Co-Curricular Project:  
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**Step 1:**

import java.util.Random;

import java.util.Scanner;

public class Sim {

public static void main(String[] args) {

double novobiocinMean = 1.76;

double novobiocinStdDev = 1.42;

double distilledMean = 0.61;

double distilledStdDev = 0.96;

double vitaminCMean = 2.67;

double vitaminCStdDev = 1.63;

Random random = new Random();

double[] novobiocinData = {

1, 7, 2, 2, 2, 3, 3, 1, 2, 0, 3, 2.5, 0, 1, 2, 1, 2, 1, 3, 3, 2, 0.5, 2, 2, 1

};

double[] distilledData = {

2, 0, 0, 0, 1, 0, 1, 2, 0, 2, 0, 0, 1, 0, 0, 0, 0, 0, 0.1, 0, 0, 3, 1, 3, 0, 0, 1, 0

};

double[] vitaminCData = {

5, 1, 2, 3, 4, 1

};

double[] novobiocinSamples = new double[100];

double[] distilledSamples = new double[100];

double[] vitaminCSamples = new double[100];

for (int i = 0; i < 100; i++) {

novobiocinSamples[i] = Math.max(0, random.nextGaussian(novobiocinMean, novobiocinStdDev));

distilledSamples[i] = Math.max(0, random.nextGaussian(distilledMean, distilledStdDev));

vitaminCSamples[i] = Math.max(0, random.nextGaussian(vitaminCMean, vitaminCStdDev));

}

System.out.println("Scenario 1: Doubling the amount of data points");

sleep();

for (int i = 0; i < distilledData.length \* 2; i++) {

String o = "";

o += String.format("%03d:\t", i + 1);

if (i < novobiocinData.length) {

o += String.format("%.2f", novobiocinData[i]);

} else {

if (i < novobiocinData.length \* 2) {

o += String.format("%.2f", novobiocinSamples[i % novobiocinSamples.length]);

}

}

o += "\t";

if (i < distilledData.length) {

o += String.format("%.2f", distilledData[i]);

} else {

o += String.format("%.2f", distilledSamples[i % distilledSamples.length]);

}

o += "\t";

if (i < vitaminCData.length) {

o += String.format("%.2f", vitaminCData[i]);

} else {

if (i < vitaminCData.length \* 2) {

o += String.format("%.2f", vitaminCSamples[i % vitaminCSamples.length]);

}

}

System.out.println(o);

sleep();

}

System.out.println("Press enter to continue...");

new Scanner(System.in).nextLine();

System.out.println("\n\n--------------------------------------------------");

for (int i = 0; i < 100; i++) {

novobiocinSamples[i] = Math.max(0, random.nextGaussian(novobiocinMean, novobiocinStdDev));

distilledSamples[i] = Math.max(0, random.nextGaussian(distilledMean, distilledStdDev));

vitaminCSamples[i] = Math.max(0, random.nextGaussian(vitaminCMean, vitaminCStdDev));

}

System.out.println("Scenario 2: Bringing the data up to 100 points");

sleep();

for (int i = 0; i < 100; i++) {

String o = "";

o += String.format("%03d:\t", i + 1);

if (i < novobiocinData.length) {

o += String.format("%.2f", novobiocinData[i]);

} else {

o += String.format("%.2f", novobiocinSamples[i % novobiocinSamples.length]);

}

o += "\t";

if (i < distilledData.length) {

o += String.format("%.2f", distilledData[i]);

} else {

o += String.format("%.2f", distilledSamples[i % distilledSamples.length]);

}

o += "\t";

if (i < vitaminCData.length) {

o += String.format("%.2f", vitaminCData[i]);

} else {

o += String.format("%.2f", vitaminCSamples[i % vitaminCSamples.length]);

}

System.out.println(o);

sleep();

}

System.out.println("Press enter to continue...");

new Scanner(System.in).nextLine();

System.out.println("\n\n--------------------------------------------------");

for (int i = 0; i < 100; i++) {

novobiocinSamples[i] = Math.max(0, random.nextGaussian(novobiocinMean, novobiocinStdDev));

distilledSamples[i] = Math.max(0, random.nextGaussian(distilledMean, distilledStdDev));

vitaminCSamples[i] = Math.max(0, random.nextGaussian(vitaminCMean, vitaminCStdDev));

}

System.out.println("Scenario 3: Creating 100 new data points");

sleep();

for (int i = 0; i < 100; i++) {

System.out.println(String.format("%03d:\t%.2f\t%.2f\t%.2f",

i + 1,

novobiocinSamples[i],

distilledSamples[i],

vitaminCSamples[i]));

sleep();

}

System.out.println("Press enter to quit...");

new Scanner(System.in).nextLine();

}

public static void sleep() {

sleep(30);

}

private static void sleep(long ms) {

try {

Thread.sleep(ms);

} catch (InterruptedException e) {

Thread.currentThread().interrupt();

}

}

}

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**Description:**

We calculated the standard deviation and mean of all three data sets. Rayhaan did this, as he is the one who is taking AP Statistics. We then used the Random.nextGaussian() method, which takes in two doubles as parameters and then generates a random number within a gaussian distribution, using the first input as the mean and the second input as the standard deviation. We used the values we had calculated, and were able to generate as many new data points as we needed, which all fell within the expected range of the actual tests that the AP Biology students conducted.