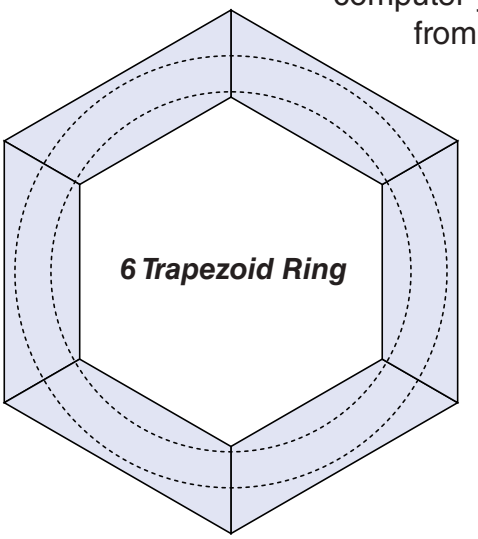
Planning your 12 Trapezoid Circle and Border project

Step 1... pick one of three trapezoid ring options. Unless you have a special reason for choosing the 6 or 12 the 8 trapezoid ring option is usually best.

Step 2... you can plan your project in inches or millimeters but making the trapezoids will be in millimeters. If you think in inches pick inches and vice versa.

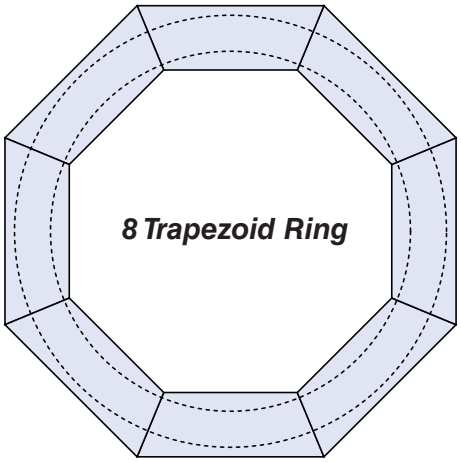
Step 3... now that you have some idea of your options and have read all of page 1, go to page 2 and learn about the inch and millimeter charts.

Available Spreadsheet: If you have Excel or Numbers on your Windows or Mac computer you can download a spreadsheet file called "Trapezoid Strip Width" from ***mortonglass.com***. Tables from this PDF needed for spreadsheet.



6 Trapezoid Ring... this option requires trapezoids that are made using a 60 degree angle setting on your Portable Glass Shop. This option might be considered if your design is based on the hexagon. The disadvantage of this option is the length and width of the trapezoids needed.

This PDF is for the 12 Trapezoid Ring. Use the PDF named "6 Trapezoid Ring" for this option. Speadsheet table option is named "6 Trapezoid Ring".



8 Trapezoid Ring... this option requires trapezoids that are made using a 67.5 degree angle setting on your Portable Glass Shop. This option might be considered if your design is based on the octagon. This option is usually preferred over the 6 trapezoid option because the strips needed to make the trapezoids are not as wide and yield less scrap.

This PDF is for the 12 Trapezoid Ring. Use the PDF named "8 Trapezoid Ring" for this option. Speadsheet table option is named "8 Trapezoid Ring".

12 Trapezoid Ring... this option requires trapezoids that are made using a 75 degree angle setting on your Portable Glass Shop. This option will require more time to make. An example of how this might be appropriate is as a clock face using two different colors such as black and white in an art deco design.

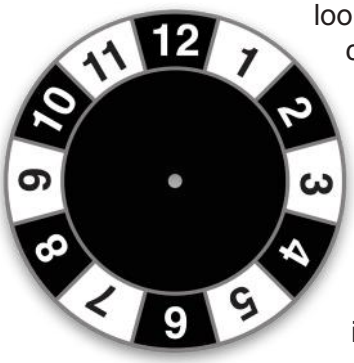
The inch and millimeter charts in this PDF are to be used only for the 12 Trapezoid Ring option.

Speadsheet table option is named "12 Trapezoid Ring"

Sizing the Trapezoids

Making the correct trapezoids for your project is important and the 1st step is to know what you want to make.

