Egg-cellent worksheet

With or without replacement?

In pairs discuss the following scenarios in the table. Write underneath whether the following probability experiments are:

* with replacement – is the result or item from the first pick available in the second pick?
* without replacement – once an item has been picked it is gone and no longer available in the second pick?

Probability experiment examples

|  |  |  |
| --- | --- | --- |
| Luca draws a coloured marble from a bag, replaces it and draws another marble. | Mrs Johnson has a digital spinner to choose which students answer questions in her maths class. The student’s name is removed from the spinner after they answer. | Ms Khan uses lolly sticks with students’ names to choose which students answer questions in her maths class. Lolly sticks are always returned to the jar. |
| Amelia picks 3 chocolates from a box to eat. | Noah is listening to music and puts his favourite album on shuffle. | Mr Woo selects 2 students from his class to send to the school office. |
| Kai is playing egg roulette with his friend Bowen. | Nira is a biologist who is counting sharks to see how many have been tagged. She catches 1 shark at a time, checks for a tag and releases it. | Sofia is playing bingo with her Nona and draws out 3 numbers at a time. |

Egg roulette: exploring the probabilities

Having prior knowledge about the game, think back to the video.

1. What was the probability that Miriam chose a cooked egg on her first pick?
2. Given that Miriam chose a cooked egg, what was the probability that Denise chose a cooked egg on her first pick?

In your pair, complete the table, listing on the sample space for the first two eggs picked. For result RR, RC, CR, CC shade the boxes a different colour, where R = raw and C = cooked. Then answer the questions that follow.

Sample space

Second egg selected – Denise

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Raw 1 | Raw 2 | Raw 3 | Cooked 1 | Cooked 2 | Cooked 3 | Cooked 4 | Cooked 5 | Cooked 6 | Cooked 7 | Cooked 8 | Cooked 9 |
| **First egg selected – Miriam** | Raw 1 |  | RR | RR |  |  |  |  | RC |  |  |  |  |
| Raw 2 |  |  |  |  |  |  |  |  |  |  |  |  |
| Raw 3 |  |  |  |  |  |  |  |  |  |  |  |  |
| Cooked 1 |  |  |  |  |  |  |  |  |  |  |  |  |
| Cooked 2 |  |  |  |  |  |  |  |  |  |  |  |  |
| Cooked 3 |  |  |  |  |  |  |  |  |  |  |  |  |
| Cooked 4 |  |  |  |  |  |  |  |  |  |  |  |  |
| Cooked 5 |  |  |  |  |  |  |  |  |  |  |  |  |
| Cooked 6 |  | CR |  |  |  |  |  |  |  |  |  |  |
| Cooked 7 |  |  |  |  |  |  | CC |  |  |  |  |  |
| Cooked 8 |  |  |  |  |  |  |  |  |  |  |  |  |
| Cooked 9 |  |  |  |  |  |  |  |  |  |  |  |  |

1. Explain why the boxes on the diagonal have been shaded out in grey.
2. How many outcomes are in the whole sample space (count the boxes in the table).
3. How many outcomes are CC (both eggs cooked)?
4. Miriam and Denise both got cooked eggs on their picks. Were they really lucky? Explain your answer by calculating and discussing the probability that this might happen.

Egg roulette – simulation

To simulate multiple games of egg roulette against the computer:

* work in pairs, with one person running the simulation and the other recording the results, then swap roles
* open the Excel spreadsheet
* click the arrows to run a simulation. 

Simulation 1: first two picks

You are going to see if you can be as lucky as Miriam and Denise and get no raw eggs in the first two picks of the game.

Record the result of each simulation from the yellow section labelled ‘What is the result of the first two picks,’ in the tally column of the table below.

|  |  |  |  |
| --- | --- | --- | --- |
| Result of first 2 picks | Tally | Frequency | Experimental probability (%) |
| Cooked – Cooked |  |  |  |
| Cooked – Raw |  |  |  |
| Raw – Cooked |  |  |  |
| Raw – Raw |  |  |  |

* Run the simulation 50 times. Record your tally each time.
* Complete the frequency column by counting the tally for each result.
* Calculate the experimental probability (%) as $\frac{frequency}{50}×100$. Use the space below for your calculations.
1. Compare your calculated probabilities with the table prepared in part 1. Explain any differences that have arisen and suggest ways to reduce them.

Simulation 2: How many times will you get egged?

You are now going to play against the computer to see how many times you get egged over a whole game.

1. What is the sample space for how many raw eggs you get over the whole game?
2. Are these outcomes equally likely? If not, which outcome(s) do you expect to be most common and have a higher probability?

Run the simulation 50 times looking at ‘How many raw eggs do you get?’ and record the results in the tally column in the table on the next page, including the frequency and experimental probability, calculated as before.

|  |  |  |  |
| --- | --- | --- | --- |
| Number of raw eggs | Tally | Frequency | Experimental probability (%) |
| 0 |  |  |  |
| 1 |  |  |  |
| 2 |  |  |  |
| 3 |  |  |  |

1. In the space below, compare your calculated probabilities with your expectations.