JPEG Encoder and Decoder

JPEG Encoder

0. Initiation (clear workspace)

```
clc;
clear;
close all;
```

1. Read and divide the image into blocks of 8x8 pixel

```
Image_Path = "D:\Zewail City\Fall 2023\CIE 425\Project\Image Compression\Test_.jpg";
Original_Image = imread(Image_Path);
imshow(Original_Image);
title("Original Image");
```

Original Image

```
Gray_Image = rgb2gray(Original_Image);
imwrite(Gray_Image, 'Original_Grayscale.jpg','JPEG');
imshow(Gray_Image)
title("Grayscale Image");
```

Grayscale Image

```
% Divide the image into block of 8x8 pixels
Image_Blocks = divideImageIntoBlocks(Gray_Image, 0)
```

```
Image_Blocks = 368×548 cell
```

...

	1	2	3	4	5	6	7	8
1	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8
2	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8
3	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8
4	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8
5	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8
6	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8
7	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8
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10	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8
11	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8

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63	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8
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68	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8
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76	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8
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78	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8
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80	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8
81	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8
82	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8
83	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8
84	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8
85	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8
86	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8
87	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8
88	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8
89	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8
90	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8
91	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8
92	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8
93	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8
94	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8
95	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8
96	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8
97	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8
98	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8
99	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8
100	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8	8x8 uint8

⋮

2. Perform DCT on each block

```
image_in_freq_domain = DCT(Image_Blocks)
```

image_in_freq_domain = 368×548 cell

...

	1	2	3	4	5	6	7	8
1	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
2	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
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5	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
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60	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
61	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
62	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
63	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
64	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
65	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
66	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
67	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
68	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
69	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
70	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double

	1	2	3	4	5	6	7	8
71	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
72	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
73	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
74	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
75	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
76	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
77	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
78	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
79	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
80	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
81	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
82	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
83	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
84	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
85	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
86	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
87	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
88	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
89	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
90	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
91	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
92	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
93	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
94	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
95	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
96	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
97	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
98	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
99	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
100	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double

⋮

```
% Validation
test_block = {Image_Blocks{1,1}};
```

```
test_block{1}
```

```
ans = 8×8 uint8 matrix
   95   85   80   67   55   59   64   68
   73   67   72   67   53   49   54   63
   67   57   62   63   51   44   47   59
   70   50   48   52   50   47   47   52
   65   44   38   42   47   51   48   44
   75   55   46   43   44   51   52   50
   88   69   59   50   44   49   55   59
   83   67   62   56   47   48   52   58
```

```
reconstructed_block = IDCT(DCT(test_block));
reconstructed_block{1};
% Calculate the RMSE
RMSE = sqrt(sum(sum((double(test_block{1}) - reconstructed_block{1}).^2))/
numel(test_block))
```

```
RMSE = 2.7738e-13
```

```
Validation = horzcat( ...
    array2table(test_block{1}, 'VariableNames', compose('Original%d', 1:8)), ...
    array2table(reconstructed_block{1}, 'VariableNames', compose('Reconstructed%d',
1:8)))
```

```
Validation = 8×16 table
```

...

	Original1	Original2	Original3	Original4	Original5	Original6
1	95	85	80	67	55	59
2	73	67	72	67	53	49
3	67	57	62	63	51	44
4	70	50	48	52	50	47
5	65	44	38	42	47	51
6	75	55	46	43	44	51
7	88	69	59	50	44	49
8	83	67	62	56	47	48

```
% The validation using a single 8x8 block is to ensure that the output
% after performing DCT and IDCT restores the original pixel values.
```

3. Perform the quantization step per 8x8 block using at least two quantization tables

Low Compression **High Compression**

1	1	1	1	1	2	2	4
1	1	1	1	1	2	2	4
1	1	1	1	2	2	2	4
1	1	1	1	2	2	4	8
1	1	2	2	2	2	4	8
2	2	2	2	2	4	8	8
2	2	2	4	4	8	8	16
4	4	4	4	8	8	16	16

