C++

CV

Project 8: K-curvature

**Corner Detection Algorithm:**

Step 1: initialize a variable called index type int and set value equal to zero.

Step 2: let index = P

Step 3: PtAry[index] -> curvature = compute Curvature (Q, P, R)

Step 4: if P is equal to K – 1 you break the loop

Step 5: increment Q, P and R by 1

Step 6: repeat step 2 to 5 while true

**Compute Curvature Algorithm:**

Note: this method should return type double

Step 1: I initialize variable called result which would return the curvature of the point

Step 2: first have boundaryPt\* temp = new boundaryPt() then temp = PtAry[Q];

Step 3: get the x and y values of Q . The initialize variable r1 = x and c1 = y;

Step 4: temp = new boundaryPt() then temp = PtAry[P] then : get the x and y values of P . The initialize variable r2 = x and c2 = y;

Step 5: : temp = new boundaryPt() then temp = PtAry[R] then : get the x and y values of R . The initialize variable r3 = x and c3 = y;

Step 6: create variables y1 and x1 type double. Then y1 = c1 – c2 and x1 = r1 – r2.

Step 7: create variables y2 x= 2 type double. Then y2 = abs(c2 – c3) and x2 = abs(r2 – r3).

Step 8: create variable s1 to represent slope 1 then let s1 equal to y1 divided by x1 then cast the answer as double

Step 9: create variable s2 to represent slope 2 then let s2 equal to y2 divided by x2 then cast the answer as double.

Step 10: result = absolute value of s1 minus s2. Then return result

**Compute local Maxima Algorithm:**

Step 1: have for that start with zero. That runs till the variable is greater than or equal to numPts. Example: for (int i = 0; i < numPts; i++)

Step 2: In the for loop create variable n1 to represent P(i – 2).

Then PtAry[((i + numPts) - 2 ) % numPts] -> curvature;

Step 3: In the for loop create variable n2 to represent P(i – 1).

Then PtAry[((i + numPts) - 1 ) % numPts] -> curvature;

Step 4: In the for loop create variable n3 to represent P(i + 1).

Then PtAry[ (i + 1) % numPts;] -> curvature;

Step 5: In the for loop create variable n3 to represent P(i + 2).

Then PtAry[i (i + 2) % numPts;] -> curvature;

Step 6: In the for loop create variable n3 to represent the current point

Then PtAry[i]-> curvature;

Step 7: if (p >= n1 && p >= n2 && p >= n3 && p >= n4 && p > 0)

PtAry[i] -> localMax = 1;

else

PtAry[i] -> localMax = 0;

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**Source Code:**

#include <iostream>

#include <iostream>

#include <fstream>

#include <string>

**using** **namespace** std;

**class** image {

**public**:

**int** numRows = -1;

**int** numCols= -1;

**int** minVal = -1;

**int** maxVal = -1;

**int** label = -1;

**int** \*\*imgAry;

**void** constructor(ifstream & input, **int** k){

input >> **this**->numRows >> **this**->numCols >> **this**->minVal >> **this**->maxVal;

input >> **this** -> label;

**this** -> imgAry = **new** **int**\*[**this** -> numRows];

**for** (**int** i = 0; i < **this** -> numRows; ++i){

imgAry[i] = **new** **int**[ **this** -> numCols];

}

**for** (**int** i = 0; i < **this** -> numRows; ++i){

**for** (**int** j = 0; j < **this** -> numCols; ++j){

imgAry[i][j] = 0;

}

}

}

**void** imgReformat(ofstream & output){

output << " " << **this**->numRows << " "

<< **this**->numCols << " "

<< **this**->minVal << " "

<< **this**->maxVal << endl;

output << endl;

**for**(**int** i = 0; i < numRows; i++){

**for**(**int** j = 0; j < numCols; j++){

**if** (0 != imgAry[i][j])

output << imgAry[i][j] << " ";

**else**

output << ". ";

}

output << endl;

}

}

**void** free\_Heap (){

**for** (**int** i = 0; i < **this**->numRows; ++i)

**delete**[] **this**->imgAry[i];

**delete**[] **this**->imgAry;

}

};

**class** boundaryPt {

**public**:

**int** x = -1;

**int** y = -1;

**double** curvature = 0.0;

**int** localMax = -1;

**int** corner = -1;

};

**class** kCurvature {

**public**:

**int** K = -1;

**int** numPts = -1;

**int** Q = 0;

**int** P = -1;

**int** R = -1;

**int** numRow = -1;

**int** numCol = -1;

**int** min = -1;

**int** max = -1;

**int** label = -1;

boundaryPt\*\* PtAry;

**void** constructor(**int** k){

**this**-> K = k;

**this**-> P = K;

**this**-> R = 2 \* K;

}

**void** initialization(ifstream & input, string args){

**this**-> numPts = countPts(input);

input.close();

input.open(args);

**int** index = 0;

input >> **this**-> numRow >> **this**-> numCol >> **this**-> min >> **this**-> max;

input >> **this**-> label;

**this** -> PtAry = **new** boundaryPt\*[**this** -> numPts];

**int** x = -1;

**int** y = -1;

**while**(input >> x){

input >> y;

storePT(x, y, index);

index++;

}

}

**int** countPts (ifstream & input){

**int** count = 0;

string x;

string y;

**while**( input >> x ){

input >> y;

count++;

}

**return** count;

}

**void** storePT( **int** a, **int** b, **int** index){

boundaryPt\* temp = **new** boundaryPt();

temp -> x = a;

temp -> y = b;

PtAry[index] = temp;

}

**void** printPtAry(ofstream & output){

output << **this**-> numRow << " " << **this**-> numCol << " ";

output << **this**-> min << " "<< **this**-> max;

output << endl;

output << **this** -> label << endl;

**for**(**int** i = 0; i < numPts; i++){

boundaryPt\* temp = **new** boundaryPt();

temp = PtAry[i];

output <<"x: " << temp -> x << " y: " << temp -> y << " curvature: ";

output << temp -> curvature << " " ;

**if** (temp -> localMax >= 0)

output << " localMax:"<< temp -> localMax;

output << endl;

}

output << endl << endl;

}

**void** cornerDetection(ofstream & output){

output << "Calculating Curvature debugging" << endl;

output << endl;

string letter = "";

**int** index = 0;

**while** (**true**){

index = P;

boundaryPt\* temp = **new** boundaryPt();

temp = PtAry[index];

temp -> curvature = computeCurvature(Q, P, R, output);

PtAry[index] = temp;

output << endl;

**if** (P == K - 1) **break**;

Q = (Q + 1) % numPts;

P = (P + 1) % numPts;

R = (R + 1) % numPts;

}

output << endl;

}

**double** computeCurvature(**int** Q, **int** P, **int** R, ofstream & output){

**double** result = 0.0;

boundaryPt\* temp = **new** boundaryPt();

temp = PtAry[Q];

**int** r1 = temp -> x;

**int** c1 = temp -> y;

printDebug("Q", Q , output);

temp = **new** boundaryPt();

temp = PtAry[P];

**int** r2 = temp -> x;

**int** c2 = temp -> y;

temp = **new** boundaryPt();

printDebug("P", P, output);

temp = PtAry[R];

**int** r3 = temp -> x;

**int** c3 = temp -> y;

printDebug("R", R , output);

**double** y1 = c1 - c2;

**double** y2 = c2 - c3;

**double** x1 = abs(r1 - r2);

**double** x2 = abs(r2 - r3);

**double** s1 = 0.0;

**double** s2 = 0.0;

**if** (x1 == 0 )

x1 = 0.5;

**if**(x2 == 0)

x2 = 0.5;

s1 = (**double**)(y1 / x1);

s2 = (**double**)(y2 / x2);

result = abs(s1 - s2);

output << c1 << " - " << c2 << " = "<< c1 - c2 <<endl;

output << c2 << " - " << c3 << " = " << c2 - c3 << endl;

output << r1 << " - " << r2 << " = " << abs(r1 - r2)<< endl;

output << r2 << " - " << r3 << " = " << abs(r2 - r3) << endl;

output << y1 << " / " << x1 << " = " << (**double**)(y1 / x1) << endl;

output << y2 << " / " << x2 << " = " << (**double**)(y1 / x1) << endl;

output << s1 << " - " << s2 << " = " << abs(s1 - s2) << endl;

**return** result;

}

**void** printDebug(string l, **int** i, ofstream & output){

boundaryPt\* temp = **new** boundaryPt();

temp = PtAry[i];

**int** r = temp -> x;

**int** c = temp -> y;

output << l << " index: " << i << " x: " << r << " y: " << c << endl;

}

**void** computeLocalMaxima(){

**for** (**int** i = 0; i < numPts; i++){

**int** index = ((i + numPts) - 2 ) % numPts;

**int** n1 = PtAry[index] -> curvature;

index = ((i + numPts) - 1 ) % numPts;

**int** n2 = PtAry[index] -> curvature;

index = (i + 1) % numPts;

**int** n3 = PtAry[index] -> curvature;

index = (i + 2) % numPts;

**int** n4 = PtAry[index] -> curvature;

**int** p = PtAry[i] -> curvature;

**if** (p >= n1 && p >= n2 && p >= n3 && p >= n4 && p > 0)

PtAry[i] -> localMax = 1;

**else**

PtAry[i] -> localMax = 0;

}

}

**void** markCorner(){

**for** (**int** i = 0; i < numPts; i++){

**int** index1 = ((i + numPts) - 1 ) % numPts;

**int** p1 = PtAry[index1] -> localMax;

**int** p2 = PtAry[i] -> localMax;

**int** index2 = (i + 1) % numPts;

**int** p3 = PtAry[index2] -> localMax;

**bool** otherNeig = **false**;

**bool** nextNeig = **false**;

**if** (p2 == 1 ){

**if** (p1 == 1 && p3 == 1)

nextNeig = **true**;

**for** (**int** j = ((i + numPts) - 2 ) % numPts; j < (i + 2) % numPts; j++){

**int** x = PtAry[j] -> localMax;

**if**( j == index1 || j == index2 || j == i)

**continue**;

**if** (x == 1){

otherNeig = **true**;

**break**;

}

}

**if**( !nextNeig && !otherNeig )

PtAry[i] -> corner = 9;

**else** **if**(nextNeig && !otherNeig){

PtAry[i] -> corner = 9;

}

**else**

PtAry[i] -> corner = 1;

}

**else**

PtAry[i] -> corner = 1;

}

}

**void** printBoundary(ofstream & output){

output << numRow << " " << numCol << " " << min << " " << max << endl;

output<< label;

**for** (**int** i = 0; i < numPts; i++){

boundaryPt\* temp = **new** boundaryPt();

temp = PtAry[i];

**int** r = temp -> x;

**int** c = temp -> y;

**int** corner = temp -> corner;

output << r << " " << c << " " << corner << endl;

}

}

**void** display(**int** \*\*imgAry){

**for** (**int** i = 0; i < numPts; i++){

boundaryPt\* temp = **new** boundaryPt();

temp = PtAry[i];

**int** r = temp -> x;

**int** c = temp -> y;

**int** corner = temp -> corner;

imgAry[r][c] = corner;

}

}

**void** free\_Heap (){

**delete**[] **this**->PtAry;

}

};

**int** main(**int** argc, **const** **char** \* argv[]) {

**int** k = -1;

string inputName = argv[1];

ifstream input;

input.open(inputName);

string output1 = argv[2];

ofstream outFile1;

outFile1.open(output1);

string output2 = argv[3];

ofstream outFile2;

outFile2.open(output2);

string output3 = argv[4];

ofstream outFile3;

outFile3.open(output3);

cout << "Please provide a K value: ";

cin >> k;

image\* img = **new** image();

img -> constructor(input, k);

kCurvature\* kCurv = **new** kCurvature();

kCurv -> constructor(k);

outFile3 << "K value: " << k << endl;

kCurv -> initialization(input, inputName);

outFile3 << "PtAry after initialization " << endl;

kCurv -> printPtAry (outFile3);

kCurv -> cornerDetection (outFile3);

outFile3 << "PtAry after Corner Detection " << endl;

kCurv -> printPtAry (outFile3);

kCurv -> computeLocalMaxima();

kCurv -> markCorner();

kCurv -> printBoundary(outFile1);

kCurv-> display(img -> imgAry);

img -> imgReformat(outFile2);

img -> free\_Heap();

kCurv -> free\_Heap();

input.close();

outFile1.close();

outFile2.close();

outFile3.close();

cout << "Compilation Complete"<< endl;

**return** 0;

}

**Data A Outputs:**

**outFile 1:**

30 40 0 9

16 6 9

7 6 1

8 6 1

9 6 1

10 6 1

11 6 1

12 6 1

13 6 1

14 6 1

15 6 1

16 6 1

17 6 1

18 6 1

19 6 1

20 6 1

21 6 1

22 6 1

23 6 1

24 6 1

25 6 9

25 7 1

25 8 1

25 9 1

25 10 1

25 11 1

25 12 1

25 13 1

25 14 1

25 15 1

25 16 1

25 17 1

25 18 1

25 19 1

25 20 1

25 21 1

25 22 1

25 23 1

25 24 1

25 25 1

25 26 1

25 27 1

25 28 1

25 29 1

25 30 1

25 31 1

25 32 1

25 33 1

25 34 1

25 35 9

24 35 1

23 35 1

22 35 1

21 35 1

20 35 1

19 35 1

18 35 1

17 35 1

16 35 1

15 35 1

14 35 1

13 35 1

12 35 1

11 35 1

10 35 1

9 35 1

8 35 1

7 35 1

6 35 9

6 34 1

6 33 1

6 32 1

6 31 1

6 30 1

6 29 1

6 28 1

6 27 1

6 26 1

6 25 1

6 24 1

6 23 1

6 22 1

6 21 1

6 20 1

6 19 1

6 18 1

6 17 1

6 16 1

6 15 1

6 14 1

6 13 1

6 12 1

6 11 1

6 10 1

6 9 1

6 8 1

6 7 1

**outFile 2:**

30 40 0 9

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. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

