ЛАБОРАТОРНАЯ РАБОТА №6

Многопоточное вычисление интегралов функций

по курсу
Объектно-ориентированное программирование

Группа 6204-010302D

Студент: С.0.Куропаткин.

Преподаватель: Борисов Дмитрий Сергеевич.

Задание 1: Реализация метода интегрирования

В класс Functions добавлен метод для вычисления интеграла по методу трапеций:

```java
public static double integrate(Function function, double left, double right,
double step) throws IllegalArgumentException,
InappropriateFunctionPointException {

    if (left >= right || step <= 0) {
        throw new IllegalArgumentException();
    }

    if (left < function.getLeftDomainBorder() || right >
function.getRightDomainBorder()) {
        throw new IllegalArgumentException();
    }

    double result = 0;
    double x = left;

    while (x + step < right) {
        result += (function.getFunctionValue(x) + function.getFunctionValue(x
+ step)) * step / 2;
        x += step;
    }

    // Последняя неполная трапеция
    if (x < right) {
        result += (function.getFunctionValue(x) +
function.getFunctionValue(right)) * (right - x) / 2;
    }

    return result;
}
```

Задание 2
Класс Task и последовательная версия

Создан пакет threads и класс Task:

```java
package threads;

import functions.Function;

public class Task {

    private Function function;
    private double leftX, rightX, step;
    private int numTasks;

    public Task(int numTasks) {
        if (numTasks <= 0) {
            throw new IllegalArgumentException();
        }
        this.numTasks = numTasks;
    }

    public Function getFunction() {
        return function;
    }
```

```java
    public void setFunction(Function function) {
        this.function = function;
    }

    public double getLeftX() {
        return leftX;
    }

    public void setLeftX(double leftX) {
        this.leftX = leftX;
    }

    public double getRightX() {
        return rightX;
    }

    public void setRightX(double rightX) {
        if (rightX <= leftX) {
            throw new IllegalArgumentException();
        }
        this.rightX = rightX;
    }

    public double getStep() {
        return step;
    }

    public void setStep(double step) {
        if (step <= 0) {
            throw new IllegalArgumentException();
        }
        this.step = step;
    }

    public int getNumTasks() {
        return numTasks;
    }

    public void setNumTasks(int numTasks) {
        if (numTasks <= 0) {
            throw new IllegalArgumentException();
        }
        this.numTasks = numTasks;
    }
}
```

Задание 3
Простая многопоточная версия

Созданы классы SimpleGenerator и SimpleIntegrator:

```java
package threads;

import functions.Function;
import functions.Functions;
import functions.basic.Log;

public class SimpleGenerator implements Runnable{
    private Task task;

    public SimpleGenerator(Task task) {
        this.task = task;
```

```java
        }

    public void run() {
        for (int i = 0; i < task.getNumTasks(); ++i) {
            double base = 1 + Math.random() * 9;
            Function function = Functions.power(new Log(base), 2);
            double leftX = Math.random() * 100;
            double rightX = Math.random() * 100 + 100;
            double step = Math.random() * 0.9 + 0.1;
            synchronized (task) {
                task.setFunction(function);
                task.setLeftX(leftX);
                task.setRightX(rightX);
                task.setStep(step);
                System.out.println("Source leftX = " + leftX + " rightX = " +
rightX + " step = " + step);
            }
        }
    }
}
```

```java
package threads;

import functions.Function;
import functions.Functions;
import functions.InappropriateFunctionPointException;

public class SimpleIntegrator implements Runnable{
    private Task task;

    public SimpleIntegrator(Task task) {
        this.task = task;
    }

    public void run(){
        for (int i = 0; i < task.getNumTasks(); ++i) {
            double leftX, rightX, step;
            Function function;
            if (task.getFunction() == null) {
                continue;
            }
            synchronized (task) {
                leftX = task.getLeftX();
                rightX = task.getRightX();
                step = task.getStep();
                function = task.getFunction();

                double result = 0;
                try {
                    result = Functions.integrate(function, leftX, rightX,
step);
                } catch (InappropriateFunctionPointException e) {
                    throw new RuntimeException(e);
                }
                System.out.println("Result leftX = " + leftX + " rightX = " +
rightX + " step = " + step + " Result: " + result);
            }
        }
    }
}
```

Задание 4
Усовершенствованная версия с семафором
Созданы классы Generator и Integrator:

```java
package threads;

import functions.*;
import functions.basic.*;

import java.util.concurrent.Semaphore;

public class Generator extends Thread {
    private Task task;
    private Semaphore semaphore;

    public Generator(Task task, Semaphore semaphore) {
        this.task = task;
        this.semaphore = semaphore;
    }

    @Override
    public void run() {
        for (int i = 0; i < task.getNumTasks(); ++i) {
            double base = 1 + Math.random() * 9;
            Function function = Functions.power(new Log(base), 2);
            double leftX = Math.random() * 100;
            double rightX = Math.random() * 100 + 100;
            double step = Math.random() * 0.9 + 0.1;

            try {
                semaphore.acquire();
                synchronized (task) {
                    task.setFunction(function);
                    task.setLeftX(leftX);
                    task.setRightX(rightX);
                    task.setStep(step);
                    System.out.println("Source leftX = " + leftX + " rightX =
" + rightX + " step = " + step);
                }
            } catch (InterruptedException e) {
                e.printStackTrace();
            } finally {
                semaphore.release();
            }
        }
    }
}
```

```java
package threads;

import functions.Function;
import functions.Functions;
import functions.InappropriateFunctionPointException;

import java.util.concurrent.Semaphore;

public class Integrator extends Thread {
    private Task task;
    private Semaphore semaphore;

    public Integrator(Task task, Semaphore semaphore) {
```

```java
        this.task = task;
        this.semaphore = semaphore;
    }

    @Override
    public void run() {
        for (int i = 0; i < task.getNumTasks(); ++i) {
            double leftX, rightX, step;
            Function function;

            try {
                semaphore.acquire();
                synchronized (task) {
                    leftX = task.getLeftX();
                    rightX = task.getRightX();
                    step = task.getStep();
                    function = task.getFunction();
                }

                double result = 0;
                try {
                    result = Functions.integrate(function, leftX, rightX,
step);
                } catch (InappropriateFunctionPointException e) {
                    throw new RuntimeException(e);
                }

                System.out.println("Result leftX = " + leftX + " rightX = " +
rightX + " step = " + step + " Result: " + result);
            } catch (InterruptedException e) {
                e.printStackTrace();
            } finally {
                semaphore.release();
            }
        }
    }
}
```

