2 4 6 8 10 12 14

62 60 58 56 54 52 50 48 46

16 18 20 22 24 26 28 30 32

Factor Max

A Game of Factors and Multiples

Carole Greenes

Tanner Wolfram

44 42 40 38 36 34

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Alge-Grid: What's the a?
Pattern Grid-unLocks
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Author Bios

Carole Greenes, Ed.D. is Professor Emerita, Mathematics Education at Arizona State University. While at ASU, she served as Associate Vice President for STEM Education, Dean of the School of Educational Innovation and Teacher Preparation, Director of the Practice Research and Innovation in Mathematics Education (PRIME) Center, Director of the Vertically Integrated Projects program that provides research experiences for undergraduate students, and Professor of Mathematics Education in the Ira A. Fulton Schools of Engineering, the College of Liberal Arts and Sciences, and the Mary Lou Fulton Teachers College. Currently, she directs the PRIME Group that develops books of challenge problems and games for students, grades K – 12, and authors Carole's Corner for the Center for Mathematics and Teaching, Inc. in California. Carole is author of more than 350 books for students, PreK-12 and college, and teachers; 81 articles; six mathematical musicals; and two histories of mathematics in story and song. She served as editor of the Arizona Association of Teachers of Mathematics journal, *OnCore*, and author of the online monthly free *MATHgazine Senior* (grades 8-12), *MATHgazine Junior* (grades 5-8), *MATHgazine Elementary* (grades 3-5) and *MATHgazine Primary* (grades K-2). In 2003, Greenes was inducted into the Massachusetts Mathematics Educators' Hall of Fame. In 2011, she received the NCSM Ross Taylor/Glenn Gilbert National Leadership Award in Mathematics Education. In 2016, she received the Copper Apple Award for Leadership in Mathematics in Arizona, and in 2018 she received the National Council of Teachers of Mathematics Lifetime Achievement Award.

Tanner Wolfram is a graduate, Summa cum Laude, from Barrett, The Honors College at Arizona State University. He holds a major in Physics and minors in both Spanish and Chinese. Tanner is co-author of *Factor Max A game of factors and multiples*, *Play It Positively or Negatively!*, *Pattern Grid-unLocks, Alge-Grid: What's the a?* puzzle books, and senior author of the *Facasumi Puzzle Book*. From Spring 2016 to Fall 2020, Tanner served as Senior Project Assistant in the Practice, Research, and Innovation in Mathematics Education (PRIME) Center at ASU and is now co-Director of the PRIME Group. During his time with the PRIME Center, Tanner assisted with the NSF-funded App Maker Pro (AMP) project, edited and contributed to eight *MATHadazzle Puzzle Books*, co-authored six articles published by the Arizona Association of Teachers of Mathematics, and co-edited two free monthly online *MATHgazines.* He also co-edited the Fall and Spring (2019, 2020) issues of *OnCore*, the journal of the Arizona Association of Teachers of Mathematics (AATM).

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Factor Max: A game of factors and multiples

Object of the Game

- Create expressions using addition, subtraction, multiplication, division, or exponentiation.
- Identify factors and multiples of multi-digit numbers.

Group Size

- 2, 3 or 4 players

Materials Required

- 3 standard dice

- 5-by-5 Playing Board with 25 squares and a two-digit number recorded in the middle of the board (middle of row 3 and column 3). Six Numbered Playing Boards are included. These may be duplicated for use. (Note: Other Boards may be developed by the players.)
    - The 24 Board
    - The 30 Board
    - The 36 Board
    - The 40 Board
    - The 42 Board
    - The 48 Board

- Score Sheet to include Board Number, players' names, points gained from each recorded number, and total scores.