1	2	4	8	16	32	64	128
2	4	4	8	16	32	64	128
4	4	8	16	32	64	128	128
8	8	16	32	64	128	128	256
16	16	32	64	128	128	256	256
32	32	64	128	128	256	256	256
64	64	128	128	256	256	256	256
128	128	128	256	256	256	256	256

```
Low_Compression_Quant_Table = [1, 1, 1, 1, 1, 2, 2, 4;
                               1, 1, 1, 1, 1, 2, 2, 4;
                               1, 1, 1, 1, 2, 2, 2, 4;
                               1, 1, 1, 1, 2, 2, 4, 8;
                               1, 1, 2, 2, 2, 2, 4, 8;
                               2, 2, 2, 2, 2, 4, 8, 8;
                               2, 2, 2, 4, 4, 8, 8, 16;
                               4, 4, 4, 4, 8, 8, 16, 16];
High_Compression_Quant_Table = [1, 2, 4, 8, 16, 32, 64, 128;
                                2, 4, 4, 8, 16, 32, 64, 128;
                                4, 4, 8, 16, 32, 64, 128, 128;
                                8, 8, 16, 32, 64, 128, 128, 256;
                                16, 16, 32, 64, 128, 128, 256, 256;
                                32, 32, 64, 128, 128, 256, 256, 256;
                                64, 64, 128, 128, 256, 256, 256, 256;
                                128, 128, 128, 256, 256, 256, 256, 256];
Quantization_Table = High_Compression_Quant_Table
```

```
Quantization_Table = 8×8
     1     2     4     8    16    32    64   128
     2     4     4     8    16    32    64   128
     4     4     8    16    32    64   128   128
     8     8    16    32    64   128   128   256
    16    16    32    64   128   128   256   256
    32    32    64   128   128   256   256   256
    64    64   128   128   256   256   256   256
   128   128   128   256   256   256   256   256
```

```
Quantized_Blocks = Quantization(image_in_freq_domain, Quantization_Table)
```

```
Quantized_Blocks = 368×548 cell
```

...

	1	2	3	4	5	6	7	8
1	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
2	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
3	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double

	1	2	3	4	5	6	7	8
4	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
5	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
6	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
7	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
8	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
9	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
10	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
11	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
12	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
13	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
14	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
15	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
16	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
17	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
18	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
19	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
20	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
21	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
22	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
23	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
24	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
25	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
26	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
27	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
28	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
29	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
30	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
31	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
32	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
33	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
34	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
35	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
36	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double

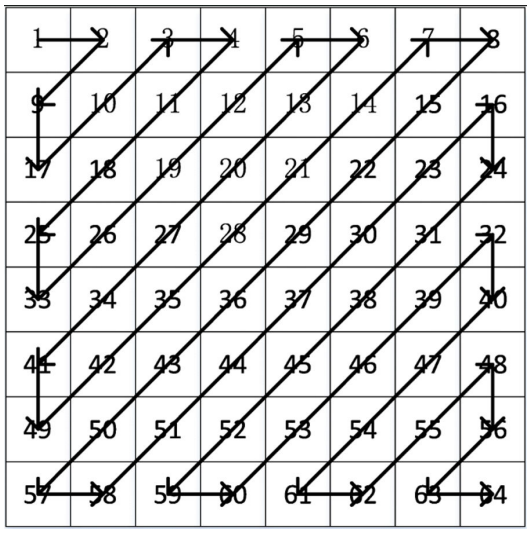
	1	2	3	4	5	6	7	8
37	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
38	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
39	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
40	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
41	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
42	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
43	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
44	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
45	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
46	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
47	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
48	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
49	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
50	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
51	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
52	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
53	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
54	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
55	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
56	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
57	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
58	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
59	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
60	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
61	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
62	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
63	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
64	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
65	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
66	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
67	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
68	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
69	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double

	1	2	3	4	5	6	7	8
70	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
71	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
72	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
73	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
74	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
75	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
76	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
77	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
78	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
79	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
80	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
81	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
82	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
83	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
84	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
85	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
86	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
87	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
88	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
89	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
90	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
91	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
92	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
93	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
94	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
95	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
96	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
97	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
98	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
99	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
100	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double

⋮

4. Transform each 2D block into 1D vector

This part and part No. 9 is inspired from the following figure:



```
TwoD_To_1D = From_2D_To_1D(Quantized_Blocks)
```

TwoD_To_1D = 368×548 cell

...

	1	2	3	4	5	6	7	8
1	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
2	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
3	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
4	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
5	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
6	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
7	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
8	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
9	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
10	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
11	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
12	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
13	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
14	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
15	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
16	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
17	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
18	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
19	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double

	1	2	3	4	5	6	7	8
20	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
21	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
22	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
23	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
24	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
25	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
26	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
27	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
28	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
29	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
30	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
31	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
32	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
33	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
34	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
35	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
36	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
37	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
38	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
39	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
40	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
41	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
42	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
43	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
44	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
45	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
46	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
47	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
48	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
49	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
50	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
51	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
52	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double

	1	2	3	4	5	6	7	8
53	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
54	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
55	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
56	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
57	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
58	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
59	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
60	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
61	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
62	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
63	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
64	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
65	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
66	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
67	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
68	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
69	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
70	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
71	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
72	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
73	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
74	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
75	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
76	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
77	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
78	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
79	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
80	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
81	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
82	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
83	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
84	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
85	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double

	1	2	3	4	5	6	7	8
86	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
87	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
88	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
89	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
90	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
91	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
92	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
93	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
94	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
95	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
96	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
97	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
98	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
99	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
100	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double

⋮

5. Perfom run-length encoding

```
Run_Length_Encoded = run_length(TwoD_To_1D)
```

```
Run_Length_Encoded = 368×548 cell
```

...

