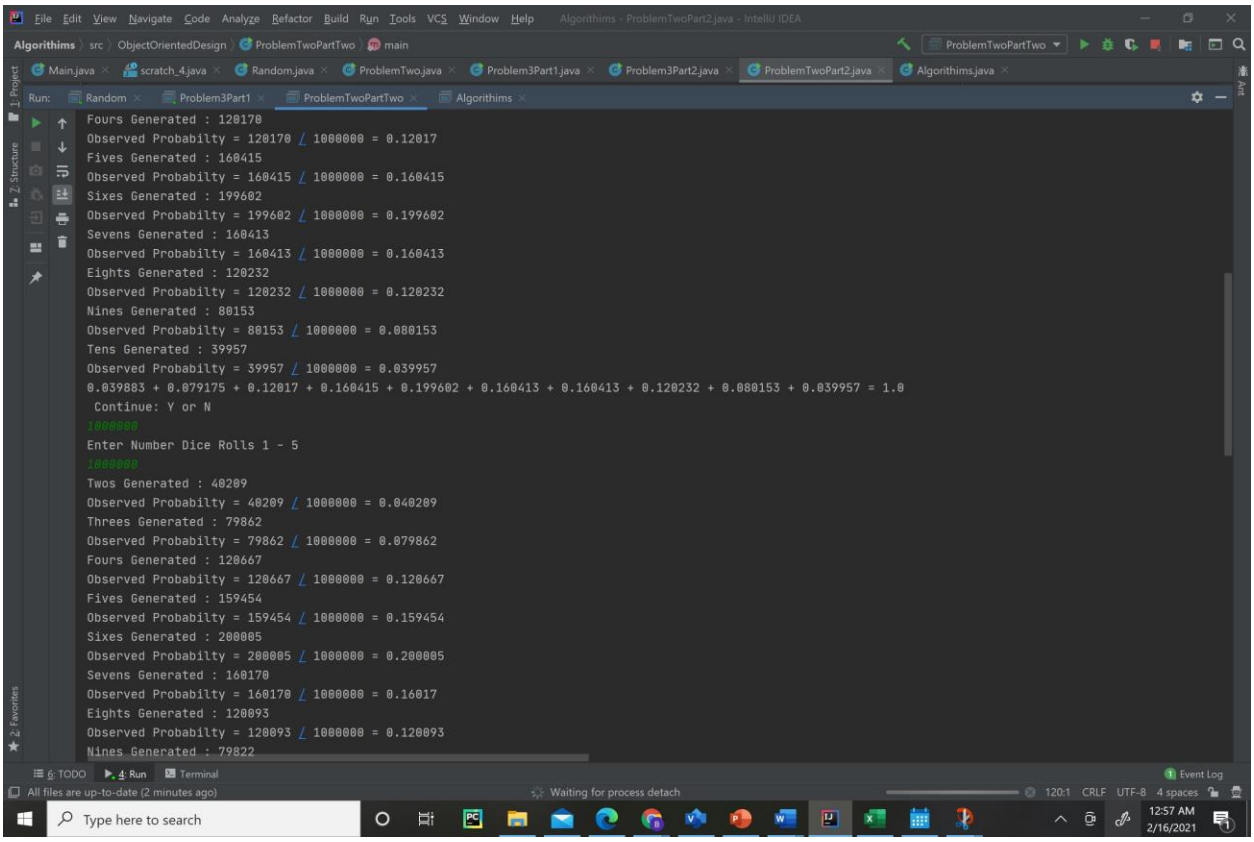
1 possibility

/25 total possibilities = .04

0.04+0.08+0.12+0.16+0.2+0.16+0.12+0.08+0.04 = 1 or a 100% chance one of the possibilities will happen.

Computer simulation

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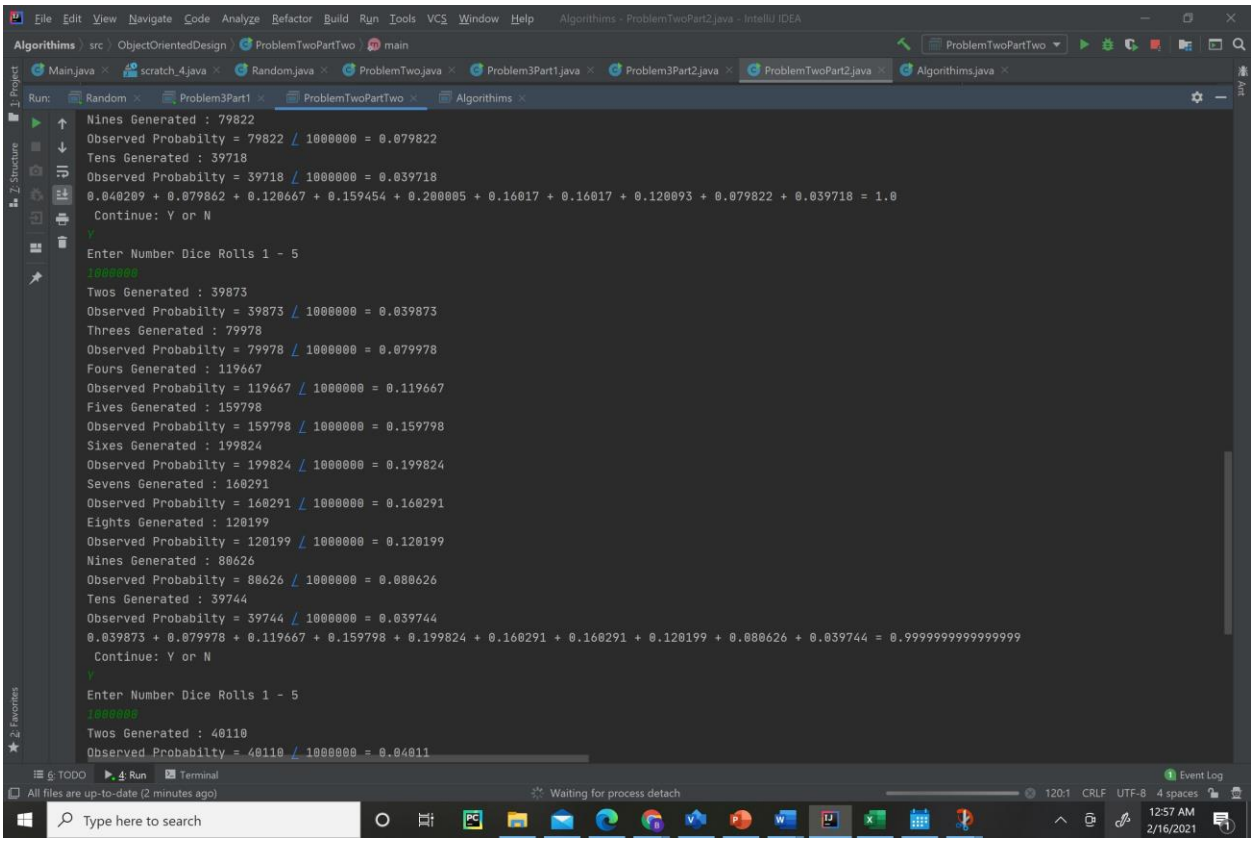
Fives Generated : 160415
Observed Probabilty = 160415 / 1000000 = 0.160415
Sixes Generated : 199602
Observed Probabilty = 199602 / 1000000 = 0.199602
Sevens Generated : 160413
Observed Probabilty = 160413 / 1000000 = 0.160413
Eights Generated : 120232
Observed Probabilty = 120232 / 1000000 = 0.120232
Nines Generated : 80153
Observed Probabilty = 80153 / 1000000 = 0.080153
Tens Generated : 39957
Observed Probabilty = 39957 / 1000000 = 0.039957
0.039883 + 0.079175 + 0.12017 + 0.160415 + 0.199602 + 0.160413 + 0.160413 + 0.120232 + 0.080153 + 0.039957 = 1.0
Continue: Y or N
1000000
Enter Number Dice Rolls 1 - 5
1000000
Twos Generated : 40289
Observed Probabilty = 40289 / 1000000 = 0.040289
Threes Generated : 79862
Observed Probabilty = 79862 / 1000000 = 0.079862
Fours Generated : 120667
Observed Probabilty = 120667 / 1000000 = 0.120667
Fives Generated : 159454
Observed Probabilty = 159454 / 1000000 = 0.159454
Sixes Generated : 200005
Observed Probabilty = 200005 / 1000000 = 0.200005
Sevens Generated : 160170
Observed Probabilty = 160170 / 1000000 = 0.16017
Eights Generated : 120093
Observed Probabilty = 120093 / 1000000 = 0.120093
Nines Generated : 79822


Nines Generated : 79822
Observed Probabilty = 79822 / 1000000 = 0.079822
Tens Generated : 39718
Observed Probabilty = 39718 / 1000000 = 0.039718
0.040289 + 0.079862 + 0.120667 + 0.159454 + 0.200005 + 0.16017 + 0.16017 + 0.120093 + 0.079822 + 0.039718 = 1.0
Continue: Y or N
Y
Enter Number Dice Rolls 1 - 5
1000000
Twos Generated : 39873
Observed Probabilty = 39873 / 1000000 = 0.039873
Threes Generated : 79978
Observed Probabilty = 79978 / 1000000 = 0.079978
Fours Generated : 119667
Observed Probabilty = 119667 / 1000000 = 0.119667
Fives Generated : 159798
Observed Probabilty = 159798 / 1000000 = 0.159798
Sixes Generated : 199824
Observed Probabilty = 199824 / 1000000 = 0.199824
Sevens Generated : 160291
Observed Probabilty = 160291 / 1000000 = 0.160291
Eights Generated : 120199
Observed Probabilty = 120199 / 1000000 = 0.120199
Nines Generated : 80626
Observed Probabilty = 80626 / 1000000 = 0.080626
Tens Generated : 39744
Observed Probabilty = 39744 / 1000000 = 0.039744
0.039873 + 0.079978 + 0.119667 + 0.159798 + 0.199824 + 0.160291 + 0.160291 + 0.120199 + 0.080626 + 0.039744 = 0.9999999999999999
Continue: Y or N
Y
Enter Number Dice Rolls 1 - 5
1000000
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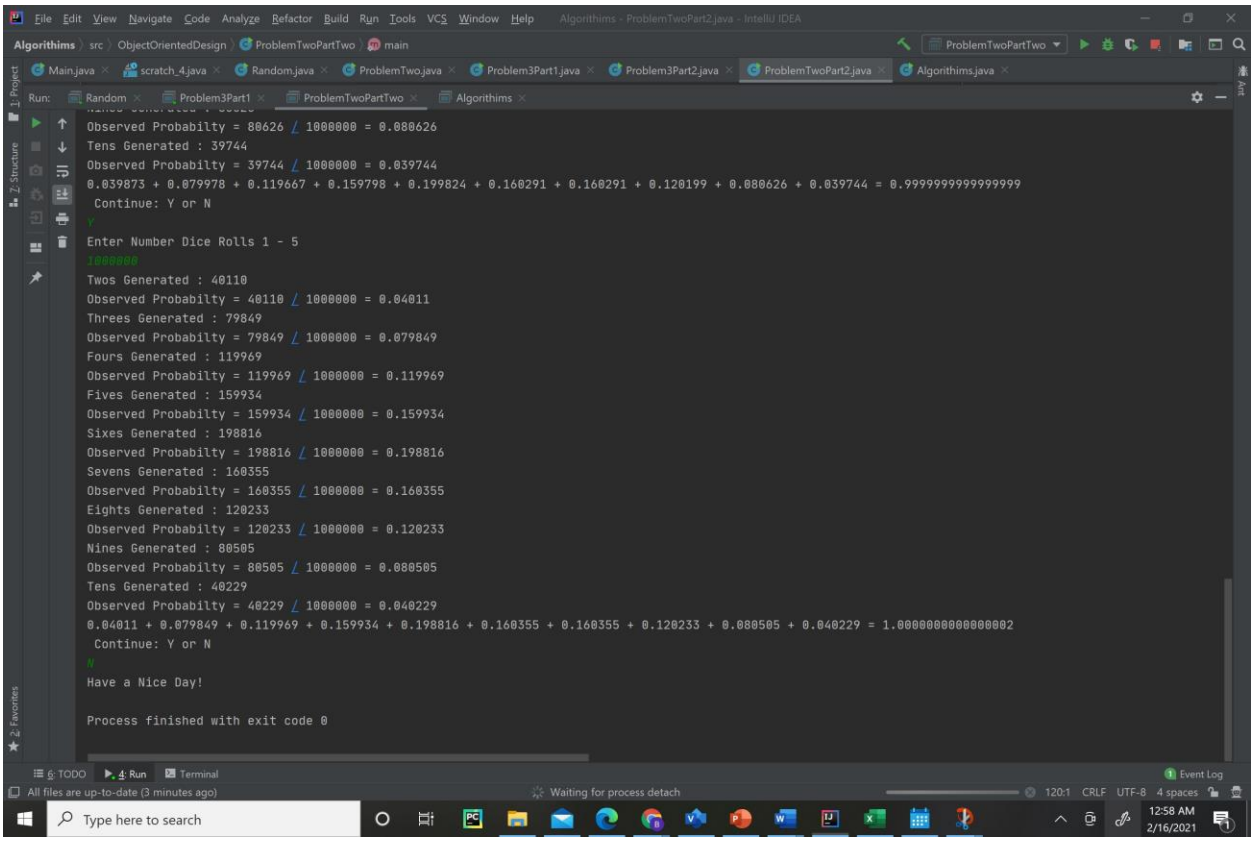
Observed Probabilty = 40110 / 1000000 = 0.04011