Game Play

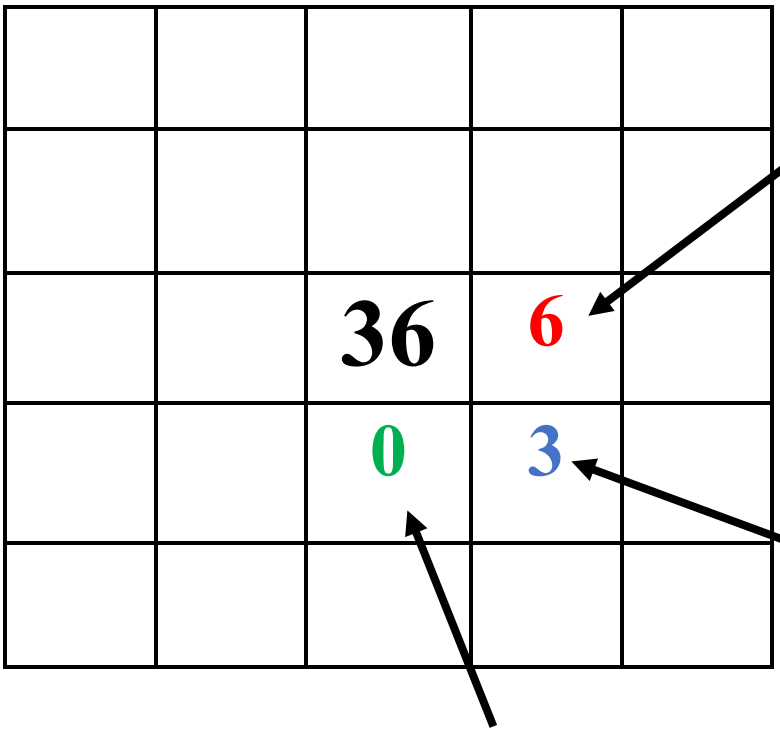
- Each player, in turn, rolls all three dice. The player with the least sum plays first.
- First player rolls all three dice. That player uses all three dice to create a multiple or a factor of the number on the game board. The player describes the process for computing the factor or multiple, and records that number in a square adjacent, either horizontally, vertically, or diagonally, to the center number.
- Play passes to the player to the right of the first player.
- The next player rolls the dice, attempts to create a factor or multiple of any number on the board, and records that number in a square adjacent to its factor or multiple.
    - NOTE: Next players keep in mind that any number recorded must be a factor or multiple of every adjacent number.
    - NOTE: **No number can be repeated!**
- If a factor or multiple of a recorded number cannot be created, the player may record any number computed in a square that is open and NOT ADJACENT to any recorded numbers.
- When a player rolls the dice and is unable to produce a number that has not been recorded, and there are no spaces free to record the number, the game is over.

Helpful info: Zero is a multiple of all numbers.
One is a factor of all numbers.

Scoring

- When a number is recorded on the board, one point is scored for each adjacent factor or multiple.
- The player scores zero points for any number recorded on the board that is not adjacent to any other number.
- At the end of the game, the player with the highest score is the winner.

Sample Game on The 36 Board with two players: First three moves



Move 1: Player 1 rolls the dice, gets 6, 3 and 3, and forms the number 6 by computing 6 x 3 ÷ 3. Player 1 records the **6** next to the 36 and scores one point.

Move 2: Player 2 rolls the dice, gets 4, 2, and 1, and forms the number 3 by computing 4 – (2 – 1).

Player 2 records the **3**, adjacent to both the 36 and the 6, and scores two points.

Move 3: Player 1 rolls the dice, gets 6, 5 and 1, and forms the number 0 by computing 6 – 5 – 1.

Player 1 records the **0** , adjacent to and a multiple of 36, 6 and 3, and scores three points.

The 24 Board

		24		

The 30 Board

		30		

Factor Max 7

The 36 Board

		36		

The 40 Board

		40		

The 42 Board

		42		

Factor Max 10

The 48 Board

		48		

Score Sheet

Board Number: _____

	Player 1 Name:	Player 2 Name:	Player 3 Name:	Player 4 Name:
Total Points				

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