

Student 3: Low Merit
NZQA Intended for teacher use only

I will use the random number function on my calculator to generate random numbers between 1 and 10. Each number represents the type of symbol stamped on an ice-block (i.e. apple, pineapple, grape or strawberry). Digits 1 to 4 represent an apple stamp, 5 to 7 represent a pineapple stamp, 8 and 9 represent a grape stamp and digit 10 represents a strawberry stamp. Each trial consists of generating random numbers between 1 & 10 until at least one of each symbol is obtained (i.e. until at least one of 1, 2, 3 or 4, one of 5, 6 or 7, one of 8 or 9 and a digit 10 is obtained) or until a maximum of 10 random numbers is obtained as Grace can only buy an ice-block per day for a maximum of 10 days. A successful outcome of a trial would be to obtain at least one of each symbol, for example 2, 9, 9, 8, 5, 10 would be the equivalent of Grace getting an apple, grape, grape, grape, pineapple and strawberry symbol in that order, one per day. This would be a successful trial as Grace got at least one of each symbol and she would win a free movie ticket. I will do 20 trials. I will record the results on a table and record which trials are successful and which are not, and also the number of days Grace has to buy ice blocks for each trial, in order to calculate the mean number of days Grace buys ice-blocks for.

Trial number	Random numbers	outcome	
		Successful or not	No of days
1	9, 6, 6, 8, 7, 7, 4, 6, 10	✓	9
2	3, 10, 1, 9, 9, 9, 7	✓	7
3	8, 10, 5, 2	✓	4
4	1, 2, 10, 1, 6, 10, 5, 4, 8	✓	9
5	6, 2, 1, 8, 5, 1, 6, 2, 9, 8	✗	10
6	3, 4, 9, 10, 8, 9, 10, 6	✓	8
7	5, 9, 2, 10	✓	4
8	8, 5, 10, 3	✓	4
9	8, 2, 9, 2, 4, 2, 5, 5, 7, 7	✗	10
10	10, 4, 5, 6, 5, 8	✓	6
11	2, 5, 1, 3, 7, 1, 6, 9, 9, 9	✗	10
12	6, 7, 7, 5, 6, 6, 8, 7, 1, 3	✗	10
13	8, 9, 3, 8, 7, 2, 6, 8, 2, 10	✓	10
14	6, 5, 4, 6, 10, 2, 7, 9	✓	8
15	4, 3, 2, 8, 7, 7, 1, 2, 3, 4	✗	10
16	4, 8, 1, 3, 3, 7, 4, 8, 2, 4	✗	10
17	6, 4, 4, 4, 4, 3, 7, 6, 3, 5	✗	10
18	7, 6, 2, 2, 4, 1, 9, 6, 8, 4	✗	10
19	10, 7, 6, 6, 10, 3, 8	✓	7
20	4, 9, 6, 10	✓	4

total successful = 12

total no of days = 160 $\frac{160}{20} = 8 \text{ days}$ $\frac{12}{20} = \frac{3}{5}$

The probability she wins a movie ticket is $\frac{3}{5}$ and the mean number of days to win the movie ticket is 8 days.

According to the results of my simulation, the estimated mean number of days Grace buys ice block is 8 days. However, this value is likely to change if the simulation is repeated because repeating the simulation is likely to give different random numbers. Thus 8 is only an estimate of the mean number of days Grace buys ice-blocks.

6

Assumptions I have made include the following:

The fraction of symbols for the fruits is the same in every shop so that I can use the same random numbers for the fruits every time.

7