In 5 Computer Simulations of 1,000,000 rolls of 2 5-sided dice, observed probabilities followed the observed.

Part One – Probability of One 8-Sided Dice (each side numbered with either 1,2,3,4,5)

Sides are numbered 1,2,3,3,4,5,5,5

Probabilities of Rolling Numbers

1= 1/8 or 0.125 - > Number is on One of the eight sides / 8 sides.

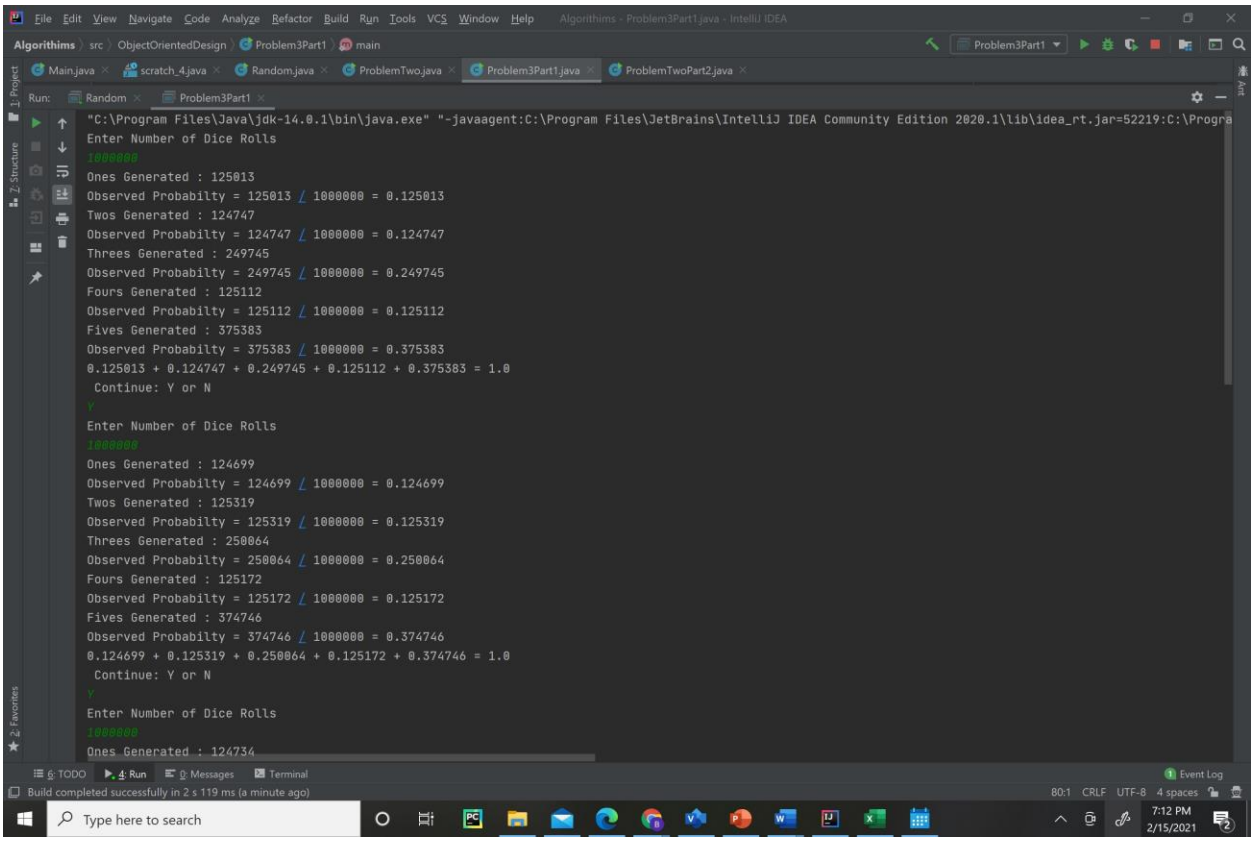
2 = 1/8 or 0.125 - > Number is on One of the eight sides / 8 sides

3= 2/8 or 0.250 - > Number is on Two of the eight sides / 8 sides

4= 1/8 or 0.125 - > Number is on One of the eight sides / 8 sides.

5 = 3/8 or 0.375 - > Number is on Three of the eight sides / 8 sides

Computer Simulation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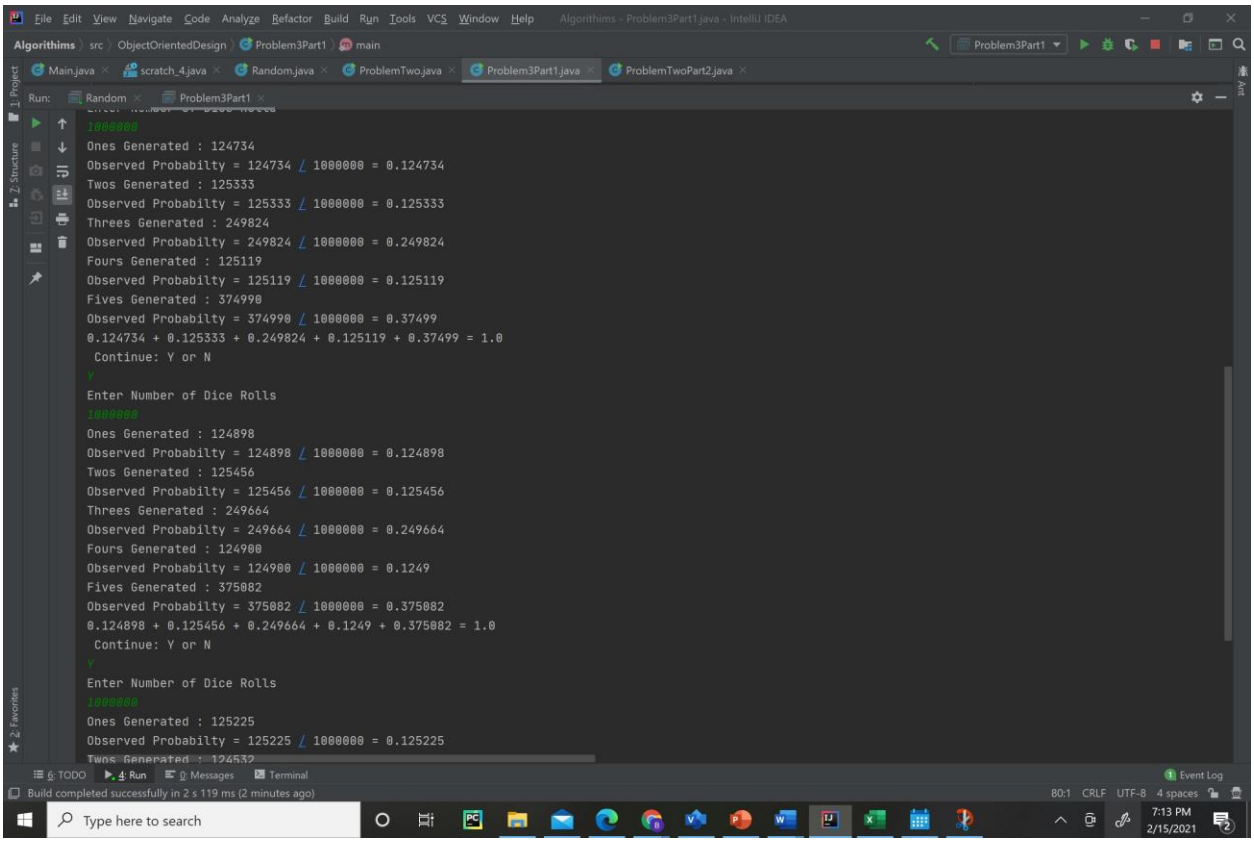
Enter Number of Dice Rolls
1000000
Ones Generated : 125013
Observed Probabilty = 125013 / 1000000 = 0.125013
Twos Generated : 124747
Observed Probabilty = 124747 / 1000000 = 0.124747
Threes Generated : 249745
Observed Probabilty = 249745 / 1000000 = 0.249745
Fours Generated : 125112
Observed Probabilty = 125112 / 1000000 = 0.125112
Fives Generated : 375383
Observed Probabilty = 375383 / 1000000 = 0.375383
0.125013 + 0.124747 + 0.249745 + 0.125112 + 0.375383 = 1.0
Continue: Y or N
Y
Enter Number of Dice Rolls
1000000
Ones Generated : 124699
Observed Probabilty = 124699 / 1000000 = 0.124699
Twos Generated : 125319
Observed Probabilty = 125319 / 1000000 = 0.125319
Threes Generated : 250064
Observed Probabilty = 250064 / 1000000 = 0.250064
Fours Generated : 125172
Observed Probabilty = 125172 / 1000000 = 0.125172
Fives Generated : 374746
Observed Probabilty = 374746 / 1000000 = 0.374746
0.124699 + 0.125319 + 0.250064 + 0.125172 + 0.374746 = 1.0
Continue: Y or N
Y
Enter Number of Dice Rolls
1000000
Ones Generated : 124734


