Source code:

```
import java.util.*;

class Attempts
{
  public int value;
  public boolean changed;
  public Attempts()
  {
    value = 0;
    changed = false;
  }
}

class Chromosome
{
  private static int numberLearningAttempts = 1000;

  private final boolean fixGenomeWhenSuccess = false;
  private final double fitnessBoost = 19.;

  private int[] genome;
  private int ID;

  public static void setNumberOfLearningAttempts(int numberLearningAttempts)
  {
    Chromosome.numberLearningAttempts = numberLearningAttempts;
  }

  public Chromosome(int ID, int[] genome)
  {
    this.ID = ID;
    this.genome = genome;
  }

  public Chromosome(int ID, int size, int fixedElements, Random random)
  {
    this.ID = ID;
    genome = new int[size];
    ArrayList<Integer> positions = new ArrayList<>();
    for(int i = 0; i < size; i++)
    {
      genome[i] = 2; // init as ?
      positions.add(i);
    }
    Collections.shuffle(positions, random);
    for(int i = 0; i < fixedElements; i++)
    {
      int pos = positions.get(i);
      genome[pos] = random.nextInt(2);
    }
  }

  @Override
  public String toString()
  {
    if(genome == null)
      return "";
    return String.valueOf(ID) + '\t' + sequenceToString(genome);
  }

  public int[] getSequence()
```

```
{
  return this.genome;
}

public static String sequenceToString(int[] genome)
{
  if(genome == null)
    return "";
  StringBuilder s = new StringBuilder();
  for(int aGenome : genome)
    if(aGenome == 2)
      s.append('?');
    else
      s.append(aGenome);
  return s.toString();
}

public static Chromosome mate(int ID, Chromosome ind1, Chromosome ind2, Random rand)
{
  int recPos = 1 + rand.nextInt(ind1.genome.length - 1);
  int[] genomeNew = new int[ind1.genome.length];
  System.arraycopy(ind1.genome, 0, genomeNew, 0, recPos);
  System.arraycopy(ind2.genome, recPos, genomeNew, recPos, genomeNew.length - recPos);
  return new Chromosome(ID, genomeNew);
}

public static int[] getCounts(int[] genome)
{
  int[] cnts = new int[3];
  for(int aGenome : genome)
    cnts[aGenome]++;
  return cnts;
}


public double liveLearnAndReturnFitness(Random random, Attempts att)
{
  int len = genome.length;
  if(getCounts(genome)[1] == len)