A simple sketch for your border project might be a productive way to start. As you look at this stained glass clock face design it is quite easy to see that 12 elements will be needed to make the border and that will lead you to the 12 Trapezoid ring. The black center circle is what we refer to as the inner circle.



Let's just say that the inner circle is 6 inches. We decide that the border will be 1.5 inches wide. Now we know that our clock face will be 9 inches. The 9 inch diameter of the plate is what we refer to as the outer circle.

Please Note: This project will be expand some when the lead or copper foil is added. No allowance will be made in this project for the metal because it is not important that the finished size will be a little bit larger than 9 inches.

The information we have for the 9 inch clock face is all that is needed to determine the strips that will be needed to make the project. The 9 inch outer circle, 6 inch inner circle, 12 sections in the border and circle sizes in inches tell where to look for the information needed for the strips.

Many of you prefer millimeters. Let's define the 9 inch plate as a 228 mm plate and the black center circle as 152 mm. We still need 12 sections but we are now planning in millimeters. The only difference between planning in mm or inches is the chart used to find the information.

The examples on page 3 will help you understand the basics. In the USA many of us tend to think and plan our projects in inches. The option to inches is millimeters but no matter how you think or plan the trapezoids will be made in ***millimeters*** on your Portable Glass Shop.

Information from the Charts

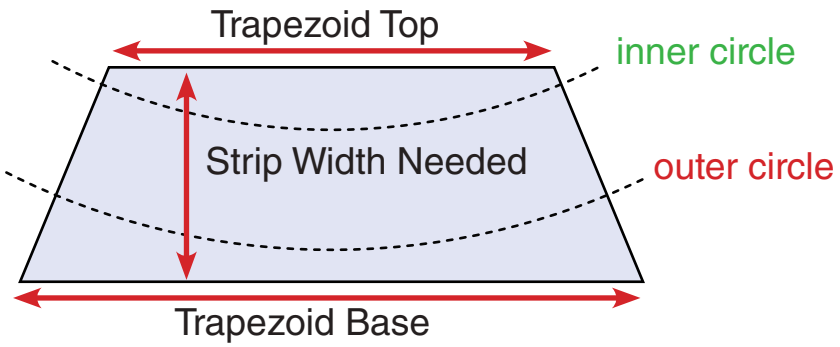
Some needed information for the 9 inch design above is found on page 4. Because 9 inches is the outer circle the information needed will be a red number. The red numbers are the length of the trapezoid base in millimeters. For a 9 inch diameter the base length is ***65 mm***.

If you were planning in millimeters the plate size from above is 228 mm and the information we need is found on page 5. For a 228 mm diameter the base length is ***65 mm***.

The inner circle diameter for the project above is 6 inches. The inner circle information from the charts will be a green number and will be the length of the trapezoid top. The green number in the 6 inch diameter row, on page 4, is ***37 mm***.

The 152 mm inner circle diameter we used to plan the project above in millimeters shows the trapezoid top length on page 5 is ***37 mm***.

The red base length number and the green top length number are used to calculate the strip width. The strip width calculation is explained on page 3. The strip width used to make the border above is about 53 mm in both the inch and millimeter project above.

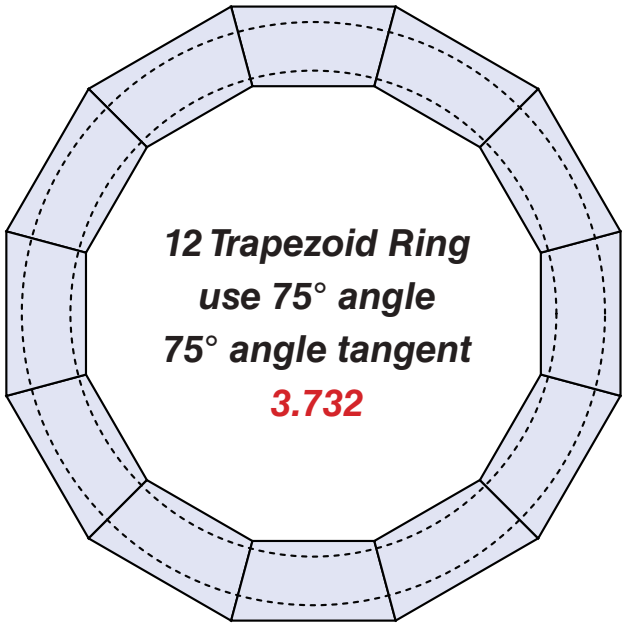


The 12 Trapezoid Ring

All sizes are not available in the inch and metric charts and it is suggested that you modify your project slightly to the sizes listed.