1000000
Ones Generated : 124734
Observed Probabilty = 124734 / 1000000 = 0.124734
Twos Generated : 125333
Observed Probabilty = 125333 / 1000000 = 0.125333
Threes Generated : 249824
Observed Probabilty = 249824 / 1000000 = 0.249824
Fours Generated : 125119
Observed Probabilty = 125119 / 1000000 = 0.125119
Fives Generated : 374990
Observed Probabilty = 374990 / 1000000 = 0.37499
0.124734 + 0.125333 + 0.249824 + 0.125119 + 0.37499 = 1.0
Continue: Y or N
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Enter Number of Dice Rolls
1000000
Ones Generated : 124898
Observed Probabilty = 124898 / 1000000 = 0.124898
Twos Generated : 125456
Observed Probabilty = 125456 / 1000000 = 0.125456
Threes Generated : 249664
Observed Probabilty = 249664 / 1000000 = 0.249664
Fours Generated : 124900
Observed Probabilty = 124900 / 1000000 = 0.1249
Fives Generated : 375082
Observed Probabilty = 375082 / 1000000 = 0.375082
0.124898 + 0.125456 + 0.249664 + 0.1249 + 0.375082 = 1.0
Continue: Y or N
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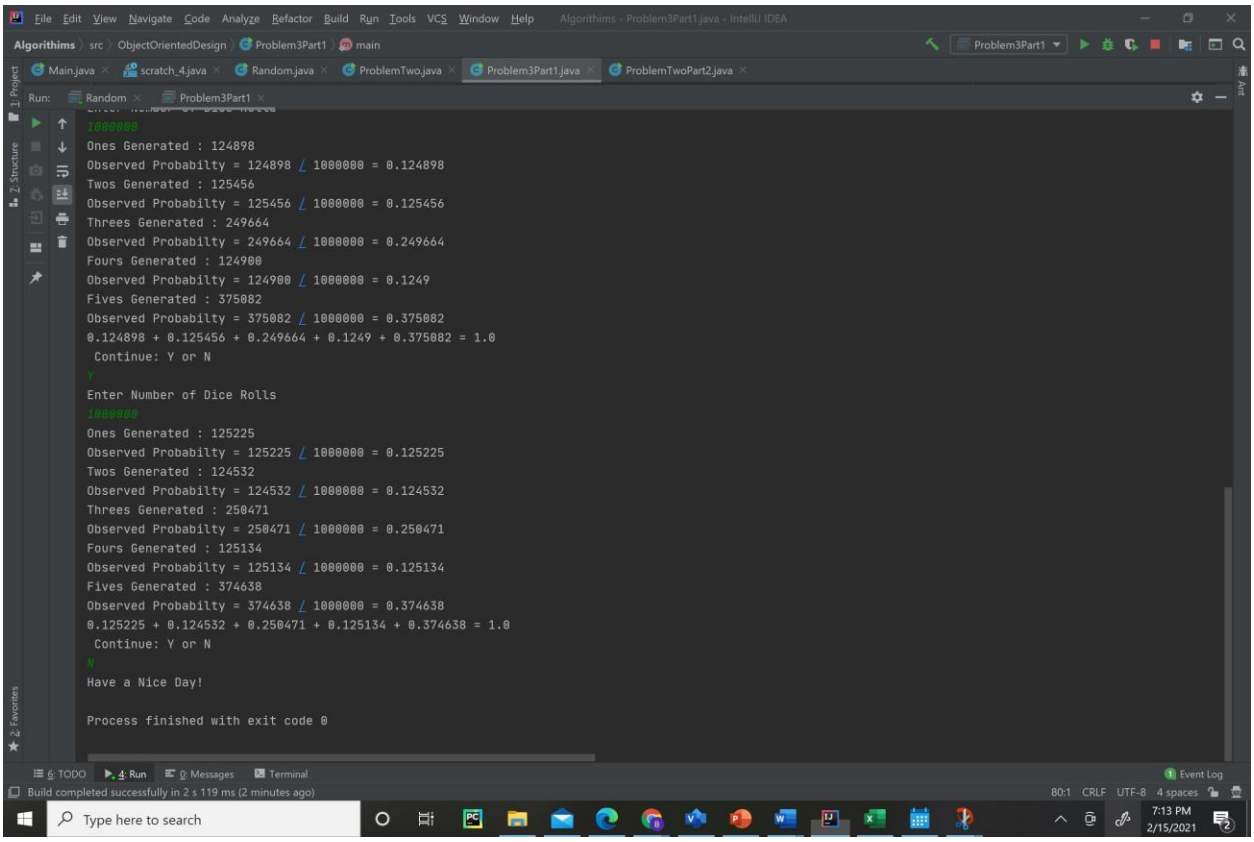
Ones Generated : 125225
Observed Probabilty = 125225 / 1000000 = 0.125225



In 5 Computer Simulations of 1,000,000 rolls of One 8-Sided Dice (each side numbered with either 1,2,3,4,5) observed probabilities followed the observed.

Part Two And Three Probability of Two 8-Sided Dice (each side numbered with either 1,2,3,4,5)

Sides are numbered (1,2,3,3,4,5,5,5)

This is very similar to problem two in that the there are multiple ways to get sums of the two dice are that are same. Since there the values being rolled are the same we can surmise the lower bound to still be 2 and the upper bound is still 10. However, probabilities will be skewed in different directions due to the existence of new sides. Thus, all sides henceforth will be mentioned with a letter(1A,2A,3A,3B,4A,5A,5B,5C) so we can understand each outcomes distinct nature and the skewed effect it will have on the probability.

Outcome Range Analysis

Sum of 2 (1 Total Possible outcome)

Outcome 1 to get a Sum of 2

D1 Rolls 1A

D2 Rolls 1A

Sum of Three(2 Total Possible outcomes)

Outcome 1 to get a Sum of 3

D1 Rolls 2A

D2 Rolls 1A

Outcome 2 to get a Sum of 3

D1 Rolls 1A

D2 Rolls 2A

Sum of Four (5 Total Possible outcomes)

Outcome 1 to get a Sum of 4

D1 Rolls 2A

D2 Rolls 2A

Outcome 2 to get a Sum of 4

D1 Rolls 3A

D2 Rolls 1A

Outcome 3 to get a Sum of 4

D1 Rolls 1A

D2 Rolls 3A

Outcome 4 to get a Sum of 4

D1 Rolls 1A

D2 Rolls 3B

Outcome 5 to get a Sum of 4

D1 Rolls 3B

D2 Rolls 1A

Sum of Five (6 Total Possible outcomes)

Outcome 1 to get a Sum of 5

D1 Rolls 3A

D2 Rolls 2A

Outcome 2 to get a Sum of 5

D1 Rolls 2A

D2 Rolls 3A

Outcome 3 to get a Sum of 5

D1 Rolls 4A

D2 Rolls 1A

Outcome 4 to get a Sum of 5

D1 Rolls 1A

D2 Rolls 4A

Outcome 5 to get a Sum of 5

D1 Rolls 3B

D2 Rolls 2A

Outcome 6 to get a Sum of 5

D1 Rolls 2A

D2 Rolls 3B

Sum of Six (12 Total Possible outcomes)

Outcome 1 to get a Sum of 6

D1 Rolls 3A

D2 Rolls 3A

Outcome 2 to get a Sum of 6

D1 Rolls 4A

D2 Rolls 2A

Outcome 3 to get a Sum of 6

D1 Rolls 2A

D2 Rolls 4A

Outcome 4 to get a Sum of 6

D1 Rolls 5A

D2 Rolls 1A

Outcome 5 to get a Sum of 6

D1 Rolls 1A

D2 Rolls 5A

Outcome 6 to get a Sum of 6

D1 Rolls 3B

D2 Rolls 3B

Outcome 7 to get a Sum of 6

D1 Rolls 5B

D2 Rolls 1A

Outcome 8 to get a Sum of 6

D1 Rolls 1A

D2 Rolls 5B

Outcome 9 to get a Sum of 6

D1 Rolls 5C

D2 Rolls 1A

Outcome 10 to get a Sum of 6

D1 Rolls 1A

D2 Rolls 5C

Outcome 11 to get a Sum of 6

D1 Rolls 3B

D2 Rolls 3A

Outcome 12 to get a Sum of 6

D1 Rolls 3A

D2 Rolls 3B

Sum of 7 (10 Total Possible outcomes)

Outcome 1 to get a Sum of 7

D1 Rolls 4A

D2 Rolls 3A

Outcome 2 to get a Sum of 7

D1 Rolls 3A

D2 Rolls 4A

Outcome 3 to get a Sum of 7

D1 Rolls 5A

D2 Rolls 2A

Outcome 4 to get a Sum of 7

D1 Rolls 2A

D2 Rolls 5A

Outcome 5 to get a Sum of 7

D1 Rolls 4A

D2 Rolls 3B

Outcome 6 to get a Sum of 7

D1 Rolls 3B

D2 Rolls 4A

Outcome 7 to get a Sum of 7

D1 Rolls 5B

D2 Rolls 2A

Outcome 8 to get a Sum of 7

D1 Rolls 2A

D2 Rolls 5B

Outcome 9 to get a Sum of 7

D1 Rolls 5C

D2 Rolls 2A

Outcome 10 to get a Sum of 7

D1 Rolls 2A

D2 Rolls 5C

Sum of 8 (13 Total Possible outcomes)

Outcome 1 to get a Sum of 8

D1 Rolls 4A

D2 Rolls 4A

Outcome 2 to get a Sum of 8

D1 Rolls 5A

D2 Rolls 3A

Outcome 3 to get a Sum of 8

D1 Rolls 3A

D2 Rolls 5A

Outcome 4 to get a Sum of 8

D1 Rolls 5A

D2 Rolls 3B

Outcome 5 to get a Sum of 8

D1 Rolls 3B

D2 Rolls 5A

Outcome 6 to get a Sum of 8

D1 Rolls 5B

D2 Rolls 3A

Outcome 7 to get a Sum of 8

D1 Rolls 3A

D2 Rolls 5B

Outcome 8 to get a Sum of 8

D1 Rolls 5B

D2 Rolls 3B

Outcome 9 to get a Sum of 8

D1 Rolls 3B

D2 Rolls 5B

Outcome 10 to get a Sum of 8

D1 Rolls 3A

D2 Rolls 5C

Outcome 11 to get a Sum of 8

D1 Rolls 5C

D2 Rolls 3A

Outcome 12 to get a Sum of 8

D1 Rolls 3B

D2 Rolls 5C

Outcome 13 to get a Sum of 8

D1 Rolls 3B

D2 Rolls 5C

Sum of 9 (6 Total Possible outcomes)

Outcome 1 to get a Sum of 9

D1 Rolls 5A

D2 Rolls 4A

Outcome 2 to get a Sum of 9

D1 Rolls 4A

D2 Rolls 5A

Outcome 3 to get a Sum of 9

D1 Rolls 5B

D2 Rolls 4A

Outcome 4 to get a Sum of 9

D1 Rolls 4A

D2 Rolls 5B

Outcome 5 to get a Sum of 9

D1 Rolls 5C

D2 Rolls 4A

Outcome 6 to get a Sum of 9

D1 Rolls 4A

D2 Rolls 5C

Sum of 10(9 Total Possible outcomes)

Outcome 1 to get a Sum of 10

D1 Rolls 5A

D2 Rolls 5A

Outcome 2 to get a Sum of 10

D1 Rolls 5A

D2 Rolls 5B

Outcome 3 to get a Sum of 10

D1 Rolls 5A

D2 Rolls 5C

Outcome 4 to get a Sum of 10

D1 Rolls 5B

D2 Rolls 5A

Outcome 5 to get a Sum of 10

D1 Rolls 5B

D2 Rolls 5B

Outcome 6 to get a Sum of 10

D1 Rolls 5B

D2 Rolls 5C

Outcome 7 to get a Sum of 10

D1 Rolls 5C

D2 Rolls 5A

Outcome 8 to get a Sum of 10

D1 Rolls 5C

D2 Rolls 5B

Outcome 9 to get a Sum of 10

D1 Rolls 5C

D2 Rolls 5C

Total Discreet/Distinct ways to get Numbers 2-10 with two 8 sided dice(each side numbered with either 1,2,3,4,5)

1+2+5+6+12+10+13+6+9 = 64

64 Possible outcomes(if each side is treated differently.)

Conclusion:

Using the Total Number of Possibilities to Get Numbers 2-10(64) and the number of possibilities that correspond to each result(Results being the Sums (Numbers 2-10)) we can find the probability.

