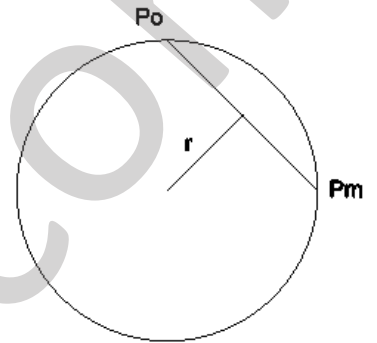
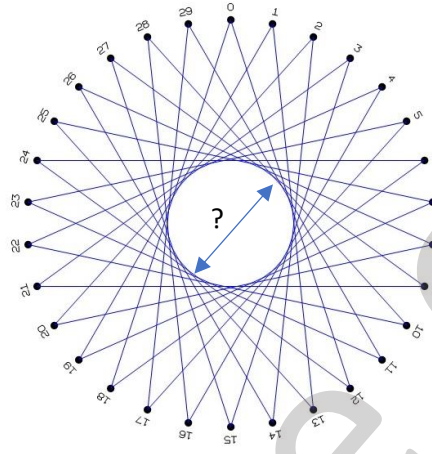
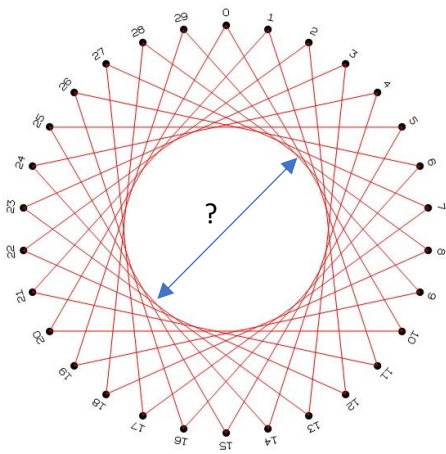


### Advanced Math Questions on String Art

- Given a frame with N holes and if you are skipping by M holes at a time (0, m, 2m.....). Prove that you will come back to the starting hole in X jumps,  $X \leq N$ .
- Find the diameter of the hole formed in the centre? (30-hole, 10 addition disc of dia 100mm ).



Hint: Find the equation of the line passing through  $P_o$  and  $P_m$

$(Ax + By + c)$  and then find the shortest distance of the line from the centre  $(0,0)$ .  $r = C / ((A^2 + B^2)^{1/2})$  Alternately: You can use chordAngle, chordLength formulas to find this.

Also verify this by dropping a ball through the centre.

- If there are 20 holes, and you do jump counting by M (0, m, 2m.....) Find the set of M's for which you will come back to the starting hole, only after 20 jumps, covering all the vertices.
- Find the points that are to be joined to form an ellipse in the centre.
- Calculate length of string needed for given N and K in "addition" case!
- Calculate length of string needed for given N and K in "multiplication" case!
- In back-forth method: Calculate length of string used on the FRONT side and BACK side for given N and K in add and multiply case! Also Calculate TOTAL string length (Front + Back side length).
- You have a string of length 2 meters. Will it be sufficient to string a 30-hole, 10 addition disc of dia 100mm using method1 ( 0 – 10F – 1B – 11F – 2B ) ? Will it be sufficient to string a 30-hole, 10 addition disc of dia 100mm using method2 ( 0 – 10f – 9b – 19f – 18b ) ?
- Student 1 has stringed 40 hole, 8-addition string art in back forth method. Now he needs the same color string to make a 30 hole, 10-addition string art, but it is out of stock! Can he dismantle the 40-hole-8-add string and complete the 30hole-10-add art?
- A cardioid shape is forming when we do 2 times multiplication. What you will do if you want to form new shapes like an ellipse, Rouleaux triangle etc.