**outFile3(debug):**

K value: 4

PtAry after initialization

30 40 0 1

1

x: 6 y: 6 curvature: 0

x: 7 y: 6 curvature: 0

x: 8 y: 6 curvature: 0

x: 9 y: 6 curvature: 0

x: 10 y: 6 curvature: 0

x: 11 y: 6 curvature: 0

x: 12 y: 6 curvature: 0

x: 13 y: 6 curvature: 0

x: 14 y: 6 curvature: 0

x: 15 y: 6 curvature: 0

x: 16 y: 6 curvature: 0

x: 17 y: 6 curvature: 0

x: 18 y: 6 curvature: 0

x: 19 y: 6 curvature: 0

x: 20 y: 6 curvature: 0

x: 21 y: 6 curvature: 0

x: 22 y: 6 curvature: 0

x: 23 y: 6 curvature: 0

x: 24 y: 6 curvature: 0

x: 25 y: 6 curvature: 0

x: 25 y: 7 curvature: 0

x: 25 y: 8 curvature: 0

x: 25 y: 9 curvature: 0

x: 25 y: 10 curvature: 0

x: 25 y: 11 curvature: 0

x: 25 y: 12 curvature: 0

x: 25 y: 13 curvature: 0

x: 25 y: 14 curvature: 0

x: 25 y: 15 curvature: 0

x: 25 y: 16 curvature: 0

x: 25 y: 17 curvature: 0

x: 25 y: 18 curvature: 0

x: 25 y: 19 curvature: 0

x: 25 y: 20 curvature: 0

x: 25 y: 21 curvature: 0

x: 25 y: 22 curvature: 0

x: 25 y: 23 curvature: 0

x: 25 y: 24 curvature: 0

x: 25 y: 25 curvature: 0

x: 25 y: 26 curvature: 0

x: 25 y: 27 curvature: 0

x: 25 y: 28 curvature: 0

x: 25 y: 29 curvature: 0

x: 25 y: 30 curvature: 0

x: 25 y: 31 curvature: 0

x: 25 y: 32 curvature: 0

x: 25 y: 33 curvature: 0

x: 25 y: 34 curvature: 0

x: 25 y: 35 curvature: 0

x: 24 y: 35 curvature: 0

x: 23 y: 35 curvature: 0

x: 22 y: 35 curvature: 0

x: 21 y: 35 curvature: 0

x: 20 y: 35 curvature: 0

x: 19 y: 35 curvature: 0

x: 18 y: 35 curvature: 0

x: 17 y: 35 curvature: 0

x: 16 y: 35 curvature: 0

x: 15 y: 35 curvature: 0

x: 14 y: 35 curvature: 0

x: 13 y: 35 curvature: 0

x: 12 y: 35 curvature: 0

x: 11 y: 35 curvature: 0

x: 10 y: 35 curvature: 0

x: 9 y: 35 curvature: 0

x: 8 y: 35 curvature: 0

x: 7 y: 35 curvature: 0

x: 6 y: 35 curvature: 0

x: 6 y: 34 curvature: 0

x: 6 y: 33 curvature: 0

x: 6 y: 32 curvature: 0

x: 6 y: 31 curvature: 0

x: 6 y: 30 curvature: 0

x: 6 y: 29 curvature: 0

x: 6 y: 28 curvature: 0

x: 6 y: 27 curvature: 0

x: 6 y: 26 curvature: 0

x: 6 y: 25 curvature: 0

x: 6 y: 24 curvature: 0

x: 6 y: 23 curvature: 0

x: 6 y: 22 curvature: 0

x: 6 y: 21 curvature: 0

x: 6 y: 20 curvature: 0

x: 6 y: 19 curvature: 0

x: 6 y: 18 curvature: 0

x: 6 y: 17 curvature: 0

x: 6 y: 16 curvature: 0

x: 6 y: 15 curvature: 0

x: 6 y: 14 curvature: 0

x: 6 y: 13 curvature: 0

x: 6 y: 12 curvature: 0

x: 6 y: 11 curvature: 0

x: 6 y: 10 curvature: 0

x: 6 y: 9 curvature: 0

x: 6 y: 8 curvature: 0

x: 6 y: 7 curvature: 0

Calculating Curvature debugging

Q index: 0 x: 6 y: 6

P index: 4 x: 10 y: 6

R index: 8 x: 14 y: 6

6 - 6 = 0

6 - 6 = 0

6 - 10 = 4

10 - 14 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 1 x: 7 y: 6

P index: 5 x: 11 y: 6

R index: 9 x: 15 y: 6

6 - 6 = 0

6 - 6 = 0

7 - 11 = 4

11 - 15 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 2 x: 8 y: 6

P index: 6 x: 12 y: 6

R index: 10 x: 16 y: 6

6 - 6 = 0

6 - 6 = 0

8 - 12 = 4

12 - 16 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 3 x: 9 y: 6

P index: 7 x: 13 y: 6

R index: 11 x: 17 y: 6

6 - 6 = 0

6 - 6 = 0

9 - 13 = 4

13 - 17 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 4 x: 10 y: 6

P index: 8 x: 14 y: 6

R index: 12 x: 18 y: 6

6 - 6 = 0

6 - 6 = 0

10 - 14 = 4

14 - 18 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 5 x: 11 y: 6

P index: 9 x: 15 y: 6

R index: 13 x: 19 y: 6

6 - 6 = 0

6 - 6 = 0

11 - 15 = 4

15 - 19 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 6 x: 12 y: 6

P index: 10 x: 16 y: 6

R index: 14 x: 20 y: 6

6 - 6 = 0

6 - 6 = 0

12 - 16 = 4

16 - 20 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 7 x: 13 y: 6

P index: 11 x: 17 y: 6

R index: 15 x: 21 y: 6

6 - 6 = 0

6 - 6 = 0

13 - 17 = 4

17 - 21 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 8 x: 14 y: 6

P index: 12 x: 18 y: 6

R index: 16 x: 22 y: 6

6 - 6 = 0

6 - 6 = 0

14 - 18 = 4

18 - 22 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 9 x: 15 y: 6

P index: 13 x: 19 y: 6

R index: 17 x: 23 y: 6

6 - 6 = 0

6 - 6 = 0

15 - 19 = 4

19 - 23 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 10 x: 16 y: 6

P index: 14 x: 20 y: 6

R index: 18 x: 24 y: 6

6 - 6 = 0

6 - 6 = 0

16 - 20 = 4

20 - 24 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 11 x: 17 y: 6

P index: 15 x: 21 y: 6

R index: 19 x: 25 y: 6

6 - 6 = 0

6 - 6 = 0

17 - 21 = 4

21 - 25 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 12 x: 18 y: 6

P index: 16 x: 22 y: 6

R index: 20 x: 25 y: 7

6 - 6 = 0

6 - 7 = -1

18 - 22 = 4

22 - 25 = 3

0 / 4 = 0

-1 / 3 = 0

0 - -0.333333 = 0.333333

Q index: 13 x: 19 y: 6

P index: 17 x: 23 y: 6

R index: 21 x: 25 y: 8

6 - 6 = 0

6 - 8 = -2

19 - 23 = 4

23 - 25 = 2

0 / 4 = 0

-2 / 2 = 0

0 - -1 = 1

Q index: 14 x: 20 y: 6

P index: 18 x: 24 y: 6

R index: 22 x: 25 y: 9

6 - 6 = 0

6 - 9 = -3

20 - 24 = 4

24 - 25 = 1

0 / 4 = 0

-3 / 1 = 0

0 - -3 = 3

Q index: 15 x: 21 y: 6

P index: 19 x: 25 y: 6

R index: 23 x: 25 y: 10

6 - 6 = 0

6 - 10 = -4

21 - 25 = 4

25 - 25 = 0

0 / 4 = 0

-4 / 0.5 = 0

0 - -8 = 8

Q index: 16 x: 22 y: 6

P index: 20 x: 25 y: 7

R index: 24 x: 25 y: 11

6 - 7 = -1

7 - 11 = -4

22 - 25 = 3

25 - 25 = 0

-1 / 3 = -0.333333

-4 / 0.5 = -0.333333

-0.333333 - -8 = 7.66667

Q index: 17 x: 23 y: 6

P index: 21 x: 25 y: 8

R index: 25 x: 25 y: 12

6 - 8 = -2

8 - 12 = -4

23 - 25 = 2

25 - 25 = 0

-2 / 2 = -1

-4 / 0.5 = -1

-1 - -8 = 7

Q index: 18 x: 24 y: 6

P index: 22 x: 25 y: 9

R index: 26 x: 25 y: 13

6 - 9 = -3

9 - 13 = -4

24 - 25 = 1

25 - 25 = 0

-3 / 1 = -3

-4 / 0.5 = -3

-3 - -8 = 5

Q index: 19 x: 25 y: 6

P index: 23 x: 25 y: 10

R index: 27 x: 25 y: 14

6 - 10 = -4

10 - 14 = -4

25 - 25 = 0

25 - 25 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 20 x: 25 y: 7

P index: 24 x: 25 y: 11

R index: 28 x: 25 y: 15

7 - 11 = -4

11 - 15 = -4

25 - 25 = 0

25 - 25 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 21 x: 25 y: 8

P index: 25 x: 25 y: 12

R index: 29 x: 25 y: 16

8 - 12 = -4

12 - 16 = -4

25 - 25 = 0

25 - 25 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 22 x: 25 y: 9

P index: 26 x: 25 y: 13

R index: 30 x: 25 y: 17

9 - 13 = -4

13 - 17 = -4

25 - 25 = 0

25 - 25 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 23 x: 25 y: 10

P index: 27 x: 25 y: 14

R index: 31 x: 25 y: 18

10 - 14 = -4

14 - 18 = -4

25 - 25 = 0

25 - 25 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 24 x: 25 y: 11

P index: 28 x: 25 y: 15

R index: 32 x: 25 y: 19

11 - 15 = -4

15 - 19 = -4

25 - 25 = 0

25 - 25 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 25 x: 25 y: 12

P index: 29 x: 25 y: 16

R index: 33 x: 25 y: 20

12 - 16 = -4

16 - 20 = -4

25 - 25 = 0

25 - 25 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 26 x: 25 y: 13

P index: 30 x: 25 y: 17

R index: 34 x: 25 y: 21

13 - 17 = -4

17 - 21 = -4

25 - 25 = 0

25 - 25 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 27 x: 25 y: 14

P index: 31 x: 25 y: 18

R index: 35 x: 25 y: 22

14 - 18 = -4

18 - 22 = -4

25 - 25 = 0

25 - 25 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 28 x: 25 y: 15

P index: 32 x: 25 y: 19

R index: 36 x: 25 y: 23

15 - 19 = -4

19 - 23 = -4

25 - 25 = 0

25 - 25 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 29 x: 25 y: 16

P index: 33 x: 25 y: 20

R index: 37 x: 25 y: 24

16 - 20 = -4

20 - 24 = -4

25 - 25 = 0

25 - 25 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 30 x: 25 y: 17

P index: 34 x: 25 y: 21

R index: 38 x: 25 y: 25

17 - 21 = -4

21 - 25 = -4

25 - 25 = 0

25 - 25 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 31 x: 25 y: 18

P index: 35 x: 25 y: 22

R index: 39 x: 25 y: 26

18 - 22 = -4

22 - 26 = -4

25 - 25 = 0

25 - 25 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 32 x: 25 y: 19

P index: 36 x: 25 y: 23

R index: 40 x: 25 y: 27

19 - 23 = -4

23 - 27 = -4

25 - 25 = 0

25 - 25 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 33 x: 25 y: 20

P index: 37 x: 25 y: 24

R index: 41 x: 25 y: 28

20 - 24 = -4

24 - 28 = -4

25 - 25 = 0

25 - 25 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 34 x: 25 y: 21

P index: 38 x: 25 y: 25

R index: 42 x: 25 y: 29

21 - 25 = -4

25 - 29 = -4

25 - 25 = 0

25 - 25 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 35 x: 25 y: 22

P index: 39 x: 25 y: 26

R index: 43 x: 25 y: 30

22 - 26 = -4

26 - 30 = -4

25 - 25 = 0

25 - 25 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 36 x: 25 y: 23

P index: 40 x: 25 y: 27

R index: 44 x: 25 y: 31

23 - 27 = -4

27 - 31 = -4

25 - 25 = 0

25 - 25 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 37 x: 25 y: 24

P index: 41 x: 25 y: 28

R index: 45 x: 25 y: 32

24 - 28 = -4

28 - 32 = -4

25 - 25 = 0

25 - 25 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 38 x: 25 y: 25

P index: 42 x: 25 y: 29

R index: 46 x: 25 y: 33

25 - 29 = -4

29 - 33 = -4

25 - 25 = 0

25 - 25 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 39 x: 25 y: 26

P index: 43 x: 25 y: 30

R index: 47 x: 25 y: 34

26 - 30 = -4

30 - 34 = -4

25 - 25 = 0

25 - 25 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 40 x: 25 y: 27

P index: 44 x: 25 y: 31

R index: 48 x: 25 y: 35

27 - 31 = -4

31 - 35 = -4

25 - 25 = 0

25 - 25 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 41 x: 25 y: 28

P index: 45 x: 25 y: 32

R index: 49 x: 24 y: 35

28 - 32 = -4

32 - 35 = -3

25 - 25 = 0

25 - 24 = 1

-4 / 0.5 = -8

-3 / 1 = -8

-8 - -3 = 5

Q index: 42 x: 25 y: 29

P index: 46 x: 25 y: 33

R index: 50 x: 23 y: 35

29 - 33 = -4

33 - 35 = -2

25 - 25 = 0

25 - 23 = 2

-4 / 0.5 = -8

-2 / 2 = -8

-8 - -1 = 7

Q index: 43 x: 25 y: 30

P index: 47 x: 25 y: 34

R index: 51 x: 22 y: 35

30 - 34 = -4

34 - 35 = -1

25 - 25 = 0

25 - 22 = 3

-4 / 0.5 = -8

-1 / 3 = -8

-8 - -0.333333 = 7.66667

Q index: 44 x: 25 y: 31

P index: 48 x: 25 y: 35

R index: 52 x: 21 y: 35

31 - 35 = -4

35 - 35 = 0

25 - 25 = 0

25 - 21 = 4

-4 / 0.5 = -8

0 / 4 = -8

-8 - 0 = 8

Q index: 45 x: 25 y: 32

P index: 49 x: 24 y: 35

R index: 53 x: 20 y: 35

32 - 35 = -3

35 - 35 = 0

25 - 24 = 1

24 - 20 = 4

-3 / 1 = -3

0 / 4 = -3

-3 - 0 = 3

Q index: 46 x: 25 y: 33

P index: 50 x: 23 y: 35

R index: 54 x: 19 y: 35

33 - 35 = -2

35 - 35 = 0

25 - 23 = 2

23 - 19 = 4

-2 / 2 = -1

0 / 4 = -1

-1 - 0 = 1

Q index: 47 x: 25 y: 34

P index: 51 x: 22 y: 35

R index: 55 x: 18 y: 35

34 - 35 = -1

35 - 35 = 0

25 - 22 = 3

22 - 18 = 4

-1 / 3 = -0.333333

0 / 4 = -0.333333

-0.333333 - 0 = 0.333333

Q index: 48 x: 25 y: 35

P index: 52 x: 21 y: 35

R index: 56 x: 17 y: 35

35 - 35 = 0

35 - 35 = 0

25 - 21 = 4

21 - 17 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 49 x: 24 y: 35

P index: 53 x: 20 y: 35

R index: 57 x: 16 y: 35

35 - 35 = 0

35 - 35 = 0

24 - 20 = 4

20 - 16 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 50 x: 23 y: 35

P index: 54 x: 19 y: 35

R index: 58 x: 15 y: 35

35 - 35 = 0

35 - 35 = 0

23 - 19 = 4

19 - 15 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 51 x: 22 y: 35

P index: 55 x: 18 y: 35

R index: 59 x: 14 y: 35

35 - 35 = 0

35 - 35 = 0

22 - 18 = 4

18 - 14 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 52 x: 21 y: 35

P index: 56 x: 17 y: 35

R index: 60 x: 13 y: 35

35 - 35 = 0

35 - 35 = 0

21 - 17 = 4

17 - 13 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 53 x: 20 y: 35

P index: 57 x: 16 y: 35

R index: 61 x: 12 y: 35

35 - 35 = 0

35 - 35 = 0

20 - 16 = 4

16 - 12 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 54 x: 19 y: 35

P index: 58 x: 15 y: 35

R index: 62 x: 11 y: 35

35 - 35 = 0

35 - 35 = 0

19 - 15 = 4

15 - 11 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 55 x: 18 y: 35

P index: 59 x: 14 y: 35

R index: 63 x: 10 y: 35

35 - 35 = 0

35 - 35 = 0

18 - 14 = 4