Probability of Rolling a 2

1 possibility

/64 total possibilities = 0.015625

Probability of Rolling a 3

2 possibilities

/64 total possibilities = 0.03125

Probability of Rolling a 4

5 possibilities

/ 64 total possibilities = 0.078125

Probability of Rolling a 5

6 possibilities

/64 total possibilities = 0.09375

Probability of Rolling a 6

12 possibilities

/64 total possibilities = 0.1875

Probability of Rolling a 7

10 possibilities

/64 total possibilities = 0.15625

Probability of Rolling a 8

13 possibilities

/64 total possibilities = 0.203125

Probability of Rolling a 9

6 possibilities

/64 total possibilities = 0.09375

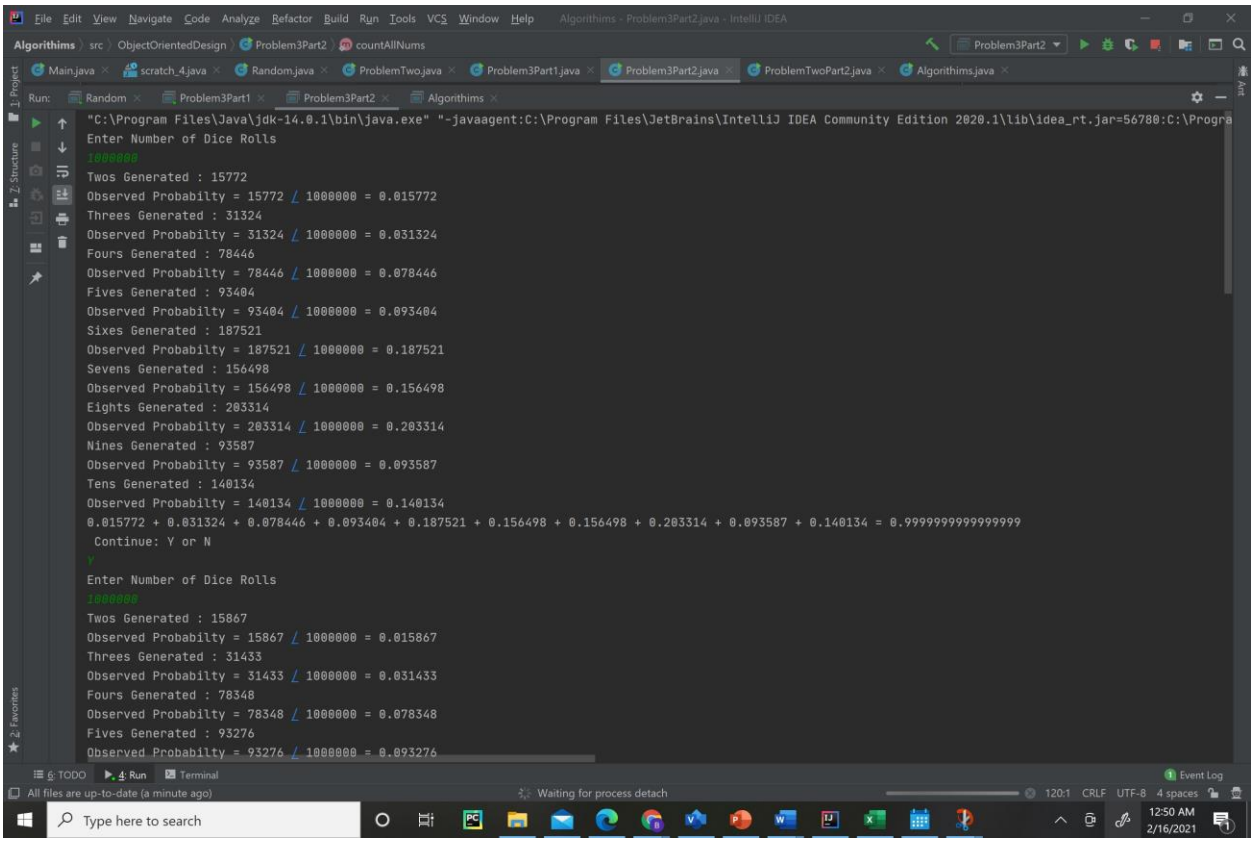
Probability of Rolling a 10

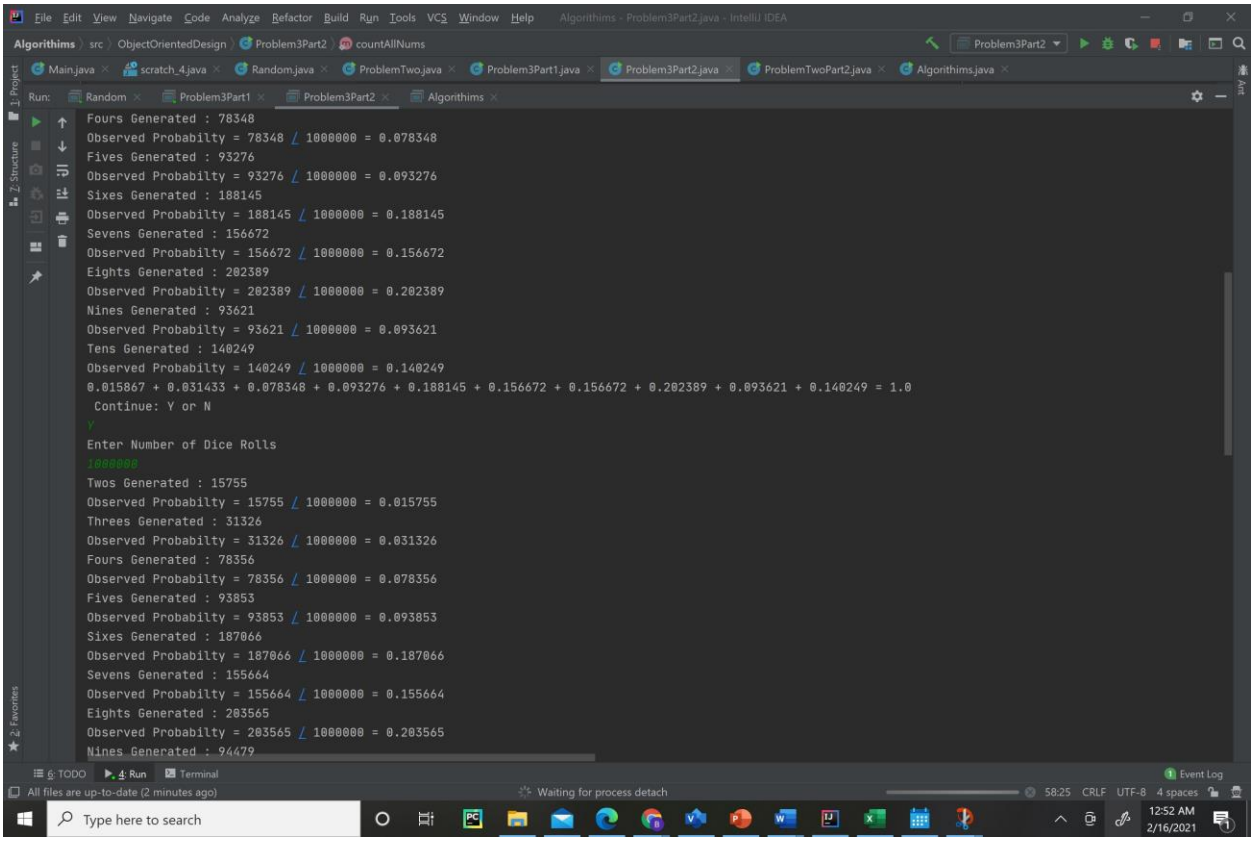
9 possibilities

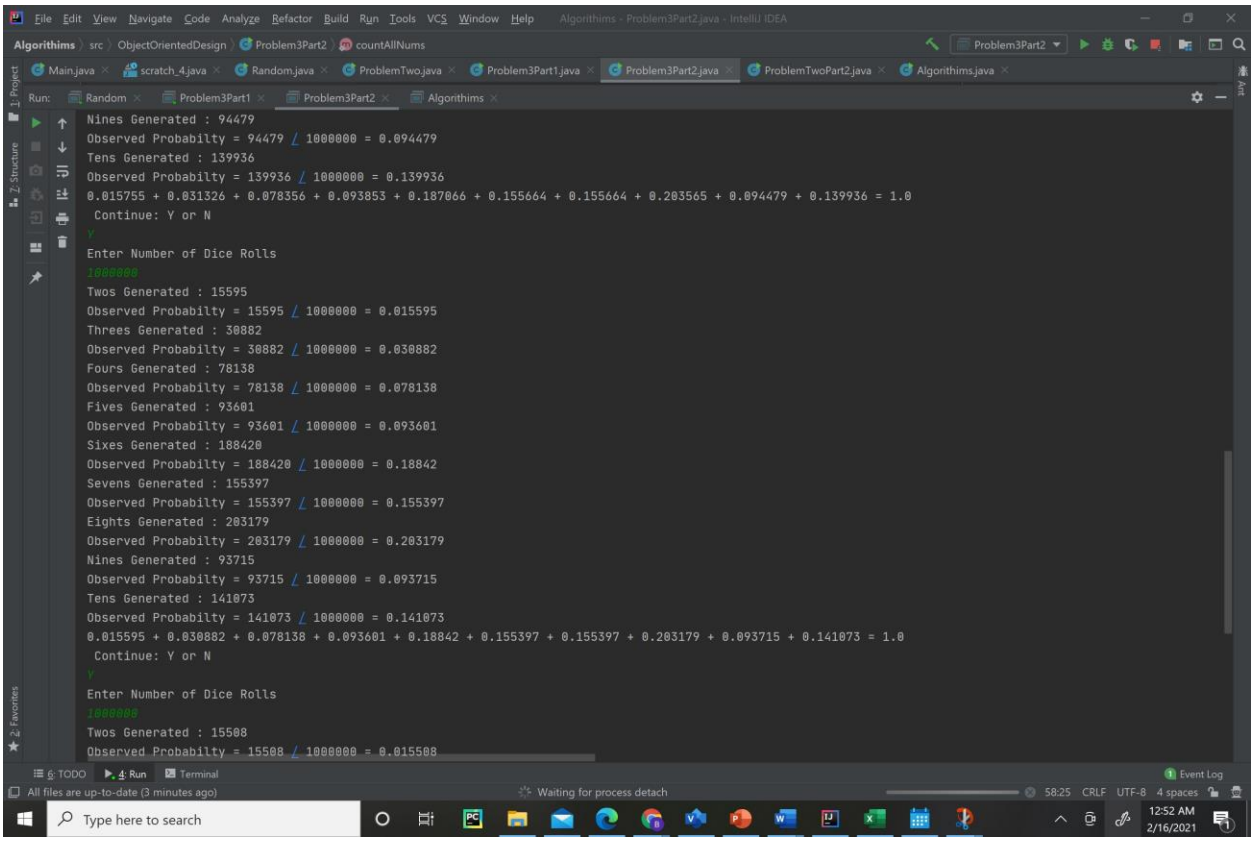
/64 total possibilities = 0.140625

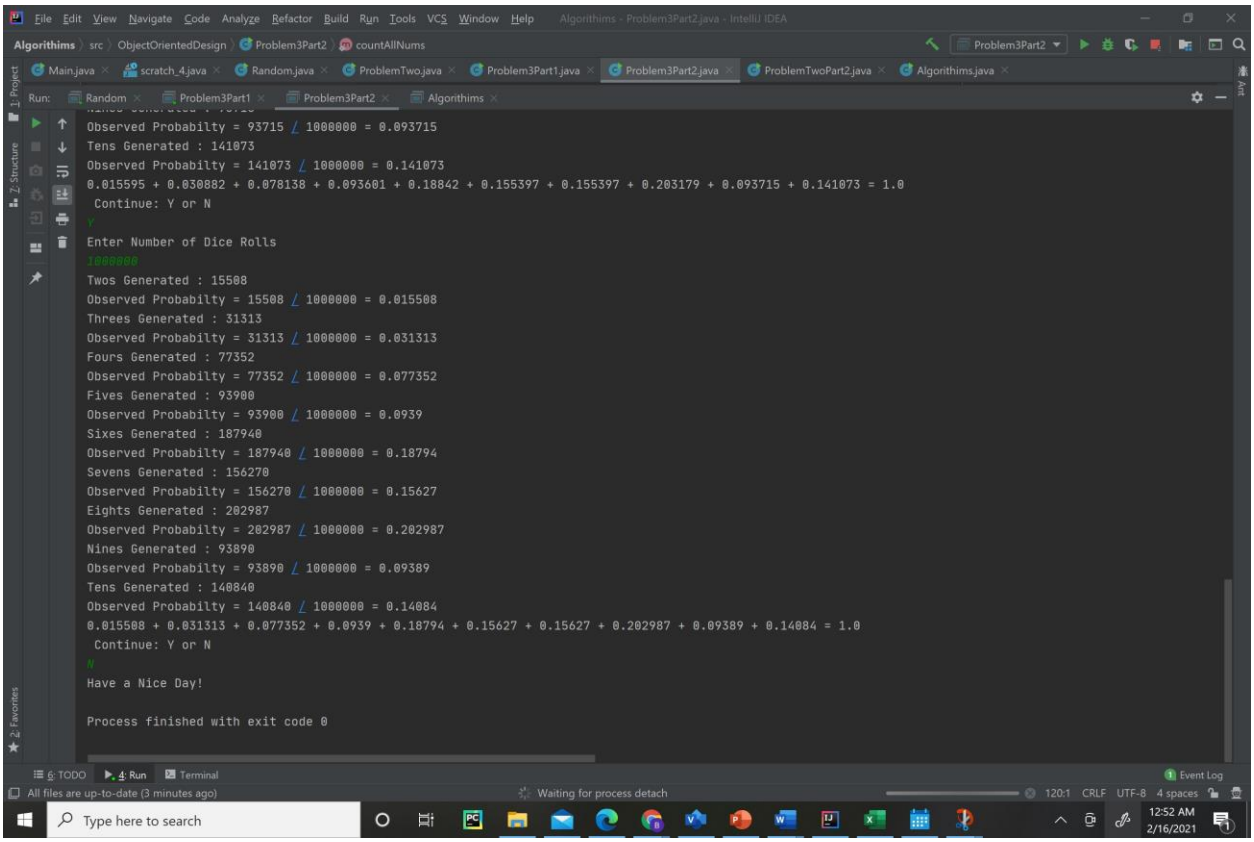
0.015602 + 0.031141 + 0.077993 + 0.094336 + 0.188141 + 0.155682 + 0.155682 + 0.202568 + 0.093737 + 0.1408 = 1 or a 100% chance one of the possibilities will happen.

Computer Simulation




Fours Generated : 78348
Observed Probabilty = 78348 / 1000000 = 0.078348
Fives Generated : 93276
Observed Probabilty = 93276 / 1000000 = 0.093276
Sixes Generated : 188145
Observed Probabilty = 188145 / 1000000 = 0.188145
Sevens Generated : 156672
Observed Probabilty = 156672 / 1000000 = 0.156672
Eights Generated : 202389
Observed Probabilty = 202389 / 1000000 = 0.202389
Nines Generated : 93621
Observed Probabilty = 93621 / 1000000 = 0.093621
Tens Generated : 140249
Observed Probabilty = 140249 / 1000000 = 0.140249
0.015867 + 0.031433 + 0.078348 + 0.093276 + 0.188145 + 0.156672 + 0.156672 + 0.202389 + 0.093621 + 0.140249 = 1.0
Continue: Y or N
Y
Enter Number of Dice Rolls
1000000
Twos Generated : 15755
Observed Probabilty = 15755 / 1000000 = 0.015755
Threes Generated : 31326
Observed Probabilty = 31326 / 1000000 = 0.031326
Fours Generated : 78356
Observed Probabilty = 78356 / 1000000 = 0.078356
Fives Generated : 93853
Observed Probabilty = 93853 / 1000000 = 0.093853
Sixes Generated : 187066
Observed Probabilty = 187066 / 1000000 = 0.187066
Sevens Generated : 155664
Observed Probabilty = 155664 / 1000000 = 0.155664
Eights Generated : 203565
Observed Probabilty = 203565 / 1000000 = 0.203565
Nines Generated : 94479


Nines Generated : 94479
Observed Probabilty = 94479 / 1000000 = 0.094479
Tens Generated : 139936
Observed Probabilty = 139936 / 1000000 = 0.139936
0.015755 + 0.031326 + 0.078356 + 0.093853 + 0.187066 + 0.155664 + 0.155664 + 0.203565 + 0.094479 + 0.139936 = 1.0
Continue: Y or N
Y
Enter Number of Dice Rolls
1000000
Twos Generated : 15595
Observed Probabilty = 15595 / 1000000 = 0.015595
Threes Generated : 30882
Observed Probabilty = 30882 / 1000000 = 0.030882
Fours Generated : 78138
Observed Probabilty = 78138 / 1000000 = 0.078138
Fives Generated : 93601
Observed Probabilty = 93601 / 1000000 = 0.093601
Sixes Generated : 188420
Observed Probabilty = 188420 / 1000000 = 0.18842
Sevens Generated : 155397
Observed Probabilty = 155397 / 1000000 = 0.155397
Eights Generated : 203179
Observed Probabilty = 203179 / 1000000 = 0.203179
Nines Generated : 93715
Observed Probabilty = 93715 / 1000000 = 0.093715
Tens Generated : 141073
Observed Probabilty = 141073 / 1000000 = 0.141073
0.015595 + 0.030882 + 0.078138 + 0.093601 + 0.18842 + 0.155397 + 0.155397 + 0.203179 + 0.093715 + 0.141073 = 1.0
Continue: Y or N
Y
Enter Number of Dice Rolls
1000000
Twos Generated : 15508
