PROBLEM CORNER

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Problem 1

Little John suggests a new method on constructing a regular 13-gon by using a compass and a ruler (see Figure 1):

1. Draw a circle c of radius 100 mm.

2. Choose an arbitrary point A on circle c.

3. Draw a circle d of radius 187 mm with center A.

4. Mark the intersection points B and M of circles c and d.

5. Draw a circle e of radius 187 mm with center B.

6. Mark the other intersection point C of circles c and e.

7. Draw a circle f of radius 187 mm with center C.

8. Mark the other intersection point D of circles c and f.

9. And so on, mark further intersection points E, F, G, H, I, J, K and L.

10. Now $AIDLGBJEMHCKF$ is a regular 13-gon.

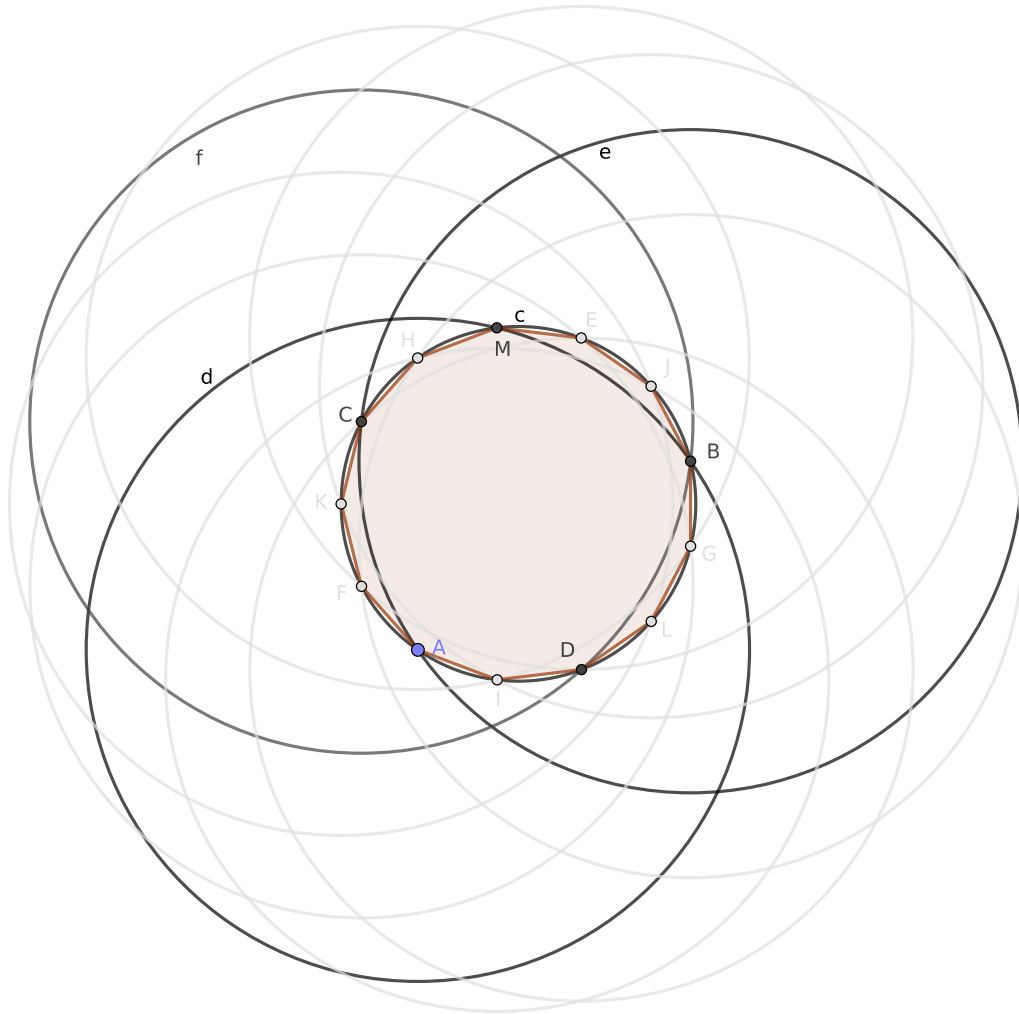We have the feeling that this cannot be accurate. Why? Explain the situation.

Figure 1 – Little John's method to construct a regular 13-gon

Problem 2

Assume we would like to use Little John's method to construct exact regular n-gons by considering two numbers as input radii, r_1 and r_2 (in Problem 1, $r_1 = 100$, $r_2 = 187$, $n = 13$). Find all natural numbers n and all associated integer numbers r_1 and r_2 that indeed produce an exact regular n-gon with this method.