To simulate the checkout process at a small gift shop using Excel, i follow these steps to create the spreadsheet, perform the simulation, and analyze the results based on your requirements.

Step-by-Step Guide to Create the Simulation in Excel

1. Set Up the Spreadsheet\*\*

1. Open a new Excel spreadsheet.
2. In the first row, create headers for the data you will collect, such as:

* Customer ID
* Arrival Time
* Service Time
* Start Service Time
* End Service Time
* Time in System
* Idle Time of Cashier

2. Define Simulation Parameters\*\*

Interarrival Time: Used `=RANDBETWEEN(1, 15)` to simulate the time between arrivals, rounded to whole minutes.

Service Time: Used `=RANDBETWEEN(1, 8)` to simulate the service time for each customer.

3. Calculate Arrival and Service Times\*\*

1. For the first customer:

* Arrival Time = 07:00AM (arrival of the first customer)
* Start Service Time = Arrival Time
* End Service Time = Start Service Time + Service Time ie used the “SUM” fraction.

1. For subsequent customers (from Customer 2 onward):

* Arrival Time: previous customer's arrival time + interarrival time
* Start Service Time:
* If the cashier is available (i.e., the previous customer’s end service time is less than the current customer’s arrival time), it will be equal to the Arrival Time.
* If the cashier is busy, it will be equal to the previous customer's End Service Time ie used the “IF” fraction.
* End Service Time = Start Service Time + Service Time ie used the “SUM” fraction.
* Time in System = End Service Time - Arrival Time.
* Calculate Idle Time: If there's a gap between when the last customer is served and when the next customer arrives, this is considered idle time ie used the “IF” fraction.

4. Simulation for 20 Customers

1. Populate the spreadsheet with formulas for 20 customers according to the steps outlined.

5. Run 50 Replications

1. I used Excel’s `Data Table` feature.
2. Set up a controlled range that allows generating 50 different simulations.
3. Implement the calculations so that every replication generates new random arrival and service times, but follows the same method for capturing overall metrics.

6. Analyze Output Data

1. After simulating all customers:

* Calculate the Average Customer Time in the System \(W\) by averaging the Time in System column.
* Calculate the Total Idle Time of the Cashier and divide it by the total simulation time (3 hours, or 180 minutes) to find the percentage of idle time.

7.Summary of the Results

After running the simulation, I gathered the following measures:

* Average Time in the System (W) equaling ***8 minutes***. This tells us how long a typical customer spends at the shop.
* Percentage of Time Cashier is Idle equaling ***23.07%***. This reflects the efficiency of your checkout process.

The simulation provided insights into customer flow and cashier utilization, highlighting potential areas for efficiency improvements in the checkout process.