Observed Probabilty = 15508 / 1000000 = 0.015508


Observed Probabilty = 93715 / 1000000 = 0.093715
Tens Generated : 141073
Observed Probabilty = 141073 / 1000000 = 0.141073
0.015595 + 0.030882 + 0.078138 + 0.093601 + 0.18842 + 0.155397 + 0.155397 + 0.203179 + 0.093715 + 0.141073 = 1.0
Continue: Y or N
Y
Enter Number of Dice Rolls
1000000
Twos Generated : 15508
Observed Probabilty = 15508 / 1000000 = 0.015508
Threes Generated : 31313
Observed Probabilty = 31313 / 1000000 = 0.031313
Fours Generated : 77352
Observed Probabilty = 77352 / 1000000 = 0.077352
Fives Generated : 93900
Observed Probabilty = 93900 / 1000000 = 0.0939
Sixes Generated : 187940
Observed Probabilty = 187940 / 1000000 = 0.18794
Sevens Generated : 156270
Observed Probabilty = 156270 / 1000000 = 0.15627
Eights Generated : 202987
Observed Probabilty = 202987 / 1000000 = 0.202987
Nines Generated : 93890
Observed Probabilty = 93890 / 1000000 = 0.09389
Tens Generated : 140840
Observed Probabilty = 140840 / 1000000 = 0.14084
0.015508 + 0.031313 + 0.077352 + 0.0939 + 0.18794 + 0.15627 + 0.15627 + 0.202987 + 0.09389 + 0.14084 = 1.0
Continue: Y or N
N
Have a Nice Day!
Process finished with exit code 0

Problem 4

Comparing the probabilities of 4 6 side die

D1- 1,2,3,9,10,11

D2 – 0,1,7,8,8,9

D3 – 5,5,6,6,7,7

D4 – 3,4,4,5,11,12

To find the probability of one dice being rolled and having a higher number appear than another dice if it was rolled. To do this I will list all the equally likely outcomes each dice duel. I will count all the distinct out comes where one dice is greater. The opposite count will be the probability the other dice is greater minus the probability that the dice are the same value.

Outcome Analysis

D1 vs. D2 (22 Outcomes D1 is greater, 2 they are equal, 12 D2 is Greater)

Outcome # 1 : D1 is greater

D1 = 1 D2 = 0

Outcome # 2 : D1 equals D2

D1 = 1 D2 = 1

Outcome # 3 : D2 is greater

D1 = 1 D2 = 7

Outcome # 4 : D2 is greater

D1 = 1 D2 = 8

Outcome # 5 : D2 is greater

D1 = 1 D2 = 8

Outcome # 6 : D2 is greater

D1 = 1 D2 = 9

Outcome # 7 : D1 is greater

D1 = 2 D2 = 0

Outcome # 8 : D1 is greater

D1 = 2 D2 = 1

Outcome # 9 : D2 is greater

D1 = 2 D2 = 7

Outcome # 10 : D2 is greater

D1 = 2 D2 = 8

Outcome # 11 : D2 is greater

D1 = 2 D2 = 8

Outcome # 12 : D2 is greater

D1 = 2 D2 = 9

Outcome # 13 : D1 is greater

D1 = 3 D2 = 0

Outcome # 14 : D1 is greater

D1 = 3 D2 = 1

Outcome # 15 : D2 is greater

D1 = 3 D2 = 7

Outcome # 16 : D2 is greater

D1 = 3 D2 = 8

Outcome # 17 : D2 is greater

D1 = 3 D2 = 8

Outcome # 18 : D2 is greater

D1 = 3 D2 = 9

Outcome # 19 : D1 is greater

D1 = 9 D2 = 0

Outcome # 20 : D1 is greater

D1 = 9 D2 = 1

Outcome # 21 : D1 is greater

D1 = 9 D2 = 7

Outcome # 22 : D1 is greater

D1 = 9 D2 = 8

Outcome # 23 : D1 is greater

D1 = 9 D2 = 8

Outcome # 24 : D1 equals D2

D1 = 9 D2 = 9

Outcome # 25 : D1 is greater

D1 = 10 D2 = 0

Outcome # 26 : D1 is greater

D1 = 10 D2 = 1

Outcome # 27 : D1 is greater

D1 = 10 D2 = 7

Outcome # 28 : D1 is greater

D1 = 10 D2 = 8

Outcome # 29 : D1 is greater

D1 = 10 D2 = 8

Outcome # 30 : D1 is greater

D1 = 10 D2 = 9

Outcome # 31 : D1 is greater

D1 = 11 D2 = 0

Outcome # 32 : D1 is greater

D1 = 11 D2 = 1

Outcome # 33 : D1 is greater

D1 = 11 D2 = 7

Outcome # 34 : D1 is greater

D1 = 11 D2 = 8

Outcome # 35 : D1 is greater

D1 = 11 D2 = 8

Outcome # 36 : D1 is greater

D1 = 11 D2 = 9

(22 Outcomes D1 is greater, 2 they are equal, 12 D2 is Greater)