Important: *If you need a size not listed you must pick the next larger size for the outer circle* **(red number)** *and the next smaller size for the inner circle* **(green number)** *to make the strip width calculations.*

The inch and millimeter examples should help you understand the charts. The 12 trapezoid ring is somewhat different than the 6 and 8 rings. The scrap at the trapezoid top might be easier to break if just a little bit greater. It is suggested that you test the strip width with window glass to see if the scrap breaks away cleanly at the top of the trapezoid. If it does continue with the calculated strip width. If the scrap is hard to remove from the trapezoid top add 1 or 2 mm to the strip width.



12 Trapezoid Strip Width Formula

(base length - top length) ÷ 2 x 3.732 = strip width

round up strip width to next millimeter
if decimal greater than .3

Inch example - 12 Trapezoid Ring

10 inch project... 6 inch center circle with a 2 inch border. Border made from 12 trapezoids.

1. Go to page 4 and find the base length for a 10 inch circle. B*ase lengths are red numbers*.

base length found = 72 mm

2. Go to page 4 and find the top length for a 8 inch circle. Top lengths are green numbers.

top length found = 37 mm

3. Calculate trapezoid strip width.

72 - 37 = 35 ÷ 2 = 17.5 x 3.732 = 65.31
round up to 66 mm strip width

4. Use 41 mm wide strips and a 75° angle to make 12 trapezoids with a base length of 72 mm.

Millimeter example - 12 Trapezoid Ring

252 mm plate... 148 mm center circle with a 52 mm border. Border made from 12 trapezoids.

1. Go to page 5 and find the base length for a 252 mm circle. Base lengths are red numbers.

base length found = 71 mm

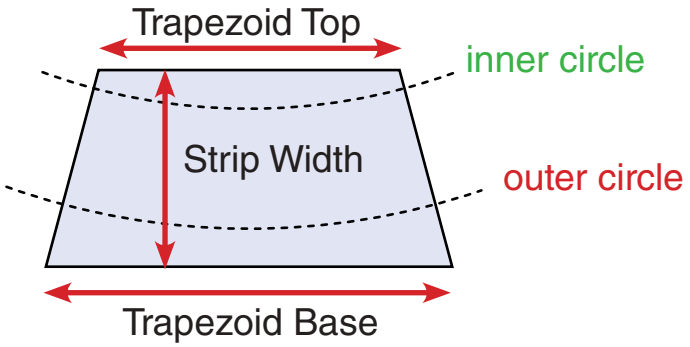
2. Go to page 5 and find the top length for a 148 mm circle. Top lengths are green numbers.

top length found = 36 mm

3. Calculate trapezoid strip width.

71 - 36 = 35 ÷ 2 = 17.5 x 3.732 = 65.31
round up to 66 mm strip width

4. Use 40 mm wide strips and a 75° angle to make 12 trapezoids with a base length of 71 mm.



Inch Circle Sizes
12 Trapezoid Ring

Although you have planned your project in inches you will be sizing trapezoids for the 12 Trapezoid Ring in millimeters.

From the chart, find the circle size of your project and select the red number in that row. The red number is in millimeters and it is the base length of the trapezoids you will make.

From the chart, find the diameter of your inner border and select the green number from that row. The green number is the top length of the trapezoid.

Once you have a red number and a green number you can calculate the strip width needed to make the 12 trapezoids on your Portable Glass Shop.

Half of the circle's diameter is the radius. To make your border elements from the trapezoids, using your Circle & border equipment, you will use the radius. The blue number on the right side of the chart is the radius and the black number is the diameter.

Important: If you have a circle size between 2 inches and 14 inches that is not listed you will need to go to the next size larger for the red numbers and the next size smaller for the green numbers.