	1	2	3	4	5	6
1	1x16 double	1x17 double	1x20 double	1x15 double	1x17 double	1x14 double
2	[65,5,-1,-1,1,1,0,...	1x23 double	1x17 double	1x12 double	1x17 double	1x17 double
3	1x11 double	1x18 double	1x17 double	1x16 double	1x16 double	1x23 double
4	1x15 double	1x12 double	1x18 double	1x16 double	1x11 double	1x15 double
5	1x15 double	1x18 double	1x17 double	1x22 double	1x14 double	1x17 double
6	1x13 double	1x22 double	1x15 double	[60,4,3,-1,1,0,1,1...	1x13 double	1x18 double
7	1x12 double	1x12 double	1x16 double	1x12 double	1x16 double	1x11 double
8	1x15 double	1x11 double	1x15 double	1x11 double	1x11 double	1x16 double
9	[46,-1,0,3,1,0,58]	1x15 double	1x16 double	1x11 double	1x14 double	1x15 double
10	[49,2,0,2,-1,0,2,1...	1x14 double	1x16 double	[74,-2,6,1,-1,3,0,...	1x12 double	1x13 double
11	1x16 double	[59,-3,-...	1x16 double	1x15 double	1x12 double	1x15 double
12	1x12 double	[57,-1,1...	1x11 double	1x16 double	1x13 double	1x15 double

	1	2	3	4	5	6
13	1x11 double	[54,-3,1...	1x11 double	1x12 double	1x15 double	1x16 double
14	1x14 double	[52,1,0,...	1x12 double	1x14 double	1x14 double	1x16 double
15	1x15 double	[50,1,1,...	[52,-3,-...	1x16 double	1x12 double	1x14 double
16	[56,3,2,-1,1,0,2,-...	[49,0,1,...	[52,-1,-...	[54,-3,1,0,61]	1x15 double	[60,-1,1...
17	[51,2,0,2,1,0,59]	1x11 double	1x12 double	1x11 double	1x12 double	[61,-1,1...
18	1x16 double	1x16 double	[46,-1,0...	1x15 double	[61,0,1,...	[60,1,0,...
19	1x17 double	1x14 double	1x13 double	[49,-1,1,0,1,-1,1,...	1x16 double	[59,-2,2...
20	1x19 double	1x13 double	1x13 double	1x13 double	[57,-2,0...	[57,-1,0...
21	1x16 double	[44,-1,-...	[52,-1,1...	1x13 double	1x11 double	1x12 double
22	1x15 double	1x16 double	1x11 double	1x12 double	[68,-1,-...	1x11 double
23	1x18 double	1x14 double	1x14 double	1x12 double	1x12 double	1x12 double
24	1x16 double	1x11 double	1x14 double	1x15 double	1x15 double	1x12 double
25	1x14 double	[60,-5,1...	1x11 double	1x16 double	1x13 double	1x15 double
26	[58,5,5,-1,1,0,1,-...	1x15 double	1x16 double	[63,0,1,1,0,1,1,0,...	[63,3,-2...	1x17 double
27	1x11 double	1x16 double	1x16 double	1x12 double	1x11 double	1x16 double
28	1x16 double	1x11 double	1x17 double	1x15 double	1x15 double	1x14 double
29	1x15 double	1x16 double	1x13 double	1x17 double	1x12 double	1x16 double
30	1x15 double	1x15 double	1x12 double	[57,1,-2,0,1,1,-1,...	[49,0,1,...	1x16 double
31	[55,3,1,0,61]	1x12 double	1x11 double	[53,2,2,1,0,9,-1,0...	[57,2,1,...	1x13 double
32	[54,2,-1,0,1,1,1,0...	[54,0,1,...	1x15 double	1x12 double	1x11 double	1x12 double
33	1x12 double	1x11 double	1x18 double	1x11 double	1x11 double	[52,-2,0...
34	1x12 double	[52,-2,-...	[51,-1,1...	[51,-1,1,0,61]	1x12 double	1x16 double
35	[52,2,0,3,-1,0,58]	1x12 double	1x12 double	[53,-1,-1,0,1,-1,1...	1x14 double	1x17 double
36	1x12 double	[48,1,0,...	[60,-5,3...	1x13 double	[53,5,0,...	[53,0,1,...
37	[57,4,0,1,-1,2,1,0...	1x13 double	[46,-2,3...	1x13 double	1x11 double	1x11 double
38	1x14 double	1x11 double	[38,-1,1...	1x12 double	[40,1,0,...	[43,-2,1...
39	1x12 double	1x13 double	[40,3,-1...	[37,1,1,0,61]	[38,1,0,...	[39,0,1,...
40	1x11 double	1x11 double	[40,3,1,...	[35,-1,-1,0,4,1,0,...	[39,1,1,...	[41,-1,-...
41	[56,0,4,2,0,1,1,-1...	1x11 double	1x12 double	[39,0,3,-1,0,59]	[37,0,63]	[43,-1,0...
42	1x15 double	1x11 double	[39,0,1,...	[40,2,0,5,1,0,56]	1x11 double	1x12 double
43	1x17 double	[47,-1,1...	[39,-1,-...	[43,1,-1,1,0,3,-1,...	1x11 double	[57,4,-5...
44	[75,11,-5,-1,1,2,-...	1x13 double	[53,1,-4...	[57,1,-1,-1,0,4,1,...	1x12 double	[69,4,-2...
45	1x13 double	1x12 double	1x11 double	[67,-1,-2,0,4,1,0,...	1x14 double	1x11 double