Тестирование написанных методов

```java
import functions.*;
import functions.basic.*;
import functions.meta.*;
import threads.*;

import java.util.concurrent.Semaphore;

public class Main {
    public static void main(String[] args) throws
InappropriateFunctionPointException, InterruptedException {

        // Пример использования метода интегрирования для экспонентов на
отрезке от 0 до 1
        System.out.println("Задание 1:");
        Function expFunction = new Exp();

        double theoreticValue = Math.E - 1;
        double integralValue = Functions.integrate(expFunction, 0, 1,
0.000001);

        System.out.println("Теоретическое значение: " + theoreticValue);
        System.out.println("Значение полученное при помощи функции: " +
integralValue);
        System.out.println("Шаг = " + 0.000001 + "\n");
```

```java
        // Пример использования метода nonThread
        System.out.println("Задание 2");
        nonThread();

        // Пример использования метода simpleThreads
        System.out.println("Задание 3");
        simpleThreads();

        // Пример использования метода complicatedThreads
        System.out.println("Задание 4");
        complicatedThreads();
    }

    public static void nonThread() throws InappropriateFunctionPointException
{
        Task t = new Task(100);
        for (int i = 0; i < t.getNumTasks(); i++) {
            t.setFunction(new Log(1 + (Math.random() * 9)));
            t.setLeftX(Math.random() * 100);
            t.setRightX(Math.random() * 100 + 100);
            t.setStep(Math.random() * 0.9 + 0.1);
            System.out.println("Source leftX = " + t.getLeftX() + " rightX =
" + t.getRightX() + " step = " + t.getStep());
            double res = Functions.integrate(t.getFunction(), t.getLeftX(),
t.getRightX(), t.getStep());
            System.out.println("Result leftX = " + t.getLeftX() + " rightX =
" + t.getRightX() + " step = " + t.getStep() + " integrate = " + res);
        }
    }

    public static void simpleThreads() {
        Task task = new Task(100);

        Thread generatorThread = new Thread(new SimpleGenerator(task));
        generatorThread.start();

        Thread integratorThread = new Thread(new SimpleIntegrator(task));
        integratorThread.start();
    }

    public static void complicatedThreads() throws InterruptedException {
        Task task = new Task(100);
        Semaphore semaphore = new Semaphore(1); // Используем семафор с одним
разрешением

        Thread generatorThread = new Generator(task, semaphore);
        generatorThread.start();

        Thread integratorThread = new Integrator(task, semaphore);
        integratorThread.start();

        Thread.sleep(500); // Ждем 50 миллисекунд

        generatorThread.interrupt();
        integratorThread.interrupt();
    }
}
```

Вывод Main:
Задание 1:
Теоретическое значение: 1.718281828459045
Значение полученное при помощи функции: 1.7182818284378987
Шаг = 1.0E-6

Задание 2
Source leftX = 31.798281541709073 rightX = 137.4079416675924 step = 0.3883836327093114
Result leftX = 31.798281541709073 rightX = 137.4079416675924 step = 0.3883836327093114 integrate = 281.09175766340525
Source leftX = 1.4047986277092583 rightX = 173.45847103691514 step = 0.49789549326157345
Result leftX = 1.4047986277092583 rightX = 173.45847103691514 step = 0.49789549326157345 integrate = 1029.8582725721235
Source leftX = 79.64703507468539 rightX = 115.6425410973415 step = 0.3589233057621867
Result leftX = 79.64703507468539 rightX = 115.6425410973415 step = 0.3589233057621867 integrate = 72.01470759109705
Source leftX = 23.180440627853073 rightX = 104.07247690688406 step = 0.3925390221763473
Result leftX = 23.180440627853073 rightX = 104.07247690688406 step = 0.3925390221763473 integrate = 179.33630105735483
Source leftX = 41.715905235678484 rightX = 173.75858390475315 step = 0.37805702941869646
Result leftX = 41.715905235678484 rightX = 173.75858390475315 step = 0.37805702941869646 integrate = 291.0883859946058
Source leftX = 55.84118166147854 rightX = 167.44300558091555 step = 0.9919286553291542
Result leftX = 55.84118166147854 rightX = 167.44300558091555 step = 0.9919286553291542 integrate = 226.77749448744956
Source leftX = 47.302263844842265 rightX = 154.2396452886107 step = 0.6050962344240184
Result leftX = 47.302263844842265 rightX = 154.2396452886107 step = 0.6050962344240184 integrate = 479.4294597199851
Source leftX = 32.118887985351996 rightX = 101.17793872837221 step = 0.9790197599072636
Result leftX = 32.118887985351996 rightX = 101.17793872837221 step = 0.9790197599072636 integrate = 140.0691880356827

Source leftX = 8.099687249747923 rightX = 119.84589657138979 step = 0.7178741695842701

Result leftX = 8.099687249747923 rightX = 119.84589657138979 step = 0.7178741695842701 integrate = 550.0880932907804

Source leftX = 2.638970788568251 rightX = 163.5505160557627 step = 0.6798259568338172

Result leftX = 2.638970788568251 rightX = 163.5505160557627 step = 0.6798259568338172 integrate = 442.76449953277256

Source leftX = 74.11847927895882 rightX = 181.7613206162361 step = 0.9238320788294225

Result leftX = 74.11847927895882 rightX = 181.7613206162361 step = 0.9238320788294225 integrate = 266.83985646044306

Source leftX = 0.8039042454894396 rightX = 148.07539491381488 step = 0.6700652311756728

Result leftX = 0.8039042454894396 rightX = 148.07539491381488 step = 0.6700652311756728 integrate = 333.2685055881681

Source leftX = 24.817338171963023 rightX = 165.5400178301564 step = 0.5818540109894544

Result leftX = 24.817338171963023 rightX = 165.5400178301564 step = 0.5818540109894544 integrate = 1205.8955608640647

Source leftX = 5.583231840976288 rightX = 118.89158092125135 step = 0.8349370752962727

Result leftX = 5.583231840976288 rightX = 118.89158092125135 step = 0.8349370752962727 integrate = 193.46820816120643

Source leftX = 77.08686399357468 rightX = 187.11717972628193 step = 0.6258653079370744

Result leftX = 77.08686399357468 rightX = 187.11717972628193 step = 0.6258653079370744 integrate = 252.7914307359128

Source leftX = 96.35070178293311 rightX = 151.71788648560357 step = 0.7855463491078837

Result leftX = 96.35070178293311 rightX = 151.71788648560357 step = 0.7855463491078837 integrate = 224.98726485430825

Source leftX = 16.725475263458744 rightX = 136.1504161690691 step = 0.9062107320541702

Result leftX = 16.725475263458744 rightX = 136.1504161690691 step = 0.9062107320541702 integrate = 289.26175285293715

Source leftX = 18.909144377510835 rightX = 190.14650294835582 step = 0.9604895451303275

Result leftX = 18.909144377510835 rightX = 190.14650294835582 step = 0.9604895451303275 integrate = 1922.2520596642028

Source leftX = 85.04840076150971 rightX = 188.95700209942527 step = 0.8898278218226382

Result leftX = 85.04840076150971 rightX = 188.95700209942527 step = 0.8898278218226382 integrate = 5784.00187816533

Source leftX = 6.843712065422047 rightX = 152.04035143039314 step = 0.36611906894980173

Result leftX = 6.843712065422047 rightX = 152.04035143039314 step = 0.36611906894980173 integrate = 307.4457874864241

Source leftX = 77.27033237607426 rightX = 198.31272166798578 step = 0.6852307994721114

Result leftX = 77.27033237607426 rightX = 198.31272166798578 step = 0.6852307994721114 integrate = 269.9926544519048

Source leftX = 27.344122561860196 rightX = 145.79980630068377 step = 0.6340010015026625

Result leftX = 27.344122561860196 rightX = 145.79980630068377 step = 0.6340010015026625 integrate = 1503.05822142197

Source leftX = 34.302405700806545 rightX = 132.3778882395177 step = 0.4833213101540603

Result leftX = 34.302405700806545 rightX = 132.3778882395177 step = 0.4833213101540603 integrate = 516.0828699878887

Source leftX = 45.63651760283848 rightX = 181.26443473748589 step = 0.19908217506001413

Result leftX = 45.63651760283848 rightX = 181.26443473748589 step = 0.19908217506001413 integrate = 294.5815467668132

Source leftX = 34.60409201197179 rightX = 160.01619658999164 step = 0.3300406929611875

Result leftX = 34.60409201197179 rightX = 160.01619658999164 step = 0.3300406929611875 integrate = 993.5179511672002

Source leftX = 27.165557623873028 rightX = 185.01536344134513 step = 0.427082062865592

