

Tool: I am going to use random number generator on my graphics calculator to generate numbers between 1 and 10. ①

- 1 – 4 will represent an apple stamp
- 5 – 7 will represent a pineapple stamp
- 8 – 9 will represent a grape stamp
- 10 will represent a strawberry stamp

Trial: For each trial I will generate 10 random numbers to symbolise the 10 ice blocks Grace is able to buy. However, if Grace gets one of each stamp before she has brought 10 ice blocks the trial will finish there. I will do 20 trials. A successful trial will be if Grace gets one of each stamp (at least one of 1, 2, 3 or 4, at least one of 5, 6 or 7 at least one of 8 or 9 and 10) ②

eg. 9 7 6 4 1 2 3 8 9 1 = not successful

10 3 2 4 1 2 5 6 8 7 = successful ③

Trial	Random numbers	success	No of days
1	3, 8, 9, 6, 1, 8, 8, 3, 1, 9	✗	10
2	10, 7, 5, 5, 10, 9, 10, 2	✓	8
3	10, 3, 8, 6	✓	4
4	3, 6, 9, 6, 8, 2, 3, 7, 5, 10	✓	10
5	8, 10, 9, 6, 7, 5, 9, 6, 6, 5	✗	10
6	9, 2, 3, 7, 3, 2, 9, 3, 4, 2	✗	10
7	2, 7, 7, 7, 8, 5, 9, 3, 5, 7	✗	10
8	5, 8, 4, 1, 3, 9, 1, 4, 8, 10	✓	10
9	6, 2, 7, 4, 1, 6, 10, 2, 4, 8	✓	10
10	5, 1, 8, 5, 6, 4, 8, 10	✓	8
11	8, 9, 10, 2, 2, 7	✓	6
12	6, 10, 6, 8, 9, 4	✓	6
13	4, 1, 9, 8, 5, 6, 6, 5, 8, 4	✗	10
14	5, 5, 8, 4, 4, 5, 1, 6, 1, 5	✗	10
15	2, 9, 5, 10	✓	4
16	2, 8, 8, 10, 1, 7,	✓	6
17	4, 2, 10, 4, 2, 6, 4, 8	✓	8
18	4, 10, 3, 8, 6	✓	5
19	1, 8, 10, 6	✓	4
20	4, 9, 6, 4, 7, 5, 6, 7, 3, 8	✗	10

The results I have gathered are only an estimate and any probabilities taken from my results are only estimates. If I were to do my trials again or if someone else were to do my simulation, the results may differ. ④

$$\frac{\text{Total number of days}}{\text{No of trials}} = \frac{159}{20} = 7.95$$

$$\frac{\text{No of successful days}}{\text{No of trials}} = \frac{13}{20}$$

From my simulation I estimated the mean number of days Grace buys an ice block to win a movie ticket for to be 7.95 and the chances of Grace winning a movie ticket to be 0.65. However, this is only an estimate because if I did it again I might get different results.

6

The assumptions I have made are that the price of the ice blocks remains the same. If the price increases or decreases the number of ice blocks Grace can buy will change. I am also assuming that the stamped ice block sticks are available in these proportions in each shop because otherwise this will change the probabilities and affect Graces chance of winning a movie ticket. That Grace will not swap ice block stamps as this will increase her chances of winning and that Grace will continue to have enough money to buy 10 ice blocks otherwise that will change my probabilities.

7

An alternative approach could be to do the simulation with two people so that the chance of winning a prize increases. You could also keep each trial going so it finishes when a movie ticket is won instead of finishing after 10 ice blocks.