    // this individual has correct sequence, no learning will happen
    return 1 + fitnessBoost;
  else if(getCounts(genome)[0] > 0)
    // this individual has 0s in the sequence, will not learn right solution
    return 1;
  else
  {
    // do learning
    int[] sequence = genome.clone();
    ArrayList<Integer> positionOfQuestionMarks = new ArrayList<>();
    for(int i = 0; i < sequence.length; i++)
      if(sequence[i] == 2)
        positionOfQuestionMarks.add(i);
    int attempts = 1;
    for(; attempts <= numberLearningAttempts; attempts++)
    {
      int[] learnedBits = getRandomBinaryString(positionOfQuestionMarks.size(), random);
      for(int i = 0; i < positionOfQuestionMarks.size(); i++)
        sequence[positionOfQuestionMarks.get(i)] = learnedBits[i];
      if(getCounts(sequence)[1] == len)
      {
        if(fixGenomeWhenSuccess)
          genome = sequence;
        att.value = attempts;
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            att.changed = true;
            return 1 + fitnessBoost * (numberLearningAttempts - attempts) / 1000.;
          }
        }
        // could not learn
        return 1;
      }
    }

    public static int[] getRandomBinaryString(int len, Random random)
    {
      int[] s = new int[len];
      for(int i = 0; i < len; i++)
        s[i] = random.nextBoolean() ? 1 : 0;
      return s;
    }

    public static Chromosome sampleIndividualPropToFitness(Random random, HashMap<Chromosome, Double>
largeFitness,
                                                            ArrayList<Chromosome> fitnessOne,
                                                            double totFitnessGreaterThanOne)
    {
      double totFitness = fitnessOne.size() + totFitnessGreaterThanOne;
      if(random.nextDouble() < fitnessOne.size() / totFitness)
        // sample from those with fitness = 1
        return fitnessOne.get(random.nextInt(fitnessOne.size()));
      else
      {
        // sample from those ith fitness > 1
        double fitnessMark = random.nextDouble() * totFitnessGreaterThanOne;
        double cumulativeFitness = 0.;
        Chromosome sampledInd = null;
        for(Chromosome ind : largeFitness.keySet())
        {
          cumulativeFitness += largeFitness.get(ind);