14 - 10 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 56 x: 17 y: 35

P index: 60 x: 13 y: 35

R index: 64 x: 9 y: 35

35 - 35 = 0

35 - 35 = 0

17 - 13 = 4

13 - 9 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 57 x: 16 y: 35

P index: 61 x: 12 y: 35

R index: 65 x: 8 y: 35

35 - 35 = 0

35 - 35 = 0

16 - 12 = 4

12 - 8 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 58 x: 15 y: 35

P index: 62 x: 11 y: 35

R index: 66 x: 7 y: 35

35 - 35 = 0

35 - 35 = 0

15 - 11 = 4

11 - 7 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 59 x: 14 y: 35

P index: 63 x: 10 y: 35

R index: 67 x: 6 y: 35

35 - 35 = 0

35 - 35 = 0

14 - 10 = 4

10 - 6 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 60 x: 13 y: 35

P index: 64 x: 9 y: 35

R index: 68 x: 6 y: 34

35 - 35 = 0

35 - 34 = 1

13 - 9 = 4

9 - 6 = 3

0 / 4 = 0

1 / 3 = 0

0 - 0.333333 = 0.333333

Q index: 61 x: 12 y: 35

P index: 65 x: 8 y: 35

R index: 69 x: 6 y: 33

35 - 35 = 0

35 - 33 = 2

12 - 8 = 4

8 - 6 = 2

0 / 4 = 0

2 / 2 = 0

0 - 1 = 1

Q index: 62 x: 11 y: 35

P index: 66 x: 7 y: 35

R index: 70 x: 6 y: 32

35 - 35 = 0

35 - 32 = 3

11 - 7 = 4

7 - 6 = 1

0 / 4 = 0

3 / 1 = 0

0 - 3 = 3

Q index: 63 x: 10 y: 35

P index: 67 x: 6 y: 35

R index: 71 x: 6 y: 31

35 - 35 = 0

35 - 31 = 4

10 - 6 = 4

6 - 6 = 0

0 / 4 = 0

4 / 0.5 = 0

0 - 8 = 8

Q index: 64 x: 9 y: 35

P index: 68 x: 6 y: 34

R index: 72 x: 6 y: 30

35 - 34 = 1

34 - 30 = 4

9 - 6 = 3

6 - 6 = 0

1 / 3 = 0.333333

4 / 0.5 = 0.333333

0.333333 - 8 = 7.66667

Q index: 65 x: 8 y: 35

P index: 69 x: 6 y: 33

R index: 73 x: 6 y: 29

35 - 33 = 2

33 - 29 = 4

8 - 6 = 2

6 - 6 = 0

2 / 2 = 1

4 / 0.5 = 1

1 - 8 = 7

Q index: 66 x: 7 y: 35

P index: 70 x: 6 y: 32

R index: 74 x: 6 y: 28

35 - 32 = 3

32 - 28 = 4

7 - 6 = 1

6 - 6 = 0

3 / 1 = 3

4 / 0.5 = 3

3 - 8 = 5

Q index: 67 x: 6 y: 35

P index: 71 x: 6 y: 31

R index: 75 x: 6 y: 27

35 - 31 = 4

31 - 27 = 4

6 - 6 = 0

6 - 6 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 68 x: 6 y: 34

P index: 72 x: 6 y: 30

R index: 76 x: 6 y: 26

34 - 30 = 4

30 - 26 = 4

6 - 6 = 0

6 - 6 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 69 x: 6 y: 33

P index: 73 x: 6 y: 29

R index: 77 x: 6 y: 25

33 - 29 = 4

29 - 25 = 4

6 - 6 = 0

6 - 6 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 70 x: 6 y: 32

P index: 74 x: 6 y: 28

R index: 78 x: 6 y: 24

32 - 28 = 4

28 - 24 = 4

6 - 6 = 0

6 - 6 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 71 x: 6 y: 31

P index: 75 x: 6 y: 27

R index: 79 x: 6 y: 23

31 - 27 = 4

27 - 23 = 4

6 - 6 = 0

6 - 6 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 72 x: 6 y: 30

P index: 76 x: 6 y: 26

R index: 80 x: 6 y: 22

30 - 26 = 4

26 - 22 = 4

6 - 6 = 0

6 - 6 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 73 x: 6 y: 29

P index: 77 x: 6 y: 25

R index: 81 x: 6 y: 21

29 - 25 = 4

25 - 21 = 4

6 - 6 = 0

6 - 6 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 74 x: 6 y: 28

P index: 78 x: 6 y: 24

R index: 82 x: 6 y: 20

28 - 24 = 4

24 - 20 = 4

6 - 6 = 0

6 - 6 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 75 x: 6 y: 27

P index: 79 x: 6 y: 23

R index: 83 x: 6 y: 19

27 - 23 = 4

23 - 19 = 4

6 - 6 = 0

6 - 6 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 76 x: 6 y: 26

P index: 80 x: 6 y: 22

R index: 84 x: 6 y: 18

26 - 22 = 4

22 - 18 = 4

6 - 6 = 0

6 - 6 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 77 x: 6 y: 25

P index: 81 x: 6 y: 21

R index: 85 x: 6 y: 17

25 - 21 = 4

21 - 17 = 4

6 - 6 = 0

6 - 6 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 78 x: 6 y: 24

P index: 82 x: 6 y: 20

R index: 86 x: 6 y: 16

24 - 20 = 4

20 - 16 = 4

6 - 6 = 0

6 - 6 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 79 x: 6 y: 23

P index: 83 x: 6 y: 19

R index: 87 x: 6 y: 15

23 - 19 = 4

19 - 15 = 4

6 - 6 = 0

6 - 6 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 80 x: 6 y: 22

P index: 84 x: 6 y: 18

R index: 88 x: 6 y: 14

22 - 18 = 4

18 - 14 = 4

6 - 6 = 0

6 - 6 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 81 x: 6 y: 21

P index: 85 x: 6 y: 17

R index: 89 x: 6 y: 13

21 - 17 = 4

17 - 13 = 4

6 - 6 = 0

6 - 6 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 82 x: 6 y: 20

P index: 86 x: 6 y: 16

R index: 90 x: 6 y: 12

20 - 16 = 4

16 - 12 = 4

6 - 6 = 0

6 - 6 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 83 x: 6 y: 19

P index: 87 x: 6 y: 15

R index: 91 x: 6 y: 11

19 - 15 = 4

15 - 11 = 4

6 - 6 = 0

6 - 6 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 84 x: 6 y: 18

P index: 88 x: 6 y: 14

R index: 92 x: 6 y: 10

18 - 14 = 4

14 - 10 = 4

6 - 6 = 0

6 - 6 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 85 x: 6 y: 17

P index: 89 x: 6 y: 13

R index: 93 x: 6 y: 9

17 - 13 = 4

13 - 9 = 4

6 - 6 = 0

6 - 6 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 86 x: 6 y: 16

P index: 90 x: 6 y: 12

R index: 94 x: 6 y: 8

16 - 12 = 4

12 - 8 = 4

6 - 6 = 0

6 - 6 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 87 x: 6 y: 15

P index: 91 x: 6 y: 11

R index: 95 x: 6 y: 7

15 - 11 = 4

11 - 7 = 4

6 - 6 = 0

6 - 6 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 88 x: 6 y: 14

P index: 92 x: 6 y: 10

R index: 0 x: 6 y: 6

14 - 10 = 4

10 - 6 = 4

6 - 6 = 0

6 - 6 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 89 x: 6 y: 13

P index: 93 x: 6 y: 9

R index: 1 x: 7 y: 6

13 - 9 = 4

9 - 6 = 3

6 - 6 = 0

6 - 7 = 1

4 / 0.5 = 8

3 / 1 = 8

8 - 3 = 5

Q index: 90 x: 6 y: 12

P index: 94 x: 6 y: 8

R index: 2 x: 8 y: 6

12 - 8 = 4

8 - 6 = 2

6 - 6 = 0

6 - 8 = 2

4 / 0.5 = 8

2 / 2 = 8

8 - 1 = 7

Q index: 91 x: 6 y: 11

P index: 95 x: 6 y: 7

R index: 3 x: 9 y: 6

11 - 7 = 4

7 - 6 = 1

6 - 6 = 0

6 - 9 = 3

4 / 0.5 = 8

1 / 3 = 8

8 - 0.333333 = 7.66667

Q index: 92 x: 6 y: 10

P index: 0 x: 6 y: 6

R index: 4 x: 10 y: 6

10 - 6 = 4

6 - 6 = 0

6 - 6 = 0

6 - 10 = 4

4 / 0.5 = 8

0 / 4 = 8

8 - 0 = 8

Q index: 93 x: 6 y: 9

P index: 1 x: 7 y: 6

R index: 5 x: 11 y: 6

9 - 6 = 3

6 - 6 = 0

6 - 7 = 1

7 - 11 = 4

3 / 1 = 3

0 / 4 = 3

3 - 0 = 3

Q index: 94 x: 6 y: 8

P index: 2 x: 8 y: 6

R index: 6 x: 12 y: 6

8 - 6 = 2

6 - 6 = 0

6 - 8 = 2

8 - 12 = 4

2 / 2 = 1

0 / 4 = 1

1 - 0 = 1

Q index: 95 x: 6 y: 7

P index: 3 x: 9 y: 6

R index: 7 x: 13 y: 6

7 - 6 = 1

6 - 6 = 0

6 - 9 = 3

9 - 13 = 4

1 / 3 = 0.333333

0 / 4 = 0.333333

0.333333 - 0 = 0.333333

PtAry after Corner Detection:

30 40 0 1

1

x: 6 y: 6 curvature: 8

x: 7 y: 6 curvature: 3

x: 8 y: 6 curvature: 1

x: 9 y: 6 curvature: 0.333333

x: 10 y: 6 curvature: 0

x: 11 y: 6 curvature: 0

x: 12 y: 6 curvature: 0

x: 13 y: 6 curvature: 0

x: 14 y: 6 curvature: 0

x: 15 y: 6 curvature: 0

x: 16 y: 6 curvature: 0

x: 17 y: 6 curvature: 0

x: 18 y: 6 curvature: 0

x: 19 y: 6 curvature: 0

x: 20 y: 6 curvature: 0

x: 21 y: 6 curvature: 0

x: 22 y: 6 curvature: 0.333333

x: 23 y: 6 curvature: 1

x: 24 y: 6 curvature: 3

x: 25 y: 6 curvature: 8

x: 25 y: 7 curvature: 7.66667

x: 25 y: 8 curvature: 7

x: 25 y: 9 curvature: 5

x: 25 y: 10 curvature: 0

x: 25 y: 11 curvature: 0

x: 25 y: 12 curvature: 0

x: 25 y: 13 curvature: 0

x: 25 y: 14 curvature: 0

x: 25 y: 15 curvature: 0

x: 25 y: 16 curvature: 0

x: 25 y: 17 curvature: 0

x: 25 y: 18 curvature: 0

x: 25 y: 19 curvature: 0

x: 25 y: 20 curvature: 0

x: 25 y: 21 curvature: 0

x: 25 y: 22 curvature: 0

x: 25 y: 23 curvature: 0

x: 25 y: 24 curvature: 0

x: 25 y: 25 curvature: 0

x: 25 y: 26 curvature: 0

x: 25 y: 27 curvature: 0

x: 25 y: 28 curvature: 0

x: 25 y: 29 curvature: 0

x: 25 y: 30 curvature: 0

x: 25 y: 31 curvature: 0

x: 25 y: 32 curvature: 5

x: 25 y: 33 curvature: 7

x: 25 y: 34 curvature: 7.66667

x: 25 y: 35 curvature: 8

x: 24 y: 35 curvature: 3

x: 23 y: 35 curvature: 1

x: 22 y: 35 curvature: 0.333333

x: 21 y: 35 curvature: 0

x: 20 y: 35 curvature: 0

x: 19 y: 35 curvature: 0

x: 18 y: 35 curvature: 0

x: 17 y: 35 curvature: 0

x: 16 y: 35 curvature: 0

x: 15 y: 35 curvature: 0

x: 14 y: 35 curvature: 0

x: 13 y: 35 curvature: 0

x: 12 y: 35 curvature: 0

x: 11 y: 35 curvature: 0

x: 10 y: 35 curvature: 0

x: 9 y: 35 curvature: 0.333333

x: 8 y: 35 curvature: 1

x: 7 y: 35 curvature: 3

x: 6 y: 35 curvature: 8

x: 6 y: 34 curvature: 7.66667

x: 6 y: 33 curvature: 7

x: 6 y: 32 curvature: 5

x: 6 y: 31 curvature: 0

x: 6 y: 30 curvature: 0

x: 6 y: 29 curvature: 0

x: 6 y: 28 curvature: 0

x: 6 y: 27 curvature: 0

x: 6 y: 26 curvature: 0

x: 6 y: 25 curvature: 0

x: 6 y: 24 curvature: 0

x: 6 y: 23 curvature: 0

x: 6 y: 22 curvature: 0

x: 6 y: 21 curvature: 0

x: 6 y: 20 curvature: 0

x: 6 y: 19 curvature: 0

x: 6 y: 18 curvature: 0

x: 6 y: 17 curvature: 0

x: 6 y: 16 curvature: 0

x: 6 y: 15 curvature: 0

x: 6 y: 14 curvature: 0

x: 6 y: 13 curvature: 0

x: 6 y: 12 curvature: 0

x: 6 y: 11 curvature: 0

x: 6 y: 10 curvature: 0

x: 6 y: 9 curvature: 5

x: 6 y: 8 curvature: 7

x: 6 y: 7 curvature: 7.66667

**Data B Outputs:**

**outFile 1:**

31 41 0 1

11 20 1

2 19 1

3 18 9

4 17 1

5 16 1

6 15 1

7 14 1

8 13 1

9 12 1

10 11 1

11 10 1

12 9 1

13 8 1

14 7 1

15 6 9

16 7 1

17 8 1

18 9 1

19 10 1

20 11 1

21 12 1

22 13 1

23 14 1

24 15 1

25 16 1

26 17 1

27 18 9

28 19 1

29 20 1

28 21 1

27 22 9

26 23 1

25 24 1

24 25 1

23 26 1

22 27 1

21 28 1

20 29 1

19 30 1

18 31 1

17 32 1

16 33 1

15 34 9

14 33 1

13 32 1

12 31 1

11 30 1

10 29 1

9 28 1

8 27 1

7 26 1

6 25 1

5 24 1

4 23 1

3 22 9

2 21 1

**outFile 2:**

31 41 0 1

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . . . . . . 1 . . . . . . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . . . . . 1 . 1 . . . . . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . . . . 9 . . . 9 . . . . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . . . 1 . . . . . 1 . . . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . . 1 . . . . . . . 1 . . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . 1 . . . . . . . . . 1 . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . 1 . . . . . . . . . . . 1 . . . . . . . . . . . . . .

. . . . . . . . . . . . . 1 . . . . . . . . . . . . . 1 . . . . . . . . . . . . .

. . . . . . . . . . . . 1 . . . . . . . . . . . . . . . 1 . . . . . . . . . . . .

. . . . . . . . . . . 1 . . . . . . . . . . . . . . . . . 1 . . . . . . . . . . .

. . . . . . . . . . 1 . . . . . . . . . . . . . . . . . . . 1 . . . . . . . . . .

. . . . . . . . . 1 . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . . . .

. . . . . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . . .

. . . . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . .

. . . . . . 9 . . . . . . . . . . . . . . . . . . . . . . . . . . . 9 . . . . . .

. . . . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . .

. . . . . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . . .

. . . . . . . . . 1 . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . . . .

. . . . . . . . . . 1 . . . . . . . . . . . . . . . . . . . 1 . . . . . . . . . .

. . . . . . . . . . . 1 . . . . . . . . . . . . . . . . . 1 . . . . . . . . . . .

. . . . . . . . . . . . 1 . . . . . . . . . . . . . . . 1 . . . . . . . . . . . .

. . . . . . . . . . . . . 1 . . . . . . . . . . . . . 1 . . . . . . . . . . . . .

. . . . . . . . . . . . . . 1 . . . . . . . . . . . 1 . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . 1 . . . . . . . . . 1 . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . . 1 . . . . . . . 1 . . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . . . 1 . . . . . 1 . . . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . . . . 9 . . . 9 . . . . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . . . . . 1 . 1 . . . . . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . . . . . . 1 . . . . . . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