Result leftX = 27.165557623873028 rightX = 185.01536344134513 step = 0.427082062865592 integrate = 487.61883832867744

Source leftX = 17.73066907704497 rightX = 104.7720326979558 step = 0.5718803784211524

Result leftX = 17.73066907704497 rightX = 104.7720326979558 step = 0.5718803784211524 integrate = 343.8211897635758

Source leftX = 21.667404361902854 rightX = 154.84391820434666 step = 0.7446252405420344

Result leftX = 21.667404361902854 rightX = 154.84391820434666 step = 0.7446252405420344 integrate = 282.7308214232761

Source leftX = 96.21684772089789 rightX = 114.77182518112187 step = 0.8402652133663828

Result leftX = 96.21684772089789 rightX = 114.77182518112187 step = 0.8402652133663828 integrate = 38.61831616074211

Source leftX = 98.2741766886425 rightX = 113.15213323878464 step = 0.5506297784020534

Result leftX = 98.2741766886425 rightX = 113.15213323878464 step = 0.5506297784020534 integrate = 38.85564293895457

Source leftX = 37.43722681582765 rightX = 120.8151360504276 step = 0.165826046293632

Result leftX = 37.43722681582765 rightX = 120.8151360504276 step = 0.165826046293632 integrate = 202.97407632889272

Source leftX = 25.790538371782425 rightX = 144.05078714558476 step = 0.7124675440618499

Result leftX = 25.790538371782425 rightX = 144.05078714558476 step = 0.7124675440618499 integrate = 614.4305724565692

Source leftX = 22.084173738287426 rightX = 179.9210308740614 step = 0.13857647469787454

Result leftX = 22.084173738287426 rightX = 179.9210308740614 step = 0.13857647469787454 integrate = 468.4165045329111

Source leftX = 17.283030639381202 rightX = 123.9205482695388 step = 0.37541175437671126

Result leftX = 17.283030639381202 rightX = 123.9205482695388 step = 0.37541175437671126 integrate = 293.20742673645054

Source leftX = 10.903754529798881 rightX = 126.59542974900356 step = 0.6550100941997236

Result leftX = 10.903754529798881 rightX = 126.59542974900356 step = 0.6550100941997236 integrate = 331.8924451264479

Source leftX = 83.12276577555522 rightX = 180.20191090860277 step = 0.33888746775866796

Result leftX = 83.12276577555522 rightX = 180.20191090860277 step = 0.33888746775866796 integrate = 378.5252502986782

Source leftX = 76.33035029298405 rightX = 179.08501121006577 step = 0.5181333722332068

Result leftX = 76.33035029298405 rightX = 179.08501121006577 step = 0.5181333722332068 integrate = 415.0250889514996

Source leftX = 61.62211771960967 rightX = 138.17949394844726 step = 0.1780408588103397

Result leftX = 61.62211771960967 rightX = 138.17949394844726 step = 0.1780408588103397 integrate = 176.27656651883737

Source leftX = 80.66058629537036 rightX = 172.88332353532638 step = 0.9814499429657566

Result leftX = 80.66058629537036 rightX = 172.88332353532638 step = 0.9814499429657566 integrate = 243.91671024724133

Source leftX = 21.406038562703745 rightX = 140.52635433224717 step = 0.8141425170648355

Result leftX = 21.406038562703745 rightX = 140.52635433224717 step = 0.8141425170648355 integrate = 274.2835638800014

Source leftX = 7.407184234874431 rightX = 118.75471208578752 step = 0.6529119491314437

Result leftX = 7.407184234874431 rightX = 118.75471208578752 step = 0.6529119491314437 integrate = 230.81208979742797

Source leftX = 54.65861232727776 rightX = 149.37394281625305 step = 0.16234067211554337

Result leftX = 54.65861232727776 rightX = 149.37394281625305 step = 0.16234067211554337 integrate = 189.3447632346583

Source leftX = 77.47337084514098 rightX = 107.54169404135156 step = 0.9998541402775143

Result leftX = 77.47337084514098 rightX = 107.54169404135156 step = 0.9998541402775143 integrate = 153.34375819664785

Source leftX = 5.385474178276894 rightX = 165.67330897259075 step = 0.31027999596254496

Result leftX = 5.385474178276894 rightX = 165.67330897259075 step = 0.31027999596254496 integrate = 348.05810480602065

Source leftX = 6.7884763914422 rightX = 109.02141226774363 step = 0.5209260781788395

Result leftX = 6.7884763914422 rightX = 109.02141226774363 step = 0.5209260781788395 integrate = 178.4662334900648

Source leftX = 1.8327355086639852 rightX = 125.6131970459342 step = 0.8061013148900797

Result leftX = 1.8327355086639852 rightX = 125.6131970459342 step = 0.8061013148900797 integrate = 247.40611252618547

Source leftX = 87.04532717804969 rightX = 137.07677955990923 step = 0.8760384874909395

Result leftX = 87.04532717804969 rightX = 137.07677955990923 step = 0.8760384874909395 integrate = 113.68312017046226

Source leftX = 87.2030184613397 rightX = 158.86065378160077 step = 0.5593382773276218

Result leftX = 87.2030184613397 rightX = 158.86065378160077 step = 0.5593382773276218 integrate = 170.16616438617243

Source leftX = 96.18009169481635 rightX = 178.4479427613399 step = 0.790338961580216

Result leftX = 96.18009169481635 rightX = 178.4479427613399 step = 0.79033896158216 integrate = 244.85280435368466

Source leftX = 67.80923958490465 rightX = 118.38976226456668 step = 0.4832261826040623

Result leftX = 67.80923958490465 rightX = 118.38976226456668 step = 0.4832261826040623 integrate = 192.98765526569647

Source leftX = 70.23515099626758 rightX = 107.32971004235245 step = 0.5732328671419059

Result leftX = 70.23515099626758 rightX = 107.32971004235245 step = 0.5732328671419059 integrate = 81.09859129797232

Source leftX = 22.80676183160103 rightX = 116.66414300351892 step = 0.13193882258741518

Result leftX = 22.80676183160103 rightX = 116.66414300351892 step = 0.13193882258741518 integrate = 200.67381651390878

Source leftX = 93.24568050808764 rightX = 133.08052836846534 step = 0.718465214102758

Result leftX = 93.24568050808764 rightX = 133.08052836846534 step = 0.718465214102758 integrate = 85.53797032952191

Source leftX = 44.644531498068496 rightX = 127.93884151484755 step = 0.7112691110889451

Result leftX = 44.644531498068496 rightX = 127.93884151484755 step = 0.7112691110889451 integrate = 689.7409774532775

Source leftX = 86.79052354005503 rightX = 153.30866859800096 step = 0.7762785901059426

Result leftX = 86.79052354005503 rightX = 153.30866859800096 step = 0.7762785901059426 integrate = 167.76385793897214

Source leftX = 4.375852844864481 rightX = 141.44721607354703 step = 0.9662686087111405

Result leftX = 4.375852844864481 rightX = 141.44721607354703 step = 0.9662686087111405 integrate = 292.650592950219

Source leftX = 5.84800272211946 rightX = 109.60124323801794 step = 0.41366356309984076

Result leftX = 5.84800272211946 rightX = 109.60124323801794 step = 0.41366356309984076 integrate = 4543.472411609779

Source leftX = 60.969396878816106 rightX = 175.2384635123816 step = 0.5743622611657558

Result leftX = 60.969396878816106 rightX = 175.2384635123816 step = 0.5743622611657558 integrate = 3119.695991123191

