Tossing Game, Grades 5+

What's really going on in the tossing game is something called "modular arithmetic" (more informally known as "clock math"-- can you see why?)

Some online educational articles or websites on modular arithmetic can be found here:

- Blog post that starts from the basics and builds up, including real life applications: http://betterexplained.com/articles/fun-with-modular-arithmetic/
- Slightly more terse article that previous article is based on: http://thales.math.uqam.ca/~rowland/investigations/modulararithmetic.html
- A step-by-step more interactive version by above author: http://web.math.princeton.edu/math_alive/Crypto/Lab2/ModArithm.html
- Short "simple english" wikipedia article: https://simple.wikipedia.org/wiki/Modular_arithmetic
- An article that starts from the basics and gets pretty advanced! https://www.ias.edu/about/publications/ias-letter/articles/2012-summer/modular-arithmetic-taylor

What is the "passing game"?

- Stephen DeBacker learned this game from Marty Weissman. http://people.ucsc.edu/~weissman/
- After defining "modular arithmetic" (or "clock arithmetic" or "circle arithmetic"), *n* participants stand in a circle with numerical labels, in order from *0* to *n-1*. (The value of *n* can be changed.)
- The facilitator moderates the game by giving instructions such as:
    - Add 2
    - Add 5
    - Add 3
    - Add 20
    - Multiply by 2
    - Multiply by 10
    - Multiply by 3
    - Square your number
- For each case, you'll observe different patterns and can ask questions for each case such as:
    - Will everyone get the ball? Why or why not? Are some numbers more "fair" than others? Which ones? Why? Does this depend on the total number of people?
    - How long will it take for person *j* to get the ball back? Is that the same for all people?

Content Areas or Math Practices:

- Division with remainder
- Addition and multiplication
- Factors, Multiples, and Divisibility
- Reasoning, Pattern Recognizing, and Problem-Solving
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