**outFile3(debug):**

K value: 4

PtAry after initialization

40 40 0 1

1

x: 5 y: 15 curvature: 0

x: 6 y: 14 curvature: 0

x: 7 y: 13 curvature: 0

x: 8 y: 12 curvature: 0

x: 9 y: 11 curvature: 0

x: 10 y: 10 curvature: 0

x: 11 y: 9 curvature: 0

x: 12 y: 8 curvature: 0

x: 13 y: 7 curvature: 0

x: 14 y: 6 curvature: 0

x: 15 y: 5 curvature: 0

x: 16 y: 5 curvature: 0

x: 17 y: 5 curvature: 0

x: 18 y: 5 curvature: 0

x: 19 y: 5 curvature: 0

x: 20 y: 5 curvature: 0

x: 21 y: 5 curvature: 0

x: 22 y: 5 curvature: 0

x: 23 y: 5 curvature: 0

x: 24 y: 5 curvature: 0

x: 25 y: 6 curvature: 0

x: 26 y: 7 curvature: 0

x: 27 y: 8 curvature: 0

x: 28 y: 9 curvature: 0

x: 29 y: 10 curvature: 0

x: 30 y: 11 curvature: 0

x: 31 y: 12 curvature: 0

x: 32 y: 13 curvature: 0

x: 33 y: 14 curvature: 0

x: 34 y: 15 curvature: 0

x: 34 y: 16 curvature: 0

x: 34 y: 17 curvature: 0

x: 34 y: 18 curvature: 0

x: 34 y: 19 curvature: 0

x: 34 y: 20 curvature: 0

x: 34 y: 21 curvature: 0

x: 34 y: 22 curvature: 0

x: 34 y: 23 curvature: 0

x: 34 y: 24 curvature: 0

x: 33 y: 25 curvature: 0

x: 32 y: 26 curvature: 0

x: 31 y: 27 curvature: 0

x: 30 y: 28 curvature: 0

x: 29 y: 29 curvature: 0

x: 28 y: 30 curvature: 0

x: 27 y: 31 curvature: 0

x: 26 y: 32 curvature: 0

x: 25 y: 33 curvature: 0

x: 24 y: 34 curvature: 0

x: 23 y: 34 curvature: 0

x: 22 y: 34 curvature: 0

x: 21 y: 34 curvature: 0

x: 20 y: 34 curvature: 0

x: 19 y: 34 curvature: 0

x: 18 y: 34 curvature: 0

x: 17 y: 34 curvature: 0

x: 16 y: 34 curvature: 0

x: 15 y: 34 curvature: 0

x: 14 y: 33 curvature: 0

x: 13 y: 32 curvature: 0

x: 12 y: 31 curvature: 0

x: 11 y: 30 curvature: 0

x: 10 y: 29 curvature: 0

x: 9 y: 28 curvature: 0

x: 8 y: 27 curvature: 0

x: 7 y: 26 curvature: 0

x: 6 y: 25 curvature: 0

x: 5 y: 24 curvature: 0

x: 5 y: 23 curvature: 0

x: 5 y: 22 curvature: 0

x: 5 y: 21 curvature: 0

x: 5 y: 20 curvature: 0

x: 5 y: 19 curvature: 0

x: 5 y: 18 curvature: 0

x: 5 y: 17 curvature: 0

x: 5 y: 16 curvature: 0

Calculating Curvature debugging

Q index: 0 x: 5 y: 15

P index: 4 x: 9 y: 11

R index: 8 x: 13 y: 7

15 - 11 = 4

11 - 7 = 4

5 - 9 = 4

9 - 13 = 4

4 / 4 = 1

4 / 4 = 1

1 - 1 = 0

Q index: 1 x: 6 y: 14

P index: 5 x: 10 y: 10

R index: 9 x: 14 y: 6

14 - 10 = 4

10 - 6 = 4

6 - 10 = 4

10 - 14 = 4

4 / 4 = 1

4 / 4 = 1

1 - 1 = 0

Q index: 2 x: 7 y: 13

P index: 6 x: 11 y: 9

R index: 10 x: 15 y: 5

13 - 9 = 4

9 - 5 = 4

7 - 11 = 4

11 - 15 = 4

4 / 4 = 1

4 / 4 = 1

1 - 1 = 0

Q index: 3 x: 8 y: 12

P index: 7 x: 12 y: 8

R index: 11 x: 16 y: 5

12 - 8 = 4

8 - 5 = 3

8 - 12 = 4

12 - 16 = 4

4 / 4 = 1

3 / 4 = 1

1 - 0.75 = 0.25

Q index: 4 x: 9 y: 11

P index: 8 x: 13 y: 7

R index: 12 x: 17 y: 5

11 - 7 = 4

7 - 5 = 2

9 - 13 = 4

13 - 17 = 4

4 / 4 = 1

2 / 4 = 1

1 - 0.5 = 0.5

Q index: 5 x: 10 y: 10

P index: 9 x: 14 y: 6

R index: 13 x: 18 y: 5

10 - 6 = 4

6 - 5 = 1

10 - 14 = 4

14 - 18 = 4

4 / 4 = 1

1 / 4 = 1

1 - 0.25 = 0.75

Q index: 6 x: 11 y: 9

P index: 10 x: 15 y: 5

R index: 14 x: 19 y: 5

9 - 5 = 4

5 - 5 = 0

11 - 15 = 4

15 - 19 = 4

4 / 4 = 1

0 / 4 = 1

1 - 0 = 1

Q index: 7 x: 12 y: 8

P index: 11 x: 16 y: 5

R index: 15 x: 20 y: 5

8 - 5 = 3

5 - 5 = 0

12 - 16 = 4

16 - 20 = 4

3 / 4 = 0.75

0 / 4 = 0.75

0.75 - 0 = 0.75

Q index: 8 x: 13 y: 7

P index: 12 x: 17 y: 5

R index: 16 x: 21 y: 5

7 - 5 = 2

5 - 5 = 0

13 - 17 = 4

17 - 21 = 4

2 / 4 = 0.5

0 / 4 = 0.5

0.5 - 0 = 0.5

Q index: 9 x: 14 y: 6

P index: 13 x: 18 y: 5

R index: 17 x: 22 y: 5

6 - 5 = 1

5 - 5 = 0

14 - 18 = 4

18 - 22 = 4

1 / 4 = 0.25

0 / 4 = 0.25

0.25 - 0 = 0.25

Q index: 10 x: 15 y: 5

P index: 14 x: 19 y: 5

R index: 18 x: 23 y: 5

5 - 5 = 0

5 - 5 = 0

15 - 19 = 4

19 - 23 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 11 x: 16 y: 5

P index: 15 x: 20 y: 5

R index: 19 x: 24 y: 5

5 - 5 = 0

5 - 5 = 0

16 - 20 = 4

20 - 24 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 12 x: 17 y: 5

P index: 16 x: 21 y: 5

R index: 20 x: 25 y: 6

5 - 5 = 0

5 - 6 = -1

17 - 21 = 4

21 - 25 = 4

0 / 4 = 0

-1 / 4 = 0

0 - -0.25 = 0.25

Q index: 13 x: 18 y: 5

P index: 17 x: 22 y: 5

R index: 21 x: 26 y: 7

5 - 5 = 0

5 - 7 = -2

18 - 22 = 4

22 - 26 = 4

0 / 4 = 0

-2 / 4 = 0

0 - -0.5 = 0.5

Q index: 14 x: 19 y: 5

P index: 18 x: 23 y: 5

R index: 22 x: 27 y: 8

5 - 5 = 0

5 - 8 = -3

19 - 23 = 4

23 - 27 = 4

0 / 4 = 0

-3 / 4 = 0

0 - -0.75 = 0.75

Q index: 15 x: 20 y: 5

P index: 19 x: 24 y: 5

R index: 23 x: 28 y: 9

5 - 5 = 0

5 - 9 = -4

20 - 24 = 4

24 - 28 = 4

0 / 4 = 0

-4 / 4 = 0

0 - -1 = 1

Q index: 16 x: 21 y: 5

P index: 20 x: 25 y: 6

R index: 24 x: 29 y: 10

5 - 6 = -1

6 - 10 = -4

21 - 25 = 4

25 - 29 = 4

-1 / 4 = -0.25

-4 / 4 = -0.25

-0.25 - -1 = 0.75

Q index: 17 x: 22 y: 5

P index: 21 x: 26 y: 7

R index: 25 x: 30 y: 11

5 - 7 = -2

7 - 11 = -4

22 - 26 = 4

26 - 30 = 4

-2 / 4 = -0.5

-4 / 4 = -0.5

-0.5 - -1 = 0.5

Q index: 18 x: 23 y: 5

P index: 22 x: 27 y: 8

R index: 26 x: 31 y: 12

5 - 8 = -3

8 - 12 = -4

23 - 27 = 4

27 - 31 = 4

-3 / 4 = -0.75

-4 / 4 = -0.75

-0.75 - -1 = 0.25

Q index: 19 x: 24 y: 5

P index: 23 x: 28 y: 9

R index: 27 x: 32 y: 13

5 - 9 = -4

9 - 13 = -4

24 - 28 = 4

28 - 32 = 4

-4 / 4 = -1

-4 / 4 = -1

-1 - -1 = 0

Q index: 20 x: 25 y: 6

P index: 24 x: 29 y: 10

R index: 28 x: 33 y: 14

6 - 10 = -4

10 - 14 = -4

25 - 29 = 4

29 - 33 = 4

-4 / 4 = -1

-4 / 4 = -1

-1 - -1 = 0

Q index: 21 x: 26 y: 7

P index: 25 x: 30 y: 11

R index: 29 x: 34 y: 15

7 - 11 = -4

11 - 15 = -4

26 - 30 = 4

30 - 34 = 4

-4 / 4 = -1

-4 / 4 = -1

-1 - -1 = 0

Q index: 22 x: 27 y: 8

P index: 26 x: 31 y: 12

R index: 30 x: 34 y: 16

8 - 12 = -4

12 - 16 = -4

27 - 31 = 4

31 - 34 = 3

-4 / 4 = -1

-4 / 3 = -1

-1 - -1.33333 = 0.333333

Q index: 23 x: 28 y: 9

P index: 27 x: 32 y: 13

R index: 31 x: 34 y: 17

9 - 13 = -4

13 - 17 = -4

28 - 32 = 4

32 - 34 = 2

-4 / 4 = -1

-4 / 2 = -1

-1 - -2 = 1

Q index: 24 x: 29 y: 10

P index: 28 x: 33 y: 14

R index: 32 x: 34 y: 18

10 - 14 = -4

14 - 18 = -4

29 - 33 = 4

33 - 34 = 1

-4 / 4 = -1

-4 / 1 = -1

-1 - -4 = 3

Q index: 25 x: 30 y: 11

P index: 29 x: 34 y: 15

R index: 33 x: 34 y: 19

11 - 15 = -4

15 - 19 = -4

30 - 34 = 4

34 - 34 = 0

-4 / 4 = -1

-4 / 0.5 = -1

-1 - -8 = 7

Q index: 26 x: 31 y: 12

P index: 30 x: 34 y: 16

R index: 34 x: 34 y: 20

12 - 16 = -4

16 - 20 = -4

31 - 34 = 3

34 - 34 = 0

-4 / 3 = -1.33333

-4 / 0.5 = -1.33333

-1.33333 - -8 = 6.66667

Q index: 27 x: 32 y: 13

P index: 31 x: 34 y: 17

R index: 35 x: 34 y: 21

13 - 17 = -4

17 - 21 = -4

32 - 34 = 2

34 - 34 = 0

-4 / 2 = -2

-4 / 0.5 = -2

-2 - -8 = 6

Q index: 28 x: 33 y: 14

P index: 32 x: 34 y: 18

R index: 36 x: 34 y: 22

14 - 18 = -4

18 - 22 = -4

33 - 34 = 1

34 - 34 = 0

-4 / 1 = -4

-4 / 0.5 = -4

-4 - -8 = 4

Q index: 29 x: 34 y: 15

P index: 33 x: 34 y: 19

R index: 37 x: 34 y: 23

15 - 19 = -4

19 - 23 = -4

34 - 34 = 0

34 - 34 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 30 x: 34 y: 16

P index: 34 x: 34 y: 20

R index: 38 x: 34 y: 24

16 - 20 = -4

20 - 24 = -4

34 - 34 = 0

34 - 34 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 31 x: 34 y: 17

P index: 35 x: 34 y: 21

R index: 39 x: 33 y: 25

17 - 21 = -4

21 - 25 = -4

34 - 34 = 0

34 - 33 = 1

-4 / 0.5 = -8

-4 / 1 = -8

-8 - -4 = 4

Q index: 32 x: 34 y: 18

P index: 36 x: 34 y: 22

R index: 40 x: 32 y: 26

18 - 22 = -4

22 - 26 = -4

34 - 34 = 0

34 - 32 = 2

-4 / 0.5 = -8

-4 / 2 = -8

-8 - -2 = 6

Q index: 33 x: 34 y: 19

P index: 37 x: 34 y: 23

R index: 41 x: 31 y: 27

19 - 23 = -4

23 - 27 = -4

34 - 34 = 0

34 - 31 = 3

-4 / 0.5 = -8

-4 / 3 = -8

-8 - -1.33333 = 6.66667

Q index: 34 x: 34 y: 20

P index: 38 x: 34 y: 24

R index: 42 x: 30 y: 28

20 - 24 = -4

24 - 28 = -4

34 - 34 = 0

34 - 30 = 4

-4 / 0.5 = -8

-4 / 4 = -8

-8 - -1 = 7

Q index: 35 x: 34 y: 21

P index: 39 x: 33 y: 25

R index: 43 x: 29 y: 29

21 - 25 = -4

25 - 29 = -4

34 - 33 = 1

33 - 29 = 4

-4 / 1 = -4

-4 / 4 = -4

-4 - -1 = 3

Q index: 36 x: 34 y: 22

P index: 40 x: 32 y: 26

R index: 44 x: 28 y: 30

22 - 26 = -4

26 - 30 = -4

34 - 32 = 2

32 - 28 = 4

-4 / 2 = -2

-4 / 4 = -2

-2 - -1 = 1

Q index: 37 x: 34 y: 23

P index: 41 x: 31 y: 27

R index: 45 x: 27 y: 31

23 - 27 = -4

27 - 31 = -4

34 - 31 = 3

31 - 27 = 4

-4 / 3 = -1.33333

-4 / 4 = -1.33333

-1.33333 - -1 = 0.333333

Q index: 38 x: 34 y: 24

P index: 42 x: 30 y: 28

R index: 46 x: 26 y: 32

24 - 28 = -4

28 - 32 = -4

34 - 30 = 4

30 - 26 = 4

-4 / 4 = -1

-4 / 4 = -1

-1 - -1 = 0

Q index: 39 x: 33 y: 25

P index: 43 x: 29 y: 29

R index: 47 x: 25 y: 33

25 - 29 = -4

29 - 33 = -4

33 - 29 = 4

29 - 25 = 4

-4 / 4 = -1

-4 / 4 = -1

-1 - -1 = 0

Q index: 40 x: 32 y: 26

P index: 44 x: 28 y: 30

R index: 48 x: 24 y: 34

26 - 30 = -4

30 - 34 = -4

32 - 28 = 4

28 - 24 = 4

-4 / 4 = -1

-4 / 4 = -1

-1 - -1 = 0

Q index: 41 x: 31 y: 27

P index: 45 x: 27 y: 31

R index: 49 x: 23 y: 34

27 - 31 = -4

31 - 34 = -3

31 - 27 = 4

27 - 23 = 4

-4 / 4 = -1

-3 / 4 = -1

-1 - -0.75 = 0.25

Q index: 42 x: 30 y: 28

P index: 46 x: 26 y: 32

R index: 50 x: 22 y: 34

28 - 32 = -4

32 - 34 = -2

30 - 26 = 4

26 - 22 = 4

-4 / 4 = -1

-2 / 4 = -1

-1 - -0.5 = 0.5

Q index: 43 x: 29 y: 29

P index: 47 x: 25 y: 33

R index: 51 x: 21 y: 34

29 - 33 = -4

33 - 34 = -1

29 - 25 = 4

25 - 21 = 4

-4 / 4 = -1

-1 / 4 = -1

-1 - -0.25 = 0.75

Q index: 44 x: 28 y: 30

P index: 48 x: 24 y: 34

R index: 52 x: 20 y: 34

30 - 34 = -4

34 - 34 = 0

28 - 24 = 4

24 - 20 = 4

-4 / 4 = -1

0 / 4 = -1

-1 - 0 = 1

Q index: 45 x: 27 y: 31

P index: 49 x: 23 y: 34

R index: 53 x: 19 y: 34

31 - 34 = -3

34 - 34 = 0

27 - 23 = 4

23 - 19 = 4

-3 / 4 = -0.75

0 / 4 = -0.75

-0.75 - 0 = 0.75

Q index: 46 x: 26 y: 32

P index: 50 x: 22 y: 34

R index: 54 x: 18 y: 34

32 - 34 = -2

34 - 34 = 0

26 - 22 = 4

22 - 18 = 4

-2 / 4 = -0.5

0 / 4 = -0.5

-0.5 - 0 = 0.5

Q index: 47 x: 25 y: 33

P index: 51 x: 21 y: 34

