= Abs(85 - 30)
= 55

Step 3. Selection

1. The fittest chromosomes have higher probability to be selected for the next generation. To compute fitness probability we must compute the fitness of each chromosome. To avoid divide by zero problem, the value of **F_obj** is added by 1.
   Fitness[1] = 1 / (1+**F_obj**[1])
   = 1 / 94
   = 0.0106
   Fitness[2] = 1 / (1+**F_obj**[2])
   = 1 / 81
   = 0.0123
   Fitness[3] = 1 / (1+**F_obj**[3])
   = 1 / 84
   = 0.0119
   Fitness[4] = 1 / (1+**F_obj**[4])
   = 1 / 47
   = 0.0213
   Fitness[5] = 1 / (1+**F_obj**[5])
   = 1 / 95
   = 0.0105
   Fitness[6] = 1 / (1+**F_obj**[6])
   = 1 / 56
   = 0.0179

Total = 0.0106 + 0.0123 + 0.0119 + 0.0213 + 0.0105 + 0.0179
= 0.0845

The probability for each chromosomes is formulated by: **P**[i] = **Fitness**[i] / **Total**

P[1] = 0.0106 / 0.0845
= 0.1254
P[2] = 0.0123 / 0.0845
= 0.1456
P[3] = 0.0119 / 0.0845
= 0.1408
P[4] = 0.0213 / 0.0845
= 0.2521
P[5] = 0.0105 / 0.0845
= 0.1243
P[6] = 0.0179 / 0.0845
= 0.2118

From the probabilities above we can see that Chromosome 4 that has the highest fitness, this chromosome has highest probability to be selected for next generation chromosomes. For the selection process we use roulette wheel, for that we should compute the cumulative probability values:

C[1] = 0.1254

C[2] = 0.1254 + 0.1456
= 0.2710

C[3] = 0.1254 + 0.1456 + 0.1408
= 0.4118

C[4] = 0.1254 + 0.1456 + 0.1408 + 0.2521
= 0.6639

C[5] = 0.1254 + 0.1456 + 0.1408 + 0.2521 + 0.1243
= 0.7882

C[6] = 0.1254 + 0.1456 + 0.1408 + 0.2521 + 0.1243 + 0.2118
= 1.0

Having calculated the cumulative probability of selection process using roulette-wheel can be done. The process is to generate random number **R** in the range 0-1 as follows.

R[1] = 0.201
R[2] = 0.284
R[3] = 0.099
R[4] = 0.822
R[5] = 0.398
R[6] = 0.501

If random number **R**[1] is greater than **C**[1] and smaller than **C**[2] then select **Chromosome**[2] as a chromosome in the new population for next generation:

NewChromosome[1] = **Chromosome**[2]
NewChromosome[2] = **Chromosome**[3]
NewChromosome[3] = **Chromosome**[1]
NewChromosome[4] = **Chromosome**[6]
NewChromosome[5] = **Chromosome**[3]
NewChromosome[6] = **Chromosome**[4]

Chromosomes in the population thus became:

Chromosome[1] = [02;21;18;03]
Chromosome[2] = [10;04;13;14]
Chromosome[3] = [12;05;23;08]
Chromosome[4] = [20;05;17;01]
Chromosome[5] = [10;04;13;14]
Chromosome[6] = [20;01;10;06]

In this example, we use one-cut point, i.e. randomly select a position in the parent chromosome then exchanging sub-chromosome. Parent chromosome which will mate is randomly selected and the number of mate Chromosomes is controlled using **crossover_rate** (**ρc**) parameters. Pseudo-code for the crossover process is as follows: