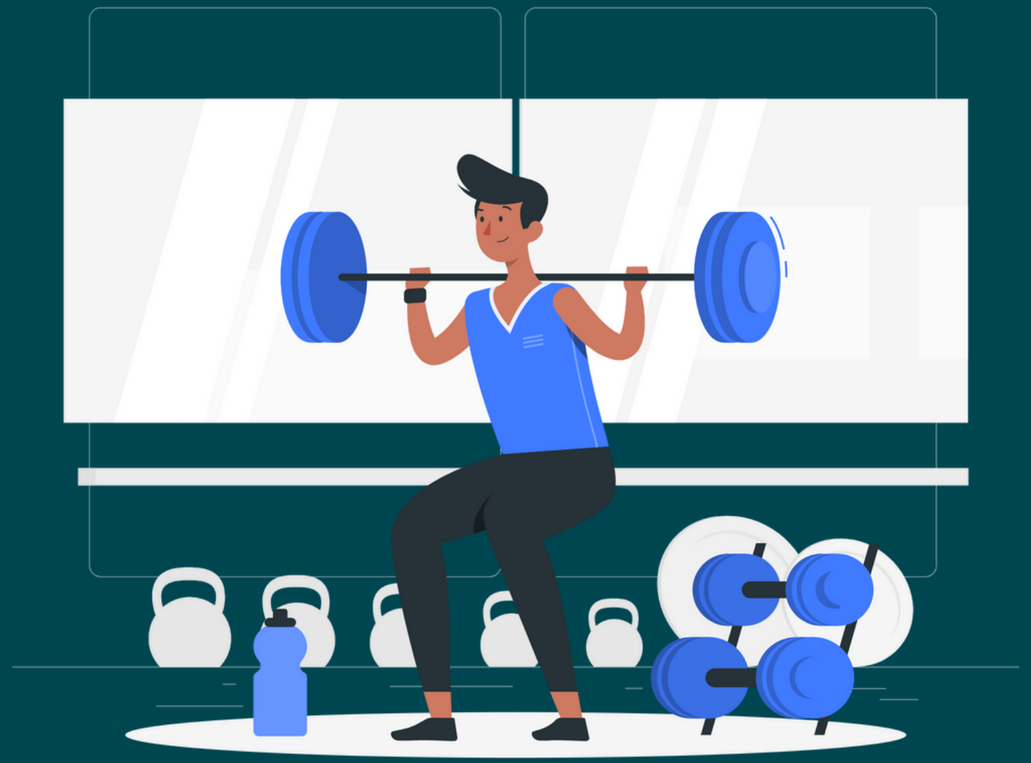
GROUP 5

GYM SIMULATION MODEL

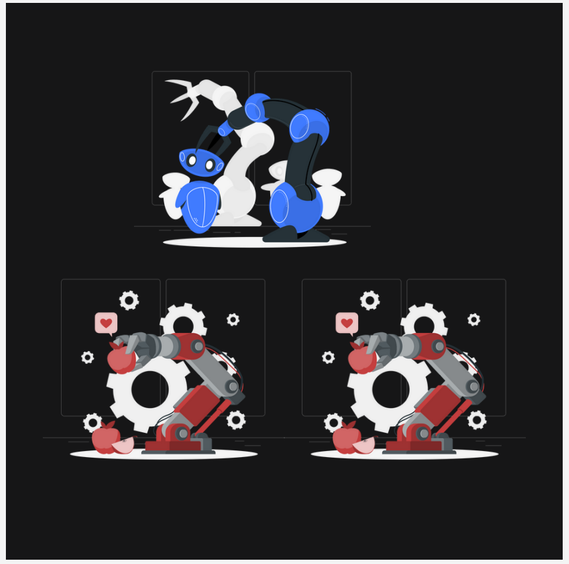
ARINDAM BARMAN
HARSH SINGH
MANISHKA MUKOPADHYAY
MUKESH BAYAL
PRANAY HARWANI
SNEHA KUMARI
SUVIGYA SAXENA
TANMAY MALATKAR

WHY RESOURCE UTILIZATION IS SO IMPORTANT ?

Let's have an example



CASE 1



CASE 2

BOTH MACHINES DO THE SAME WORK

The process timing of red is 4min.
The process timing of blue is 8min.

Neglecting the delays & interarrival time.
The function of both the machines are same.

