

I will use my calculator to find a maximum of 10 random numbers from 1 to 10. The formula I will use is $10\text{RAN}\# + 1$. I will ignore decimals. ①

I will allocate letters/symbols to numbers. Each number represents 10%.

Apple	0.4 (40%)	4 numbers allocated:	1-4
Pineapple	0.3 (30%)	3 numbers allocated:	5-7
Grape	0.2 (20%)	2 numbers allocated:	8-9
Strawberry	0.1 (10%)	1 number allocated:	10

A successful trial is when all four letters/symbols are found.

Eg 3,6,9,10 – apple, pineapple, grape strawberry. ③

An unsuccessful trial is when all four letters/symbols are not found.

Eg 1,3,2,4,7,6,5,9,9,8 – there is no strawberry here.

10 random numbers is the maximum to be found as the trial goes on for ten days, one ice block bought per day. ②

The trial will be repeated 30 times.

Results of the simulation

Trial number	Random numbers	Win/lose	Number of ice blocks bought
1	9 6 6 4 6 8 3 9 7 9	x	10
2	4 6 8 4 7 4 10	✓	7
3	3 8 6 1 1 2 4 9 6 8	x	10
4	7 6 3 5 3 5 3 9 10	✓	9
5	1 7 4 6 1 7 6 2 2 8	x	10
6	4 5 9 7 1 3 9 5 9 10	✓	10
7	1 7 8 1 1 2 7 10	✓	8
8	7 2 1 10 2 1 1 4 10 6	x	10
9	5 9 5 5 4 4 6 8 9 2	x	10
10	5 1 3 5 8 5 5 1 2 1	x	10
11	1 1 7 2 5 5 1 3 9 1	x	10
12	8 1 3 6 4 4 3 7 10	✓	9
13	9 9 5 10 4	✓	5
14	3 2 6 7 1 10 9	✓	7
15	2 2 4 7 3 2 6 7 9 1	x	10
16	6 1 1 2 9 2 1 8 5 4	x	10
17	3 4 8 4 5 1 5 1 4 5	x	10
18	4 10 6 10 9	✓	5
19	7 8 10 6 10 1	✓	6
20	1 2 1 2 9 4 6 6 10	✓	9
21	6 9 4 1 5 6 9 5 7 10	✓	10
22	6 9 7 6 6 7 9 2 4 3	x	10
23	4 1 2 6 10 2 9	✓	7
24	4 4 3 9 3 2 6 8 6 7	x	10
25	1 2 8 6 6 3 9 10	✓	8
26	2 2 6 3 1 10 10 7 1 6	x	10
27	4 4 1 6 10 6 5 4 4 1	x	10
28	5 1 6 5 2 8 4 5 9 8	x	10
29	2 7 6 7 6 3 3 3 8 1	x	10
30	2 7 9 7 10	✓	5

④

$$\text{Probability of winning} = \frac{\# \text{ of wins}}{\# \text{ of trials}} = \frac{14}{30} = 0.47$$

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$$\text{Average number of ice blocks to win} = \frac{\# \text{ of ice blocks bought}}{\# \text{ of trials}} = \frac{265}{30} = 8.83$$

The estimated probability of winning a movie ticket is 0.47

The estimated average number of ice blocks needed to win a movie ticket is 8.83.

Any results found in this experiment should be treated with caution as they are estimates thus they are likely to be different if the experiment was repeated again.

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I would expect different results if I repeated the experiment.

In this simulation there are several assumptions which are made which must be taken into consideration.

- It is assumed that the proportions of symbols is kept the same throughout the competition by the suppliers. This means that the probabilities (0.4, 0.3, 0.2 and 0.1) are kept constant.
- It is assumed that the ice blocks are distributed evenly across all the outlets as are the different symbols (i.e. no clustering of certain symbols in a particular outlet, as this will alter the probability of Grace getting all 4 sticks to win a movie ticket.)
- It is assumed that the 4 symbols are all released at the same time (none are held back affecting the probabilities of collecting a symbol).
- It is assumed the price of the ice blocks is not changed during the competition which may affect the number of ice blocks Grace purchases.
- It is also assumed that each symbol is independent from another. For example collecting a certain symbol will have no influence on the next symbol/ ice block purchased.

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