Simulating a queue

In this exercise we will use a coin to simulate a queue.

Each minute, flip two coins.

- Coin 1 – *Joining the queue*:

    - **heads**: 1 person arrives;
    - **tails**: 2 people arrive.

- Coin 2 – *Leaving the queue*:

    - **heads**: 1 person is served and leaves;
    - **tails**: 2 people are served and leave.

Repeat this for five rounds (minutes) and record your results.

time (mins)	no. joining queue	no. leaving queue	new length of queue
0	–	–	0
1			
2			
3			
4			
5			

Answer the following questions by thinking about theoretical probabilities.

1. What is the average number of arrivals and departures for our simulation in **the first minute**?

2. What are the possible queue lengths after 1, 2, 3, 4 and 5 minutes?

3. What are the probabilities of each queue length at the end of the first minute? What about the second minute?

4. What is the average queue length at the end of each minute you have worked out probabilities for?