Source leftX = 72.59727720982274 rightX = 168.16165543811638 step = 0.30371637640179616

Result leftX = 72.59727720982274 rightX = 168.16165543811638 step = 0.30371637640179616 integrate = 216.29374888453637

Source leftX = 58.76106648677341 rightX = 185.43141983308325 step = 0.697453331336412

Result leftX = 58.76106648677341 rightX = 185.43141983308325 step = 0.697453331336412 integrate = 265.51169392237796

Source leftX = 4.8058956010461396 rightX = 172.6211213875548 step = 0.7101201721204118

Result leftX = 4.8058956010461396 rightX = 172.6211213875548 step = 0.7101201721204118 integrate = 541.3407345895812

Source leftX = 82.18738071499838 rightX = 130.65022210193152 step = 0.5715346084186977

Result leftX = 82.18738071499838 rightX = 130.65022210193152 step = 0.5715346084186977 integrate = 112.86975902092519

Source leftX = 20.44414570476434 rightX = 141.28990418329894 step = 0.3577650299885342

Result leftX = 20.44414570476434 rightX = 141.28990418329894 step = 0.3577650299885342 integrate = 240.96667749354705

Source leftX = 61.94096089468244 rightX = 176.4074900001668 step = 0.9373212163939049

Result leftX = 61.94096089468244 rightX = 176.4074900001668 step = 0.9373212163939049 integrate = 255.44162000769123

Source leftX = 25.166841418033382 rightX = 106.11385141555161 step = 0.20552258139840246

Result leftX = 25.166841418033382 rightX = 106.11385141555161 step = 0.20552258139840246 integrate = 311.20576439021335

Source leftX = 51.68876576160738 rightX = 149.20065149954786 step = 0.14042099117545934

Result leftX = 51.68876576160738 rightX = 149.20065149954786 step = 0.14042099117545934 integrate = 216.9682275984657

Source leftX = 14.303166478344497 rightX = 115.60190061541539 step = 0.7621907337954406

Result leftX = 14.303166478344497 rightX = 115.60190061541539 step = 0.7621907337954406 integrate = 185.3969724113648

Source leftX = 19.493694778287573 rightX = 175.0870151541509 step = 0.45455747375775746

Result leftX = 19.493694778287573 rightX = 175.0870151541509 step = 0.45455747375775746 integrate = 990.9208731856301

Source leftX = 45.99519076065525 rightX = 148.99013363536682 step = 0.711624258516649

Result leftX = 45.99519076065525 rightX = 148.99013363536682 step = 0.711624258516649 integrate = 220.2828482526813

Source leftX = 23.080189670272933 rightX = 162.50322763482345 step = 0.10636192456543213

Result leftX = 23.080189670272933 rightX = 162.50322763482345 step = 0.10636192456543213 integrate = 372.5060564485919

Source leftX = 67.1257064533778 rightX = 113.9080478324839 step = 0.3380668241687299

Result leftX = 67.1257064533778 rightX = 113.9080478324839 step = 0.3380668241687299 integrate = 99.77299462188742

Source leftX = 63.08444816954404 rightX = 114.0947555052359 step = 0.7052492252836517

Result leftX = 63.08444816954404 rightX = 114.0947555052359 step = 0.7052492252836517 integrate = 241.6538744630325

Source leftX = 98.67598711664925 rightX = 124.81263630097644 step = 0.867699900061297

Result leftX = 98.67598711664925 rightX = 124.81263630097644 step = 0.867699900061297 integrate = 83.42194072142163

Source leftX = 33.42988519208549 rightX = 177.32098292728583 step = 0.6068938789073223

Result leftX = 33.42988519208549 rightX = 177.32098292728583 step = 0.6068938789073223 integrate = 352.33296842422527

Source leftX = 12.154102801060029 rightX = 184.45592788762605 step = 0.9674244805940474

Result leftX = 12.154102801060029 rightX = 184.45592788762605 step = 0.9674244805940474 integrate = 765.8842282533992

Source leftX = 12.968472578904056 rightX = 168.6015829212497 step = 0.7638213162714448

Result leftX = 12.968472578904056 rightX = 168.6015829212497 step = 0.7638213162714448 integrate = 346.46520354695

Source leftX = 53.73442477754631 rightX = 115.65158743232355 step = 0.8668911154629457

Result leftX = 53.73442477754631 rightX = 115.65158743232355 step = 0.8668911154629457 integrate = 205.85994598749062

Source leftX = 67.52854717903598 rightX = 130.7697605739595 step = 0.3416303644078045

Result leftX = 67.52854717903598 rightX = 130.7697605739595 step = 0.3416303644078045 integrate = 156.99399246807394

Source leftX = 97.74893144993857 rightX = 115.60622026178832 step = 0.49479369367010995

Result leftX = 97.74893144993857 rightX = 115.60622026178832 step = 0.49479369367010995 integrate = 58.001694703652255

Source leftX = 56.50977130293268 rightX = 108.59802656545659 step = 0.10436249402711792

Result leftX = 56.50977130293268 rightX = 108.59802656545659 step = 0.10436249402711792 integrate = 184.0851796220943

Source leftX = 36.17094080523334 rightX = 130.08099702487655 step = 0.7454429691166373

Result leftX = 36.17094080523334 rightX = 130.08099702487655 step = 0.7454429691166373 integrate = 180.33155195899405

Source leftX = 63.16581073785279 rightX = 152.16207780071753 step = 0.29753338631225523

Result leftX = 63.16581073785279 rightX = 152.16207780071753 step = 0.29753338631225523 integrate = 200.53360521146223

Source leftX = 35.73190854022879 rightX = 169.64922278099516 step = 0.11663510812499812

Result leftX = 35.73190854022879 rightX = 169.64922278099516 step = 0.11663510812499812 integrate = 595.0372301971324

Source leftX = 92.71540168766292 rightX = 182.80846661370313 step = 0.6823424162050974

Result leftX = 92.71540168766292 rightX = 182.80846661370313 step = 0.6823424162050974 integrate = 237.7460801470252

Source leftX = 19.31190604372004 rightX = 115.31548803671238 step = 0.7848310522100829

Result leftX = 19.31190604372004 rightX = 115.31548803671238 step = 0.7848310522100829 integrate = 183.00804529234645

Source leftX = 7.4223844946620705 rightX = 181.49163160503537 step = 0.699575813654888

Result leftX = 7.4223844946620705 rightX = 181.49163160503537 step = 0.699575813654888 integrate = 1074.346331436776

Source leftX = 53.244401726675996 rightX = 185.76200701562993 step = 0.6086623854824017

Result leftX = 53.244401726675996 rightX = 185.76200701562993 step = 0.6086623854824017 integrate = 302.5488196301942

Source leftX = 92.78539562239988 rightX = 184.24594848375395 step = 0.6667190933051169

Result leftX = 92.78539562239988 rightX = 184.24594848375395 step = 0.6667190933051169 integrate = 204.38570502430335

Source leftX = 47.17597552581232 rightX = 163.48777415108555 step = 0.8767791311987863

Result leftX = 47.17597552581232 rightX = 163.48777415108555 step = 0.8767791311987863 integrate = 274.24862887354914

Source leftX = 73.977766699839 rightX = 194.5584164427662 step = 0.6367941855161928

Result leftX = 73.977766699839 rightX = 194.5584164427662 step = 0.6367941855161928 integrate = 2143.7087039816543

Source leftX = 98.12159081804069 rightX = 102.10619251552451 step = 0.4410552808379733

Result leftX = 98.12159081804069 rightX = 102.10619251552451 step = 0.4410552808379733 integrate = 7.991308353012194