D2 vs D1

Outcome # 1 : D1 is greater

D2 = 0 D1 = 1

Outcome # 2 : D1 is greater

D2 = 0 D1 = 2

Outcome # 3 : D1 is greater

D2 = 0 D1 = 3

Outcome # 4 : D1 is greater

D2 = 0 D1 = 9

Outcome # 5 : D1 is greater

D2 = 0 D1 = 10

Outcome # 6 : D1 is greater

D2 = 0 D1 = 11

Outcome # 7 : D2 equals D1

D2 = 1 D1 = 1

Outcome # 8 : D1 is greater

D2 = 1 D1 = 2

Outcome # 9 : D1 is greater

D2 = 1 D1 = 3

Outcome # 10 : D1 is greater

D2 = 1 D1 = 9

Outcome # 11 : D1 is greater

D2 = 1 D1 = 10

Outcome # 12 : D1 is greater

D2 = 1 D1 = 11

Outcome # 13 : D2 is greater

D2 = 7 D1 = 1

Outcome # 14 : D2 is greater

D2 = 7 D1 = 2

Outcome # 15 : D2 is greater

D2 = 7 D1 = 3

Outcome # 16 : D1 is greater

D2 = 7 D1 = 9

Outcome # 17 : D1 is greater

D2 = 7 D1 = 10

Outcome # 18 : D1 is greater

D2 = 7 D1 = 11

Outcome # 19 : D2 is greater

D2 = 8 D1 = 1

Outcome # 20 : D2 is greater

D2 = 8 D1 = 2

Outcome # 21 : D2 is greater

D2 = 8 D1 = 3

Outcome # 22 : D1 is greater

D2 = 8 D1 = 9

Outcome # 23 : D1 is greater

D2 = 8 D1 = 10

Outcome # 24 : D1 is greater

D2 = 8 D1 = 11

Outcome # 25 : D2 is greater

D2 = 8 D1 = 1

Outcome # 26 : D2 is greater

D2 = 8 D1 = 2

Outcome # 27 : D2 is greater

D2 = 8 D1 = 3

Outcome # 28 : D1 is greater

D2 = 8 D1 = 9

Outcome # 29 : D1 is greater

D2 = 8 D1 = 10

Outcome # 30 : D1 is greater

D2 = 8 D1 = 11

Outcome # 31 : D2 is greater

D2 = 9 D1 = 1

Outcome # 32 : D2 is greater

D2 = 9 D1 = 2

Outcome # 33 : D2 is greater

D2 = 9 D1 = 3

Outcome # 34 : D2 equals D1

D2 = 9 D1 = 9

Outcome # 35 : D1 is greater

D2 = 9 D1 = 10

Outcome # 36 : D1 is greater

D2 = 9 D1 = 11

D1 vs D3(18 D1 is Greater, 18 D3 is greater)

Outcome # 1 : D3 is greater

D1 = 1 D3 = 5

Outcome # 2 : D3 is greater

D1 = 1 D3 = 5

Outcome # 3 : D3 is greater

D1 = 1 D3 = 6

Outcome # 4 : D3 is greater

D1 = 1 D3 = 6

Outcome # 5 : D3 is greater

D1 = 1 D3 = 7

Outcome # 6 : D3 is greater

D1 = 1 D3 = 7

Outcome # 7 : D3 is greater

D1 = 2 D3 = 5

Outcome # 8 : D3 is greater

D1 = 2 D3 = 5

Outcome # 9 : D3 is greater

D1 = 2 D3 = 6

Outcome # 10 : D3 is greater

D1 = 2 D3 = 6

Outcome # 11 : D3 is greater

D1 = 2 D3 = 7

Outcome # 12 : D3 is greater

D1 = 2 D3 = 7

Outcome # 13 : D3 is greater

D1 = 3 D3 = 5

Outcome # 14 : D3 is greater

D1 = 3 D3 = 5

Outcome # 15 : D3 is greater

D1 = 3 D3 = 6

Outcome # 16 : D3 is greater

D1 = 3 D3 = 6

Outcome # 17 : D3 is greater

D1 = 3 D3 = 7

Outcome # 18 : D3 is greater

D1 = 3 D3 = 7

Outcome # 19 : D1 is greater

D1 = 9 D3 = 5

Outcome # 20 : D1 is greater

D1 = 9 D3 = 5

Outcome # 21 : D1 is greater

D1 = 9 D3 = 6

Outcome # 22 : D1 is greater

D1 = 9 D3 = 6

Outcome # 23 : D1 is greater

D1 = 9 D3 = 7

Outcome # 24 : D1 is greater

D1 = 9 D3 = 7

Outcome # 25 : D1 is greater

D1 = 10 D3 = 5

Outcome # 26 : D1 is greater

D1 = 10 D3 = 5

Outcome # 27 : D1 is greater

D1 = 10 D3 = 6

Outcome # 28 : D1 is greater

D1 = 10 D3 = 6

Outcome # 29 : D1 is greater

D1 = 10 D3 = 7

Outcome # 30 : D1 is greater

D1 = 10 D3 = 7

Outcome # 31 : D1 is greater

D1 = 11 D3 = 5

Outcome # 32 : D1 is greater

D1 = 11 D3 = 5

Outcome # 33 : D1 is greater

D1 = 11 D3 = 6

Outcome # 34 : D1 is greater

D1 = 11 D3 = 6

Outcome # 35 : D1 is greater

D1 = 11 D3 = 7

Outcome # 36 : D1 is greater

D1 = 11 D3 = 7

D3 vs D1 (18 D1 is Greater, 18 D3 is greater)

Outcome # 1 : D3 is greater

D3 = 5 D1 = 1

Outcome # 2 : D3 is greater

D3 = 5 D1 = 2

Outcome # 3 : D3 is greater

D3 = 5 D1 = 3

Outcome # 4 : D1 is greater

D3 = 5 D1 = 9

Outcome # 5 : D1 is greater

D3 = 5 D1 = 10

Outcome # 6 : D1 is greater

D3 = 5 D1 = 11

Outcome # 7 : D3 is greater

D3 = 5 D1 = 1

Outcome # 8 : D3 is greater

D3 = 5 D1 = 2

Outcome # 9 : D3 is greater

D3 = 5 D1 = 3

Outcome # 10 : D1 is greater

D3 = 5 D1 = 9

Outcome # 11 : D1 is greater

D3 = 5 D1 = 10

Outcome # 12 : D1 is greater

D3 = 5 D1 = 11

Outcome # 13 : D3 is greater

D3 = 6 D1 = 1

Outcome # 14 : D3 is greater

D3 = 6 D1 = 2

Outcome # 15 : D3 is greater

D3 = 6 D1 = 3

Outcome # 16 : D1 is greater

D3 = 6 D1 = 9

Outcome # 17 : D1 is greater

D3 = 6 D1 = 10

Outcome # 18 : D1 is greater

D3 = 6 D1 = 11

Outcome # 19 : D3 is greater

D3 = 6 D1 = 1

Outcome # 20 : D3 is greater

D3 = 6 D1 = 2

Outcome # 21 : D3 is greater

D3 = 6 D1 = 3

Outcome # 22 : D1 is greater

D3 = 6 D1 = 9

Outcome # 23 : D1 is greater

D3 = 6 D1 = 10

Outcome # 24 : D1 is greater

D3 = 6 D1 = 11

Outcome # 25 : D3 is greater

D3 = 7 D1 = 1

Outcome # 26 : D3 is greater

D3 = 7 D1 = 2

Outcome # 27 : D3 is greater

D3 = 7 D1 = 3

Outcome # 28 : D1 is greater

D3 = 7 D1 = 9

Outcome # 29 : D1 is greater

D3 = 7 D1 = 10

Outcome # 30 : D1 is greater

D3 = 7 D1 = 11

Outcome # 31 : D3 is greater

D3 = 7 D1 = 1

Outcome # 32 : D3 is greater

D3 = 7 D1 = 2

Outcome # 33 : D3 is greater

D3 = 7 D1 = 3

Outcome # 34 : D1 is greater

D3 = 7 D1 = 9

Outcome # 35 : D1 is greater

D3 = 7 D1 = 10

Outcome # 36 : D1 is greater

D3 = 7 D1 = 11

D1 vs D4 (12 D1 is greater, 2 D1 and D4 are Equal, 22 D4 is greater than D1)

Outcome # 1 : D4 is greater

D1 = 1 D4 = 3

Outcome # 2 : D4 is greater

D1 = 1 D4 = 4

Outcome # 3 : D4 is greater

D1 = 1 D4 = 4

Outcome # 4 : D4 is greater

D1 = 1 D4 = 5

Outcome # 5 : D4 is greater

D1 = 1 D4 = 11

Outcome # 6 : D4 is greater

D1 = 1 D4 = 12

Outcome # 7 : D4 is greater

D1 = 2 D4 = 3

Outcome # 8 : D4 is greater

D1 = 2 D4 = 4

Outcome # 9 : D4 is greater

D1 = 2 D4 = 4

Outcome # 10 : D4 is greater

D1 = 2 D4 = 5

Outcome # 11 : D4 is greater

D1 = 2 D4 = 11

Outcome # 12 : D4 is greater

D1 = 2 D4 = 12

Outcome # 13 : D1 equals D4

D1 = 3 D4 = 3

Outcome # 14 : D4 is greater

D1 = 3 D4 = 4

Outcome # 15 : D4 is greater

D1 = 3 D4 = 4

Outcome # 16 : D4 is greater

D1 = 3 D4 = 5

Outcome # 17 : D4 is greater

D1 = 3 D4 = 11

Outcome # 18 : D4 is greater

D1 = 3 D4 = 12

Outcome # 19 : D1 is greater

D1 = 9 D4 = 3

Outcome # 20 : D1 is greater

D1 = 9 D4 = 4

Outcome # 21 : D1 is greater

D1 = 9 D4 = 4

Outcome # 22 : D1 is greater

D1 = 9 D4 = 5

Outcome # 23 : D4 is greater

D1 = 9 D4 = 11

Outcome # 24 : D4 is greater

D1 = 9 D4 = 12

Outcome # 25 : D1 is greater

D1 = 10 D4 = 3

Outcome # 26 : D1 is greater

D1 = 10 D4 = 4

Outcome # 27 : D1 is greater

D1 = 10 D4 = 4

Outcome # 28 : D1 is greater

D1 = 10 D4 = 5

Outcome # 29 : D4 is greater

D1 = 10 D4 = 11

Outcome # 30 : D4 is greater

D1 = 10 D4 = 12

Outcome # 31 : D1 is greater

D1 = 11 D4 = 3

Outcome # 32 : D1 is greater

D1 = 11 D4 = 4

Outcome # 33 : D1 is greater

D1 = 11 D4 = 4

Outcome # 34 : D1 is greater

D1 = 11 D4 = 5

Outcome # 35 : D1 equals D4

D1 = 11 D4 = 11

Outcome # 36 : D4 is greater

D1 = 11 D4 = 12

D4 vs D1 (12 D1 is greater, 2 D1 and D4 are Equal, 22 D4 is greater than D1)

