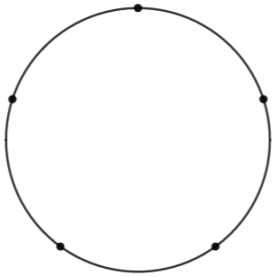
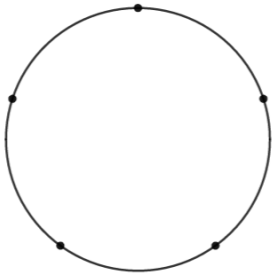
Relatively Prime Stars

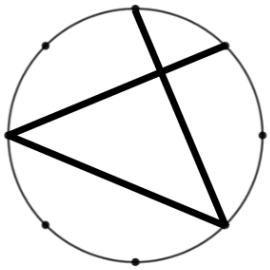
1. Draw 5 points around a circle, evenly spaced. Start at a point, and going around the circle, connect it to a point 2 points over. Repeat until you're back at the starting point. You should get a 5-pointed star.



2. Now do the same thing, starting with 8 points around a circle, each time connecting to a point 2 points over. If you get back to your starting point before using up all the points, find a lonely point and start again with a different color.



3. Experiment with different numbers of points around the circle "P" and different numbers of points that you go over "Q". Here is the beginning of a star where P = 8 and Q = 3.



4.
- For what values of P and Q do you end up connecting all the points?
- For what values of P and Q do you end up getting back to your starting point before connecting all the points?
- Any time you get back to your starting point, if there are any dots left, start a new line with a different color and keep track of the number of colors.

P	Q	Number of colors
5	1	1
8	2	2

5. What values of P and Q make the best looking stars?

Pouring Water

1. Given a 5-liter unmarked container, a 3-liter unmarked container, and an unlimited supply of water, can you obtain an accurate measure of 4 liters of water?

   You can keep track of your pourings here.

5-liter	3-liter
0	0
5	0

5-liter	3-liter
0	0
0	3

   Could you also obtain an accurate measure of 1 L of water? 2 L? 3 L? 6 L?

2. Given a 4-liter unmarked container, a 7-liter unmarked container, and an unlimited supply of water, can you obtain an accurate measure of 5 liters of water? If so, what is the minimum number of pourings necessary?

4-liter	7-liter
0	0
4	0

4-liter	7-liter
0	0
0	7

   Could you also obtain an accurate measure of 1 L of water? 2 L? 3 L? 6 L?

3. Under the same conditions, but with a 3-liter container and a 6-liter container, can you obtain a measure of 5 liters? If so, what is the minimum number of pourings necessary?

3-liter	6-liter
0	0
3	0

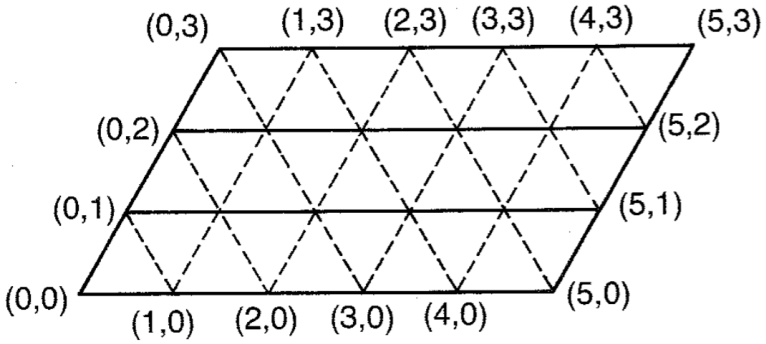
3-liter	6-liter
0	0
0	6

4. Given a 5-liter unmarked container, a 9-liter unmarked container, and an unlimited supply of water, can you obtain an accurate measure of 6 liters of water? If so, what is the minimum number of pourings necessary?

5-liter	9-liter
0	0
5	0

5-liter	9-liter
0	0
0	9

5. On the pool table shown below, a pool ball must be shot initially from the point $(0, 0)$ and must roll along the side to either $(0, 3)$ or $(5, 0)$. Each time the ball strikes another side, it will bounce off at an angle of $60°$ as indicated by the dotted lines. First, start at $(0, 0)$, and shoot the ball towards $(5, 0)$, and record the coordinates each time the ball strikes a side. Then start at $(0, 0)$, shoot the ball towards $(0, 3)$, and record the coordinates again. Can you relate your results to the previous problem?



(0,0)	(0,0)
(5,0)	(0,3)
(2,3)	(,)
(,)	(,)
(,)	(,)
(,)	(,)
(,)	(,)
	(,)
	(,)