R index: 55 x: 17 y: 34

33 - 34 = -1

34 - 34 = 0

25 - 21 = 4

21 - 17 = 4

-1 / 4 = -0.25

0 / 4 = -0.25

-0.25 - 0 = 0.25

Q index: 48 x: 24 y: 34

P index: 52 x: 20 y: 34

R index: 56 x: 16 y: 34

34 - 34 = 0

34 - 34 = 0

24 - 20 = 4

20 - 16 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 49 x: 23 y: 34

P index: 53 x: 19 y: 34

R index: 57 x: 15 y: 34

34 - 34 = 0

34 - 34 = 0

23 - 19 = 4

19 - 15 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 50 x: 22 y: 34

P index: 54 x: 18 y: 34

R index: 58 x: 14 y: 33

34 - 34 = 0

34 - 33 = 1

22 - 18 = 4

18 - 14 = 4

0 / 4 = 0

1 / 4 = 0

0 - 0.25 = 0.25

Q index: 51 x: 21 y: 34

P index: 55 x: 17 y: 34

R index: 59 x: 13 y: 32

34 - 34 = 0

34 - 32 = 2

21 - 17 = 4

17 - 13 = 4

0 / 4 = 0

2 / 4 = 0

0 - 0.5 = 0.5

Q index: 52 x: 20 y: 34

P index: 56 x: 16 y: 34

R index: 60 x: 12 y: 31

34 - 34 = 0

34 - 31 = 3

20 - 16 = 4

16 - 12 = 4

0 / 4 = 0

3 / 4 = 0

0 - 0.75 = 0.75

Q index: 53 x: 19 y: 34

P index: 57 x: 15 y: 34

R index: 61 x: 11 y: 30

34 - 34 = 0

34 - 30 = 4

19 - 15 = 4

15 - 11 = 4

0 / 4 = 0

4 / 4 = 0

0 - 1 = 1

Q index: 54 x: 18 y: 34

P index: 58 x: 14 y: 33

R index: 62 x: 10 y: 29

34 - 33 = 1

33 - 29 = 4

18 - 14 = 4

14 - 10 = 4

1 / 4 = 0.25

4 / 4 = 0.25

0.25 - 1 = 0.75

Q index: 55 x: 17 y: 34

P index: 59 x: 13 y: 32

R index: 63 x: 9 y: 28

34 - 32 = 2

32 - 28 = 4

17 - 13 = 4

13 - 9 = 4

2 / 4 = 0.5

4 / 4 = 0.5

0.5 - 1 = 0.5

Q index: 56 x: 16 y: 34

P index: 60 x: 12 y: 31

R index: 64 x: 8 y: 27

34 - 31 = 3

31 - 27 = 4

16 - 12 = 4

12 - 8 = 4

3 / 4 = 0.75

4 / 4 = 0.75

0.75 - 1 = 0.25

Q index: 57 x: 15 y: 34

P index: 61 x: 11 y: 30

R index: 65 x: 7 y: 26

34 - 30 = 4

30 - 26 = 4

15 - 11 = 4

11 - 7 = 4

4 / 4 = 1

4 / 4 = 1

1 - 1 = 0

Q index: 58 x: 14 y: 33

P index: 62 x: 10 y: 29

R index: 66 x: 6 y: 25

33 - 29 = 4

29 - 25 = 4

14 - 10 = 4

10 - 6 = 4

4 / 4 = 1

4 / 4 = 1

1 - 1 = 0

Q index: 59 x: 13 y: 32

P index: 63 x: 9 y: 28

R index: 67 x: 5 y: 24

32 - 28 = 4

28 - 24 = 4

13 - 9 = 4

9 - 5 = 4

4 / 4 = 1

4 / 4 = 1

1 - 1 = 0

Q index: 60 x: 12 y: 31

P index: 64 x: 8 y: 27

R index: 68 x: 5 y: 23

31 - 27 = 4

27 - 23 = 4

12 - 8 = 4

8 - 5 = 3

4 / 4 = 1

4 / 3 = 1

1 - 1.33333 = 0.333333

Q index: 61 x: 11 y: 30

P index: 65 x: 7 y: 26

R index: 69 x: 5 y: 22

30 - 26 = 4

26 - 22 = 4

11 - 7 = 4

7 - 5 = 2

4 / 4 = 1

4 / 2 = 1

1 - 2 = 1

Q index: 62 x: 10 y: 29

P index: 66 x: 6 y: 25

R index: 70 x: 5 y: 21

29 - 25 = 4

25 - 21 = 4

10 - 6 = 4

6 - 5 = 1

4 / 4 = 1

4 / 1 = 1

1 - 4 = 3

Q index: 63 x: 9 y: 28

P index: 67 x: 5 y: 24

R index: 71 x: 5 y: 20

28 - 24 = 4

24 - 20 = 4

9 - 5 = 4

5 - 5 = 0

4 / 4 = 1

4 / 0.5 = 1

1 - 8 = 7

Q index: 64 x: 8 y: 27

P index: 68 x: 5 y: 23

R index: 72 x: 5 y: 19

27 - 23 = 4

23 - 19 = 4

8 - 5 = 3

5 - 5 = 0

4 / 3 = 1.33333

4 / 0.5 = 1.33333

1.33333 - 8 = 6.66667

Q index: 65 x: 7 y: 26

P index: 69 x: 5 y: 22

R index: 73 x: 5 y: 18

26 - 22 = 4

22 - 18 = 4

7 - 5 = 2

5 - 5 = 0

4 / 2 = 2

4 / 0.5 = 2

2 - 8 = 6

Q index: 66 x: 6 y: 25

P index: 70 x: 5 y: 21

R index: 74 x: 5 y: 17

25 - 21 = 4

21 - 17 = 4

6 - 5 = 1

5 - 5 = 0

4 / 1 = 4

4 / 0.5 = 4

4 - 8 = 4

Q index: 67 x: 5 y: 24

P index: 71 x: 5 y: 20

R index: 75 x: 5 y: 16

24 - 20 = 4

20 - 16 = 4

5 - 5 = 0

5 - 5 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 68 x: 5 y: 23

P index: 72 x: 5 y: 19

R index: 0 x: 5 y: 15

23 - 19 = 4

19 - 15 = 4

5 - 5 = 0

5 - 5 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 69 x: 5 y: 22

P index: 73 x: 5 y: 18

R index: 1 x: 6 y: 14

22 - 18 = 4

18 - 14 = 4

5 - 5 = 0

5 - 6 = 1

4 / 0.5 = 8

4 / 1 = 8

8 - 4 = 4

Q index: 70 x: 5 y: 21

P index: 74 x: 5 y: 17

R index: 2 x: 7 y: 13

21 - 17 = 4

17 - 13 = 4

5 - 5 = 0

5 - 7 = 2

4 / 0.5 = 8

4 / 2 = 8

8 - 2 = 6

Q index: 71 x: 5 y: 20

P index: 75 x: 5 y: 16

R index: 3 x: 8 y: 12

20 - 16 = 4

16 - 12 = 4

5 - 5 = 0

5 - 8 = 3

4 / 0.5 = 8

4 / 3 = 8

8 - 1.33333 = 6.66667

Q index: 72 x: 5 y: 19

P index: 0 x: 5 y: 15

R index: 4 x: 9 y: 11

19 - 15 = 4

15 - 11 = 4

5 - 5 = 0

5 - 9 = 4

4 / 0.5 = 8

4 / 4 = 8

8 - 1 = 7

Q index: 73 x: 5 y: 18

P index: 1 x: 6 y: 14

R index: 5 x: 10 y: 10

18 - 14 = 4

14 - 10 = 4

5 - 6 = 1

6 - 10 = 4

4 / 1 = 4

4 / 4 = 4

4 - 1 = 3

Q index: 74 x: 5 y: 17

P index: 2 x: 7 y: 13

R index: 6 x: 11 y: 9

17 - 13 = 4

13 - 9 = 4

5 - 7 = 2

7 - 11 = 4

4 / 2 = 2

4 / 4 = 2

2 - 1 = 1

Q index: 75 x: 5 y: 16

P index: 3 x: 8 y: 12

R index: 7 x: 12 y: 8

16 - 12 = 4

12 - 8 = 4

5 - 8 = 3

8 - 12 = 4

4 / 3 = 1.33333

4 / 4 = 1.33333

1.33333 - 1 = 0.333333

PtAry after Corner Detection

40 40 0 1

1

x: 5 y: 15 curvature: 7

x: 6 y: 14 curvature: 3

x: 7 y: 13 curvature: 1

x: 8 y: 12 curvature: 0.333333

x: 9 y: 11 curvature: 0

x: 10 y: 10 curvature: 0

x: 11 y: 9 curvature: 0

x: 12 y: 8 curvature: 0.25

x: 13 y: 7 curvature: 0.5

x: 14 y: 6 curvature: 0.75

x: 15 y: 5 curvature: 1

x: 16 y: 5 curvature: 0.75

x: 17 y: 5 curvature: 0.5

x: 18 y: 5 curvature: 0.25

x: 19 y: 5 curvature: 0

x: 20 y: 5 curvature: 0

x: 21 y: 5 curvature: 0.25

x: 22 y: 5 curvature: 0.5

x: 23 y: 5 curvature: 0.75

x: 24 y: 5 curvature: 1

x: 25 y: 6 curvature: 0.75

x: 26 y: 7 curvature: 0.5

x: 27 y: 8 curvature: 0.25

x: 28 y: 9 curvature: 0

x: 29 y: 10 curvature: 0

x: 30 y: 11 curvature: 0

x: 31 y: 12 curvature: 0.333333

x: 32 y: 13 curvature: 1

x: 33 y: 14 curvature: 3

x: 34 y: 15 curvature: 7

x: 34 y: 16 curvature: 6.66667

x: 34 y: 17 curvature: 6

x: 34 y: 18 curvature: 4

x: 34 y: 19 curvature: 0

x: 34 y: 20 curvature: 0

x: 34 y: 21 curvature: 4

x: 34 y: 22 curvature: 6

x: 34 y: 23 curvature: 6.66667

x: 34 y: 24 curvature: 7

x: 33 y: 25 curvature: 3

x: 32 y: 26 curvature: 1

x: 31 y: 27 curvature: 0.333333

x: 30 y: 28 curvature: 0

x: 29 y: 29 curvature: 0

x: 28 y: 30 curvature: 0

x: 27 y: 31 curvature: 0.25

x: 26 y: 32 curvature: 0.5

x: 25 y: 33 curvature: 0.75

x: 24 y: 34 curvature: 1

x: 23 y: 34 curvature: 0.75

x: 22 y: 34 curvature: 0.5

x: 21 y: 34 curvature: 0.25

x: 20 y: 34 curvature: 0

x: 19 y: 34 curvature: 0

x: 18 y: 34 curvature: 0.25

x: 17 y: 34 curvature: 0.5

x: 16 y: 34 curvature: 0.75

x: 15 y: 34 curvature: 1

x: 14 y: 33 curvature: 0.75

x: 13 y: 32 curvature: 0.5

x: 12 y: 31 curvature: 0.25

x: 11 y: 30 curvature: 0

x: 10 y: 29 curvature: 0

x: 9 y: 28 curvature: 0

x: 8 y: 27 curvature: 0.333333

x: 7 y: 26 curvature: 1

x: 6 y: 25 curvature: 3

x: 5 y: 24 curvature: 7

x: 5 y: 23 curvature: 6.66667

x: 5 y: 22 curvature: 6

x: 5 y: 21 curvature: 4

x: 5 y: 20 curvature: 0

x: 5 y: 19 curvature: 0

x: 5 y: 18 curvature: 4

x: 5 y: 17 curvature: 6

x: 5 y: 16 curvature: 6.66667

**Data C Outputs:**

**outFile 1:**

40 40 0 1

15 5 9

6 5 1

7 5 1

8 5 1

9 5 1

10 5 1

11 5 1

12 5 1

13 5 1

14 5 1

15 5 9

16 6 1

17 7 1

18 8 1

19 9 1

20 10 9

21 9 1

22 8 1

23 7 1

24 6 1

25 5 9

26 5 1

27 5 1

28 5 1

29 5 1

30 5 1

31 5 1

32 5 1

33 5 1

34 5 1

35 5 9

35 6 1

35 7 1

35 8 1

35 9 1

35 10 1

35 11 1

35 12 1

35 13 1

35 14 1

35 15 1

35 16 1

35 17 1

35 18 1

35 19 1

35 20 1

35 21 1

35 22 1

35 23 1

35 24 1

35 25 1

35 26 1

35 27 1

35 28 1

35 29 9

34 29 1

33 29 1

32 29 1

31 29 1

30 29 1

29 29 1

28 29 1

27 29 1

26 29 1

25 29 9

24 30 1

23 31 1

22 32 1

21 33 1

20 34 9

19 33 1

18 32 1

17 31 1

16 30 1

15 29 9

14 29 1

13 29 1

12 29 1

11 29 1

10 29 1

9 29 1

8 29 1

7 29 1

6 29 1

5 29 9

5 28 1

5 27 1

5 26 1

5 25 1

5 24 1

5 23 1

5 22 1

5 21 1

5 20 1

5 19 1

5 18 1

5 17 1

5 16 1

5 15 1

5 14 1

5 13 1

5 12 1

5 11 1

5 10 1

5 9 1

5 8 1

5 7 1

5 6 1

**outFile 2:**

40 40 0 1

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

. . . . . 9 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 9 . . . . . . . . . .

. . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . . . . .

. . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . . . . .

. . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . . . . .

. . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . . . . .

. . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . . . . .

. . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . . . . .

. . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . . . . .

. . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . . . . .

. . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . . . . .

. . . . . 9 . . . . . . . . . . . . . . . . . . . . . . . 9 . . . . . . . . . .

. . . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . . . .

. . . . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . . .

. . . . . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . .

. . . . . . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . .

. . . . . . . . . . 9 . . . . . . . . . . . . . . . . . . . . . . . 9 . . . . .

. . . . . . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . .

. . . . . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . .

. . . . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . . .

. . . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . . . .

. . . . . 9 . . . . . . . . . . . . . . . . . . . . . . . 9 . . . . . . . . . .

. . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . . . . .

. . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . . . . .

. . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . . . . .

. . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . . . . .

. . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . . . . .

. . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . . . . .

. . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . . . . .

. . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . . . . .

. . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . . . . .

. . . . . 9 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 9 . . . . . . . . . .