Circle Diameter	12 Trapezoid base length	12 Trapezoid top length	Circle Diameter	Circle Radius
2 inch	17 mm	11 mm	2 inch	1 inch
2.25	19	13	2.25	1.125
2.5	21	14	2.5	1.25
2.75	22	16	2.75	1.375
3	24	18	3	1.5
3.25	26	19	3.25	1.625
3.5	28	21	3.5	1.75
3.75	29	23	3.75	1.875
4	31	24	4	2
4.25	33	26	4.25	2.125
4.5	34	27	4.5	2.25
4.75	36	29	4.75	2.375
5	38	31	5	2.5
5.25	39	32	5.25	2.625
5.5	41	34	5.5	2.75
5.75	43	36	5.75	2.875
6	45	37	6	3
6.25	46	39	6.25	3.125
6.5	48	41	6.5	3.25
6.75	50	42	6.75	3.375
7	51	44	7	3.5
7.25	53	46	7.25	3.625
7.5	55	47	7.5	3.75
7.75	56	49	7.75	3.875
8	58	50	8	4
8.25	60	52	8.25	4.125
8.5	62	54	8.5	4.25
8.75	63	55	8.75	4.375
9	65	57	9	4.5
9.25	67	59	9.25	4.625
9.5	68	60	9.5	4.75
9.75	70	62	9.75	4.875
10	72	64	10	5
10.25	73	65	10.25	5.125
10.5	75	67	10.5	5.25
10.75	77	69	10.75	5.375
11	79	70	11	5.5
11.25	80	72	11.25	5.625
11.5	82	73	11.5	5.75
11.75	84	75	11.75	5.875
12	85	77	12	6
12.25	87	78	12.25	6.125
12.5	89	80	12.5	6.25
12.75	91	82	12.75	6.375
13	92	83	13	6.5
13.25	94	85	13.25	6.625
13.5	96	87	13.5	6.75
13.75	97	88	13.75	6.875
14	99	90	14	7

12 Millimeter Circle Sizes
12 Trapezoid Ring

From the chart, find the circle size of your project and select the red number in that row. The red number is the base length for the trapezoid.

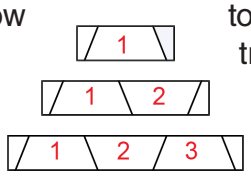
From the chart, find the diameter of your inner border and select the green number from that row. The green number is the top length of the trapezoid.

Once you have a red number and a green number you can calculate the strip width needed to make the trapezoids on your Portable Glass Shop.

Circle Diameter	6 Base	6 Top	Circle Radius
50 mm	17 mm	11 mm	25 mm
52	18	11	26
56	19	12	28
60	20	13	30
64	21	14	32
68	22	16	34
72	23	17	36
76	24	18	38
80	25	19	40
84	26	20	42
88	27	21	44
92	28	22	46
96	29	23	48
100	31	24	50
104	32	25	52
108	33	26	54
112	34	27	56
116	35	28	58
120	36	29	60
124	37	30	62
128	38	31	64
132	39	32	66
136	40	33	68
140	41	34	70
144	42	35	72
148	43	36	74
152	44	37	76
156	46	38	78
160	47	39	80
164	48	40	82
168	49	41	84
172	50	42	86
176	51	43	88
180	52	45	90
184	53	46	92
188	54	47	94
192	55	48	96
196	56	49	98
200	57	50	100
204	58	51	102
208	59	52	104
212	61	53	106
216	62	54	108
220	63	55	110
224	64	56	112
228	65	57	114
232	66	58	116
236	67	59	118
240	68	60	120
244	69	61	122
248	70	62	124
252	71	63	126
256	72	64	128
260	73	65	130
264	74	66	132
268	76	67	134
272	77	68	136
276	78	69	138
280	79	70	140
284	80	71	142
288	81	72	144
292	82	74	146
296	83	75	148
300	84	76	150
304	85	77	152
308	86	78	154
312	87	79	156
316	88	80	158
320	89	81	160
324	91	82	162
328	92	83	164
332	93	84	166
336	94	85	168
340	95	86	170
344	96	87	172
348	97	88	174
352	98	89	176
356	99	90	178
360	100	91	180

For 12 Trapezoid Ring - Calculating Strip Length for Multiple Trapezoids

Once you determine the strip width needed for your project you may want to know something about the strip length.