	1	2	3	4	5	6
46	1x12 double	[60,-1,0...	1x12 double	1x13 double	[71,2,2,...	1x12 double
47	1x19 double	1x16 double	1x13 double	1x11 double	[71,-1,1...	1x12 double
48	1x20 double	1x16 double	1x16 double	1x12 double	1x11 double	1x12 double
49	1x16 double	1x15 double	1x14 double	1x13 double	1x11 double	[60,-2,1...
50	1x16 double	1x15 double	[21,2,-1...	1x19 double	1x12 double	[55,-3,3...
51	1x15 double	1x17 double	1x13 double	1x15 double	1x12 double	[51,0,1,...
52	1x12 double	1x16 double	1x14 double	[25,1,-3,1,-3,0,3,...	[40,-8,0...	[48,0,1,...
53	[113,3,-1,1,0,5,-1...	[90,10,-...	1x12 double	1x12 double	1x11 double	1x18 double
54	[116,0,3,1,1,1,2,0...	1x11 double	1x16 double	1x17 double	1x14 double	1x19 double
55	1x12 double	[107,1,3...	1x13 double	1x17 double	1x20 double	1x17 double
56	1x13 double	1x14 double	1x17 double	1x11 double	1x15 double	1x20 double
57	1x16 double	1x11 double	1x11 double	[75,18,-4,0,2,2,-1...	[50,-1,0...	[48,1,-1...
58	1x20 double	1x14 double	1x19 double	1x15 double	1x16 double	1x14 double
59	1x15 double	1x18 double	1x12 double	1x18 double	1x22 double	1x15 double
60	1x15 double	1x11 double	1x16 double	1x13 double	1x16 double	1x17 double
61	[112,-6,2,1,0,1,2,...	1x21 double	1x18 double	1x13 double	1x11 double	1x11 double
62	1x12 double	1x18 double	1x19 double	1x21 double	[102,6,-...	1x14 double
63	[113,-3,3,-1,1,1,1...	1x21 double	1x17 double	1x12 double	1x12 double	1x15 double
64	1x15 double	1x15 double	1x23 double	1x19 double	1x16 double	1x21 double
65	1x18 double	1x14 double	1x17 double	1x22 double	1x16 double	1x18 double
66	1x14 double	1x14 double	1x14 double	1x18 double	1x19 double	1x12 double
67	1x15 double	1x17 double	1x13 double	1x22 double	1x18 double	1x17 double
68	1x15 double	1x11 double	1x12 double	1x15 double	1x24 double	1x22 double
69	1x19 double	1x12 double	1x19 double	1x19 double	1x20 double	1x13 double
70	1x19 double	1x19 double	1x14 double	1x20 double	1x16 double	1x15 double
71	1x12 double	1x17 double	1x17 double	1x17 double	1x12 double	1x15 double
72	1x15 double	1x19 double	1x12 double	1x17 double	1x18 double	1x12 double
73	1x16 double	1x17 double	[86,-3,3...	1x14 double	1x15 double	1x15 double
74	1x23 double	1x12 double	1x16 double	1x20 double	1x20 double	1x16 double
75	1x13 double	1x15 double	1x18 double	1x18 double	1x18 double	1x17 double
76	1x20 double	1x15 double	1x13 double	1x14 double	1x16 double	1x18 double
77	1x25 double	1x16 double	1x16 double	[77,0,1,2,0,9,1,-1...	1x15 double	1x15 double
78	1x15 double	1x12 double	1x11 double	1x17 double	[80,-7,8...	1x14 double