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

**outFile3(debug):**

K value: 4

PtAry after initialization

40 40 0 1

1

x: 5 y: 5 curvature: 0

x: 6 y: 5 curvature: 0

x: 7 y: 5 curvature: 0

x: 8 y: 5 curvature: 0

x: 9 y: 5 curvature: 0

x: 10 y: 5 curvature: 0

x: 11 y: 5 curvature: 0

x: 12 y: 5 curvature: 0

x: 13 y: 5 curvature: 0

x: 14 y: 5 curvature: 0

x: 15 y: 5 curvature: 0

x: 16 y: 6 curvature: 0

x: 17 y: 7 curvature: 0

x: 18 y: 8 curvature: 0

x: 19 y: 9 curvature: 0

x: 20 y: 10 curvature: 0

x: 21 y: 9 curvature: 0

x: 22 y: 8 curvature: 0

x: 23 y: 7 curvature: 0

x: 24 y: 6 curvature: 0

x: 25 y: 5 curvature: 0

x: 26 y: 5 curvature: 0

x: 27 y: 5 curvature: 0

x: 28 y: 5 curvature: 0

x: 29 y: 5 curvature: 0

x: 30 y: 5 curvature: 0

x: 31 y: 5 curvature: 0

x: 32 y: 5 curvature: 0

x: 33 y: 5 curvature: 0

x: 34 y: 5 curvature: 0

x: 35 y: 5 curvature: 0

x: 35 y: 6 curvature: 0

x: 35 y: 7 curvature: 0

x: 35 y: 8 curvature: 0

x: 35 y: 9 curvature: 0

x: 35 y: 10 curvature: 0

x: 35 y: 11 curvature: 0

x: 35 y: 12 curvature: 0

x: 35 y: 13 curvature: 0

x: 35 y: 14 curvature: 0

x: 35 y: 15 curvature: 0

x: 35 y: 16 curvature: 0

x: 35 y: 17 curvature: 0

x: 35 y: 18 curvature: 0

x: 35 y: 19 curvature: 0

x: 35 y: 20 curvature: 0

x: 35 y: 21 curvature: 0

x: 35 y: 22 curvature: 0

x: 35 y: 23 curvature: 0

x: 35 y: 24 curvature: 0

x: 35 y: 25 curvature: 0

x: 35 y: 26 curvature: 0

x: 35 y: 27 curvature: 0

x: 35 y: 28 curvature: 0

x: 35 y: 29 curvature: 0

x: 34 y: 29 curvature: 0

x: 33 y: 29 curvature: 0

x: 32 y: 29 curvature: 0

x: 31 y: 29 curvature: 0

x: 30 y: 29 curvature: 0

x: 29 y: 29 curvature: 0

x: 28 y: 29 curvature: 0

x: 27 y: 29 curvature: 0

x: 26 y: 29 curvature: 0

x: 25 y: 29 curvature: 0

x: 24 y: 30 curvature: 0

x: 23 y: 31 curvature: 0

x: 22 y: 32 curvature: 0

x: 21 y: 33 curvature: 0

x: 20 y: 34 curvature: 0

x: 19 y: 33 curvature: 0

x: 18 y: 32 curvature: 0

x: 17 y: 31 curvature: 0

x: 16 y: 30 curvature: 0

x: 15 y: 29 curvature: 0

x: 14 y: 29 curvature: 0

x: 13 y: 29 curvature: 0

x: 12 y: 29 curvature: 0

x: 11 y: 29 curvature: 0

x: 10 y: 29 curvature: 0

x: 9 y: 29 curvature: 0

x: 8 y: 29 curvature: 0

x: 7 y: 29 curvature: 0

x: 6 y: 29 curvature: 0

x: 5 y: 29 curvature: 0

x: 5 y: 28 curvature: 0

x: 5 y: 27 curvature: 0

x: 5 y: 26 curvature: 0

x: 5 y: 25 curvature: 0

x: 5 y: 24 curvature: 0

x: 5 y: 23 curvature: 0

x: 5 y: 22 curvature: 0

x: 5 y: 21 curvature: 0

x: 5 y: 20 curvature: 0

x: 5 y: 19 curvature: 0

x: 5 y: 18 curvature: 0

x: 5 y: 17 curvature: 0

x: 5 y: 16 curvature: 0

x: 5 y: 15 curvature: 0

x: 5 y: 14 curvature: 0

x: 5 y: 13 curvature: 0

x: 5 y: 12 curvature: 0

x: 5 y: 11 curvature: 0

x: 5 y: 10 curvature: 0

x: 5 y: 9 curvature: 0

x: 5 y: 8 curvature: 0

x: 5 y: 7 curvature: 0

x: 5 y: 6 curvature: 0

Calculating Curvature debugging

Q index: 0 x: 5 y: 5

P index: 4 x: 9 y: 5

R index: 8 x: 13 y: 5

5 - 5 = 0

5 - 5 = 0

5 - 9 = 4

9 - 13 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 1 x: 6 y: 5

P index: 5 x: 10 y: 5

R index: 9 x: 14 y: 5

5 - 5 = 0

5 - 5 = 0

6 - 10 = 4

10 - 14 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 2 x: 7 y: 5

P index: 6 x: 11 y: 5

R index: 10 x: 15 y: 5

5 - 5 = 0

5 - 5 = 0

7 - 11 = 4

11 - 15 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 3 x: 8 y: 5

P index: 7 x: 12 y: 5

R index: 11 x: 16 y: 6

5 - 5 = 0

5 - 6 = -1

8 - 12 = 4

12 - 16 = 4

0 / 4 = 0

-1 / 4 = 0

0 - -0.25 = 0.25

Q index: 4 x: 9 y: 5

P index: 8 x: 13 y: 5

R index: 12 x: 17 y: 7

5 - 5 = 0

5 - 7 = -2

9 - 13 = 4

13 - 17 = 4

0 / 4 = 0

-2 / 4 = 0

0 - -0.5 = 0.5

Q index: 5 x: 10 y: 5

P index: 9 x: 14 y: 5

R index: 13 x: 18 y: 8

5 - 5 = 0

5 - 8 = -3

10 - 14 = 4

14 - 18 = 4

0 / 4 = 0

-3 / 4 = 0

0 - -0.75 = 0.75

Q index: 6 x: 11 y: 5

P index: 10 x: 15 y: 5

R index: 14 x: 19 y: 9

5 - 5 = 0

5 - 9 = -4

11 - 15 = 4

15 - 19 = 4

0 / 4 = 0

-4 / 4 = 0

0 - -1 = 1

Q index: 7 x: 12 y: 5

P index: 11 x: 16 y: 6

R index: 15 x: 20 y: 10

5 - 6 = -1

6 - 10 = -4

12 - 16 = 4

16 - 20 = 4

-1 / 4 = -0.25

-4 / 4 = -0.25

-0.25 - -1 = 0.75

Q index: 8 x: 13 y: 5

P index: 12 x: 17 y: 7

R index: 16 x: 21 y: 9

5 - 7 = -2

7 - 9 = -2

13 - 17 = 4

17 - 21 = 4

-2 / 4 = -0.5

-2 / 4 = -0.5

-0.5 - -0.5 = 0

Q index: 9 x: 14 y: 5

P index: 13 x: 18 y: 8

R index: 17 x: 22 y: 8

5 - 8 = -3

8 - 8 = 0

14 - 18 = 4

18 - 22 = 4

-3 / 4 = -0.75

0 / 4 = -0.75

-0.75 - 0 = 0.75

Q index: 10 x: 15 y: 5

P index: 14 x: 19 y: 9

R index: 18 x: 23 y: 7

5 - 9 = -4

9 - 7 = 2

15 - 19 = 4

19 - 23 = 4

-4 / 4 = -1

2 / 4 = -1

-1 - 0.5 = 1.5

Q index: 11 x: 16 y: 6

P index: 15 x: 20 y: 10

R index: 19 x: 24 y: 6

6 - 10 = -4

10 - 6 = 4

16 - 20 = 4

20 - 24 = 4

-4 / 4 = -1

4 / 4 = -1

-1 - 1 = 2

Q index: 12 x: 17 y: 7

P index: 16 x: 21 y: 9

R index: 20 x: 25 y: 5

7 - 9 = -2

9 - 5 = 4

17 - 21 = 4

21 - 25 = 4

-2 / 4 = -0.5

4 / 4 = -0.5

-0.5 - 1 = 1.5

Q index: 13 x: 18 y: 8

P index: 17 x: 22 y: 8

R index: 21 x: 26 y: 5

8 - 8 = 0

8 - 5 = 3

18 - 22 = 4

22 - 26 = 4

0 / 4 = 0

3 / 4 = 0

0 - 0.75 = 0.75

Q index: 14 x: 19 y: 9

P index: 18 x: 23 y: 7

R index: 22 x: 27 y: 5

9 - 7 = 2

7 - 5 = 2

19 - 23 = 4

23 - 27 = 4

2 / 4 = 0.5

2 / 4 = 0.5

0.5 - 0.5 = 0

Q index: 15 x: 20 y: 10

P index: 19 x: 24 y: 6

R index: 23 x: 28 y: 5

10 - 6 = 4

6 - 5 = 1

20 - 24 = 4

24 - 28 = 4

4 / 4 = 1

1 / 4 = 1

1 - 0.25 = 0.75

Q index: 16 x: 21 y: 9

P index: 20 x: 25 y: 5

R index: 24 x: 29 y: 5

9 - 5 = 4

5 - 5 = 0

21 - 25 = 4

25 - 29 = 4

4 / 4 = 1

0 / 4 = 1

1 - 0 = 1

Q index: 17 x: 22 y: 8

P index: 21 x: 26 y: 5

R index: 25 x: 30 y: 5

8 - 5 = 3

5 - 5 = 0

22 - 26 = 4

26 - 30 = 4

3 / 4 = 0.75

0 / 4 = 0.75

0.75 - 0 = 0.75

Q index: 18 x: 23 y: 7

P index: 22 x: 27 y: 5

R index: 26 x: 31 y: 5

7 - 5 = 2

5 - 5 = 0

23 - 27 = 4

27 - 31 = 4

2 / 4 = 0.5

0 / 4 = 0.5

0.5 - 0 = 0.5

Q index: 19 x: 24 y: 6

P index: 23 x: 28 y: 5

R index: 27 x: 32 y: 5

6 - 5 = 1

5 - 5 = 0

24 - 28 = 4

28 - 32 = 4

1 / 4 = 0.25

0 / 4 = 0.25

0.25 - 0 = 0.25

Q index: 20 x: 25 y: 5

P index: 24 x: 29 y: 5

R index: 28 x: 33 y: 5

5 - 5 = 0

5 - 5 = 0

25 - 29 = 4

29 - 33 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 21 x: 26 y: 5

P index: 25 x: 30 y: 5

R index: 29 x: 34 y: 5

5 - 5 = 0

5 - 5 = 0

26 - 30 = 4

30 - 34 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 22 x: 27 y: 5

P index: 26 x: 31 y: 5

R index: 30 x: 35 y: 5

5 - 5 = 0

5 - 5 = 0

27 - 31 = 4

31 - 35 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 23 x: 28 y: 5

P index: 27 x: 32 y: 5

R index: 31 x: 35 y: 6

5 - 5 = 0

5 - 6 = -1

28 - 32 = 4

32 - 35 = 3

0 / 4 = 0

-1 / 3 = 0

0 - -0.333333 = 0.333333

Q index: 24 x: 29 y: 5

P index: 28 x: 33 y: 5

R index: 32 x: 35 y: 7

5 - 5 = 0

5 - 7 = -2

29 - 33 = 4

33 - 35 = 2

0 / 4 = 0

-2 / 2 = 0

0 - -1 = 1

Q index: 25 x: 30 y: 5

P index: 29 x: 34 y: 5

R index: 33 x: 35 y: 8

5 - 5 = 0

5 - 8 = -3

30 - 34 = 4

34 - 35 = 1

0 / 4 = 0

-3 / 1 = 0

0 - -3 = 3

Q index: 26 x: 31 y: 5

P index: 30 x: 35 y: 5

R index: 34 x: 35 y: 9

5 - 5 = 0

5 - 9 = -4

31 - 35 = 4

35 - 35 = 0

0 / 4 = 0

-4 / 0.5 = 0

0 - -8 = 8

Q index: 27 x: 32 y: 5

P index: 31 x: 35 y: 6

R index: 35 x: 35 y: 10

5 - 6 = -1

6 - 10 = -4

32 - 35 = 3

35 - 35 = 0

-1 / 3 = -0.333333

-4 / 0.5 = -0.333333

-0.333333 - -8 = 7.66667

Q index: 28 x: 33 y: 5

P index: 32 x: 35 y: 7

R index: 36 x: 35 y: 11

5 - 7 = -2

7 - 11 = -4

33 - 35 = 2

35 - 35 = 0

-2 / 2 = -1

-4 / 0.5 = -1

-1 - -8 = 7

Q index: 29 x: 34 y: 5

P index: 33 x: 35 y: 8

R index: 37 x: 35 y: 12

5 - 8 = -3

8 - 12 = -4

34 - 35 = 1

35 - 35 = 0

-3 / 1 = -3

-4 / 0.5 = -3

-3 - -8 = 5

Q index: 30 x: 35 y: 5

P index: 34 x: 35 y: 9

R index: 38 x: 35 y: 13

5 - 9 = -4

9 - 13 = -4

35 - 35 = 0

35 - 35 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 31 x: 35 y: 6

P index: 35 x: 35 y: 10

R index: 39 x: 35 y: 14

6 - 10 = -4

10 - 14 = -4

35 - 35 = 0

35 - 35 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 32 x: 35 y: 7

P index: 36 x: 35 y: 11

R index: 40 x: 35 y: 15

7 - 11 = -4

11 - 15 = -4

35 - 35 = 0

35 - 35 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 33 x: 35 y: 8

P index: 37 x: 35 y: 12

R index: 41 x: 35 y: 16

8 - 12 = -4

12 - 16 = -4

35 - 35 = 0

35 - 35 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 34 x: 35 y: 9

P index: 38 x: 35 y: 13

R index: 42 x: 35 y: 17

9 - 13 = -4

13 - 17 = -4

35 - 35 = 0

35 - 35 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 35 x: 35 y: 10

P index: 39 x: 35 y: 14

R index: 43 x: 35 y: 18

10 - 14 = -4

14 - 18 = -4

35 - 35 = 0

35 - 35 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 36 x: 35 y: 11

P index: 40 x: 35 y: 15

R index: 44 x: 35 y: 19

11 - 15 = -4

15 - 19 = -4

35 - 35 = 0

35 - 35 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 37 x: 35 y: 12

P index: 41 x: 35 y: 16

R index: 45 x: 35 y: 20

12 - 16 = -4

16 - 20 = -4

35 - 35 = 0

35 - 35 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 38 x: 35 y: 13

P index: 42 x: 35 y: 17

R index: 46 x: 35 y: 21

13 - 17 = -4

17 - 21 = -4

35 - 35 = 0

35 - 35 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 39 x: 35 y: 14

P index: 43 x: 35 y: 18

R index: 47 x: 35 y: 22

14 - 18 = -4

18 - 22 = -4

35 - 35 = 0

35 - 35 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 40 x: 35 y: 15

P index: 44 x: 35 y: 19

R index: 48 x: 35 y: 23

15 - 19 = -4

19 - 23 = -4

35 - 35 = 0

35 - 35 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 41 x: 35 y: 16

P index: 45 x: 35 y: 20

R index: 49 x: 35 y: 24

16 - 20 = -4

20 - 24 = -4

35 - 35 = 0

35 - 35 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 42 x: 35 y: 17

P index: 46 x: 35 y: 21

R index: 50 x: 35 y: 25

17 - 21 = -4

21 - 25 = -4

35 - 35 = 0

35 - 35 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 43 x: 35 y: 18

P index: 47 x: 35 y: 22

R index: 51 x: 35 y: 26

18 - 22 = -4

22 - 26 = -4

35 - 35 = 0

35 - 35 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 44 x: 35 y: 19

P index: 48 x: 35 y: 23

R index: 52 x: 35 y: 27

19 - 23 = -4

23 - 27 = -4

35 - 35 = 0

35 - 35 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 45 x: 35 y: 20

P index: 49 x: 35 y: 24

R index: 53 x: 35 y: 28

20 - 24 = -4

24 - 28 = -4

35 - 35 = 0

35 - 35 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 46 x: 35 y: 21

P index: 50 x: 35 y: 25

R index: 54 x: 35 y: 29

21 - 25 = -4

25 - 29 = -4

35 - 35 = 0

35 - 35 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 47 x: 35 y: 22

P index: 51 x: 35 y: 26

R index: 55 x: 34 y: 29

22 - 26 = -4

26 - 29 = -3

35 - 35 = 0

35 - 34 = 1

-4 / 0.5 = -8

-3 / 1 = -8

-8 - -3 = 5

Q index: 48 x: 35 y: 23

P index: 52 x: 35 y: 27

R index: 56 x: 33 y: 29

23 - 27 = -4

27 - 29 = -2

35 - 35 = 0

35 - 33 = 2

-4 / 0.5 = -8

-2 / 2 = -8

-8 - -1 = 7

Q index: 49 x: 35 y: 24

P index: 53 x: 35 y: 28

R index: 57 x: 32 y: 29

24 - 28 = -4

28 - 29 = -1

35 - 35 = 0

35 - 32 = 3

-4 / 0.5 = -8

-1 / 3 = -8

-8 - -0.333333 = 7.66667

Q index: 50 x: 35 y: 25

P index: 54 x: 35 y: 29

R index: 58 x: 31 y: 29

25 - 29 = -4

29 - 29 = 0

35 - 35 = 0

35 - 31 = 4

-4 / 0.5 = -8

0 / 4 = -8

-8 - 0 = 8

Q index: 51 x: 35 y: 26

P index: 55 x: 34 y: 29

R index: 59 x: 30 y: 29

26 - 29 = -3

29 - 29 = 0

35 - 34 = 1

34 - 30 = 4

-3 / 1 = -3

0 / 4 = -3

-3 - 0 = 3

Q index: 52 x: 35 y: 27

P index: 56 x: 33 y: 29

R index: 60 x: 29 y: 29

27 - 29 = -2

29 - 29 = 0

35 - 33 = 2

33 - 29 = 4

-2 / 2 = -1

0 / 4 = -1

-1 - 0 = 1

Q index: 53 x: 35 y: 28

P index: 57 x: 32 y: 29

R index: 61 x: 28 y: 29

28 - 29 = -1

29 - 29 = 0

35 - 32 = 3

32 - 28 = 4

-1 / 3 = -0.333333

0 / 4 = -0.333333

-0.333333 - 0 = 0.333333

Q index: 54 x: 35 y: 29

P index: 58 x: 31 y: 29

R index: 62 x: 27 y: 29

29 - 29 = 0

29 - 29 = 0

35 - 31 = 4

31 - 27 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 55 x: 34 y: 29

P index: 59 x: 30 y: 29

R index: 63 x: 26 y: 29

29 - 29 = 0

29 - 29 = 0

34 - 30 = 4

30 - 26 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 56 x: 33 y: 29

P index: 60 x: 29 y: 29

R index: 64 x: 25 y: 29

29 - 29 = 0

29 - 29 = 0

33 - 29 = 4

29 - 25 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 57 x: 32 y: 29

P index: 61 x: 28 y: 29

R index: 65 x: 24 y: 30

29 - 29 = 0

29 - 30 = -1

32 - 28 = 4

28 - 24 = 4

0 / 4 = 0

-1 / 4 = 0

0 - -0.25 = 0.25

Q index: 58 x: 31 y: 29

P index: 62 x: 27 y: 29

R index: 66 x: 23 y: 31

29 - 29 = 0

29 - 31 = -2

31 - 27 = 4

27 - 23 = 4

0 / 4 = 0

-2 / 4 = 0

0 - -0.5 = 0.5

Q index: 59 x: 30 y: 29

P index: 63 x: 26 y: 29

R index: 67 x: 22 y: 32

29 - 29 = 0

29 - 32 = -3

30 - 26 = 4

26 - 22 = 4

0 / 4 = 0

-3 / 4 = 0

0 - -0.75 = 0.75

Q index: 60 x: 29 y: 29

P index: 64 x: 25 y: 29

R index: 68 x: 21 y: 33

29 - 29 = 0

29 - 33 = -4

29 - 25 = 4

25 - 21 = 4

0 / 4 = 0

-4 / 4 = 0

0 - -1 = 1

Q index: 61 x: 28 y: 29

P index: 65 x: 24 y: 30

R index: 69 x: 20 y: 34

29 - 30 = -1

30 - 34 = -4

28 - 24 = 4

24 - 20 = 4

-1 / 4 = -0.25

-4 / 4 = -0.25

-0.25 - -1 = 0.75

Q index: 62 x: 27 y: 29

P index: 66 x: 23 y: 31