If we operate it for one hour.

Case 1 is producing 15+8+8 = 31 units/Hour
Case 2 is producing 8+15+15 = 38 units/Hour

Clearly, case 2 is more productive than case 1, as it produces 7 units more.

CONCLUSION

Number of Resources

Preference of Resources

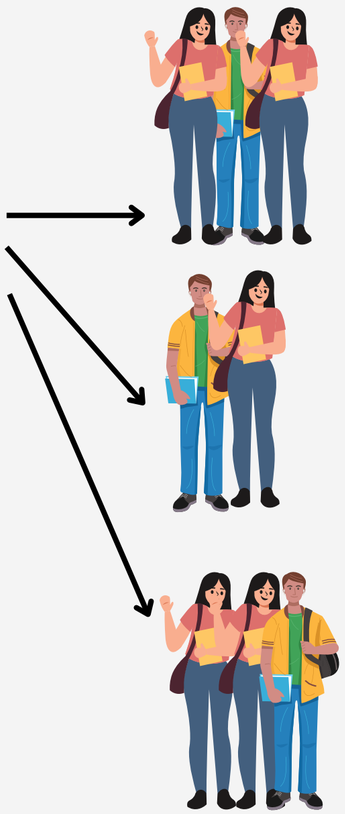
...Are Important.

PROBLEM & AIM

LARGE POPULATION

TIME CRUNCH

LESS GYM FACILITIES



SLOT A

SLOT B

SLOT N

- The number of people allowed per slot is fixed. (Around 70)
- Is there any way that we can increase the number of users per slot ?

GYM

BY SIMULATING A MODEL

- And Studying the behavior of

  - RESOURCES (4 GYM EQUIPMENT)
  - ENTITIES (MALE AND FEMALE)

We can figure out how we can optimize the slot size

RESOURCES

TREADMILL (CARDIO)

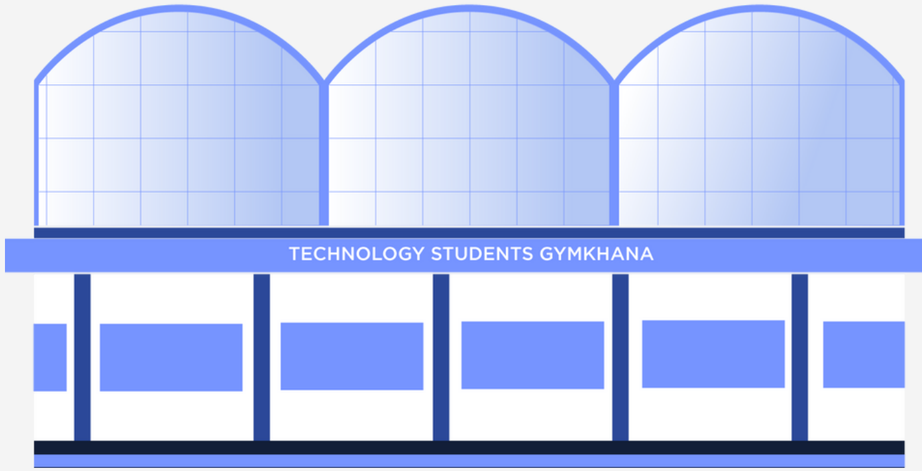
CYCLES (CARDIO)

FREE WEIGHT (WEIGHTING)

WEIGHT MACHINE (WEIGHTING)

HOW WE HAVE STRUCTURED OUR MODEL

ENTERS



CHOICE 1
(CARDIO VS WEIGHT LIFTING)

CHOICE 2
(TREADMILL vs BIKES)