Source leftX = 26.67831838054161 rightX = 147.40760342071334 step = 0.9724371743604981

Result leftX = 26.67831838054161 rightX = 147.40760342071334 step = 0.9724371743604981 integrate = 235.75755804201665

Source leftX = 35.356039415105975 rightX = 162.06673886594157 step = 0.20116754056612507

Result leftX = 35.356039415105975 rightX = 162.06673886594157 step = 0.20116754056612507 integrate = 268.1467374587859

Source leftX = 51.4336298547272 rightX = 184.7344724853895 step = 0.8137321492478335

Result leftX = 51.4336298547272 rightX = 184.7344724853895 step = 0.8137321492478335 integrate = 345.10310020658574

Source leftX = 47.7822174035038 rightX = 147.06635701719316 step = 0.731563145408321

Result leftX = 47.7822174035038 rightX = 147.06635701719316 step = 0.731563145408321 integrate = 196.2788278482539

Source leftX = 5.692442710616719 rightX = 127.11072088707492 step = 0.7433166667809716

Result leftX = 5.692442710616719 rightX = 127.11072088707492 step = 0.7433166667809716 integrate = 234.36097815517718

Source leftX = 0.41680205044869467 rightX = 138.41615688856803 step = 0.36683205835301447

Result leftX = 0.41680205044869467 rightX = 138.41615688856803 step = 0.36683205835301447 integrate = 273.0570430542859

Source leftX = 12.652798609362259 rightX = 151.37025625209415 step = 0.8772746580699283

Result leftX = 12.652798609362259 rightX = 151.37025625209415 step = 0.8772746580699283 integrate = 298.9222497631569

Source leftX = 71.63400467732073 rightX = 149.6290625066427 step = 0.3864993711778758

Result leftX = 71.63400467732073 rightX = 149.6290625066427 step = 0.3864993711778758 integrate = 208.65492672917256

Source leftX = 91.06255084352573 rightX = 108.9694258187413 step = 0.235332351865421

Result leftX = 91.06255084352573 rightX = 108.9694258187413 step = 0.235332351865421 integrate = 43.35481500176241

Задание 3

Задание 4

Source leftX = 67.8079957983928 rightX = 148.4940377188155 step = 0.7652535527946192

Source leftX = 75.1138678698569 rightX = 144.84163883210238 step = 0.7688726397032482

Result leftX = 75.1138678698569 rightX = 144.84163883210238 step = 0.7688726397032482 Result: 291.7436395436194

Result leftX = 75.1138678698569 rightX = 144.84163883210238 step = 0.7688726397032482 Result: 291.7436395436194

Result leftX = 75.1138678698569 rightX = 144.84163883210238 step = 0.7688726397032482 Result: 291.7436395436194

Result leftX = 75.1138678698569 rightX = 144.84163883210238 step = 0.7688726397032482 Result: 291.7436395436194

Result leftX = 75.1138678698569 rightX = 144.84163883210238 step = 0.7688726397032482 Result: 291.7436395436194

Result leftX = 75.1138678698569 rightX = 144.84163883210238 step = 0.7688726397032482 Result: 291.7436395436194

Result leftX = 75.1138678698569 rightX = 144.84163883210238 step = 0.7688726397032482 Result: 291.7436395436194

Source leftX = 18.572357710463827 rightX = 101.51198980427817 step = 0.7502838624569335

Source leftX = 8.29321257730362 rightX = 159.69258471536597 step = 0.9871381519597819

Source leftX = 2.28143950876436 rightX = 118.23752946206037 step = 0.2521583304964846

Source leftX = 28.528504693833522 rightX = 142.77679261091592 step = 0.6189298637000646

Result leftX = 75.1138678698569 rightX = 144.84163883210238 step = 0.7688726397032482 Result: 291.7436395436194

Source leftX = 89.18257101774412 rightX = 159.93877097199643 step = 0.2698563489794128

Result leftX = 75.1138678698569 rightX = 144.84163883210238 step = 0.7688726397032482 Result: 291.7436395436194

Source leftX = 52.89435975864585 rightX = 177.81879125173236 step = 0.8518880503870506

Result leftX = 75.1138678698569 rightX = 144.84163883210238 step = 0.7688726397032482 Result: 291.7436395436194

Source leftX = 95.99199034440672 rightX = 135.6881177529733 step = 0.6659513353982887

Result leftX = 75.1138678698569 rightX = 144.84163883210238 step = 0.7688726397032482 Result: 291.7436395436194

Source leftX = 71.19880768567036 rightX = 155.72485756937775 step = 0.35128768439645264

Result leftX = 75.1138678698569 rightX = 144.84163883210238 step = 0.7688726397032482 Result: 291.7436395436194

Source leftX = 75.67455912125702 rightX = 191.52076395841078 step = 0.5400717405612735

Result leftX = 75.1138678698569 rightX = 144.84163883210238 step = 0.7688726397032482 Result: 291.7436395436194

Source leftX = 36.35174417073818 rightX = 168.21565533553806 step = 0.2999629862449172

Source leftX = 29.855357233065295 rightX = 187.33375468325198 step = 0.3526551790807959

Result leftX = 75.1138678698569 rightX = 144.84163883210238 step = 0.7688726397032482 Result: 291.7436395436194

Source leftX = 6.73560888204594 rightX = 125.74397437277786 step = 0.35502376253835066

Result leftX = 75.1138678698569 rightX = 144.84163883210238 step = 0.7688726397032482 Result: 291.7436395436194

Source leftX = 95.309654267714 rightX = 192.63879199557138 step = 0.8561307018290574

Source leftX = 96.99465283935048 rightX = 118.90250384328172 step = 0.7796261003858564

Source leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865

Source leftX = 19.09978345991823 rightX = 121.02401939659805 step = 0.4981322884334298

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Source leftX = 98.50408896750181 rightX = 167.46331056988825 step = 0.597645157966043

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Source leftX = 37.758335123363075 rightX = 110.58503300862868 step = 0.3076176478541971

Source leftX = 58.865016965308214 rightX = 120.11993987784817 step = 0.5304431257667813

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Source leftX = 0.5796406216769578 rightX = 132.2397405647178 step = 0.2177388547042573

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Source leftX = 23.51953495176624 rightX = 178.27485170971244 step = 0.16426147520763995

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Source leftX = 34.139654389435925 rightX = 198.98325568092056 step = 0.2651263111002704

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Source leftX = 34.929950053572526 rightX = 139.2805631251964 step = 0.6352921403635943

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Source leftX = 43.61078262263561 rightX = 122.77517842402744 step = 0.7540822140690445

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Source leftX = 67.16928718203515 rightX = 177.42507239382934 step = 0.7616741961907325

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Source leftX = 12.770980200501391 rightX = 133.7303542714332 step = 0.1267751860690481

Source leftX = 66.89733373362043 rightX = 145.09849464720983 step = 0.725109376474639

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Source leftX = 76.50140373933112 rightX = 186.3666750999977 step = 0.8168803656593495

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Source leftX = 21.54006087488408 rightX = 170.93844507882517 step = 0.7880305782613032

Source leftX = 76.93274110257022 rightX = 189.5894613314789 step = 0.3249052895287885

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Source leftX = 23.813030561840666 rightX = 114.71981576842906 step = 0.22483900695005343

Source leftX = 84.8808602310502 rightX = 132.67803648006816 step = 0.7062171211584244

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Source leftX = 26.729426128560608 rightX = 163.75456575841028 step = 0.9707255525255553

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Source leftX = 93.21238625718021 rightX = 104.54012956194423 step = 0.587787026141874