Outcome # 1 : D4 is greater

D4 = 3 D1 = 1

Outcome # 2 : D4 is greater

D4 = 3 D1 = 2

Outcome # 3 : D4 equals D1

D4 = 3 D1 = 3

Outcome # 4 : D1 is greater

D4 = 3 D1 = 9

Outcome # 5 : D1 is greater

D4 = 3 D1 = 10

Outcome # 6 : D1 is greater

D4 = 3 D1 = 11

Outcome # 7 : D4 is greater

D4 = 4 D1 = 1

Outcome # 8 : D4 is greater

D4 = 4 D1 = 2

Outcome # 9 : D4 is greater

D4 = 4 D1 = 3

Outcome # 10 : D1 is greater

D4 = 4 D1 = 9

Outcome # 11 : D1 is greater

D4 = 4 D1 = 10

Outcome # 12 : D1 is greater

D4 = 4 D1 = 11

Outcome # 13 : D4 is greater

D4 = 4 D1 = 1

Outcome # 14 : D4 is greater

D4 = 4 D1 = 2

Outcome # 15 : D4 is greater

D4 = 4 D1 = 3

Outcome # 16 : D1 is greater

D4 = 4 D1 = 9

Outcome # 17 : D1 is greater

D4 = 4 D1 = 10

Outcome # 18 : D1 is greater

D4 = 4 D1 = 11

Outcome # 19 : D4 is greater

D4 = 5 D1 = 1

Outcome # 20 : D4 is greater

D4 = 5 D1 = 2

Outcome # 21 : D4 is greater

D4 = 5 D1 = 3

Outcome # 22 : D1 is greater

D4 = 5 D1 = 9

Outcome # 23 : D1 is greater

D4 = 5 D1 = 10

Outcome # 24 : D1 is greater

D4 = 5 D1 = 11

Outcome # 25 : D4 is greater

D4 = 11 D1 = 1

Outcome # 26 : D4 is greater

D4 = 11 D1 = 2

Outcome # 27 : D4 is greater

D4 = 11 D1 = 3

Outcome # 28 : D4 is greater

D4 = 11 D1 = 9

Outcome # 29 : D4 is greater

D4 = 11 D1 = 10

Outcome # 30 : D4 equals D1

D4 = 11 D1 = 11

Outcome # 31 : D4 is greater

D4 = 12 D1 = 1

Outcome # 32 : D4 is greater

D4 = 12 D1 = 2

Outcome # 33 : D4 is greater

D4 = 12 D1 = 3

Outcome # 34 : D4 is greater

D4 = 12 D1 = 9

Outcome # 35 : D4 is greater

D4 = 12 D1 = 10

Outcome # 36 : D4 is greater

D4 = 12 D1 = 11

D2 vs D3(12 D3 is greater, D2 and D3 equal 2, 22 D2 is greater)

Outcome # 1 : D3 is greater

D2 = 0 D3 = 5

Outcome # 2 : D3 is greater

D2 = 0 D3 = 5

Outcome # 3 : D3 is greater

D2 = 0 D3 = 6

Outcome # 4 : D3 is greater

D2 = 0 D3 = 6

Outcome # 5 : D3 is greater

D2 = 0 D3 = 7

Outcome # 6 : D3 is greater

D2 = 0 D3 = 7

Outcome # 7 : D3 is greater

D2 = 1 D3 = 5

Outcome # 8 : D3 is greater

D2 = 1 D3 = 5

Outcome # 9 : D3 is greater

D2 = 1 D3 = 6

Outcome # 10 : D3 is greater

D2 = 1 D3 = 6

Outcome # 11 : D3 is greater

D2 = 1 D3 = 7

Outcome # 12 : D3 is greater

D2 = 1 D3 = 7

Outcome # 13 : D2 is greater

D2 = 7 D3 = 5

Outcome # 14 : D2 is greater

D2 = 7 D3 = 5

Outcome # 15 : D2 is greater

D2 = 7 D3 = 6

Outcome # 16 : D2 is greater

D2 = 7 D3 = 6

Outcome # 17 : D2 equals D3

D2 = 7 D3 = 7

Outcome # 18 : D2 equals D3

D2 = 7 D3 = 7

Outcome # 19 : D2 is greater

D2 = 8 D3 = 5

Outcome # 20 : D2 is greater

D2 = 8 D3 = 5

Outcome # 21 : D2 is greater

D2 = 8 D3 = 6

Outcome # 22 : D2 is greater

D2 = 8 D3 = 6

Outcome # 23 : D2 is greater

D2 = 8 D3 = 7

Outcome # 24 : D2 is greater

D2 = 8 D3 = 7

Outcome # 25 : D2 is greater

D2 = 8 D3 = 5

Outcome # 26 : D2 is greater

D2 = 8 D3 = 5

Outcome # 27 : D2 is greater

D2 = 8 D3 = 6

Outcome # 28 : D2 is greater

D2 = 8 D3 = 6

Outcome # 29 : D2 is greater

D2 = 8 D3 = 7

Outcome # 30 : D2 is greater

D2 = 8 D3 = 7

Outcome # 31 : D2 is greater

D2 = 9 D3 = 5

Outcome # 32 : D2 is greater

D2 = 9 D3 = 5

Outcome # 33 : D2 is greater

D2 = 9 D3 = 6

Outcome # 34 : D2 is greater

D2 = 9 D3 = 6

Outcome # 35 : D2 is greater

D2 = 9 D3 = 7

Outcome # 36 : D2 is greater

D2 = 9 D3 = 7

D3 VS D2 (12 D3 is greater, D2 and D3 equal 2, 22 D2 is greater)

Outcome # 1 : D3 is greater

D3 = 5 D2 = 0

Outcome # 2 : D3 is greater

D3 = 5 D2 = 1

Outcome # 3 : D2 is greater

D3 = 5 D2 = 7

Outcome # 4 : D2 is greater

D3 = 5 D2 = 8

Outcome # 5 : D2 is greater

D3 = 5 D2 = 8

Outcome # 6 : D2 is greater

D3 = 5 D2 = 9

Outcome # 7 : D3 is greater

D3 = 5 D2 = 0

Outcome # 8 : D3 is greater

D3 = 5 D2 = 1

Outcome # 9 : D2 is greater

D3 = 5 D2 = 7

Outcome # 10 : D2 is greater

D3 = 5 D2 = 8

Outcome # 11 : D2 is greater

D3 = 5 D2 = 8

Outcome # 12 : D2 is greater

D3 = 5 D2 = 9

Outcome # 13 : D3 is greater

D3 = 6 D2 = 0

Outcome # 14 : D3 is greater

D3 = 6 D2 = 1

Outcome # 15 : D2 is greater

D3 = 6 D2 = 7

Outcome # 16 : D2 is greater

D3 = 6 D2 = 8

Outcome # 17 : D2 is greater

D3 = 6 D2 = 8

Outcome # 18 : D2 is greater

D3 = 6 D2 = 9

Outcome # 19 : D3 is greater

D3 = 6 D2 = 0

Outcome # 20 : D3 is greater

D3 = 6 D2 = 1

Outcome # 21 : D2 is greater

D3 = 6 D2 = 7

Outcome # 22 : D2 is greater

D3 = 6 D2 = 8

Outcome # 23 : D2 is greater

D3 = 6 D2 = 8

Outcome # 24 : D2 is greater

D3 = 6 D2 = 9

Outcome # 25 : D3 is greater

D3 = 7 D2 = 0

Outcome # 26 : D3 is greater

D3 = 7 D2 = 1

Outcome # 27 : D3 equals D2

D3 = 7 D2 = 7

Outcome # 28 : D2 is greater

D3 = 7 D2 = 8

Outcome # 29 : D2 is greater

D3 = 7 D2 = 8

Outcome # 30 : D2 is greater

D3 = 7 D2 = 9

Outcome # 31 : D3 is greater

D3 = 7 D2 = 0

Outcome # 32 : D3 is greater

D3 = 7 D2 = 1

Outcome # 33 : D3 equals D2

D3 = 7 D2 = 7

Outcome # 34 : D2 is greater

D3 = 7 D2 = 8

Outcome # 35 : D2 is greater

D3 = 7 D2 = 8

Outcome # 36 : D2 is greater

D3 = 7 D2 = 9

D2 VS D4 (20 for D4, 16 for D2)

Outcome # 1 : D4 is greater

D2 = 0 D4 = 3

Outcome # 2 : D4 is greater

D2 = 0 D4 = 4

Outcome # 3 : D4 is greater

D2 = 0 D4 = 4

Outcome # 4 : D4 is greater

D2 = 0 D4 = 5

Outcome # 5 : D4 is greater

D2 = 0 D4 = 11

Outcome # 6 : D4 is greater

D2 = 0 D4 = 12

Outcome # 7 : D4 is greater

D2 = 1 D4 = 3

Outcome # 8 : D4 is greater

D2 = 1 D4 = 4

Outcome # 9 : D4 is greater

D2 = 1 D4 = 4

Outcome # 10 : D4 is greater

D2 = 1 D4 = 5

Outcome # 11 : D4 is greater

D2 = 1 D4 = 11

Outcome # 12 : D4 is greater

D2 = 1 D4 = 12

Outcome # 13 : D2 is greater

D2 = 7 D4 = 3

Outcome # 14 : D2 is greater

D2 = 7 D4 = 4

Outcome # 15 : D2 is greater

D2 = 7 D4 = 4

Outcome # 16 : D2 is greater

D2 = 7 D4 = 5

Outcome # 17 : D4 is greater

D2 = 7 D4 = 11

Outcome # 18 : D4 is greater

D2 = 7 D4 = 12

Outcome # 19 : D2 is greater

D2 = 8 D4 = 3

Outcome # 20 : D2 is greater

D2 = 8 D4 = 4

Outcome # 21 : D2 is greater

D2 = 8 D4 = 4

Outcome # 22 : D2 is greater

D2 = 8 D4 = 5

Outcome # 23 : D4 is greater

D2 = 8 D4 = 11

Outcome # 24 : D4 is greater

D2 = 8 D4 = 12

Outcome # 25 : D2 is greater

D2 = 8 D4 = 3

Outcome # 26 : D2 is greater

D2 = 8 D4 = 4

Outcome # 27 : D2 is greater

D2 = 8 D4 = 4

Outcome # 28 : D2 is greater

D2 = 8 D4 = 5

Outcome # 29 : D4 is greater

D2 = 8 D4 = 11

Outcome # 30 : D4 is greater

D2 = 8 D4 = 12

Outcome # 31 : D2 is greater

D2 = 9 D4 = 3

Outcome # 32 : D2 is greater

D2 = 9 D4 = 4

Outcome # 33 : D2 is greater

D2 = 9 D4 = 4

Outcome # 34 : D2 is greater

D2 = 9 D4 = 5

Outcome # 35 : D4 is greater

D2 = 9 D4 = 11

Outcome # 36 : D4 is greater

D2 = 9 D4 = 12

D4 vs D2 (20 for D4, 16 for D2)