VS

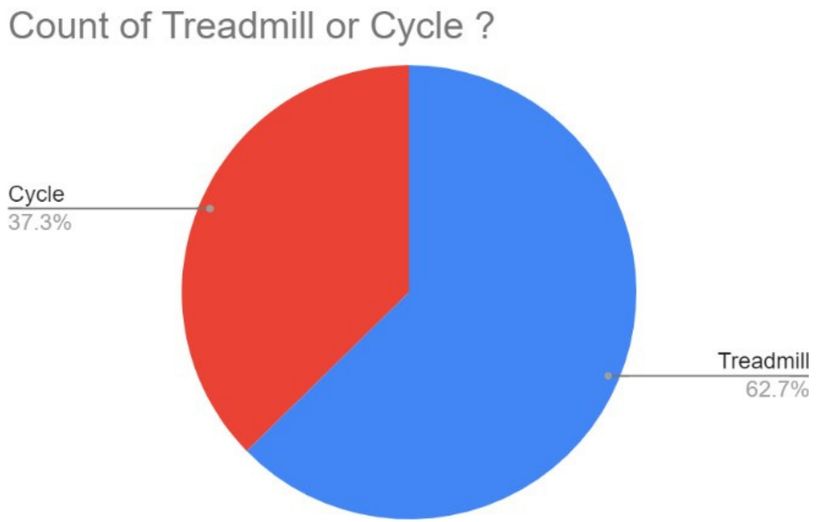
CHOICE 3
(LEAVE vs CONTINUE)

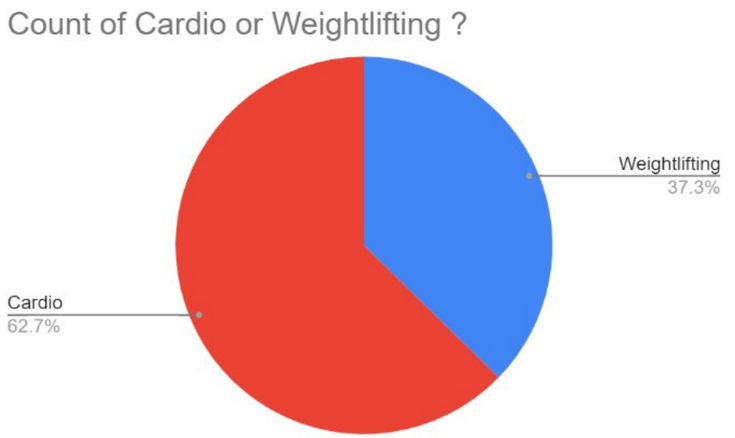
CHOICE 2
(MACHINE VS FREE WEIGHTING)