Source leftX = 8.233326770919636 rightX = 180.56712501060477 step = 0.9165918968813526

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Source leftX = 13.780816239409754 rightX = 128.49971437720146 step = 0.6546671622647918

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Source leftX = 89.59885109430272 rightX = 136.6110877503385 step = 0.7035873517488649

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Source leftX = 34.57385126126803 rightX = 159.88392931970765 step = 0.6722159703742236

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Source leftX = 76.735795266594 rightX = 191.79277272935371 step = 0.39577654496953873

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

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Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Result leftX = 76.735795266594 rightX = 191.79277272935371 step = 0.39577654496953873 Result: 1659.5463437240742

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Result leftX = 76.735795266594 rightX = 191.79277272935371 step = 0.39577654496953873 Result: 1659.5463437240742

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Result leftX = 76.735795266594 rightX = 191.79277272935371 step = 0.39577654496953873 Result: 1659.5463437240742

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Result leftX = 76.735795266594 rightX = 191.79277272935371 step = 0.39577654496953873 Result: 1659.5463437240742

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Result leftX = 76.735795266594 rightX = 191.79277272935371 step = 0.39577654496953873 Result: 1659.5463437240742

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Result leftX = 76.735795266594 rightX = 191.79277272935371 step = 0.39577654496953873 Result: 1659.5463437240742

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Result leftX = 76.735795266594 rightX = 191.79277272935371 step = 0.39577654496953873 Result: 1659.5463437240742

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Result leftX = 76.735795266594 rightX = 191.79277272935371 step = 0.39577654496953873 Result: 1659.5463437240742

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Source leftX = 18.712496371711328 rightX = 118.67469641100189 step = 0.5350873213108761

Source leftX = 18.54238423973207 rightX = 104.56728940656077 step = 0.4344539479185382

Source leftX = 51.94262822765134 rightX = 154.49065713675563 step = 0.9589993457510089

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Source leftX = 1.4457831878458838 rightX = 182.3727509082037 step = 0.8026207574435071

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Source leftX = 70.25959060115089 rightX = 166.16505346766178 step = 0.5562982407156142

Source leftX = 24.270954097638132 rightX = 107.16824370911671 step = 0.6531397965561816

Source leftX = 24.30649004501143 rightX = 123.1851857993788 step = 0.6613330606426953

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Source leftX = 22.57853073606312 rightX = 195.8411732899766 step = 0.879083860068592

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Source leftX = 62.186780936503396 rightX = 161.25907395822 step = 0.6966567800747886

Source leftX = 36.61229469579206 rightX = 180.24963669042154 step = 0.6297935248043283

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Source leftX = 37.33180846767334 rightX = 149.2749224598346 step = 0.39606948163052313

Source leftX = 41.99690562694527 rightX = 116.66540917544421 step = 0.6011595622391385

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

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Result leftX = 41.99690562694527 rightX = 116.66540917544421 step = 0.6011595622391385 Result: 290.3592974782623

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

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Result leftX = 41.99690562694527 rightX = 116.66540917544421 step = 0.6011595622391385 Result: 290.3592974782623

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Result leftX = 41.99690562694527 rightX = 116.66540917544421 step = 0.6011595622391385 Result: 290.3592974782623

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Result leftX = 41.99690562694527 rightX = 116.66540917544421 step = 0.6011595622391385 Result: 290.3592974782623

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Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Result leftX = 41.99690562694527 rightX = 116.66540917544421 step = 0.6011595622391385 Result: 290.3592974782623

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Result leftX = 41.99690562694527 rightX = 116.66540917544421 step = 0.6011595622391385 Result: 290.3592974782623

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Result leftX = 41.99690562694527 rightX = 116.66540917544421 step = 0.6011595622391385 Result: 290.3592974782623

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Result leftX = 41.99690562694527 rightX = 116.66540917544421 step = 0.6011595622391385 Result: 290.3592974782623

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Result leftX = 41.99690562694527 rightX = 116.66540917544421 step = 0.6011595622391385 Result: 290.3592974782623

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Source leftX = 73.06387570517906 rightX = 149.91905416553215 step = 0.22551911053937793

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Source leftX = 87.32650039308038 rightX = 159.3832056206848 step = 0.9536460469620829

Source leftX = 40.49551893430595 rightX = 121.2179023476252 step = 0.5678756695250008

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Source leftX = 7.78477328172319 rightX = 158.26182246048344 step = 0.83656939939435

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Source leftX = 31.405580506915655 rightX = 131.2697037017592 step = 0.46259420814445584

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Result leftX = 31.405580506915655 rightX = 131.2697037017592 step = 0.46259420814445584 Result: 1034.6658231823303

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Result leftX = 31.405580506915655 rightX = 131.2697037017592 step = 0.46259420814445584 Result: 1034.6658231823303

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

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Result leftX = 31.405580506915655 rightX = 131.2697037017592 step = 0.46259420814445584 Result: 1034.6658231823303

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Result leftX = 31.405580506915655 rightX = 131.2697037017592 step = 0.46259420814445584 Result: 1034.6658231823303

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Result leftX = 31.405580506915655 rightX = 131.2697037017592 step = 0.46259420814445584 Result: 1034.6658231823303

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

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Result leftX = 31.405580506915655 rightX = 131.2697037017592 step = 0.46259420814445584 Result: 1034.6658231823303

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Result leftX = 31.405580506915655 rightX = 131.2697037017592 step = 0.46259420814445584 Result: 1034.6658231823303

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Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Source leftX = 8.937198946087799 rightX = 164.9627917470533 step = 0.4221493287520308

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Source leftX = 32.73270454839352 rightX = 183.43150839463553 step = 0.5162823797859241

Result leftX = 73.67185790048444 rightX = 160.93443734014244 step = 0.4120445426747865 Result: 587.1837330082442

Source leftX = 39.83597668065989 rightX = 157.65215390969144 step = 0.2778468945733872

Source leftX = 34.32690658316482 rightX = 174.2271578807359 step = 0.4251882355917844

Source leftX = 99.57835845234824 rightX = 118.93102472081482 step = 0.3305058204349778

Source leftX = 73.619274703761 rightX = 110.43791635873933 step = 0.570356987259683

Source leftX = 46.45896238667763 rightX = 126.76050568826773 step = 0.9008122178274713

Source leftX = 26.599804435885332 rightX = 131.24180261802854 step = 0.6756236597058604

Source leftX = 69.71417860421147 rightX = 103.26864841422503 step = 0.21333939003818214

Source leftX = 3.856711033928839 rightX = 143.14663945771989 step = 0.411588565478043

Source leftX = 40.95344126461696 rightX = 199.9734998082782 step = 0.9978669685963484

Source leftX = 81.99700729056967 rightX = 110.35097360070495 step = 0.7984376318264644

Source leftX = 91.91168285221946 rightX = 103.34277357247078 step = 0.8828433979387735

Source leftX = 59.7297969866372 rightX = 189.39240382473812 step = 0.37625176349386225

Source leftX = 72.1448835717224 rightX = 198.18056042553985 step = 0.5883340824921922

Source leftX = 95.46409599668677 rightX = 100.60588605809461 step = 0.9401033950893201

Source leftX = 0.9239416441005011 rightX = 193.92040431689622 step = 0.3561696904727354

Source leftX = 61.39966143234826 rightX = 151.0236772698168 step = 0.30403215625464025

Source leftX = 93.73012874293386 rightX = 135.01739450871995 step = 0.8043125218584714

Source leftX = 20.196400420324224 rightX = 158.34468628189322 step = 0.206244437997964

Source leftX = 75.13360430845138 rightX = 122.18620628837735 step = 0.22126813214660906