	1	2	3	4	5	6
79	1x11 double	1x13 double	[46,2,1,...	[42,0,1,4,0,5,-1,0...	1x12 double	1x12 double
80	[36,-2,2,0,2,1,0,58]	[47,0,1,...	[41,0,1,...	[36,2,0,6,-1,0,55]	1x13 double	[62,-10,...
81	1x11 double	[42,-2,0...	[44,1,0,...	[38,1,-1,0,61]	[40,-3,-...	[61,-5,-...
82	1x11 double	[36,-1,0...	[37,0,1,...	[39,-3,2,0,2,1,0,58]	1x11 double	[58,-4,2...
83	[36,3,0,2,-1,1,0,58]	[33,-1,0...	[35,1,0,...	[37,-1,-1,0,61]	1x11 double	[60,-6,0...
84	1x11 double	[33,-1,0...	1x11 double	[40,-3,-1,0,5,1,0,...	1x16 double	1x11 double
85	1x12 double	1x11 double	[37,-1,0...	1x11 double	1x16 double	[48,1,1,...
86	[23,0,63]	[24,-1,0...	[38,-3,0...	1x15 double	1x12 double	1x12 double
87	[23,0,63]	1x11 double	1x14 double	1x16 double	1x16 double	1x16 double
88	[21,-1,1,0,2,1,1,0...	1x16 double	1x17 double	1x20 double	1x14 double	1x15 double
89	1x12 double	1x18 double	1x13 double	1x21 double	1x17 double	1x21 double
90	1x12 double	1x23 double	1x14 double	1x19 double	1x21 double	1x21 double
91	1x15 double	1x15 double	1x11 double	[38,-1,0,3,-1,0,1,...	[40,-4,2...	[50,3,-3...
92	1x14 double	1x18 double	[25,-4,2...	1x11 double	[31,-1,1...	[49,4,3,...
93	1x15 double	1x11 double	[23,0,2,...	[32,-1,0,2,1,0,59]	[29,-1,0...	[27,1,0,...
94	[17,0,4,1,0,58]	1x14 double	[16,-1,1...	[25,-2,2,0,61]	[23,0,1,...	[24,-2,0...
95	1x21 double	[22,-2,0...	1x11 double	[16,-1,2,0,61]	[17,0,63]	[21,-1,0...
96	1x23 double	1x15 double	1x16 double	1x13 double	1x13 double	1x11 double
97	1x17 double	1x20 double	1x17 double	1x20 double	[21,0,3,...	[18,1,0,...
98	1x17 double	1x15 double	[16,1,2,...	[17,-1,1,0,61]	[21,-2,1...	[14,0,1,...
99	1x18 double	1x14 double	1x18 double	1x20 double	[19,1,1,...	1x12 double
100	1x22 double	1x16 double	1x12 double	1x20 double	1x11 double	1x14 double

⋮

6. Use Entropy encoder

```
Entropy_Encoder = "Huffman"
```

```
Entropy_Encoder =
"Huffman"
```

```
pre_entropy = pre_entropy_encoding(Run_Length_Encoded)
```

```
pre_entropy = 1×2620027
   368  -200   548  -200    57     4     2     2     0     1     2     0     1 ···
```

```
if Entropy_Encoder == "Huffman"
    [tree, encoded_data, ~] = encode_Huffman(pre_entropy);
    print_encoded_data(encoded_data(1:10))
else
```

```
    % Use Finite Precision Arithmetic
end
```

```
0011111010010100111011100001000101100100100001100101101001100001101010100111 1
```

JPEG Decoder

7. Use Huffman decoder

```
if Entropy_Encoder == "Huffman"
    decoded_data = Huffman_Decode(encoded_data, tree)
    received_image = post_entropy_encoding(decoded_data(5:end-1), decoded_data(1),
decoded_data(3))
else
    % Use Finite Precision Arithmetic
end
```

```
decoded_data = 1×2620027
   368  -200   548  -200    57     4     2     2     0     1     2     0     1 ···
received_image = 368×548 cell
                                                                                ···
```

	1	2	3	4	5	6
1	1x16 double	1x17 double	1x20 double	1x15 double	1x17 double	1x14 double
2	[65,5,-1,-1,1,1,0,...	1x23 double	1x17 double	1x12 double	1x17 double	1x17 double
3	1x11 double	1x18 double	1x17 double	1x16 double	1x16 double	1x23 double
4	1x15 double	1x12 double	1x18 double	1x16 double	1x11 double	1x15 double
5	1x15 double	1x18 double	1x17 double	1x22 double	1x14 double	1x17 double
6	1x13 double	1x22 double	1x15 double	[60,4,3,-1,1,0,1,1...	1x13 double	1x18 double
7	1x12 double	1x12 double	1x16 double	1x12 double	1x16 double	1x11 double
8	1x15 double	1x11 double	1x15 double	1x11 double	1x11 double	1x16 double
9	[46,-1,0,3,1,0,58]	1x15 double	1x16 double	1x11 double	1x14 double	1x15 double
10	[49,2,0,2,-1,0,2,1...	1x14 double	1x16 double	[74,-2,6,1,-1,3,0,...	1x12 double	1x13 double
11	1x16 double	[59,-3,-...	1x16 double	1x15 double	1x12 double	1x15 double
12	1x12 double	[57,-1,1...	1x11 double	1x16 double	1x13 double	1x15 double
13	1x11 double	[54,-3,1...	1x11 double	1x12 double	1x15 double	1x16 double
14	1x14 double	[52,1,0,...	1x12 double	1x14 double	1x14 double	1x16 double
15	1x15 double	[50,1,1,...	[52,-3,-...	1x16 double	1x12 double	1x14 double
16	[56,3,2,-1,1,0,2,-...	[49,0,1,...	[52,-1,-...	[54,-3,1,0,61]	1x15 double	[60,-1,1...
17	[51,2,0,2,1,0,59]	1x11 double	1x12 double	1x11 double	1x12 double	[61,-1,1...
18	1x16 double	1x16 double	[46,-1,0...	1x15 double	[61,0,1,...	[60,1,0,...
19	1x17 double	1x14 double	1x13 double	[49,-1,1,0,1,-1,1,...	1x16 double	[59,-2,2...
20	1x19 double	1x13 double	1x13 double	1x13 double	[57,-2,0...	[57,-1,0...