          if(cumulativeFitness >= fitnessMark)
          {
            sampledInd = ind;
            break;
          }
        }
        return sampledInd;
      }
    }

    public static boolean isFixated(ArrayList<Chromosome> inds)
    {
      int[] firstGenome = inds.get(0).genome;
      for(Chromosome ind : inds)
        if(!Arrays.equals(firstGenome, ind.genome))
          return false;
      return true;
    }

    public static double[] getGenomeProb(Collection<Chromosome> inds)
    {
      double[] res = new double[3];
      for(Chromosome ind : inds)
      {
        int[] thisInd = getCounts(ind.genome);
        res[0] += thisInd[0];
        res[1] += thisInd[1];
        res[2] += thisInd[2];
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    }
    double sum = res[0] + res[1] + res[2];
    res[0] /= sum;
    res[1] /= sum;
    res[2] /= sum;
    return res;
  }

}

public class Main
{
  static long seed = System.currentTimeMillis();

  public static void main(String[] args) throws InterruptedException
  {
    Random random = new Random(seed);
    int numberOfSamples = 1000;
    int len = 20;
    int fixed = 10;

    Chromosome.setNumberOfLearningAttempts(numberOfSamples);

    ArrayList<Chromosome> inds = new ArrayList<>();
    for(int i = 0; i < numberOfSamples; i++)
      inds.add(new Chromosome(i, len, fixed, random));

    int generation = 0;
    double[] populationStats = Chromosome.getGenomeProb(inds);

    while(!Chromosome.isFixated(inds))
    {
      HashMap<Chromosome, Double> largeFitness = new HashMap<>();
      ArrayList<Chromosome> fitnessOne = new ArrayList<>();
      double totFitnessGreaterThanOne = 0., totalAttempts = 0, bestAttempts = 1000;
      int cnt = 0;
      for(Chromosome ind : inds)
      {
        Attempts attempts = new Attempts();
        double fitness = ind.liveLearnAndReturnFitness(random, attempts);
        totalAttempts += attempts.value;
        if(attempts.changed)
          cnt++;
        if(attempts.changed && attempts.value < bestAttempts)
          bestAttempts = attempts.value;
        if(fitness > 1)
        {
          largeFitness.put(ind, fitness);
          totFitnessGreaterThanOne += fitness;
        } else
