

The phone repair shop (solution)

The phone repair shop repairs cellular phones of four brands whose arrival percentages are: Sinsong (25%), CTH (40%), Hawai (20%) and Nikao (15%). The time between consecutive arrivals of clients follows an exponential distribution of mean 10 minutes (included the first creation). Each client arrives with only one phone to repair. The time spent by the unique shop assistant follows a normal distribution of mean 5 minutes and standard deviation of 1 minute.

Then, the repair process continues sending mobiles from the shop to the *technical repair center*. In the shop mobiles are grouped in packages of 3 cellulars of the same brand before sending them by a *courier company* to the *technical repair center*. The *courier service* has 4 motorists to provide the package delivery service. The delivery service duration per package follows a triangular distribution with a minimum time of 30 minutes, the mode of 60 minutes and a maximum time of 120 minutes. *The courier service* is used from *the phone repair shop* to the *technical repair center* and vice versa.

The technical repair center has 5 technicians. All the cellulars of the same package are repaired by the same technician. The repair time in minutes for each package depends on the brand as the next table shows:

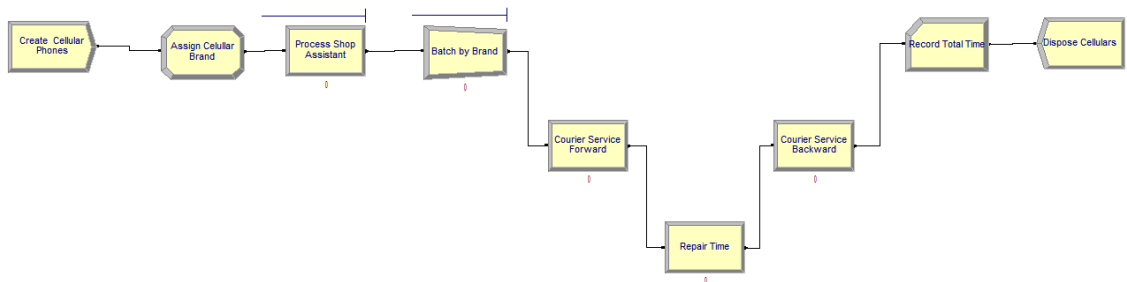
	Sinsong	CTH	Hawai	Nikao
Group Repair Time	Normal(100,20)	Normal(200,20)	Normal(150,20)	Normal(250,20)

Use pseudo code to describe your simulation model to analyze the total time to repair (from the arrival of the mobile phone till the instant in which the cellular is repaired and available at *the phone repair shop*).

- a) Define the elements of the simulation model (entities, variables,...)
- b) Develop the simulation pseudo-code based on ARENA modules.

Solution:

Next, the plot of the ARENA diagram flow:



Elements of the simulation model:

1 punto

ENTITIES (Cellular)

myBrand (1, 2, 3, 4) % type of brand Simsong (1), CTH (2), Hawai(3), Nikao(4)

myStartTime % Arrival Time of the cellular

1 punto

RESOURCE

shopAssistant

Fixed capacity = 1

rTechnicians

Fixed capacity= 5

rMotorists

Fixed capacity= 4

1 punto

VARIABLE (vRepairMean)

Rows=4

vRepairMean (1)=100,vRepairMean (2)=200,vRepairMean (3)=150,

vRepairMean(4)=250

PseudoCode of the simulation model

2 puntos

CREATE(Cellular, Expo(10) ,1,infinite,Expo(10)) % creation of the cellulars to be repaired

ASSIGN(

myStartTime=TNOW % save the arrival time into an attribute

myBrand=DISC(0.25,1,0.65,2,0.85,3,1,4) %save the brand type into an attribute

)

PROCESS (SDR,shopAssistance,1,Normal(5,1)) % use of the unique Shop Assistant

2 puntos

BATCH(3,byAttribute (myBrand), Last) %Grouping 3 cellulars by the attribute myBrand and using the variable vBatch to group a different number of cellulars by the type of brand. The last entity to be grouped keeps the value of the different attributes.

2 puntos

PROCESS(SDR,rMotorists,1,Triang(30,60,120)) %Delay time by the courier service

PROCESS(SDR, rTechnician,1,Normal(vRepairMean(myBrand),20)) %Process of the repair service whose duration depends on the brand type

PROCESS(SDR, rMotorists,1,Triang(30,60,120)) %Delay time by the courier service

1 punto

RECORD(Time Interval,,myStartTime,Record Total Time)

DISPOSE