Ring-a-ding Numeration

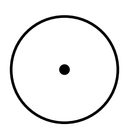
Jim Henle[1]

Ostensibly this paper is my gift to you, but really it's the website I created with animation that you generate. What you are reading now is a simple introduction.[2]

Ring-a-ding numeration is a simple system for writing numbers. It is, actually, a disguised version of binary. It's a pretty version, but it's totally impractical. It does have a lovely visual process for adding numbers, but it's singular feature is that it also has a visual process for multiplying numbers. I can't think of any other numeration system where multiplication is attractive.[3]

Here's the idea. A dot represents the number 1.

A ring doubles whatever is inside it.



Here's the numeral for 27:

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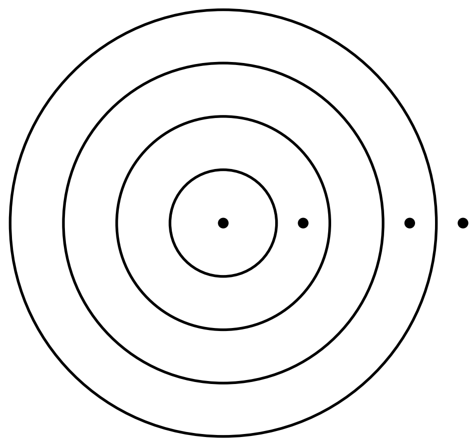
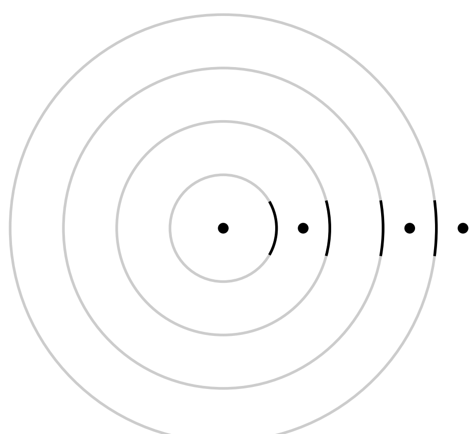
[1] With much thanks to Fred Henle for encouragement and technical assistance.

[2] And some of this is excerpted from a column I wrote for the *Mathematical Intelligencer*, "The Same, Only Different" 39(2): 60-63, 2017.

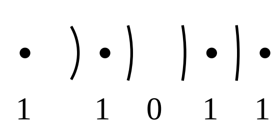
[3] Possible exception: Napier's bones?



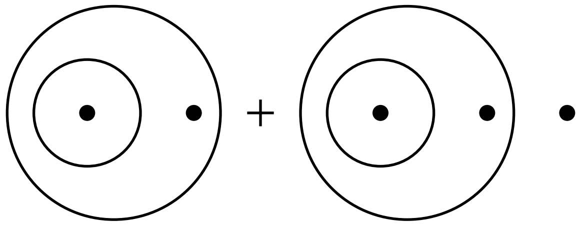
Going from outside in (right to left), the dots are worth 1, 2, 8, and 16.
If you just look at a piece of this,



you can see the connection to binary:



To add numbers, you place them side-by-side,

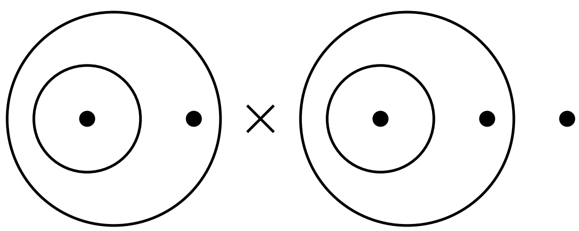


and smoosh them together. The smooshing process is fun, a little like cells splitting, but in reverse. You smoosh so that the numeral consists of nested circles with no more than one dot per region.