R index: 70 x: 19 y: 33

29 - 31 = -2

31 - 33 = -2

27 - 23 = 4

23 - 19 = 4

-2 / 4 = -0.5

-2 / 4 = -0.5

-0.5 - -0.5 = 0

Q index: 63 x: 26 y: 29

P index: 67 x: 22 y: 32

R index: 71 x: 18 y: 32

29 - 32 = -3

32 - 32 = 0

26 - 22 = 4

22 - 18 = 4

-3 / 4 = -0.75

0 / 4 = -0.75

-0.75 - 0 = 0.75

Q index: 64 x: 25 y: 29

P index: 68 x: 21 y: 33

R index: 72 x: 17 y: 31

29 - 33 = -4

33 - 31 = 2

25 - 21 = 4

21 - 17 = 4

-4 / 4 = -1

2 / 4 = -1

-1 - 0.5 = 1.5

Q index: 65 x: 24 y: 30

P index: 69 x: 20 y: 34

R index: 73 x: 16 y: 30

30 - 34 = -4

34 - 30 = 4

24 - 20 = 4

20 - 16 = 4

-4 / 4 = -1

4 / 4 = -1

-1 - 1 = 2

Q index: 66 x: 23 y: 31

P index: 70 x: 19 y: 33

R index: 74 x: 15 y: 29

31 - 33 = -2

33 - 29 = 4

23 - 19 = 4

19 - 15 = 4

-2 / 4 = -0.5

4 / 4 = -0.5

-0.5 - 1 = 1.5

Q index: 67 x: 22 y: 32

P index: 71 x: 18 y: 32

R index: 75 x: 14 y: 29

32 - 32 = 0

32 - 29 = 3

22 - 18 = 4

18 - 14 = 4

0 / 4 = 0

3 / 4 = 0

0 - 0.75 = 0.75

Q index: 68 x: 21 y: 33

P index: 72 x: 17 y: 31

R index: 76 x: 13 y: 29

33 - 31 = 2

31 - 29 = 2

21 - 17 = 4

17 - 13 = 4

2 / 4 = 0.5

2 / 4 = 0.5

0.5 - 0.5 = 0

Q index: 69 x: 20 y: 34

P index: 73 x: 16 y: 30

R index: 77 x: 12 y: 29

34 - 30 = 4

30 - 29 = 1

20 - 16 = 4

16 - 12 = 4

4 / 4 = 1

1 / 4 = 1

1 - 0.25 = 0.75

Q index: 70 x: 19 y: 33

P index: 74 x: 15 y: 29

R index: 78 x: 11 y: 29

33 - 29 = 4

29 - 29 = 0

19 - 15 = 4

15 - 11 = 4

4 / 4 = 1

0 / 4 = 1

1 - 0 = 1

Q index: 71 x: 18 y: 32

P index: 75 x: 14 y: 29

R index: 79 x: 10 y: 29

32 - 29 = 3

29 - 29 = 0

18 - 14 = 4

14 - 10 = 4

3 / 4 = 0.75

0 / 4 = 0.75

0.75 - 0 = 0.75

Q index: 72 x: 17 y: 31

P index: 76 x: 13 y: 29

R index: 80 x: 9 y: 29

31 - 29 = 2

29 - 29 = 0

17 - 13 = 4

13 - 9 = 4

2 / 4 = 0.5

0 / 4 = 0.5

0.5 - 0 = 0.5

Q index: 73 x: 16 y: 30

P index: 77 x: 12 y: 29

R index: 81 x: 8 y: 29

30 - 29 = 1

29 - 29 = 0

16 - 12 = 4

12 - 8 = 4

1 / 4 = 0.25

0 / 4 = 0.25

0.25 - 0 = 0.25

Q index: 74 x: 15 y: 29

P index: 78 x: 11 y: 29

R index: 82 x: 7 y: 29

29 - 29 = 0

29 - 29 = 0

15 - 11 = 4

11 - 7 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 75 x: 14 y: 29

P index: 79 x: 10 y: 29

R index: 83 x: 6 y: 29

29 - 29 = 0

29 - 29 = 0

14 - 10 = 4

10 - 6 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 76 x: 13 y: 29

P index: 80 x: 9 y: 29

R index: 84 x: 5 y: 29

29 - 29 = 0

29 - 29 = 0

13 - 9 = 4

9 - 5 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 77 x: 12 y: 29

P index: 81 x: 8 y: 29

R index: 85 x: 5 y: 28

29 - 29 = 0

29 - 28 = 1

12 - 8 = 4

8 - 5 = 3

0 / 4 = 0

1 / 3 = 0

0 - 0.333333 = 0.333333

Q index: 78 x: 11 y: 29

P index: 82 x: 7 y: 29

R index: 86 x: 5 y: 27

29 - 29 = 0

29 - 27 = 2

11 - 7 = 4

7 - 5 = 2

0 / 4 = 0

2 / 2 = 0

0 - 1 = 1

Q index: 79 x: 10 y: 29

P index: 83 x: 6 y: 29

R index: 87 x: 5 y: 26

29 - 29 = 0

29 - 26 = 3

10 - 6 = 4

6 - 5 = 1

0 / 4 = 0

3 / 1 = 0

0 - 3 = 3

Q index: 80 x: 9 y: 29

P index: 84 x: 5 y: 29

R index: 88 x: 5 y: 25

29 - 29 = 0

29 - 25 = 4

9 - 5 = 4

5 - 5 = 0

0 / 4 = 0

4 / 0.5 = 0

0 - 8 = 8

Q index: 81 x: 8 y: 29

P index: 85 x: 5 y: 28

R index: 89 x: 5 y: 24

29 - 28 = 1

28 - 24 = 4

8 - 5 = 3

5 - 5 = 0

1 / 3 = 0.333333

4 / 0.5 = 0.333333

0.333333 - 8 = 7.66667

Q index: 82 x: 7 y: 29

P index: 86 x: 5 y: 27

R index: 90 x: 5 y: 23

29 - 27 = 2

27 - 23 = 4

7 - 5 = 2

5 - 5 = 0

2 / 2 = 1

4 / 0.5 = 1

1 - 8 = 7

Q index: 83 x: 6 y: 29

P index: 87 x: 5 y: 26

R index: 91 x: 5 y: 22

29 - 26 = 3

26 - 22 = 4

6 - 5 = 1

5 - 5 = 0

3 / 1 = 3

4 / 0.5 = 3

3 - 8 = 5

Q index: 84 x: 5 y: 29

P index: 88 x: 5 y: 25

R index: 92 x: 5 y: 21

29 - 25 = 4

25 - 21 = 4

5 - 5 = 0

5 - 5 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 85 x: 5 y: 28

P index: 89 x: 5 y: 24

R index: 93 x: 5 y: 20

28 - 24 = 4

24 - 20 = 4

5 - 5 = 0

5 - 5 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 86 x: 5 y: 27

P index: 90 x: 5 y: 23

R index: 94 x: 5 y: 19

27 - 23 = 4

23 - 19 = 4

5 - 5 = 0

5 - 5 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 87 x: 5 y: 26

P index: 91 x: 5 y: 22

R index: 95 x: 5 y: 18

26 - 22 = 4

22 - 18 = 4

5 - 5 = 0

5 - 5 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 88 x: 5 y: 25

P index: 92 x: 5 y: 21

R index: 96 x: 5 y: 17

25 - 21 = 4

21 - 17 = 4

5 - 5 = 0

5 - 5 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 89 x: 5 y: 24

P index: 93 x: 5 y: 20

R index: 97 x: 5 y: 16

24 - 20 = 4

20 - 16 = 4

5 - 5 = 0

5 - 5 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 90 x: 5 y: 23

P index: 94 x: 5 y: 19

R index: 98 x: 5 y: 15

23 - 19 = 4

19 - 15 = 4

5 - 5 = 0

5 - 5 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 91 x: 5 y: 22

P index: 95 x: 5 y: 18

R index: 99 x: 5 y: 14

22 - 18 = 4

18 - 14 = 4

5 - 5 = 0

5 - 5 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 92 x: 5 y: 21

P index: 96 x: 5 y: 17

R index: 100 x: 5 y: 13

21 - 17 = 4

17 - 13 = 4

5 - 5 = 0

5 - 5 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 93 x: 5 y: 20

P index: 97 x: 5 y: 16

R index: 101 x: 5 y: 12

20 - 16 = 4

16 - 12 = 4

5 - 5 = 0

5 - 5 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 94 x: 5 y: 19

P index: 98 x: 5 y: 15

R index: 102 x: 5 y: 11

19 - 15 = 4

15 - 11 = 4

5 - 5 = 0

5 - 5 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 95 x: 5 y: 18

P index: 99 x: 5 y: 14

R index: 103 x: 5 y: 10

18 - 14 = 4

14 - 10 = 4

5 - 5 = 0

5 - 5 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 96 x: 5 y: 17

P index: 100 x: 5 y: 13

R index: 104 x: 5 y: 9

17 - 13 = 4

13 - 9 = 4

5 - 5 = 0

5 - 5 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 97 x: 5 y: 16

P index: 101 x: 5 y: 12

R index: 105 x: 5 y: 8

16 - 12 = 4

12 - 8 = 4

5 - 5 = 0

5 - 5 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 98 x: 5 y: 15

P index: 102 x: 5 y: 11

R index: 106 x: 5 y: 7

15 - 11 = 4

11 - 7 = 4

5 - 5 = 0

5 - 5 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 99 x: 5 y: 14

P index: 103 x: 5 y: 10

R index: 107 x: 5 y: 6

14 - 10 = 4

10 - 6 = 4

5 - 5 = 0

5 - 5 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 100 x: 5 y: 13

P index: 104 x: 5 y: 9

R index: 0 x: 5 y: 5

13 - 9 = 4

9 - 5 = 4

5 - 5 = 0

5 - 5 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 101 x: 5 y: 12

P index: 105 x: 5 y: 8

R index: 1 x: 6 y: 5

12 - 8 = 4

8 - 5 = 3

5 - 5 = 0

5 - 6 = 1

4 / 0.5 = 8

3 / 1 = 8

8 - 3 = 5

Q index: 102 x: 5 y: 11

P index: 106 x: 5 y: 7

R index: 2 x: 7 y: 5

11 - 7 = 4

7 - 5 = 2

5 - 5 = 0

5 - 7 = 2

4 / 0.5 = 8

2 / 2 = 8

8 - 1 = 7

Q index: 103 x: 5 y: 10

P index: 107 x: 5 y: 6

R index: 3 x: 8 y: 5

10 - 6 = 4

6 - 5 = 1

5 - 5 = 0

5 - 8 = 3

4 / 0.5 = 8

1 / 3 = 8

8 - 0.333333 = 7.66667

Q index: 104 x: 5 y: 9

P index: 0 x: 5 y: 5

R index: 4 x: 9 y: 5

9 - 5 = 4

5 - 5 = 0

5 - 5 = 0

5 - 9 = 4

4 / 0.5 = 8

0 / 4 = 8

8 - 0 = 8

Q index: 105 x: 5 y: 8

P index: 1 x: 6 y: 5

R index: 5 x: 10 y: 5

8 - 5 = 3

5 - 5 = 0

5 - 6 = 1

6 - 10 = 4

3 / 1 = 3

0 / 4 = 3

3 - 0 = 3

Q index: 106 x: 5 y: 7

P index: 2 x: 7 y: 5

R index: 6 x: 11 y: 5

7 - 5 = 2

5 - 5 = 0

5 - 7 = 2

7 - 11 = 4

2 / 2 = 1

0 / 4 = 1

1 - 0 = 1

Q index: 107 x: 5 y: 6

P index: 3 x: 8 y: 5

R index: 7 x: 12 y: 5

6 - 5 = 1

5 - 5 = 0

5 - 8 = 3

8 - 12 = 4

1 / 3 = 0.333333

0 / 4 = 0.333333

0.333333 - 0 = 0.333333

40 40 0 1

1

x: 5 y: 5 curvature: 8

x: 6 y: 5 curvature: 3

x: 7 y: 5 curvature: 1

x: 8 y: 5 curvature: 0.333333

x: 9 y: 5 curvature: 0

x: 10 y: 5 curvature: 0

x: 11 y: 5 curvature: 0

x: 12 y: 5 curvature: 0.25

x: 13 y: 5 curvature: 0.5

x: 14 y: 5 curvature: 0.75

x: 15 y: 5 curvature: 1

x: 16 y: 6 curvature: 0.75

x: 17 y: 7 curvature: 0

x: 18 y: 8 curvature: 0.75

x: 19 y: 9 curvature: 1.5

x: 20 y: 10 curvature: 2

x: 21 y: 9 curvature: 1.5

x: 22 y: 8 curvature: 0.75

x: 23 y: 7 curvature: 0

x: 24 y: 6 curvature: 0.75

x: 25 y: 5 curvature: 1

x: 26 y: 5 curvature: 0.75

x: 27 y: 5 curvature: 0.5

x: 28 y: 5 curvature: 0.25

x: 29 y: 5 curvature: 0

x: 30 y: 5 curvature: 0

x: 31 y: 5 curvature: 0

x: 32 y: 5 curvature: 0.333333

x: 33 y: 5 curvature: 1

x: 34 y: 5 curvature: 3

x: 35 y: 5 curvature: 8

x: 35 y: 6 curvature: 7.66667

x: 35 y: 7 curvature: 7

x: 35 y: 8 curvature: 5

x: 35 y: 9 curvature: 0

x: 35 y: 10 curvature: 0

x: 35 y: 11 curvature: 0

x: 35 y: 12 curvature: 0

x: 35 y: 13 curvature: 0

x: 35 y: 14 curvature: 0

x: 35 y: 15 curvature: 0

x: 35 y: 16 curvature: 0

x: 35 y: 17 curvature: 0

x: 35 y: 18 curvature: 0

x: 35 y: 19 curvature: 0

x: 35 y: 20 curvature: 0

x: 35 y: 21 curvature: 0

x: 35 y: 22 curvature: 0

x: 35 y: 23 curvature: 0

x: 35 y: 24 curvature: 0

x: 35 y: 25 curvature: 0

x: 35 y: 26 curvature: 5

x: 35 y: 27 curvature: 7

x: 35 y: 28 curvature: 7.66667

x: 35 y: 29 curvature: 8

x: 34 y: 29 curvature: 3

x: 33 y: 29 curvature: 1

x: 32 y: 29 curvature: 0.333333

x: 31 y: 29 curvature: 0

x: 30 y: 29 curvature: 0

x: 29 y: 29 curvature: 0

x: 28 y: 29 curvature: 0.25

x: 27 y: 29 curvature: 0.5

x: 26 y: 29 curvature: 0.75

x: 25 y: 29 curvature: 1

x: 24 y: 30 curvature: 0.75

x: 23 y: 31 curvature: 0

x: 22 y: 32 curvature: 0.75

x: 21 y: 33 curvature: 1.5

x: 20 y: 34 curvature: 2

x: 19 y: 33 curvature: 1.5

x: 18 y: 32 curvature: 0.75

x: 17 y: 31 curvature: 0

x: 16 y: 30 curvature: 0.75

x: 15 y: 29 curvature: 1

x: 14 y: 29 curvature: 0.75

x: 13 y: 29 curvature: 0.5

x: 12 y: 29 curvature: 0.25

x: 11 y: 29 curvature: 0

x: 10 y: 29 curvature: 0

x: 9 y: 29 curvature: 0

x: 8 y: 29 curvature: 0.333333

x: 7 y: 29 curvature: 1

x: 6 y: 29 curvature: 3

x: 5 y: 29 curvature: 8

x: 5 y: 28 curvature: 7.66667

x: 5 y: 27 curvature: 7

x: 5 y: 26 curvature: 5

x: 5 y: 25 curvature: 0

x: 5 y: 24 curvature: 0

x: 5 y: 23 curvature: 0

x: 5 y: 22 curvature: 0

x: 5 y: 21 curvature: 0

x: 5 y: 20 curvature: 0

x: 5 y: 19 curvature: 0

x: 5 y: 18 curvature: 0

x: 5 y: 17 curvature: 0

x: 5 y: 16 curvature: 0

x: 5 y: 15 curvature: 0

x: 5 y: 14 curvature: 0

x: 5 y: 13 curvature: 0

x: 5 y: 12 curvature: 0

x: 5 y: 11 curvature: 0

x: 5 y: 10 curvature: 0

x: 5 y: 9 curvature: 0

x: 5 y: 8 curvature: 5

x: 5 y: 7 curvature: 7

x: 5 y: 6 curvature: 7.66667

**Data D Outputs:**

**outFile 1:**

40 40 0 1

15 15 9

6 14 1

7 13 1

8 12 1

9 11 1

10 10 1

11 9 1

12 8 1

13 7 1

14 6 1

15 5 9

16 5 1

17 5 1

18 5 1

19 5 1

20 5 1

21 5 1

22 5 1

23 5 1

24 5 9

25 6 1

26 7 1

27 8 1

28 9 1

29 10 1

30 11 1

31 12 1

32 13 1

33 14 1

34 15 9

34 16 1

34 17 1

34 18 1

34 19 1

34 20 1

34 21 1

34 22 1

34 23 1

34 24 9

33 25 1

32 26 1

31 27 1

30 28 1

29 29 1

28 30 1

27 31 1

26 32 1

25 33 1

24 34 9

23 34 1

22 34 1

21 34 1

20 34 1

19 34 1

18 34 1

17 34 1

16 34 1

15 34 9

14 33 1

13 32 1

12 31 1

11 30 1

10 29 1

9 28 1

8 27 1

7 26 1

6 25 1

5 24 9

5 23 1

5 22 1

5 21 1

5 20 1

5 19 1

5 18 1

5 17 1

5 16 1

**outFile 2:**

40 40 0 1

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . 9 1 1 1 1 1 1 1 1 9 . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . 1 . . . . . . . . . . 1 . . . . . . . . . . . . . .

. . . . . . . . . . . . . 1 . . . . . . . . . . . . 1 . . . . . . . . . . . . .

. . . . . . . . . . . . 1 . . . . . . . . . . . . . . 1 . . . . . . . . . . . .

. . . . . . . . . . . 1 . . . . . . . . . . . . . . . . 1 . . . . . . . . . . .

. . . . . . . . . . 1 . . . . . . . . . . . . . . . . . . 1 . . . . . . . . . .

. . . . . . . . . 1 . . . . . . . . . . . . . . . . . . . . 1 . . . . . . . . .

. . . . . . . . 1 . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . . .

. . . . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . .

. . . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . .

. . . . . 9 . . . . . . . . . . . . . . . . . . . . . . . . . . . . 9 . . . . .

. . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . .

. . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . .

. . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . .

. . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . .

. . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . .

. . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . .

. . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . .

. . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . .

. . . . . 9 . . . . . . . . . . . . . . . . . . . . . . . . . . . . 9 . . . . .

. . . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . .

. . . . . . . 1 . . . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . .

. . . . . . . . 1 . . . . . . . . . . . . . . . . . . . . . . 1 . . . . . . . .

. . . . . . . . . 1 . . . . . . . . . . . . . . . . . . . . 1 . . . . . . . . .

. . . . . . . . . . 1 . . . . . . . . . . . . . . . . . . 1 . . . . . . . . . .

. . . . . . . . . . . 1 . . . . . . . . . . . . . . . . 1 . . . . . . . . . . .

. . . . . . . . . . . . 1 . . . . . . . . . . . . . . 1 . . . . . . . . . . . .

. . . . . . . . . . . . . 1 . . . . . . . . . . . . 1 . . . . . . . . . . . . .

. . . . . . . . . . . . . . 1 . . . . . . . . . . 1 . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . 9 1 1 1 1 1 1 1 1 9 . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