          fitnessOne.add(ind);
      }
      System.out.printf(
          "GENERATION %4d\t\t0 --> %.6f\t\t\t1 --> %.6f\t\t\t? --> %.6f\t\t\taverage --> %3.6f\t\t\tbest --> 
%3.6f\n",
          generation, populationStats[0], populationStats[1], populationStats[2], totalAttempts / cnt,
          bestAttempts);

      ArrayList<Chromosome> newGen = new ArrayList<>();
      for(int i = 0; i < numberOfSamples; i++)
      {
        Chromosome samp1 = Chromosome.sampleIndividualPropToFitness(random, largeFitness, fitnessOne,
                                    totFitnessGreaterThanOne);
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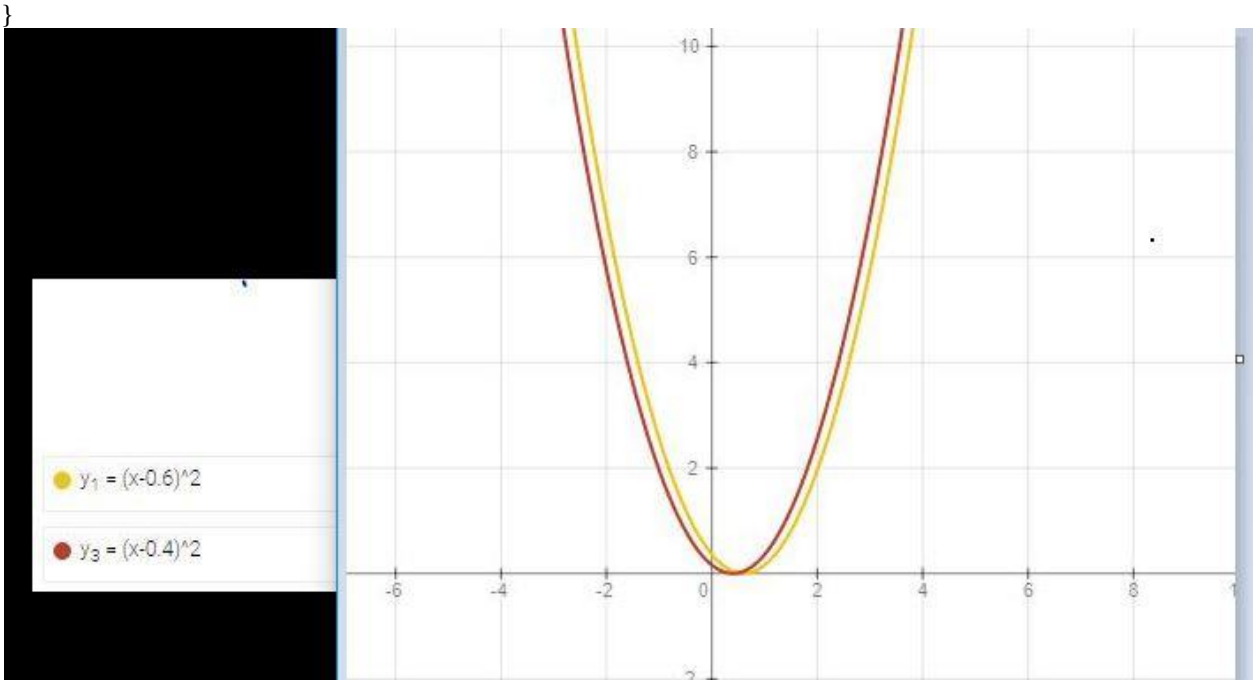
```
            Chromosome samp2 = Chromosome.sampleIndividualPropToFitness(random, largeFitness, fitnessOne,
                                        totFitnessGreaterThanOne);
            Chromosome newSamp = Chromosome.mate(i, samp1, samp2, random);
            newGen.add(newSamp);
          }
          inds = newGen;
          populationStats = Chromosome.getGenomeProb(inds);
          generation++;
        }
        System.out.println("Done:\t" + Chromosome.sequenceToString(inds.get(0) .getSequence()) + "\t" +
populationStats[0] + "\t" + populationStats[1] + "\t" + populationStats[2]);
        Thread.sleep(1000);
      }

}
```



	A	B	C	D	E	F	G
1	0 : 0.21747751					0 : 0.51747932	
2	1 : 0.17643043					1 : 0.47643043	
3	2 : 0.12644100					2 : 0.42644254	
4	3 : 0.10857654					3 : 0.40857936	
5	4 : 0.08274021					4 : 0.38274184	
6	5 : 0.07661301					5 : 0.37661706	
7	6 : 0.0663210					6 : 0.3665887	
8	7 : 0.0496021					7 : 0.34961778	
9	8 : 0.04036321					8 : 0.34037143	
10	9 : 0.027723256					9 : 0.327727623	
11	10 : 0.027446589					10 : 0.327442953	
12	11 : 0.02361369					11 : 0.32363541	
13	12 : 0.02371857					12 : 0.32371857	
14	13 : 0.0231231					13 : 0.3232465	
15	14 : 0.023100145					14 : 0.323100017	
16	15 : 0.023047152					15 : 0.323059485	
17	16 : 0.023047152					16 : 0.323051761	
18	17 : 0.023047152					17 : 0.323051761	

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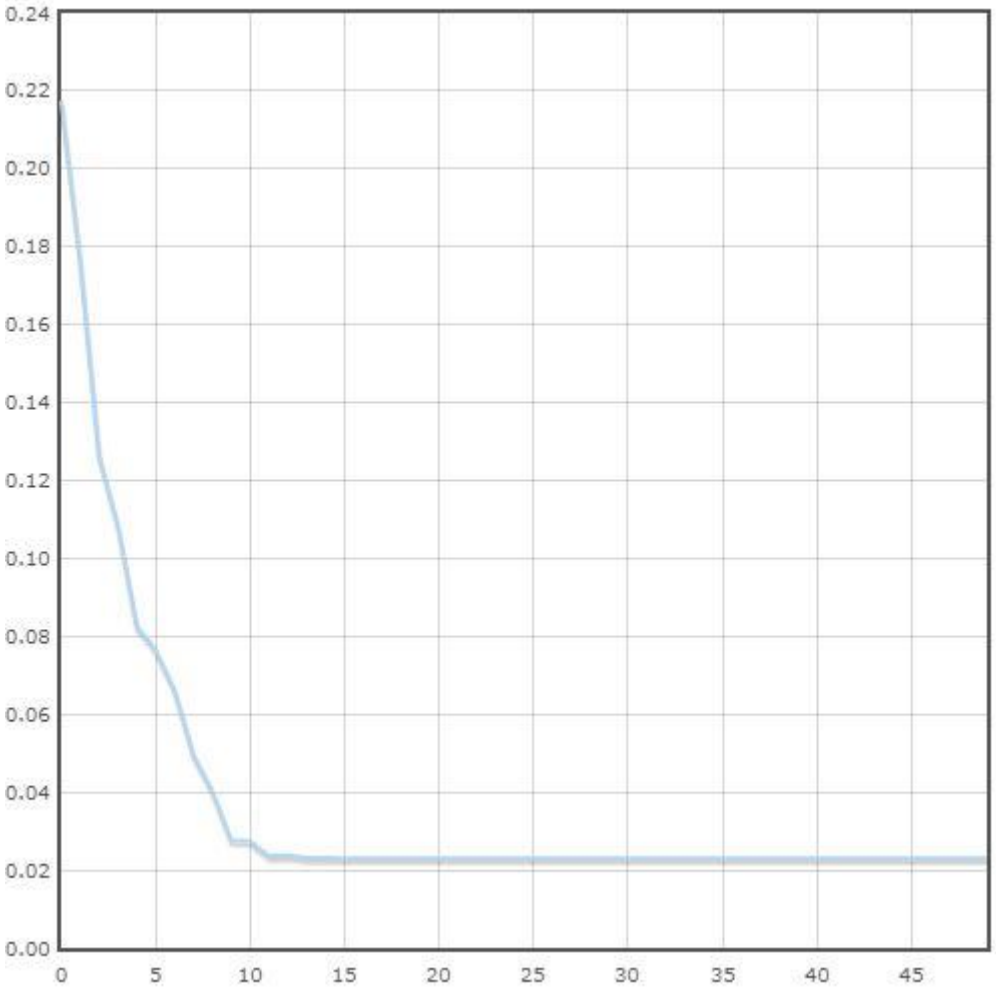

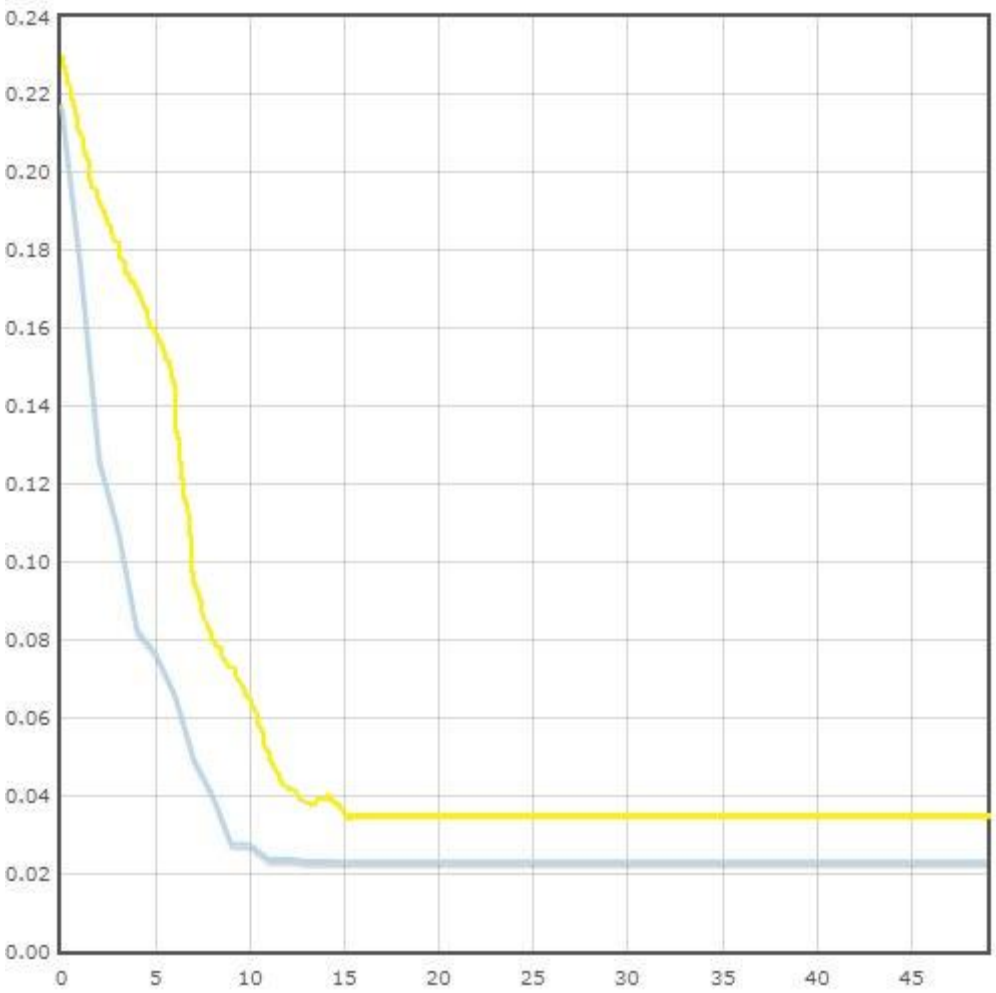

Blue line- y=(x-0.6)^2

Yellow line- y=(x-0.4)^2