Source leftX = 88.22213567416775 rightX = 106.2576041199319 step = 0.3342408679773125

Source leftX = 34.69561036905964 rightX = 191.75071459520598 step = 0.5665576162941497

Source leftX = 54.51939363430641 rightX = 190.8834167659551 step = 0.7483875232571366

Source leftX = 7.534970362778903 rightX = 125.37080223800939 step = 0.4682664299801096

Source leftX = 49.631774034947405 rightX = 143.10291547039947 step = 0.10744605527251219

Source leftX = 86.19953072469812 rightX = 187.41199816317902 step = 0.5336851861157161

Source leftX = 83.43059572959437 rightX = 136.5348529354901 step = 0.7245791254934852

Source leftX = 95.48313520525772 rightX = 112.22354733321752 step = 0.6140581361026354

Source leftX = 96.08240073061086 rightX = 115.93036127213125 step = 0.2073459308983751

Source leftX = 86.82881762412975 rightX = 188.59057226249666 step = 0.389454914581604

Source leftX = 91.29793902392952 rightX = 105.74924204452022 step = 0.9602039964662934

Source leftX = 33.95876055619511 rightX = 113.62592404473418 step = 0.4647812638770499

Source leftX = 46.00329583555391 rightX = 183.68378081247292 step = 0.653032691055466

Source leftX = 36.37171534014178 rightX = 113.3673404507131 step = 0.49294424311932583

Source leftX = 15.573745912991033 rightX = 128.89568232956412 step = 0.7841941141413337

Source leftX = 62.348464433796615 rightX = 152.34558418159156 step = 0.9661876047225247

Source leftX = 78.77098532239096 rightX = 179.73177806201255 step = 0.49164685671967767

Source leftX = 88.10597754828933 rightX = 179.38911552639235 step = 0.24161301083756873

Source leftX = 91.5243528916794 rightX = 160.68411038205326 step = 0.5906285453641236

Source leftX = 14.740852270915772 rightX = 181.93099262558724 step = 0.19190259140942859

Result leftX = 91.5243528916794 rightX = 160.68411038205326 step = 0.5906285453641236 Result: 314.2818602711172

Source leftX = 69.60271519571494 rightX = 146.08358413674586 step = 0.7972586170410049

Result leftX = 91.5243528916794 rightX = 160.68411038205326 step = 0.5906285453641236 Result: 314.2818602711172

Source leftX = 37.975348708029735 rightX = 191.22793473744014 step = 0.7757237192183952

Source leftX = 23.738154155059643 rightX = 144.74671225330044 step = 0.21957576817596233

Result leftX = 91.5243528916794 rightX = 160.68411038205326 step = 0.5906285453641236 Result: 314.2818602711172

Source leftX = 35.02930141182119 rightX = 102.90423825603152 step = 0.33512216414697626

Source leftX = 82.04584639540417 rightX = 101.01490400465309 step = 0.9248618073306559

Source leftX = 34.0724378256257 rightX = 113.7472747028059 step = 0.20021450669560803

Result leftX = 91.5243528916794 rightX = 160.68411038205326 step = 0.5906285453641236 Result: 314.2818602711172

Source leftX = 27.783494268681874 rightX = 199.1492994982782 step = 0.14492200848251693

Result leftX = 91.5243528916794 rightX = 160.68411038205326 step = 0.5906285453641236 Result: 314.2818602711172

Source leftX = 82.97420749285428 rightX = 140.5236587823662 step = 0.8138646221809464

Result leftX = 91.5243528916794 rightX = 160.68411038205326 step = 0.5906285453641236 Result: 314.2818602711172

Source leftX = 28.06718336360654 rightX = 140.3799166387295 step = 0.7943232241057842

Result leftX = 91.5243528916794 rightX = 160.68411038205326 step = 0.5906285453641236 Result: 314.2818602711172

Source leftX = 37.057925469223704 rightX = 198.91283199011502 step = 0.9271257110496742

Result leftX = 91.5243528916794 rightX = 160.68411038205326 step = 0.5906285453641236 Result: 314.2818602711172

Source leftX = 32.00379625505377 rightX = 165.80383812054015 step = 0.8836531786552355

Result leftX = 91.5243528916794 rightX = 160.68411038205326 step = 0.5906285453641236 Result: 314.2818602711172

Source leftX = 10.727443895696664 rightX = 188.61531488932565 step = 0.42134034875396953

Source leftX = 18.097133303621415 rightX = 193.644988192429 step = 0.6950903928967073

Result leftX = 91.5243528916794 rightX = 160.68411038205326 step = 0.5906285453641236 Result: 314.2818602711172

Source leftX = 91.06283691957444 rightX = 125.83039590017566 step = 0.7849343778737728

Source leftX = 72.56829545244892 rightX = 143.14109106683333 step = 0.6113006430446138

Source leftX = 7.525693585164161 rightX = 107.86879129155766 step = 0.5484197635763087

Source leftX = 5.231040803097409 rightX = 142.32347176665834 step = 0.5136754596880947

Result leftX = 91.5243528916794 rightX = 160.68411038205326 step = 0.5906285453641236 Result: 314.2818602711172

Source leftX = 76.91465839145472 rightX = 119.66596045062143 step = 0.3061225963286467

Result leftX = 91.5243528916794 rightX = 160.68411038205326 step = 0.5906285453641236 Result: 314.2818602711172

Source leftX = 34.562681093441384 rightX = 141.9552815975093 step = 0.190928174840171

Result leftX = 91.5243528916794 rightX = 160.68411038205326 step = 0.5906285453641236 Result: 314.2818602711172

Source leftX = 43.69667615424054 rightX = 163.36003392485566 step = 0.7414223575837104

Source leftX = 98.61114417769694 rightX = 182.8938068021226 step = 0.42406349818363764

Source leftX = 52.960692789387096 rightX = 145.9114646237858 step = 0.1911210664488086

Source leftX = 73.37887666495597 rightX = 189.14248803380286 step = 0.1387356681670211

Source leftX = 67.71183425479103 rightX = 116.96167147056522 step = 0.6781512891930079

Source leftX = 5.3241494864163075 rightX = 183.8582279942538 step = 0.5410114875949299

Source leftX = 45.81609546779673 rightX = 183.8956020553819 step = 0.2811501194417536

Source leftX = 36.9070593983115 rightX = 111.29117883126906 step = 0.5476431039560494

Source leftX = 89.62043235203853 rightX = 150.57968565312618 step = 0.37755329607165244

Source leftX = 50.81445127582557 rightX = 186.94210682752203 step = 0.886237846960679

Source leftX = 77.65288543750782 rightX = 148.97296951979794 step = 0.9113776433475198

Source leftX = 78.67330100136421 rightX = 121.30868618619125 step = 0.5554094379729448

Source leftX = 7.523542231333414 rightX = 123.14438581348779 step = 0.5282265502558776

Source leftX = 17.433195805093693 rightX = 129.41421825340154 step = 0.8523115311595235

Source leftX = 27.812953114570448 rightX = 102.4339175334911 step = 0.3175027070453521

Source leftX = 74.2626245017959 rightX = 144.43452340318282 step = 0.8062635401209808

Source leftX = 6.893685469209732 rightX = 145.87492371604253 step = 0.28889161941162944

Source leftX = 40.8926626457124 rightX = 155.6157779689384 step = 0.7635063148924242

Source leftX = 23.781536346910272 rightX = 148.6658311979084 step = 0.27057867171292677

Source leftX = 70.64776685339037 rightX = 132.93440607524872 step = 0.6696776258192721