	1	2	3	4	5	6
21	1x16 double	[44,-1,-...	[52,-1,1...	1x13 double	1x11 double	1x12 double
22	1x15 double	1x16 double	1x11 double	1x12 double	[68,-1,-...	1x11 double
23	1x18 double	1x14 double	1x14 double	1x12 double	1x12 double	1x12 double
24	1x16 double	1x11 double	1x14 double	1x15 double	1x15 double	1x12 double
25	1x14 double	[60,-5,1...	1x11 double	1x16 double	1x13 double	1x15 double
26	[58,5,5,-1,1,0,1,-...	1x15 double	1x16 double	[63,0,1,1,0,1,1,0,...	[63,3,-2...	1x17 double
27	1x11 double	1x16 double	1x16 double	1x12 double	1x11 double	1x16 double
28	1x16 double	1x11 double	1x17 double	1x15 double	1x15 double	1x14 double
29	1x15 double	1x16 double	1x13 double	1x17 double	1x12 double	1x16 double
30	1x15 double	1x15 double	1x12 double	[57,1,-2,0,1,1,-1,...	[49,0,1,...	1x16 double
31	[55,3,1,0,61]	1x12 double	1x11 double	[53,2,2,1,0,9,-1,0...	[57,2,1,...	1x13 double
32	[54,2,-1,0,1,1,1,0...	[54,0,1,...	1x15 double	1x12 double	1x11 double	1x12 double
33	1x12 double	1x11 double	1x18 double	1x11 double	1x11 double	[52,-2,0...
34	1x12 double	[52,-2,-...	[51,-1,1...	[51,-1,1,0,61]	1x12 double	1x16 double
35	[52,2,0,3,-1,0,58]	1x12 double	1x12 double	[53,-1,-1,0,1,-1,1...	1x14 double	1x17 double
36	1x12 double	[48,1,0,...	[60,-5,3...	1x13 double	[53,5,0,...	[53,0,1,...
37	[57,4,0,1,-1,2,1,0...	1x13 double	[46,-2,3...	1x13 double	1x11 double	1x11 double
38	1x14 double	1x11 double	[38,-1,1...	1x12 double	[40,1,0,...	[43,-2,1...
39	1x12 double	1x13 double	[40,3,-1...	[37,1,1,0,61]	[38,1,0,...	[39,0,1,...
40	1x11 double	1x11 double	[40,3,1,...	[35,-1,-1,0,4,1,0,...	[39,1,1,...	[41,-1,-...
41	[56,0,4,2,0,1,1,-1...	1x11 double	1x12 double	[39,0,3,-1,0,59]	[37,0,63]	[43,-1,0...
42	1x15 double	1x11 double	[39,0,1,...	[40,2,0,5,1,0,56]	1x11 double	1x12 double
43	1x17 double	[47,-1,1...	[39,-1,-...	[43,1,-1,1,0,3,-1,...	1x11 double	[57,4,-5...
44	[75,11,-5,-1,1,2,-...	1x13 double	[53,1,-4...	[57,1,-1,-1,0,4,1,...	1x12 double	[69,4,-2...
45	1x13 double	1x12 double	1x11 double	[67,-1,-2,0,4,1,0,...	1x14 double	1x11 double
46	1x12 double	[60,-1,0...	1x12 double	1x13 double	[71,2,2,...	1x12 double
47	1x19 double	1x16 double	1x13 double	1x11 double	[71,-1,1...	1x12 double
48	1x20 double	1x16 double	1x16 double	1x12 double	1x11 double	1x12 double
49	1x16 double	1x15 double	1x14 double	1x13 double	1x11 double	[60,-2,1...
50	1x16 double	1x15 double	[21,2,-1...	1x19 double	1x12 double	[55,-3,3...
51	1x15 double	1x17 double	1x13 double	1x15 double	1x12 double	[51,0,1,...
52	1x12 double	1x16 double	1x14 double	[25,1,-3,1,-3,0,3,...	[40,-8,0...	[48,0,1,...
53	[113,3,-1,1,0,5,-1...	[90,10,-...	1x12 double	1x12 double	1x11 double	1x18 double