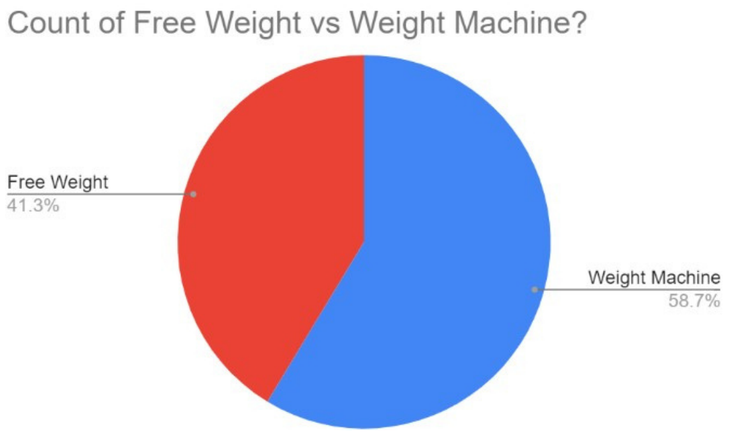
VS

SURVEY AND ANALYSIS

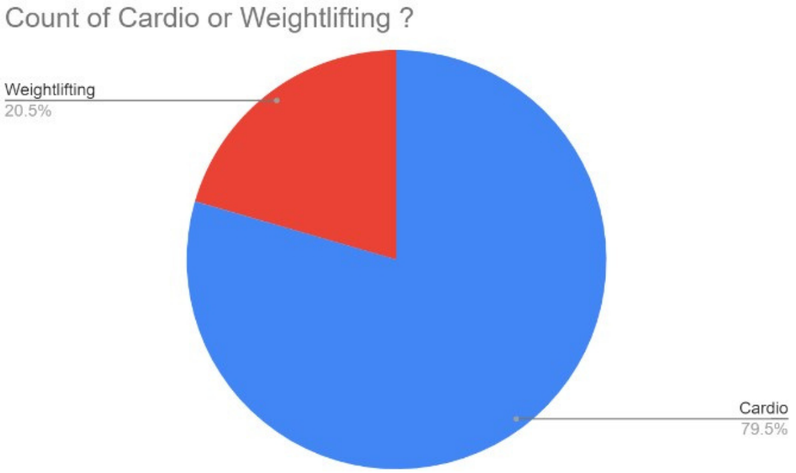
MALE

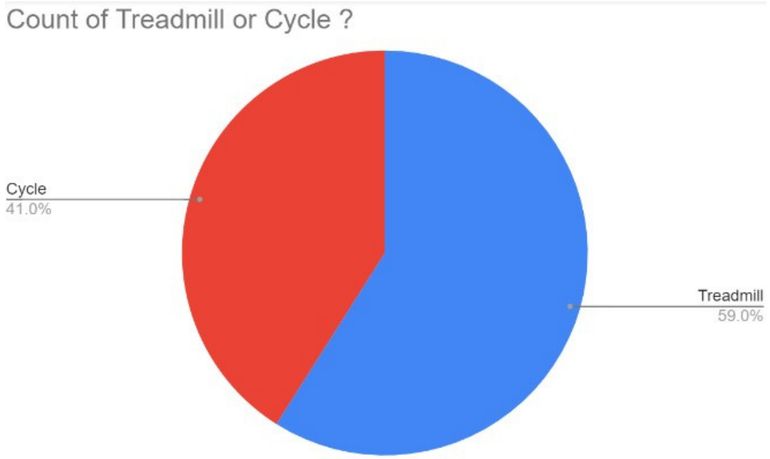


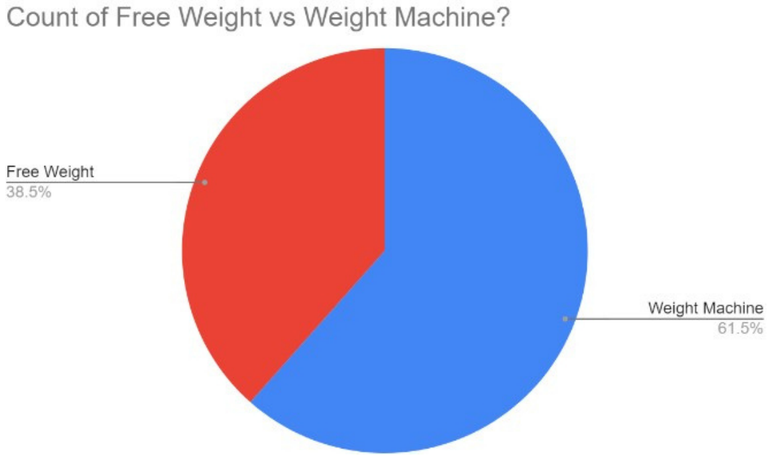




FEMALE



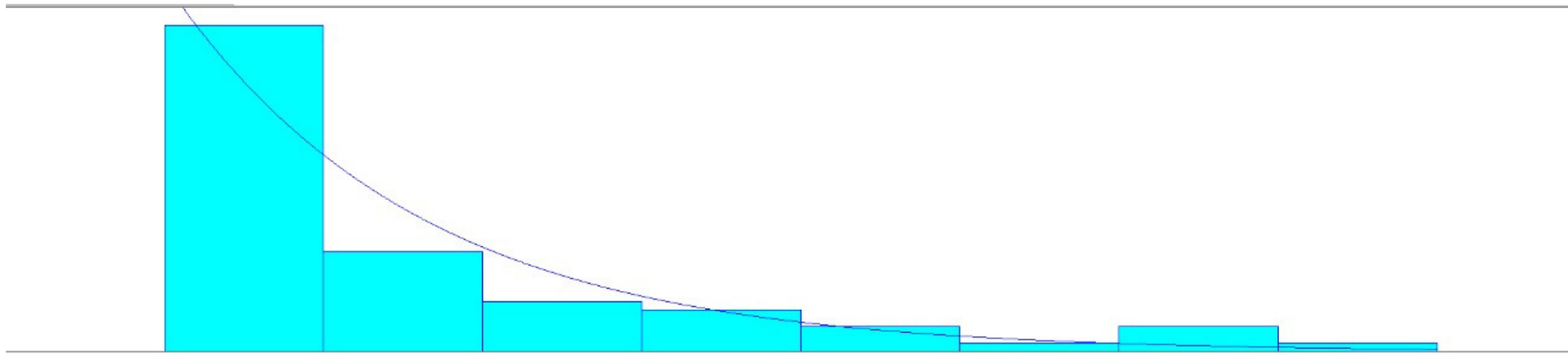




ARENA MODEL

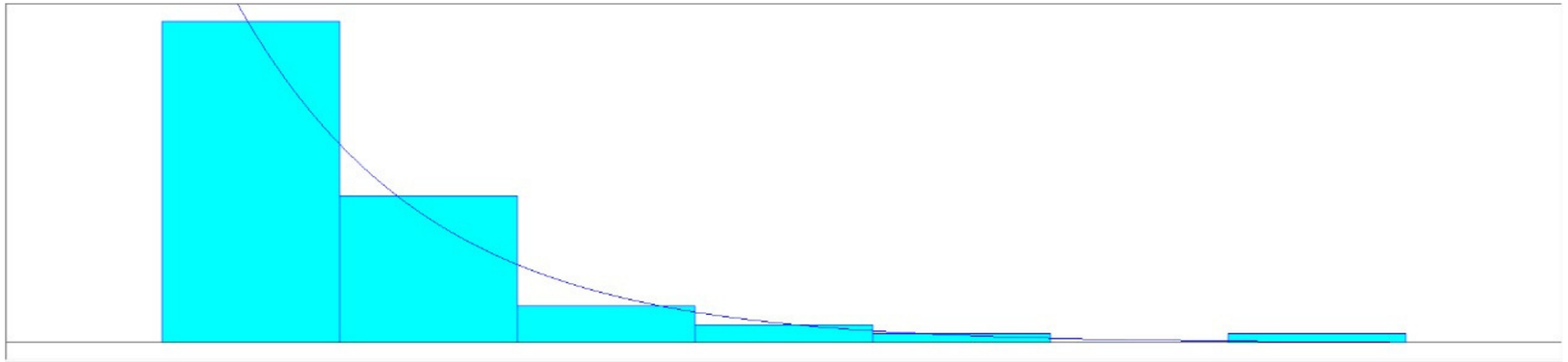
SURVEY AND ANALYSIS

MALE



```
       Distribution Summary

Distribution:   Exponential
Expression:     EXPO(1.58)
Square Error:   0.017219

Chi Square Test
  Number of intervals   = 4
  Degrees of freedom    = 2
  Test Statistic        = 4.9
  Corresponding p-value = 0.0893

Kolmogorov-Smirnov Test
  Test Statistic        = 0.11
  Corresponding p-value > 0.15

       Data Summary

Number of Data Points   = 70
Min Data Value          = 0.00651
Max Data Value          = 7.73
Sample Mean             = 1.58
Sample Std Dev          = 1.77

       Histogram Summary

Histogram Range         = 0 to 8
Number of Intervals     = 8
```

