

Lab Framework

Text: CORD

Unit number and title: 23 Factoring

Short Description: The object of the game is similar to that of tic-tac-toe; the winner is the first of two players to place four tokens in a row, either vertically, horizontally, or diagonally.

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Lab Title

Connect Four Factors

LAB PLAN

TEACHER: Teacher Prep/ Lesson Plan

- **Lab Objective**

"Algebra tic-tac-times" combines mathematical skills with a competitive strategy. It is a highly motivational skill-review exercise that involves the problem-solving strategy of working backward.

- **Statement of pre-requisite skills needed** (i.e., vocabulary, measurement techniques, formulas, etc.)

Factoring of monomials, polynomials, trinomials, squares, roots, vocabulary, multiplication, distributive properties

- **Vocabulary**

Factoring, squared

- **Materials List**

Factor board, game board, 40 tokens, 2 different colors, zip lock bag for tokens

- **GLEs (State Standards) addressed**

Math: **1.5.5 Combine and simplify algebraic expressions that contain polynomials, rational expressions, radicals, or rational exponents. (aligns with CRS 7.2)**

- **SCAN Skills/Workplace Skills**

A. Approaches practical problems by choosing appropriately from a variety of mathematical techniques

- **Set-up information**

Method of play

Player 1 begins the game by placing a factor marker and one of player 2's factor markers on any factors on the factor board. The product of these factors determines the placement of player 1's game token. For example, player 1 placed a factor marker on $x + 1$ and player 2's marker on $x - 1$. Player 1 then placed a game token on $x^2 - 1$ because $(x - 1)(x + 1) = x^2 - 1$.

Note: factor markers can be placed on the same factor, resulting in squared factors.

Player 2 can move only player 2's factor marker (player 1's marker remains in place) to another factor on the factor board. For example, player 2 could move a factor marker to x . The product of these new factors determines the placement of player 2's game token. In

this example, player 2 would place a game token on the product of $x + 1$ (player 1's marker) and x (player 2's marker), or $x^2 + x$, on the game board.

Players must use a strategy of working backward to determine which products combined with the available factors will win the game. These same problem-solving strategies become a part of the defensive play of the game when a player wishes to block an opponent.

Penalties

A player is penalized when a product that has already been covered is used or when an incorrect response to the factors is given. A move is considered to be completed when a player's hand is removed from the factor marker in the event of a duplicate product or from the game token in the event of an incorrect response. In the event of a penalty, the opposing player has the opportunity to move both factor markers, as in the beginning of the game.

Players play until one gets a “connect four” or 4 in a row. This can be up and down, across, or diagonally.

- **Lab organization**(-Grouping/leadership opportunities/cooperative learning expectations; -**Timeline required**)
 - 1 class period-50 minutes
- **Teacher Assessment of student learning** (scoring guide, rubric)
 - Teacher observation
- **Summary of learning** (to be finished after student completes lab)
 - discuss real world application of learning from lab
 - opportunity for students to share/present learning
- **Optional activities**
 - Create additional game boards with different equations and turn the game into a tournament.
 - This can also be used as “BINGO”. Create different cards with different arrangements of factors.
- **Game Boards Below:**

<https://wa-appliedmath.org/>

| | | | | |
|-----------------|----------------|----------------|-----------------|----------------|
| $x^2 - 7x + 12$ | $x^2 - 3x + 2$ | $x^2 - 16$ | $x^2 + 8x + 16$ | $x^2 - x$ |
| $x^2 + 5x + 4$ | $x^2 - 4x$ | $x^2 + 2x - 3$ | $x^2 + x$ | $x^2 - 1$ |
| $x^2 - 8x + 16$ | $x^2 - 5x + 6$ | $x^2 - 4x + 4$ | $x^2 + 7x + 12$ | $x^2 - 2x - 8$ |
| $x^2 - 4$ | $x^2 + 2x$ | $x^2 - 6x + 9$ | $x^2 - 9$ | $x^2 + 3x - 4$ |
| $x^2 - 2x + 1$ | $x^2 - 2x - 3$ | $x^2 - 2x$ | x^2 | $x^2 + 5x + 6$ |
| $x^2 - 6x + 8$ | $x^2 + 4x + 4$ | $x^2 + 2x - 8$ | $x^2 + 3x$ | $x^2 - 4x + 3$ |
| $x^2 + 6x + 9$ | $x^2 + x - 2$ | $x^2 + 4x + 3$ | $x^2 - x - 2$ | $x^2 - 3x$ |
| $x^2 - 3x - 4$ | $x^2 + x - 12$ | $x^2 - x - 6$ | $x^2 + 4x$ | $x^2 + 6x + 8$ |
| $x^2 + 3x + 2$ | $x^2 + 2x + 1$ | $x^2 - 5x + 4$ | $x^2 - x - 12$ | $x^2 + x - 6$ |

| | | | | | | | | |
|---------|---------|---------|---------|-----|---------|---------|---------|---------|
| $x - 4$ | $x - 3$ | $x - 2$ | $x - 1$ | x | $x + 1$ | $x + 2$ | $x + 3$ | $x + 4$ |
|---------|---------|---------|---------|-----|---------|---------|---------|---------|

Factor Board

Washington

LAB TITLE: Connect four factors **STUDENT INSTRUCTIONS:**

- **Grouping instructions and roles**
You will work with a partner and decide who will be player 1 and 2.
- **Procedures** – steps to follow/instructions
- *Method of play*
Player 1 begins the game by placing a factor marker and one of player 2's factor markers on any factors on the factor board. The product of these factors determines the placement of player 1's game token. In figure 1, player 1 placed a factor marker on $x + 1$ and player 2's marker on $x - 1$. Player 1 then placed a game token on $x^2 - 1$ because $(x - 1)(x + 1) = x^2 - 1$.
- Note: factor markers can be placed on the same factor, resulting in squared factors.
- Player 2 can move only player 2's factor marker (player 1's marker remains in place) to another factor on the factor board, as shown in figure 2. In this example, player 2 could move a factor marker to x . The product of these new factors determines the placement of player 2's game token. In this example, player 2 would place a game token on the product of $x + 1$ (player 1's marker) and x (player 2's marker), or $x^2 + x$, on the game board.
- Players must use a strategy of working backward to determine which products combined with the available factors will win the game. These same problem-solving strategies become a part of the defensive play of the game when a player wishes to block an opponent.
- **Penalties**
- A player is penalized when a product that has already been covered is used or when an incorrect response to the factors is given. A move is considered to be completed when a player's hand is removed from the factor marker in the event of a duplicate product or from the game token in the event of an incorrect response. In the event of a penalty, the opposing player has the opportunity to move both factor markers, as in the beginning of the game.

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- **Outcome instructions**
You will play until one person has reached a Connect Four “4 in a row going any direction-up and down, across, diagonally
- **Assessment instructions** (peer-teacher)

Washington Applied Math Council

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Lab Data Collection

Student: _____ Date: _____

Unit: _____

Lab Title:

Criteria: Write the problem/objective in statement form

Data Collection: Record the collected/given data

Calculations: Complete the given calculations to solve for an answer(s)

Summary Statement:

Other Assessment(s)

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