	1	2	3	4	5	6
54	[116,0,3,1,1,1,2,0...	1x11 double	1x16 double	1x17 double	1x14 double	1x19 double
55	1x12 double	[107,1,3...	1x13 double	1x17 double	1x20 double	1x17 double
56	1x13 double	1x14 double	1x17 double	1x11 double	1x15 double	1x20 double
57	1x16 double	1x11 double	1x11 double	[75,18,-4,0,2,2,-1...	[50,-1,0...	[48,1,-1...
58	1x20 double	1x14 double	1x19 double	1x15 double	1x16 double	1x14 double
59	1x15 double	1x18 double	1x12 double	1x18 double	1x22 double	1x15 double
60	1x15 double	1x11 double	1x16 double	1x13 double	1x16 double	1x17 double
61	[112,-6,2,1,0,1,2,...	1x21 double	1x18 double	1x13 double	1x11 double	1x11 double
62	1x12 double	1x18 double	1x19 double	1x21 double	[102,6,-...	1x14 double
63	[113,-3,3,-1,1,1,1...	1x21 double	1x17 double	1x12 double	1x12 double	1x15 double
64	1x15 double	1x15 double	1x23 double	1x19 double	1x16 double	1x21 double
65	1x18 double	1x14 double	1x17 double	1x22 double	1x16 double	1x18 double
66	1x14 double	1x14 double	1x14 double	1x18 double	1x19 double	1x12 double
67	1x15 double	1x17 double	1x13 double	1x22 double	1x18 double	1x17 double
68	1x15 double	1x11 double	1x12 double	1x15 double	1x24 double	1x22 double
69	1x19 double	1x12 double	1x19 double	1x19 double	1x20 double	1x13 double
70	1x19 double	1x19 double	1x14 double	1x20 double	1x16 double	1x15 double
71	1x12 double	1x17 double	1x17 double	1x17 double	1x12 double	1x15 double
72	1x15 double	1x19 double	1x12 double	1x17 double	1x18 double	1x12 double
73	1x16 double	1x17 double	[86,-3,3...	1x14 double	1x15 double	1x15 double
74	1x23 double	1x12 double	1x16 double	1x20 double	1x20 double	1x16 double
75	1x13 double	1x15 double	1x18 double	1x18 double	1x18 double	1x17 double
76	1x20 double	1x15 double	1x13 double	1x14 double	1x16 double	1x18 double
77	1x25 double	1x16 double	1x16 double	[77,0,1,2,0,9,1,-1...	1x15 double	1x15 double
78	1x15 double	1x12 double	1x11 double	1x17 double	[80,-7,8...	1x14 double
79	1x11 double	1x13 double	[46,2,1,...	[42,0,1,4,0,5,-1,0...	1x12 double	1x12 double
80	[36,-2,2,0,2,1,0,58]	[47,0,1,...	[41,0,1,...	[36,2,0,6,-1,0,55]	1x13 double	[62,-10,...
81	1x11 double	[42,-2,0...	[44,1,0,...	[38,1,-1,0,61]	[40,-3,-...	[61,-5,-...
82	1x11 double	[36,-1,0...	[37,0,1,...	[39,-3,2,0,2,1,0,58]	1x11 double	[58,-4,2...
83	[36,3,0,2,-1,1,0,58]	[33,-1,0...	[35,1,0,...	[37,-1,-1,0,61]	1x11 double	[60,-6,0...
84	1x11 double	[33,-1,0...	1x11 double	[40,-3,-1,0,5,1,0,...	1x16 double	1x11 double
85	1x12 double	1x11 double	[37,-1,0...	1x11 double	1x16 double	[48,1,1,...
86	[23,0,63]	[24,-1,0...	[38,-3,0...	1x15 double	1x12 double	1x12 double

	1	2	3	4	5	6
87	[23,0,63]	1x11 double	1x14 double	1x16 double	1x16 double	1x16 double
88	[21,-1,1,0,2,1,1,0...	1x16 double	1x17 double	1x20 double	1x14 double	1x15 double
89	1x12 double	1x18 double	1x13 double	1x21 double	1x17 double	1x21 double
90	1x12 double	1x23 double	1x14 double	1x19 double	1x21 double	1x21 double
91	1x15 double	1x15 double	1x11 double	[38,-1,0,3,-1,0,1,...	[40,-4,2...	[50,3,-3...
92	1x14 double	1x18 double	[25,-4,2...	1x11 double	[31,-1,1...	[49,4,3,...
93	1x15 double	1x11 double	[23,0,2,...	[32,-1,0,2,1,0,59]	[29,-1,0...	[27,1,0,...
94	[17,0,4,1,0,58]	1x14 double	[16,-1,1...	[25,-2,2,0,61]	[23,0,1,...	[24,-2,0...
95	1x21 double	[22,-2,0...	1x11 double	[16,-1,2,0,61]	[17,0,63]	[21,-1,0...
96	1x23 double	1x15 double	1x16 double	1x13 double	1x13 double	1x11 double
97	1x17 double	1x20 double	1x17 double	1x20 double	[21,0,3,...	[18,1,0,...
98	1x17 double	1x15 double	[16,1,2,...	[17,-1,1,0,61]	[21,-2,1...	[14,0,1,...
99	1x18 double	1x14 double	1x18 double	1x20 double	[19,1,1,...	1x12 double
100	1x22 double	1x16 double	1x12 double	1x20 double	1x11 double	1x14 double

⋮

8. Perform run-length decoding

```
Run_Length_Decoded = inv_run_length(received_image)
```

```
Run_Length_Decoded = 368×548 cell
```

...