FEMALE



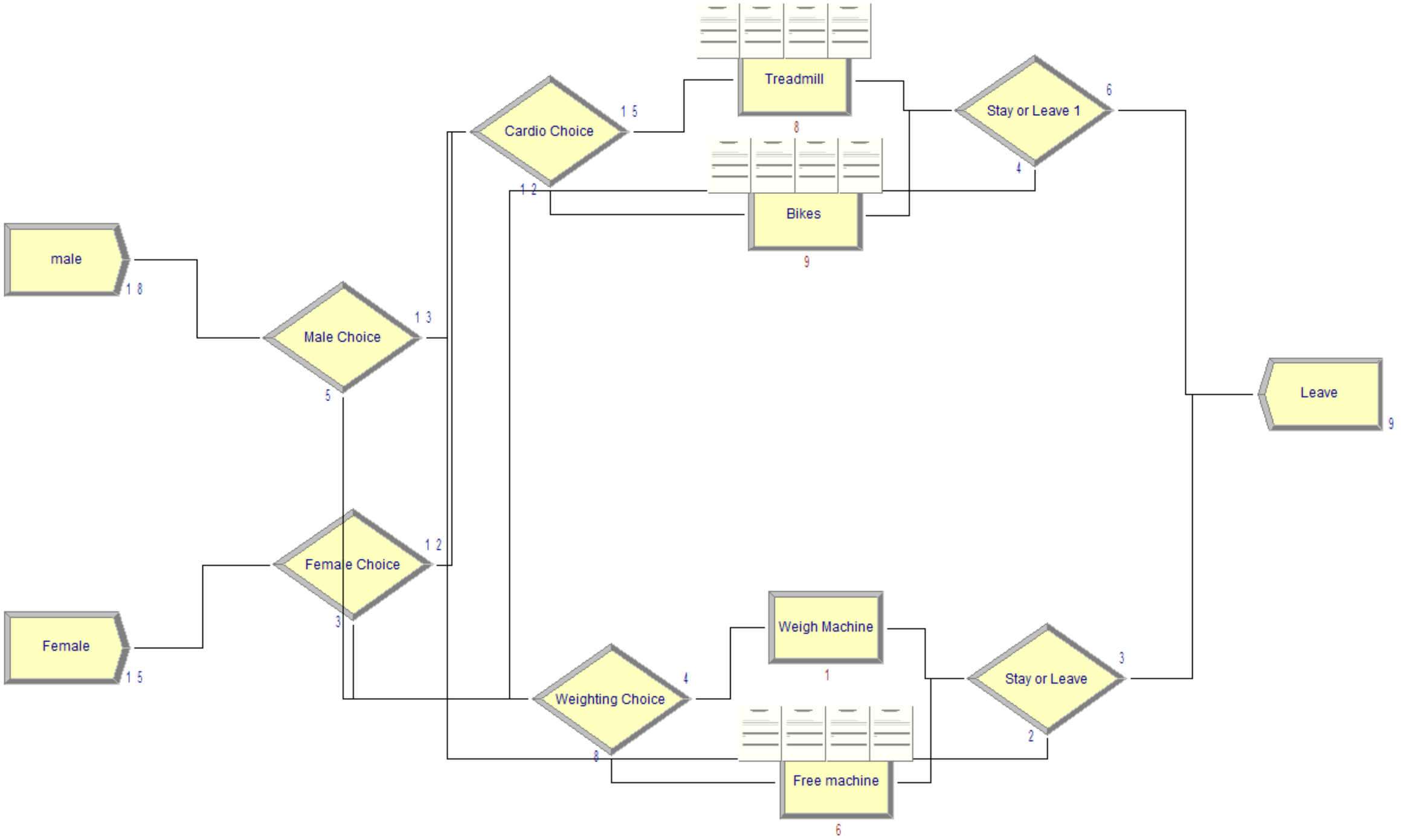
```
      Distribution Summary

Distribution:   Exponential
Expression:     EXPO(2.76)
Square Error:   0.002168

Chi Square Test
  Number of intervals   = 3
  Degrees of freedom    = 1
  Test Statistic        = 0.753
  Corresponding p-value = 0.403

Kolmogorov-Smirnov Test
  Test Statistic        = 0.096
  Corresponding p-value > 0.15

      Data Summary

Number of Data Points   = 59
Min Data Value          = 0.00899
Max Data Value          = 17.9
Sample Mean             = 2.76
Sample Std Dev          = 3.19

      Histogram Summary

Histogram Range         = 0 to 18
Number of Intervals     = 7
```

ENTITY (MvsF)

ARENA MODEL

Resource Quantity

Treadmills	3
Bicycles	3
Free Weights	10
Weighting Machine	1


male
1 8
Female
1 5
Male Choice
1 3
5
Female Choice
1 2
3
Cardio Choice
1 5
1 2
Treadmill
8
Bikes
9
Stay or Leave 1
6
4
Weighting Choice
4
8
Weigh Machine
1
Free machine
6
Stay or Leave
3
2
Leave
9

Entity & Average Number in Queue

Treadmill.Queue.NumberInQueue	6.7872	(Insuf)	.00000	17.000	16.000
Bikes.Queue.NumberInQueue	4.6150	(Insuf)	.00000	11.000	10.000
Weigh Machine.Queue.NumberInQueue	4.8794	(Insuf)	.00000	12.000	11.000
Free machine.Queue.NumberInQueue	5.3632	(Insuf)	.00000	12.000	11.000

Resource & Average Queue waiting Time

Treadmill.Queue.WaitingTime	.22112	(Insuf)	.00000	.43016	8
Bikes.Queue.WaitingTime	.20836	(Insuf)	.00000	.34407	4
Weigh Machine.Queue.WaitingTime	.14634	(Insuf)	.00000	.29427	4
Free machine.Queue.WaitingTime	.15883	(Insuf)	.00000	.39761	3

OBSERVATION

Resource & Average Queue waiting Time

TREADMILL > BIKES

Entity & Average Number in Queue

TREADMILL > BIKES

MODIFICATION

So,
we can **reduce** the number of treadmills by 1
and **increase** the number of bikes by 1

CONCLUSION

THANK YOU