**outFile3(debug):**

K value: 4PtAry after initialization

40 40 0 1

1

x: 5 y: 15 curvature: 0

x: 6 y: 14 curvature: 0

x: 7 y: 13 curvature: 0

x: 8 y: 12 curvature: 0

x: 9 y: 11 curvature: 0

x: 10 y: 10 curvature: 0

x: 11 y: 9 curvature: 0

x: 12 y: 8 curvature: 0

x: 13 y: 7 curvature: 0

x: 14 y: 6 curvature: 0

x: 15 y: 5 curvature: 0

x: 16 y: 5 curvature: 0

x: 17 y: 5 curvature: 0

x: 18 y: 5 curvature: 0

x: 19 y: 5 curvature: 0

x: 20 y: 5 curvature: 0

x: 21 y: 5 curvature: 0

x: 22 y: 5 curvature: 0

x: 23 y: 5 curvature: 0

x: 24 y: 5 curvature: 0

x: 25 y: 6 curvature: 0

x: 26 y: 7 curvature: 0

x: 27 y: 8 curvature: 0

x: 28 y: 9 curvature: 0

x: 29 y: 10 curvature: 0

x: 30 y: 11 curvature: 0

x: 31 y: 12 curvature: 0

x: 32 y: 13 curvature: 0

x: 33 y: 14 curvature: 0

x: 34 y: 15 curvature: 0

x: 34 y: 16 curvature: 0

x: 34 y: 17 curvature: 0

x: 34 y: 18 curvature: 0

x: 34 y: 19 curvature: 0

x: 34 y: 20 curvature: 0

x: 34 y: 21 curvature: 0

x: 34 y: 22 curvature: 0

x: 34 y: 23 curvature: 0

x: 34 y: 24 curvature: 0

x: 33 y: 25 curvature: 0

x: 32 y: 26 curvature: 0

x: 31 y: 27 curvature: 0

x: 30 y: 28 curvature: 0

x: 29 y: 29 curvature: 0

x: 28 y: 30 curvature: 0

x: 27 y: 31 curvature: 0

x: 26 y: 32 curvature: 0

x: 25 y: 33 curvature: 0

x: 24 y: 34 curvature: 0

x: 23 y: 34 curvature: 0

x: 22 y: 34 curvature: 0

x: 21 y: 34 curvature: 0

x: 20 y: 34 curvature: 0

x: 19 y: 34 curvature: 0

x: 18 y: 34 curvature: 0

x: 17 y: 34 curvature: 0

x: 16 y: 34 curvature: 0

x: 15 y: 34 curvature: 0

x: 14 y: 33 curvature: 0

x: 13 y: 32 curvature: 0

x: 12 y: 31 curvature: 0

x: 11 y: 30 curvature: 0

x: 10 y: 29 curvature: 0

x: 9 y: 28 curvature: 0

x: 8 y: 27 curvature: 0

x: 7 y: 26 curvature: 0

x: 6 y: 25 curvature: 0

x: 5 y: 24 curvature: 0

x: 5 y: 23 curvature: 0

x: 5 y: 22 curvature: 0

x: 5 y: 21 curvature: 0

x: 5 y: 20 curvature: 0

x: 5 y: 19 curvature: 0

x: 5 y: 18 curvature: 0

x: 5 y: 17 curvature: 0

x: 5 y: 16 curvature: 0

Calculating Curvature debugging

Q index: 0 x: 5 y: 15

P index: 4 x: 9 y: 11

R index: 8 x: 13 y: 7

15 - 11 = 4

11 - 7 = 4

5 - 9 = 4

9 - 13 = 4

4 / 4 = 1

4 / 4 = 1

1 - 1 = 0

Q index: 1 x: 6 y: 14

P index: 5 x: 10 y: 10

R index: 9 x: 14 y: 6

14 - 10 = 4

10 - 6 = 4

6 - 10 = 4

10 - 14 = 4

4 / 4 = 1

4 / 4 = 1

1 - 1 = 0

Q index: 2 x: 7 y: 13

P index: 6 x: 11 y: 9

R index: 10 x: 15 y: 5

13 - 9 = 4

9 - 5 = 4

7 - 11 = 4

11 - 15 = 4

4 / 4 = 1

4 / 4 = 1

1 - 1 = 0

Q index: 3 x: 8 y: 12

P index: 7 x: 12 y: 8

R index: 11 x: 16 y: 5

12 - 8 = 4

8 - 5 = 3

8 - 12 = 4

12 - 16 = 4

4 / 4 = 1

3 / 4 = 1

1 - 0.75 = 0.25

Q index: 4 x: 9 y: 11

P index: 8 x: 13 y: 7

R index: 12 x: 17 y: 5

11 - 7 = 4

7 - 5 = 2

9 - 13 = 4

13 - 17 = 4

4 / 4 = 1

2 / 4 = 1

1 - 0.5 = 0.5

Q index: 5 x: 10 y: 10

P index: 9 x: 14 y: 6

R index: 13 x: 18 y: 5

10 - 6 = 4

6 - 5 = 1

10 - 14 = 4

14 - 18 = 4

4 / 4 = 1

1 / 4 = 1

1 - 0.25 = 0.75

Q index: 6 x: 11 y: 9

P index: 10 x: 15 y: 5

R index: 14 x: 19 y: 5

9 - 5 = 4

5 - 5 = 0

11 - 15 = 4

15 - 19 = 4

4 / 4 = 1

0 / 4 = 1

1 - 0 = 1

Q index: 7 x: 12 y: 8

P index: 11 x: 16 y: 5

R index: 15 x: 20 y: 5

8 - 5 = 3

5 - 5 = 0

12 - 16 = 4

16 - 20 = 4

3 / 4 = 0.75

0 / 4 = 0.75

0.75 - 0 = 0.75

Q index: 8 x: 13 y: 7

P index: 12 x: 17 y: 5

R index: 16 x: 21 y: 5

7 - 5 = 2

5 - 5 = 0

13 - 17 = 4

17 - 21 = 4

2 / 4 = 0.5

0 / 4 = 0.5

0.5 - 0 = 0.5

Q index: 9 x: 14 y: 6

P index: 13 x: 18 y: 5

R index: 17 x: 22 y: 5

6 - 5 = 1

5 - 5 = 0

14 - 18 = 4

18 - 22 = 4

1 / 4 = 0.25

0 / 4 = 0.25

0.25 - 0 = 0.25

Q index: 10 x: 15 y: 5

P index: 14 x: 19 y: 5

R index: 18 x: 23 y: 5

5 - 5 = 0

5 - 5 = 0

15 - 19 = 4

19 - 23 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 11 x: 16 y: 5

P index: 15 x: 20 y: 5

R index: 19 x: 24 y: 5

5 - 5 = 0

5 - 5 = 0

16 - 20 = 4

20 - 24 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 12 x: 17 y: 5

P index: 16 x: 21 y: 5

R index: 20 x: 25 y: 6

5 - 5 = 0

5 - 6 = -1

17 - 21 = 4

21 - 25 = 4

0 / 4 = 0

-1 / 4 = 0

0 - -0.25 = 0.25

Q index: 13 x: 18 y: 5

P index: 17 x: 22 y: 5

R index: 21 x: 26 y: 7

5 - 5 = 0

5 - 7 = -2

18 - 22 = 4

22 - 26 = 4

0 / 4 = 0

-2 / 4 = 0

0 - -0.5 = 0.5

Q index: 14 x: 19 y: 5

P index: 18 x: 23 y: 5

R index: 22 x: 27 y: 8

5 - 5 = 0

5 - 8 = -3

19 - 23 = 4

23 - 27 = 4

0 / 4 = 0

-3 / 4 = 0

0 - -0.75 = 0.75

Q index: 15 x: 20 y: 5

P index: 19 x: 24 y: 5

R index: 23 x: 28 y: 9

5 - 5 = 0

5 - 9 = -4

20 - 24 = 4

24 - 28 = 4

0 / 4 = 0

-4 / 4 = 0

0 - -1 = 1

Q index: 16 x: 21 y: 5

P index: 20 x: 25 y: 6

R index: 24 x: 29 y: 10

5 - 6 = -1

6 - 10 = -4

21 - 25 = 4

25 - 29 = 4

-1 / 4 = -0.25

-4 / 4 = -0.25

-0.25 - -1 = 0.75

Q index: 17 x: 22 y: 5

P index: 21 x: 26 y: 7

R index: 25 x: 30 y: 11

5 - 7 = -2

7 - 11 = -4

22 - 26 = 4

26 - 30 = 4

-2 / 4 = -0.5

-4 / 4 = -0.5

-0.5 - -1 = 0.5

Q index: 18 x: 23 y: 5

P index: 22 x: 27 y: 8

R index: 26 x: 31 y: 12

5 - 8 = -3

8 - 12 = -4

23 - 27 = 4

27 - 31 = 4

-3 / 4 = -0.75

-4 / 4 = -0.75

-0.75 - -1 = 0.25

Q index: 19 x: 24 y: 5

P index: 23 x: 28 y: 9

R index: 27 x: 32 y: 13

5 - 9 = -4

9 - 13 = -4

24 - 28 = 4

28 - 32 = 4

-4 / 4 = -1

-4 / 4 = -1

-1 - -1 = 0

Q index: 20 x: 25 y: 6

P index: 24 x: 29 y: 10

R index: 28 x: 33 y: 14

6 - 10 = -4

10 - 14 = -4

25 - 29 = 4

29 - 33 = 4

-4 / 4 = -1

-4 / 4 = -1

-1 - -1 = 0

Q index: 21 x: 26 y: 7

P index: 25 x: 30 y: 11

R index: 29 x: 34 y: 15

7 - 11 = -4

11 - 15 = -4

26 - 30 = 4

30 - 34 = 4

-4 / 4 = -1

-4 / 4 = -1

-1 - -1 = 0

Q index: 22 x: 27 y: 8

P index: 26 x: 31 y: 12

R index: 30 x: 34 y: 16

8 - 12 = -4

12 - 16 = -4

27 - 31 = 4

31 - 34 = 3

-4 / 4 = -1

-4 / 3 = -1

-1 - -1.33333 = 0.333333

Q index: 23 x: 28 y: 9

P index: 27 x: 32 y: 13

R index: 31 x: 34 y: 17

9 - 13 = -4

13 - 17 = -4

28 - 32 = 4

32 - 34 = 2

-4 / 4 = -1

-4 / 2 = -1

-1 - -2 = 1

Q index: 24 x: 29 y: 10

P index: 28 x: 33 y: 14

R index: 32 x: 34 y: 18

10 - 14 = -4

14 - 18 = -4

29 - 33 = 4

33 - 34 = 1

-4 / 4 = -1

-4 / 1 = -1

-1 - -4 = 3

Q index: 25 x: 30 y: 11

P index: 29 x: 34 y: 15

R index: 33 x: 34 y: 19

11 - 15 = -4

15 - 19 = -4

30 - 34 = 4

34 - 34 = 0

-4 / 4 = -1

-4 / 0.5 = -1

-1 - -8 = 7

Q index: 26 x: 31 y: 12

P index: 30 x: 34 y: 16

R index: 34 x: 34 y: 20

12 - 16 = -4

16 - 20 = -4

31 - 34 = 3

34 - 34 = 0

-4 / 3 = -1.33333

-4 / 0.5 = -1.33333

-1.33333 - -8 = 6.66667

Q index: 27 x: 32 y: 13

P index: 31 x: 34 y: 17

R index: 35 x: 34 y: 21

13 - 17 = -4

17 - 21 = -4

32 - 34 = 2

34 - 34 = 0

-4 / 2 = -2

-4 / 0.5 = -2

-2 - -8 = 6

Q index: 28 x: 33 y: 14

P index: 32 x: 34 y: 18

R index: 36 x: 34 y: 22

14 - 18 = -4

18 - 22 = -4

33 - 34 = 1

34 - 34 = 0

-4 / 1 = -4

-4 / 0.5 = -4

-4 - -8 = 4

Q index: 29 x: 34 y: 15

P index: 33 x: 34 y: 19

R index: 37 x: 34 y: 23

15 - 19 = -4

19 - 23 = -4

34 - 34 = 0

34 - 34 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 30 x: 34 y: 16

P index: 34 x: 34 y: 20

R index: 38 x: 34 y: 24

16 - 20 = -4

20 - 24 = -4

34 - 34 = 0

34 - 34 = 0

-4 / 0.5 = -8

-4 / 0.5 = -8

-8 - -8 = 0

Q index: 31 x: 34 y: 17

P index: 35 x: 34 y: 21

R index: 39 x: 33 y: 25

17 - 21 = -4

21 - 25 = -4

34 - 34 = 0

34 - 33 = 1

-4 / 0.5 = -8

-4 / 1 = -8

-8 - -4 = 4

Q index: 32 x: 34 y: 18

P index: 36 x: 34 y: 22

R index: 40 x: 32 y: 26

18 - 22 = -4

22 - 26 = -4

34 - 34 = 0

34 - 32 = 2

-4 / 0.5 = -8

-4 / 2 = -8

-8 - -2 = 6

Q index: 33 x: 34 y: 19

P index: 37 x: 34 y: 23

R index: 41 x: 31 y: 27

19 - 23 = -4

23 - 27 = -4

34 - 34 = 0

34 - 31 = 3

-4 / 0.5 = -8

-4 / 3 = -8

-8 - -1.33333 = 6.66667

Q index: 34 x: 34 y: 20

P index: 38 x: 34 y: 24

R index: 42 x: 30 y: 28

20 - 24 = -4

24 - 28 = -4

34 - 34 = 0

34 - 30 = 4

-4 / 0.5 = -8

-4 / 4 = -8

-8 - -1 = 7

Q index: 35 x: 34 y: 21

P index: 39 x: 33 y: 25

R index: 43 x: 29 y: 29

21 - 25 = -4

25 - 29 = -4

34 - 33 = 1

33 - 29 = 4

-4 / 1 = -4

-4 / 4 = -4

-4 - -1 = 3

Q index: 36 x: 34 y: 22

P index: 40 x: 32 y: 26

R index: 44 x: 28 y: 30

22 - 26 = -4

26 - 30 = -4

34 - 32 = 2

32 - 28 = 4

-4 / 2 = -2

-4 / 4 = -2

-2 - -1 = 1

Q index: 37 x: 34 y: 23

P index: 41 x: 31 y: 27

R index: 45 x: 27 y: 31

23 - 27 = -4

27 - 31 = -4

34 - 31 = 3

31 - 27 = 4

-4 / 3 = -1.33333

-4 / 4 = -1.33333

-1.33333 - -1 = 0.333333

Q index: 38 x: 34 y: 24

P index: 42 x: 30 y: 28

R index: 46 x: 26 y: 32

24 - 28 = -4

28 - 32 = -4

34 - 30 = 4

30 - 26 = 4

-4 / 4 = -1

-4 / 4 = -1

-1 - -1 = 0

Q index: 39 x: 33 y: 25

P index: 43 x: 29 y: 29

R index: 47 x: 25 y: 33

25 - 29 = -4

29 - 33 = -4

33 - 29 = 4

29 - 25 = 4

-4 / 4 = -1

-4 / 4 = -1

-1 - -1 = 0

Q index: 40 x: 32 y: 26

P index: 44 x: 28 y: 30

R index: 48 x: 24 y: 34

26 - 30 = -4

30 - 34 = -4

32 - 28 = 4

28 - 24 = 4

-4 / 4 = -1

-4 / 4 = -1

-1 - -1 = 0

Q index: 41 x: 31 y: 27

P index: 45 x: 27 y: 31

R index: 49 x: 23 y: 34

27 - 31 = -4

31 - 34 = -3

31 - 27 = 4

27 - 23 = 4

-4 / 4 = -1

-3 / 4 = -1

-1 - -0.75 = 0.25

Q index: 42 x: 30 y: 28

P index: 46 x: 26 y: 32

R index: 50 x: 22 y: 34

28 - 32 = -4

32 - 34 = -2

30 - 26 = 4

26 - 22 = 4

-4 / 4 = -1

-2 / 4 = -1

-1 - -0.5 = 0.5

Q index: 43 x: 29 y: 29

P index: 47 x: 25 y: 33

R index: 51 x: 21 y: 34

29 - 33 = -4

33 - 34 = -1

29 - 25 = 4

25 - 21 = 4

-4 / 4 = -1

-1 / 4 = -1

-1 - -0.25 = 0.75

Q index: 44 x: 28 y: 30

P index: 48 x: 24 y: 34

R index: 52 x: 20 y: 34

30 - 34 = -4

34 - 34 = 0

28 - 24 = 4

24 - 20 = 4

-4 / 4 = -1

0 / 4 = -1

-1 - 0 = 1

Q index: 45 x: 27 y: 31

P index: 49 x: 23 y: 34

R index: 53 x: 19 y: 34

31 - 34 = -3

34 - 34 = 0

27 - 23 = 4

23 - 19 = 4

-3 / 4 = -0.75

0 / 4 = -0.75

-0.75 - 0 = 0.75

Q index: 46 x: 26 y: 32

P index: 50 x: 22 y: 34

R index: 54 x: 18 y: 34

32 - 34 = -2

34 - 34 = 0

26 - 22 = 4

22 - 18 = 4

-2 / 4 = -0.5

0 / 4 = -0.5

-0.5 - 0 = 0.5

Q index: 47 x: 25 y: 33

P index: 51 x: 21 y: 34

R index: 55 x: 17 y: 34

33 - 34 = -1

34 - 34 = 0

25 - 21 = 4

21 - 17 = 4

-1 / 4 = -0.25

0 / 4 = -0.25

-0.25 - 0 = 0.25

Q index: 48 x: 24 y: 34

P index: 52 x: 20 y: 34

R index: 56 x: 16 y: 34

34 - 34 = 0

34 - 34 = 0

24 - 20 = 4

20 - 16 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 49 x: 23 y: 34

P index: 53 x: 19 y: 34

R index: 57 x: 15 y: 34

34 - 34 = 0

34 - 34 = 0

23 - 19 = 4

19 - 15 = 4

0 / 4 = 0

0 / 4 = 0

0 - 0 = 0

Q index: 50 x: 22 y: 34

P index: 54 x: 18 y: 34

R index: 58 x: 14 y: 33

34 - 34 = 0

34 - 33 = 1

22 - 18 = 4

18 - 14 = 4

0 / 4 = 0

1 / 4 = 0

0 - 0.25 = 0.25

Q index: 51 x: 21 y: 34

P index: 55 x: 17 y: 34

R index: 59 x: 13 y: 32

34 - 34 = 0

34 - 32 = 2

21 - 17 = 4

17 - 13 = 4

0 / 4 = 0

2 / 4 = 0

0 - 0.5 = 0.5

Q index: 52 x: 20 y: 34

P index: 56 x: 16 y: 34

R index: 60 x: 12 y: 31

34 - 34 = 0

34 - 31 = 3

20 - 16 = 4

16 - 12 = 4

0 / 4 = 0

3 / 4 = 0

0 - 0.75 = 0.75

Q index: 53 x: 19 y: 34

P index: 57 x: 15 y: 34

R index: 61 x: 11 y: 30

34 - 34 = 0

34 - 30 = 4

19 - 15 = 4

15 - 11 = 4

0 / 4 = 0

4 / 4 = 0

0 - 1 = 1

Q index: 54 x: 18 y: 34

P index: 58 x: 14 y: 33

R index: 62 x: 10 y: 29

34 - 33 = 1

33 - 29 = 4

18 - 14 = 4

14 - 10 = 4

1 / 4 = 0.25

4 / 4 = 0.25

0.25 - 1 = 0.75

Q index: 55 x: 17 y: 34

P index: 59 x: 13 y: 32

R index: 63 x: 9 y: 28

34 - 32 = 2

32 - 28 = 4

17 - 13 = 4

13 - 9 = 4

2 / 4 = 0.5

4 / 4 = 0.5

0.5 - 1 = 0.5

Q index: 56 x: 16 y: 34

P index: 60 x: 12 y: 31

R index: 64 x: 8 y: 27

34 - 31 = 3

31 - 27 = 4

16 - 12 = 4

12 - 8 = 4

3 / 4 = 0.75

4 / 4 = 0.75

0.75 - 1 = 0.25

Q index: 57 x: 15 y: 34

P index: 61 x: 11 y: 30

R index: 65 x: 7 y: 26

34 - 30 = 4

30 - 26 = 4

15 - 11 = 4

11 - 7 = 4

4 / 4 = 1

4 / 4 = 1

1 - 1 = 0

Q index: 58 x: 14 y: 33

P index: 62 x: 10 y: 29

R index: 66 x: 6 y: 25

33 - 29 = 4

29 - 25 = 4

14 - 10 = 4

10 - 6 = 4

4 / 4 = 1

4 / 4 = 1

1 - 1 = 0

Q index: 59 x: 13 y: 32

P index: 63 x: 9 y: 28

R index: 67 x: 5 y: 24

32 - 28 = 4

28 - 24 = 4

13 - 9 = 4

9 - 5 = 4

4 / 4 = 1

4 / 4 = 1

1 - 1 = 0

Q index: 60 x: 12 y: 31

P index: 64 x: 8 y: 27

R index: 68 x: 5 y: 23

31 - 27 = 4

27 - 23 = 4

12 - 8 = 4

8 - 5 = 3

4 / 4 = 1

4 / 3 = 1

1 - 1.33333 = 0.333333

Q index: 61 x: 11 y: 30

P index: 65 x: 7 y: 26

R index: 69 x: 5 y: 22

30 - 26 = 4

26 - 22 = 4

11 - 7 = 4

7 - 5 = 2

4 / 4 = 1

4 / 2 = 1

1 - 2 = 1

Q index: 62 x: 10 y: 29

P index: 66 x: 6 y: 25

R index: 70 x: 5 y: 21

29 - 25 = 4

25 - 21 = 4

10 - 6 = 4

6 - 5 = 1

4 / 4 = 1

4 / 1 = 1

1 - 4 = 3

Q index: 63 x: 9 y: 28

P index: 67 x: 5 y: 24

R index: 71 x: 5 y: 20

28 - 24 = 4

24 - 20 = 4

9 - 5 = 4

5 - 5 = 0

4 / 4 = 1

4 / 0.5 = 1

1 - 8 = 7

Q index: 64 x: 8 y: 27

P index: 68 x: 5 y: 23

R index: 72 x: 5 y: 19

27 - 23 = 4

23 - 19 = 4

8 - 5 = 3

5 - 5 = 0

4 / 3 = 1.33333

4 / 0.5 = 1.33333

1.33333 - 8 = 6.66667

Q index: 65 x: 7 y: 26

P index: 69 x: 5 y: 22

R index: 73 x: 5 y: 18

26 - 22 = 4

22 - 18 = 4

7 - 5 = 2

5 - 5 = 0

4 / 2 = 2

4 / 0.5 = 2

2 - 8 = 6

Q index: 66 x: 6 y: 25

P index: 70 x: 5 y: 21

R index: 74 x: 5 y: 17

25 - 21 = 4

21 - 17 = 4

6 - 5 = 1

5 - 5 = 0

4 / 1 = 4

4 / 0.5 = 4

4 - 8 = 4

Q index: 67 x: 5 y: 24

P index: 71 x: 5 y: 20

R index: 75 x: 5 y: 16

24 - 20 = 4

20 - 16 = 4

5 - 5 = 0

5 - 5 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 68 x: 5 y: 23

P index: 72 x: 5 y: 19

R index: 0 x: 5 y: 15

23 - 19 = 4

19 - 15 = 4

5 - 5 = 0

5 - 5 = 0

4 / 0.5 = 8

4 / 0.5 = 8

8 - 8 = 0

Q index: 69 x: 5 y: 22

P index: 73 x: 5 y: 18

R index: 1 x: 6 y: 14

22 - 18 = 4

18 - 14 = 4

5 - 5 = 0

5 - 6 = 1

4 / 0.5 = 8

4 / 1 = 8

8 - 4 = 4

Q index: 70 x: 5 y: 21

P index: 74 x: 5 y: 17

R index: 2 x: 7 y: 13

21 - 17 = 4

17 - 13 = 4

5 - 5 = 0

5 - 7 = 2

4 / 0.5 = 8

4 / 2 = 8

8 - 2 = 6

Q index: 71 x: 5 y: 20

P index: 75 x: 5 y: 16

R index: 3 x: 8 y: 12

20 - 16 = 4

16 - 12 = 4

5 - 5 = 0

5 - 8 = 3

4 / 0.5 = 8

4 / 3 = 8

8 - 1.33333 = 6.66667

Q index: 72 x: 5 y: 19

P index: 0 x: 5 y: 15

R index: 4 x: 9 y: 11

19 - 15 = 4

15 - 11 = 4

5 - 5 = 0

5 - 9 = 4

4 / 0.5 = 8

4 / 4 = 8

8 - 1 = 7

Q index: 73 x: 5 y: 18

P index: 1 x: 6 y: 14

R index: 5 x: 10 y: 10

18 - 14 = 4

14 - 10 = 4

5 - 6 = 1

6 - 10 = 4

4 / 1 = 4

4 / 4 = 4

4 - 1 = 3

Q index: 74 x: 5 y: 17

P index: 2 x: 7 y: 13

R index: 6 x: 11 y: 9

17 - 13 = 4

13 - 9 = 4

5 - 7 = 2

7 - 11 = 4

4 / 2 = 2

4 / 4 = 2

2 - 1 = 1

Q index: 75 x: 5 y: 16

P index: 3 x: 8 y: 12

R index: 7 x: 12 y: 8

16 - 12 = 4

12 - 8 = 4

5 - 8 = 3

8 - 12 = 4

4 / 3 = 1.33333

4 / 4 = 1.33333

1.33333 - 1 = 0.333333

PtAry after Corner Detection

40 40 0 1

1

x: 5 y: 15 curvature: 7

x: 6 y: 14 curvature: 3

x: 7 y: 13 curvature: 1

x: 8 y: 12 curvature: 0.333333

x: 9 y: 11 curvature: 0

x: 10 y: 10 curvature: 0

x: 11 y: 9 curvature: 0

x: 12 y: 8 curvature: 0.25

x: 13 y: 7 curvature: 0.5

x: 14 y: 6 curvature: 0.75

x: 15 y: 5 curvature: 1

x: 16 y: 5 curvature: 0.75

x: 17 y: 5 curvature: 0.5

x: 18 y: 5 curvature: 0.25

x: 19 y: 5 curvature: 0

x: 20 y: 5 curvature: 0

x: 21 y: 5 curvature: 0.25

x: 22 y: 5 curvature: 0.5

x: 23 y: 5 curvature: 0.75

x: 24 y: 5 curvature: 1

x: 25 y: 6 curvature: 0.75

x: 26 y: 7 curvature: 0.5

x: 27 y: 8 curvature: 0.25

x: 28 y: 9 curvature: 0

x: 29 y: 10 curvature: 0

x: 30 y: 11 curvature: 0

x: 31 y: 12 curvature: 0.333333

x: 32 y: 13 curvature: 1

x: 33 y: 14 curvature: 3

x: 34 y: 15 curvature: 7

x: 34 y: 16 curvature: 6.66667

x: 34 y: 17 curvature: 6

x: 34 y: 18 curvature: 4

x: 34 y: 19 curvature: 0

x: 34 y: 20 curvature: 0

x: 34 y: 21 curvature: 4

x: 34 y: 22 curvature: 6

x: 34 y: 23 curvature: 6.66667

x: 34 y: 24 curvature: 7

x: 33 y: 25 curvature: 3

x: 32 y: 26 curvature: 1

x: 31 y: 27 curvature: 0.333333

x: 30 y: 28 curvature: 0

x: 29 y: 29 curvature: 0

x: 28 y: 30 curvature: 0

x: 27 y: 31 curvature: 0.25

x: 26 y: 32 curvature: 0.5

x: 25 y: 33 curvature: 0.75

x: 24 y: 34 curvature: 1

x: 23 y: 34 curvature: 0.75

x: 22 y: 34 curvature: 0.5

x: 21 y: 34 curvature: 0.25

x: 20 y: 34 curvature: 0

x: 19 y: 34 curvature: 0

x: 18 y: 34 curvature: 0.25

x: 17 y: 34 curvature: 0.5

x: 16 y: 34 curvature: 0.75

x: 15 y: 34 curvature: 1

x: 14 y: 33 curvature: 0.75

x: 13 y: 32 curvature: 0.5

x: 12 y: 31 curvature: 0.25

x: 11 y: 30 curvature: 0

x: 10 y: 29 curvature: 0

x: 9 y: 28 curvature: 0

x: 8 y: 27 curvature: 0.333333

x: 7 y: 26 curvature: 1

x: 6 y: 25 curvature: 3

x: 5 y: 24 curvature: 7

x: 5 y: 23 curvature: 6.66667

x: 5 y: 22 curvature: 6

x: 5 y: 21 curvature: 4

x: 5 y: 20 curvature: 0

x: 5 y: 19 curvature: 0

x: 5 y: 18 curvature: 4

x: 5 y: 17 curvature: 6

x: 5 y: 16 curvature: 6.66667