	1	2	3	4	5	6	7	8
1	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
2	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
3	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
4	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
5	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
6	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
7	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
8	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
9	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
10	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
11	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
12	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
13	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double

	1	2	3	4	5	6	7	8
14	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
15	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
16	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
17	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
18	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
19	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
20	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
21	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
22	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
23	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
24	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
25	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
26	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
27	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
28	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
29	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
30	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
31	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
32	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
33	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
34	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
35	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
36	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
37	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
38	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
39	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
40	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
41	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
42	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
43	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
44	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
45	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
46	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double

	1	2	3	4	5	6	7	8
47	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
48	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
49	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
50	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
51	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
52	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
53	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
54	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
55	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
56	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
57	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
58	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
59	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
60	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
61	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
62	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
63	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
64	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
65	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
66	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
67	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
68	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
69	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
70	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
71	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
72	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
73	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
74	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
75	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
76	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
77	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
78	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
79	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double

	1	2	3	4	5	6	7	8
80	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
81	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
82	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
83	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
84	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
85	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
86	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
87	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
88	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
89	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
90	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
91	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
92	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
93	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
94	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
95	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
96	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
97	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
98	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
99	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double
100	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double	1x64 double

⋮

9. Transform each 1D vector into 2D block

```
OneD_To_2D = From_1D_To_2D(Run_Length_Decoded)
```

OneD_To_2D = 368×548 cell

...

	1	2	3	4	5	6	7	8
1	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
2	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
3	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
4	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
5	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
6	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double

	1	2	3	4	5	6	7	8
7	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
8	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
9	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
10	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
11	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
12	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
13	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
14	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
15	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
16	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
17	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
18	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
19	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
20	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
21	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
22	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
23	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
24	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
25	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
26	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
27	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
28	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
29	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
30	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
31	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
32	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
33	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
34	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
35	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
36	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
37	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
38	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
39	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double

	1	2	3	4	5	6	7	8
40	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
41	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
42	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
43	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
44	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
45	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
46	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
47	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
48	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
49	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
50	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
51	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
52	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
53	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
54	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
55	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
56	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
57	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
58	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
59	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
60	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
61	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
62	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
63	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
64	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
65	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
66	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
67	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
68	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
69	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
70	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
71	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
72	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double

	1	2	3	4	5	6	7	8
73	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
74	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
75	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
76	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
77	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
78	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
79	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
80	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
81	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
82	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
83	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
84	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
85	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
86	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
87	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
88	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
89	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
90	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
91	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
92	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
93	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
94	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
95	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
96	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
97	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
98	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
99	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
100	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double

⋮

10. Multiply each group by the quantization table

```
Dequantization_out = Dequantization(OneD_To_2D, Quantization_Table)
```

```
Dequantization_out = 368×548 cell
```

...

	1	2	3	4	5	6	7	8
1	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
2	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
3	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
4	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
5	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
6	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
7	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
8	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
9	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
10	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
11	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
12	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
13	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
14	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
15	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
16	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
17	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
18	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
19	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
20	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
21	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
22	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
23	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
24	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
25	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
26	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
27	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
28	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
29	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
30	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
31	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
32	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
33	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double

	1	2	3	4	5	6	7	8
34	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
35	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
36	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
37	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
38	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
39	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
40	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
41	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
42	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
43	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
44	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
45	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
46	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
47	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
48	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
49	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
50	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
51	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
52	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
53	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
54	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
55	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
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61	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
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66	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double

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67	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
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72	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
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74	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
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79	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
80	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
81	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
82	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
83	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
84	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
85	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
86	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
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88	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
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91	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
92	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
93	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
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97	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
98	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
99	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double

	1	2	3	4	5	6	7	8
100	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double

⋮

11. Perform IDCT on each block

```
image_in_spatial_domain = IDCT(Dequantization_out)
```

image_in_spatial_domain = 368×548 cell

...

	1	2	3	4	5	6	7	8
1	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
2	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
3	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
4	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
5	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
6	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
7	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
8	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
9	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
10	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
11	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
12	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
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76	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
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96	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
97	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
98	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
99	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double
100	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double	8x8 double

⋮

12. Combine the 8x8 pixel groups into a single image and save it back to a file

```
Received_Image = combineBlocks(image_in_spatial_domain);
imshow(Received_Image)
title("Received Image");
```

Received Image

```
imwrite(Received_Image, ...
```

```
    'result.jpg','JPEG');
```

13. Compare the original image with the compressed image when using each quantization table

```
CompRatio = getCompRatio(encoded_data, size(Gray_Image, 1), size(Gray_Image, 2));
subplot(1,2,1)
imshow(Gray_Image)
title("Original Image");
subplot(1,2,2)
imshow(Received_Image)
title("Received Image");
```

```
fprintf("Compression Ratio = %.2f%%", CompRatio*100);
```

```
Compression Ratio = 88.92%
```