When more than one trapezoids are made from a strip the angles and the end scrap make the length harder to determine. You can often avoid costly mistakes by knowing in advance the strip length needed for one or more trapezoids.

The examples below will show you how to calculate the strip length for one or more trapezoid. Simple math is all that is needed.

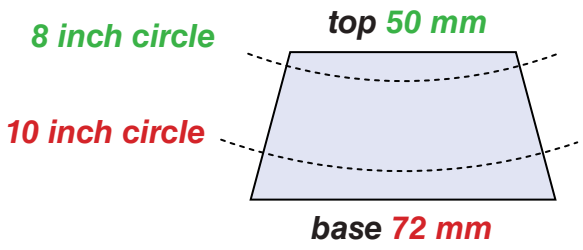
Using the spreadsheet file named "Trapezoid Strip Width" can make the trapezoid calculations easier for you. Using the charts, from this PDF, and the Excel or Numbers application on your computer, you can quickly find the strip width and the strip lengths required for multiple trapezoids.

Example for 12 Trapezoid Ring

From inch chart on page 4

10 inch outer circle - 72 mm base length

8 inch inner circle - 50 mm top length



1. Calculated trapezoid strip width.

72 - 50 = 22 ÷ 2 = 11 x 3.732 = 41.052
round to 42 mm strip width

2. 75° PG01B angle and base length of 72 mm.

3. Make 12 trapezoids using 42 mm wide strips.

4. Determine number of strips needed for 8 trapezoids. Use example below to calculate strip lengths for one or more trapezoids.

Important: • 12 mm for end scrap needed

• Additional calculation for the 2 & 4 trapezoids:
(base - top) ÷ 2 or 72 - 50 = 22 ÷ 2 = 11 mm

5. Millimeter strip length to inches:
Divide the mm by 25.4
84 mm ÷ 25.4 = 3.30 inch
145 mm ÷ 25.4 = 5.70 inch

1. 12 + base = length

12 + 72 = 84 mm

2. 12 + base + top + (base – top ÷ 2) = length

12 + 72 + 50 + 11 = 145 mm

3. 12 + base + top + base = length

12 + 72 + 50 + 72 = 206 mm

4. 12 + base + top + base + top + (base – top ÷ 2) = length

12 + 72 + 50 + 72 + 50 + 11 = 267 mm

5. 12 + base + top + base + top + base = length

12 + 72 + 50 + 72 + 75 + 72 = 328 mm

Calculating the strip length is for project planning.

Calculated results will be the minimum length needed.

Zero Border Option - Millimeters or Inches

There may be a reason why you would want to make just one score to your 12 trapezoids instead of the two. This is very easy to do but you should think of the one score as a "0" border to calculate the strip width of your trapezoids.

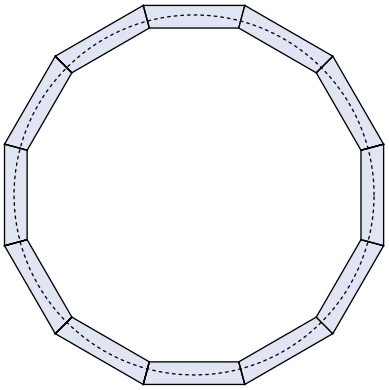
Example: This will be the same for inches & millimeters. If you wanted a 10 inch circle to be your "0" border you will first go to the inch chart and get the red number for 10 inches (***72 mm***) and then get the green number for 10 inches (***64 mm***). Once you have the 2 numbers you will calculate the same as for any border to get the strip width for a 12 trapezoid ring.

72 mm - 64 mm = 8 ÷ 2 = 4

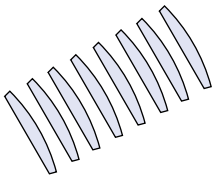
4 x 3.732 = 14.928 mm

round to 15 mm strip width

Make 12 trapezoids from 15 mm strips using a 75° degree angle setting and a 111 mm base length.



The "0" border option will give you another way to create unique glass art.



Scrap not used in this border design.