Outcome # 1 : D4 is greater

D4 = 3 D2 = 0

Outcome # 2 : D4 is greater

D4 = 3 D2 = 1

Outcome # 3 : D2 is greater

D4 = 3 D2 = 7

Outcome # 4 : D2 is greater

D4 = 3 D2 = 8

Outcome # 5 : D2 is greater

D4 = 3 D2 = 8

Outcome # 6 : D2 is greater

D4 = 3 D2 = 9

Outcome # 7 : D4 is greater

D4 = 4 D2 = 0

Outcome # 8 : D4 is greater

D4 = 4 D2 = 1

Outcome # 9 : D2 is greater

D4 = 4 D2 = 7

Outcome # 10 : D2 is greater

D4 = 4 D2 = 8

Outcome # 11 : D2 is greater

D4 = 4 D2 = 8

Outcome # 12 : D2 is greater

D4 = 4 D2 = 9

Outcome # 13 : D4 is greater

D4 = 4 D2 = 0

Outcome # 14 : D4 is greater

D4 = 4 D2 = 1

Outcome # 15 : D2 is greater

D4 = 4 D2 = 7

Outcome # 16 : D2 is greater

D4 = 4 D2 = 8

Outcome # 17 : D2 is greater

D4 = 4 D2 = 8

Outcome # 18 : D2 is greater

D4 = 4 D2 = 9

Outcome # 19 : D4 is greater

D4 = 5 D2 = 0

Outcome # 20 : D4 is greater

D4 = 5 D2 = 1

Outcome # 21 : D2 is greater

D4 = 5 D2 = 7

Outcome # 22 : D2 is greater

D4 = 5 D2 = 8

Outcome # 23 : D2 is greater

D4 = 5 D2 = 8

Outcome # 24 : D2 is greater

D4 = 5 D2 = 9

Outcome # 25 : D4 is greater

D4 = 11 D2 = 0

Outcome # 26 : D4 is greater

D4 = 11 D2 = 1

Outcome # 27 : D4 is greater

D4 = 11 D2 = 7

Outcome # 28 : D4 is greater

D4 = 11 D2 = 8

Outcome # 29 : D4 is greater

D4 = 11 D2 = 8

Outcome # 30 : D4 is greater

D4 = 11 D2 = 9

Outcome # 31 : D4 is greater

D4 = 12 D2 = 0

Outcome # 32 : D4 is greater

D4 = 12 D2 = 1

Outcome # 33 : D4 is greater

D4 = 12 D2 = 7

Outcome # 34 : D4 is greater

D4 = 12 D2 = 8

Outcome # 35 : D4 is greater

D4 = 12 D2 = 8

Outcome # 36 : D4 is greater

D4 = 12 D2 = 9

D3 vs D4 (D3 is 22, D4 is 12, Equal is 2)

Outcome # 1 : D3 is greater

D3 = 5 D4 = 3

Outcome # 2 : D3 is greater

D3 = 5 D4 = 4

Outcome # 3 : D3 is greater

D3 = 5 D4 = 4

Outcome # 4 : D3 equals D4

D3 = 5 D4 = 5

Outcome # 5 : D4 is greater

D3 = 5 D4 = 11

Outcome # 6 : D4 is greater

D3 = 5 D4 = 12

Outcome # 7 : D3 is greater

D3 = 5 D4 = 3

Outcome # 8 : D3 is greater

D3 = 5 D4 = 4

Outcome # 9 : D3 is greater

D3 = 5 D4 = 4

Outcome # 10 : D3 equals D4

D3 = 5 D4 = 5

Outcome # 11 : D4 is greater

D3 = 5 D4 = 11

Outcome # 12 : D4 is greater

D3 = 5 D4 = 12

Outcome # 13 : D3 is greater

D3 = 6 D4 = 3

Outcome # 14 : D3 is greater

D3 = 6 D4 = 4

Outcome # 15 : D3 is greater

D3 = 6 D4 = 4

Outcome # 16 : D3 is greater

D3 = 6 D4 = 5

Outcome # 17 : D4 is greater

D3 = 6 D4 = 11

Outcome # 18 : D4 is greater

D3 = 6 D4 = 12

Outcome # 19 : D3 is greater

D3 = 6 D4 = 3

Outcome # 20 : D3 is greater

D3 = 6 D4 = 4

Outcome # 21 : D3 is greater

D3 = 6 D4 = 4

Outcome # 22 : D3 is greater

D3 = 6 D4 = 5

Outcome # 23 : D4 is greater

D3 = 6 D4 = 11

Outcome # 24 : D4 is greater

D3 = 6 D4 = 12

Outcome # 25 : D3 is greater

D3 = 7 D4 = 3

Outcome # 26 : D3 is greater

D3 = 7 D4 = 4

Outcome # 27 : D3 is greater

D3 = 7 D4 = 4

Outcome # 28 : D3 is greater

D3 = 7 D4 = 5

Outcome # 29 : D4 is greater

D3 = 7 D4 = 11

Outcome # 30 : D4 is greater

D3 = 7 D4 = 12

Outcome # 31 : D3 is greater

D3 = 7 D4 = 3

Outcome # 32 : D3 is greater

D3 = 7 D4 = 4

Outcome # 33 : D3 is greater

D3 = 7 D4 = 4

Outcome # 34 : D3 is greater

D3 = 7 D4 = 5

Outcome # 35 : D4 is greater

D3 = 7 D4 = 11

Outcome # 36 : D4 is greater

D3 = 7 D4 = 12

D4 vs D3 (D3 is 22, D4 is 12, Equal is 2)

Outcome # 1 : D3 is greater

D4 = 3 D3 = 5

Outcome # 2 : D3 is greater

D4 = 3 D3 = 5

Outcome # 3 : D3 is greater

D4 = 3 D3 = 6

Outcome # 4 : D3 is greater

D4 = 3 D3 = 6

Outcome # 5 : D3 is greater

D4 = 3 D3 = 7

Outcome # 6 : D3 is greater

D4 = 3 D3 = 7

Outcome # 7 : D3 is greater

D4 = 4 D3 = 5

Outcome # 8 : D3 is greater

D4 = 4 D3 = 5

Outcome # 9 : D3 is greater

D4 = 4 D3 = 6

Outcome # 10 : D3 is greater

D4 = 4 D3 = 6

Outcome # 11 : D3 is greater

D4 = 4 D3 = 7

Outcome # 12 : D3 is greater

D4 = 4 D3 = 7

Outcome # 13 : D3 is greater

D4 = 4 D3 = 5

Outcome # 14 : D3 is greater

D4 = 4 D3 = 5

Outcome # 15 : D3 is greater

D4 = 4 D3 = 6

Outcome # 16 : D3 is greater

D4 = 4 D3 = 6

Outcome # 17 : D3 is greater

D4 = 4 D3 = 7

Outcome # 18 : D3 is greater

D4 = 4 D3 = 7

Outcome # 19 : D4 equals D3

D4 = 5 D3 = 5

Outcome # 20 : D4 equals D3

D4 = 5 D3 = 5

Outcome # 21 : D3 is greater

D4 = 5 D3 = 6

Outcome # 22 : D3 is greater

D4 = 5 D3 = 6

Outcome # 23 : D3 is greater

D4 = 5 D3 = 7

Outcome # 24 : D3 is greater

D4 = 5 D3 = 7

Outcome # 25 : D4 is greater

D4 = 11 D3 = 5

Outcome # 26 : D4 is greater

D4 = 11 D3 = 5

Outcome # 27 : D4 is greater

D4 = 11 D3 = 6

Outcome # 28 : D4 is greater

D4 = 11 D3 = 6

Outcome # 29 : D4 is greater

D4 = 11 D3 = 7

Outcome # 30 : D4 is greater

D4 = 11 D3 = 7

Outcome # 31 : D4 is greater

D4 = 12 D3 = 5

Outcome # 32 : D4 is greater

D4 = 12 D3 = 5

Outcome # 33 : D4 is greater

D4 = 12 D3 = 6

Outcome # 34 : D4 is greater

D4 = 12 D3 = 6

Outcome # 35 : D4 is greater

D4 = 12 D3 = 7

Outcome # 36 : D4 is greater

D4 = 12 D3 = 7

Conclusion:

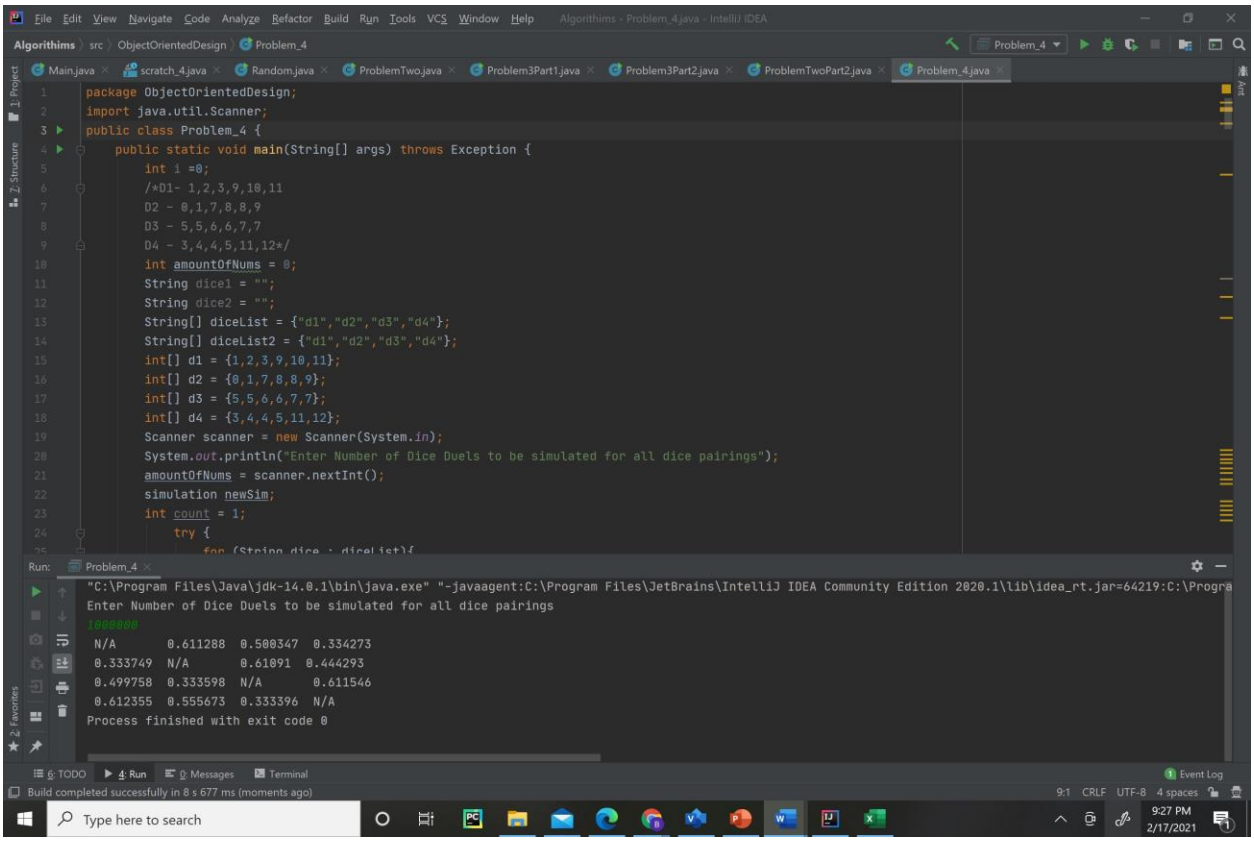
If you divide all the counts you can get the matrix the problem asks for.

	D1	D2	D3	D4
D1	X	61%	50%	33%
D2	33%	X	61%	44%
D3	50%	33%	X	61%
D4	61%	55%	33%	X

	D1	D2	D3	D4
D1	X	22/36	18/36	12/36
D2	12/36	X	22/36	16/36
D3	18/36	12/36	X	22/36
D4	22/36	20/36	12/36	X

In regards to the special property of this dice- the only thing I can surmise is that the are a kinda rock paper scissors complex in regards to likely probability, D1 beats D2, is relatively even with D3, and loses to D4. D2 loses to D1, beats D3 and is relatively even with D4. D3 is even with one beats D2 and loses to D4. D4 Beats D1, is relatively even with D2 and loses to D3.

Computer Simulation



My Computer simulation matches my mathematically computed probability.