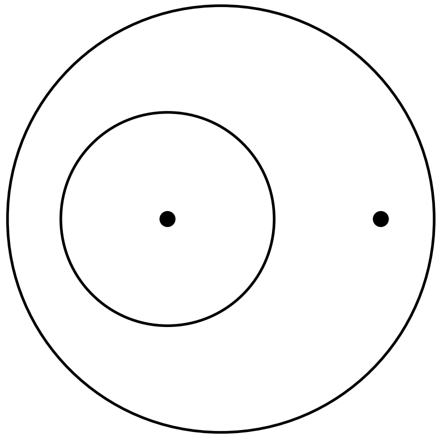
I could show you pictures, but the animated version (on the website) is more satisfying.

www.math.smith.edu/ jhenle/Ringading

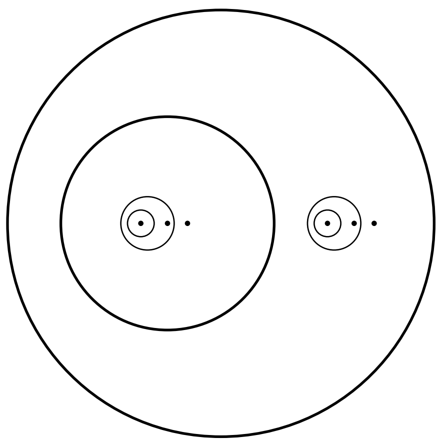
And to multiplying two numbers,



you simply replace every dot in one numeral



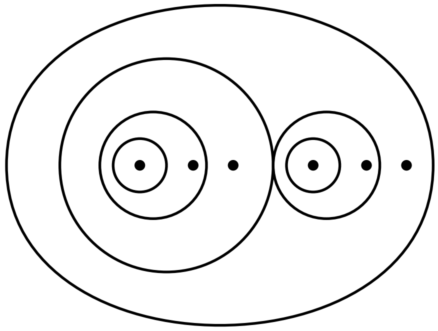
with the other numeral.



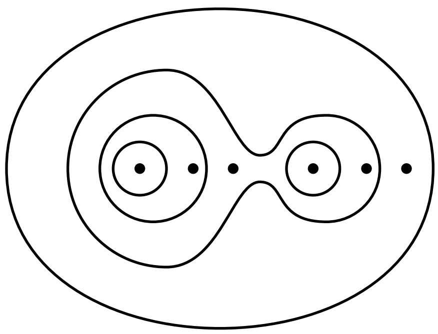
And then smoosh

But we're not done yet. If we allowed pictures like this, then numbers wouldn't be represented uniquely. To insure uniqueness, we insist that the curves are all nested. I also insist that no more than one dot appear in any region.

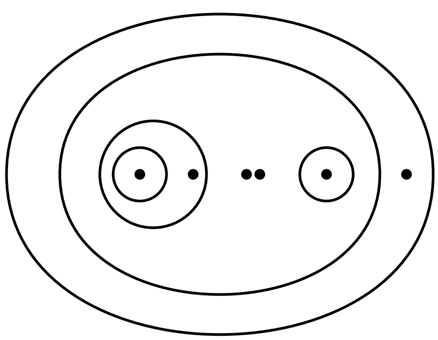
Fixing this numeral above goes like this: A circle on the left goes up to a circle on the right,



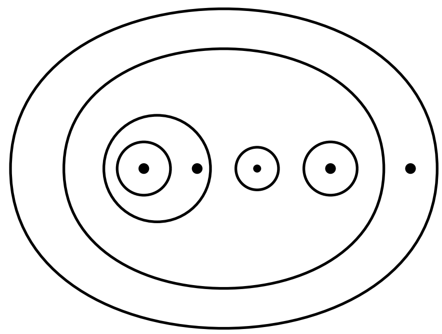
and they do something affectionate.



And now we have two dots in one region. So of course the dots get together.



It's love. They produce a baby and disappear.



To see this all happen in real time, go to

www.math.smith.edu/ jhenle/Ringading