Source leftX = 58.55791462133669 rightX = 180.2713612781602 step = 0.35214159565974856

Source leftX = 76.87313608709844 rightX = 185.6349283310745 step = 0.2641122364138073

Result leftX = 70.64776685339037 rightX = 132.93440607524872 step = 0.6696776258192721 Result: 1247.366284150323

Source leftX = 11.672484064209787 rightX = 150.33811655860205 step = 0.13364922720103342

Source leftX = 13.332729193888703 rightX = 109.73700586207035 step = 0.710083247577383

Result leftX = 70.64776685339037 rightX = 132.93440607524872 step = 0.6696776258192721 Result: 1247.366284150323

Source leftX = 30.292526611699554 rightX = 171.79746952374182 step = 0.7973797354526737

Result leftX = 70.64776685339037 rightX = 132.93440607524872 step = 0.6696776258192721 Result: 1247.366284150323

Source leftX = 10.407456492102229 rightX = 192.76504107736326 step = 0.9173759643677458

Source leftX = 74.9686640187242 rightX = 155.54899858611307 step = 0.2709884650527339

Result leftX = 70.64776685339037 rightX = 132.93440607524872 step = 0.6696776258192721 Result: 1247.366284150323

Source leftX = 94.50761269747659 rightX = 108.1605798768126 step = 0.3972843396974327

Result leftX = 70.64776685339037 rightX = 132.93440607524872 step = 0.6696776258192721 Result: 1247.366284150323

Source leftX = 7.698634259854842 rightX = 157.7405687626702 step = 0.24406683008565178

Result leftX = 70.64776685339037 rightX = 132.93440607524872 step = 0.6696776258192721 Result: 1247.366284150323

Source leftX = 95.86229029493289 rightX = 140.80921686825417 step = 0.5309111455163442

Result leftX = 70.64776685339037 rightX = 132.93440607524872 step = 0.6696776258192721 Result: 1247.366284150323

Source leftX = 49.88906386338382 rightX = 193.59407127536053 step = 0.9809958923710063

Source leftX = 43.84416688363785 rightX = 127.6389809037893 step = 0.921611692940192

Source leftX = 60.08079661919966 rightX = 175.37014720062894 step = 0.20488744515755042

Source leftX = 94.3804954977086 rightX = 107.89281022439863 step = 0.9800610388279744

Source leftX = 6.455686111736847 rightX = 143.0147900984332 step = 0.9565309564759669

Source leftX = 71.0908930827755 rightX = 155.3407031264363 step = 0.33295984516121724

Source leftX = 28.26552865580869 rightX = 172.25347109006069 step = 0.5318625661244102

Source leftX = 26.79256142416634 rightX = 189.6972064320114 step = 0.871394986292586

Source leftX = 5.3237465304352245 rightX = 169.89839893412778 step = 0.32647109979751554

Source leftX = 57.013572214772154 rightX = 189.50984779337998 step = 0.8798702648767611

Source leftX = 79.70041389691383 rightX = 191.1345250424405 step = 0.14065730103846052

Source leftX = 22.154822991210033 rightX = 153.78414505609004 step = 0.7120228420480328

Source leftX = 98.76130756687627 rightX = 138.54994994352253 step = 0.1235615462732735

Source leftX = 59.94130531209782 rightX = 184.6107934955965 step = 0.1040412321606585

Source leftX = 73.69154892954771 rightX = 127.67632697938635 step = 0.45987582115905534

Source leftX = 94.80330308292679 rightX = 188.06070364016557 step = 0.7418002329631483

Source leftX = 72.64450951819666 rightX = 128.80491005759885 step = 0.8276556057200941

Source leftX = 75.82814526501217 rightX = 115.6134599474054 step = 0.9227284470623642

Source leftX = 92.65658303283637 rightX = 119.84385540032027 step = 0.9807470776997982

Source leftX = 99.92315098957496 rightX = 193.38487528241643 step = 0.8784243623401093

Source leftX = 79.46843743957984 rightX = 109.98241144638084 step = 0.43434566381721174

Source leftX = 1.8303667275189395 rightX = 111.41921966053658 step = 0.64903603697554

Source leftX = 89.39340584306346 rightX = 118.92761504371241 step = 0.8572010466075266

Source leftX = 17.633743221711317 rightX = 170.31179298726897 step = 0.5254205243741414

Source leftX = 12.373606655541614 rightX = 121.4791273431418 step = 0.5989847973513245

Source leftX = 53.399368968666 rightX = 107.42742696388954 step = 0.8000983988161559

Source leftX = 0.3644405831963571 rightX = 192.2078208253402 step = 0.7063357226553976

Source leftX = 15.589381879406083 rightX = 149.98056875498673 step = 0.4930190946772871

Source leftX = 70.18807805006448 rightX = 110.00376353792261 step = 0.6060990348401795

Source leftX = 84.89019155262359 rightX = 167.24256511404354 step = 0.34315257426158974

Source leftX = 74.99657191413867 rightX = 107.25920377885294 step = 0.5592746013346953

Source leftX = 40.09563304485519 rightX = 119.14175560488826 step = 0.2819232449705618

Result leftX = 70.64776685339037 rightX = 132.93440607524872 step = 0.66967762258192721 Result: 1247.366284150323

Source leftX = 63.48520090040694 rightX = 173.4521901272779 step = 0.3141901351297318

Source leftX = 63.6856659443404 rightX = 123.52202863285359 step = 0.7295012720446116

Source leftX = 70.99670319230266 rightX = 147.8964516646289 step = 0.7124148564165594

Result leftX = 70.64776685339037 rightX = 132.93440607524872 step = 0.6696776258192721 Result: 1247.366284150323

Source leftX = 85.74127614112562 rightX = 189.32544072783122 step = 0.1799673618279371

Source leftX = 11.656975058948893 rightX = 161.42317105194098 step = 0.8259291454802562

Source leftX = 47.8361724933973 rightX = 187.9645296962618 step = 0.6663664367194105

Source leftX = 65.68292599716628 rightX = 111.76025966000893 step = 0.5290661528339331

Source leftX = 93.54590225499456 rightX = 160.149963062441 step = 0.5216658409015426

Result leftX = 70.64776685339037 rightX = 132.93440607524872 step = 0.6696776258192721 Result: 1247.366284150323

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Source leftX = 64.43524570510539 rightX = 189.04862503290565 step = 0.9775447517092373

Source leftX = 81.00303918859562 rightX = 182.37475773257444 step = 0.6337404910370782

Source leftX = 17.2150527149485 rightX = 180.43911888856871 step = 0.8766336388260917

Source leftX = 33.331329495962905 rightX = 139.54402316840316 step = 0.1414800881782052

Source leftX = 27.623105544528258 rightX = 126.77125156979284 step = 0.3606528131864579

Source leftX = 13.835282816566341 rightX = 167.42126857251031 step = 0.29077664262458097

Source leftX = 8.189618008163425 rightX = 127.2548434189652 step = 0.39648682377258604

Source leftX = 38.53841909812342 rightX = 125.8611451801225 step = 0.10327017563875648

Source leftX = 80.35932361075479 rightX = 181.4727909120707 step = 0.5050122333556811

Source leftX = 98.59809338243802 rightX = 140.7709221277634 step = 0.7572835707346887

Source leftX = 1.8077987705950815 rightX = 178.5710271541052 step = 0.16093393575920972

Source leftX = 95.59917494685108 rightX = 161.75296638057375 step = 0.3422254943451624

Result leftX = 95.59917494685108 rightX = 161.75296638057375 step = 0.3422254943451624 Result: 701.2378556217359

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