Name: _____ Period: _____ Date: _____

Integer Exponent Card Game: Properties of integer exponents Math 8

If you have ever played the card game of **WAR**, you can play this game. It helps you practice your exponents: the product of powers and quotient of powers. If you play your cards right, you may even get a chance to steal your opponent's cards and win the game!

This is a 2-player game.

Materials:

- Deck of cards
- Product of Powers Template for each player
- Quotient of Powers Template for each player
- Record chart included in the Exponent Card Game Worksheet

Goal:

- To win all the cards, or most of them, for each round.
- How do you earn the cards? The expression with the smallest product of powers or quotient of powers wins the cards on hand.
- In cases where the expression can be simplified to 1, you can steal all your opponent's earned cards in a pile.

Overall Rules:

❖ For this game:
- All **RED cards** have a **negative value**.
- All **BLACK cards** have a **positive value**.

❖ Number Cards
- All number cards are worth their spot or index value.

❖ Face Cards
- Jack has a value of 11
- Queen has a value of 12
- King has a value of 13

❖ For example:
a. Red KING = -13
b. 10 of Diamonds = -10
c. 7 of Spades = 7
d. 2 of Clubs = 2

Name: _____ Period: _____ Date: _____

Integer Exponent Card Game: Properties of integer exponents **Math 8**

Round 1: Product of Powers

1. Each player has a Product of Powers Template.
2. Lay down your top 2 cards, each in the exponent spot.
3. Compare your product of powers with your opponent's.
4. In cases where the product of powers is negative, you may keep it as it is. There is no need to make it positive.
5. Whoever has the SMALLEST product of powers wins all those 4 cards.
6. Keep winning cards in a separate pile.
7. Play again.
8. The game continues until:
    - There's a tie- tie breaker, WAR, just play 2 cards face down and 2 cards face up (4 more cards each) and calculate the new product of powers battle.
    - If someone gets a simplified answer equal to 1 – (this can be obtained if the resulting product of powers is zero), you take the winning pile of cards from your opponent.
    - Someone who can get all the cards, or most of them, is the **WINNER**!
9. Your teacher may end the round if no one wins in 10-15 min.

Name: _____ Period: _____ Date: _____

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Round 2: Quotient of Powers

1. Each player has a Quotient of Powers Template.
2. Players lay down 2 cards, face up, write the expression, and solve the quotient of powers.
3. Compare your quotient of powers with your opponent's.
4. Whoever has the SMALLEST quotient of powers wins all those 4 cards.
5. In cases where the quotient of powers is negative, you may keep it as it is. There is no need to make it positive.
6. Keep winning cards in a separate pile.
7. Play again.
8. Play continues until:
    - There's a tie- tie breaker, WAR, just play 2 cards face down and 2 cards face up (4 more cards each) and calculate the new quotient of powers battle.
    - If someone gets a simplified answer equal to 1 – (this can be obtained if the resulting quotient of powers is zero), you take the winning pile of cards from your opponent.
    - Someone who can get all the cards, or most of them, is the **WINNER**!
9. Your teacher may end the round if no one wins in 10-15 min.

Name: _____ Period: _____ Date: _____

Integer Exponent Card Game: Properties of integer exponents **Math 8**

Round 1: Product of Powers Record Sheet

Use this chart to record each hand, expression and solution.

Notes to the designer:

- When writing quotients with exponents, make them in the vertical form with a top and bottom, in the form $\frac{1}{x}$ (not a backslash)
- Students do not need to name the cards they play, but here is an example of a hand, along with the variable product and exponents. Provide room for students to write their equations to show their work. Students need a separate record sheet for each round - one for Product of Powers round and another one for Quotient of Powers round.

Cards on Hand	Expression	Solution
x  $\cdot$ x 	$x^{11} \cdot x^{-13}$	$x^{11+(-13)} = x^{-2}$

Name: _____ Period: _____ Date: _____

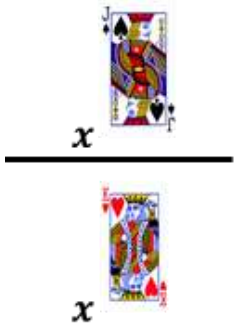
Integer Exponent Card Game: Properties of integer exponents **Math 8**

Round 2: Quotient of Powers Record Sheet

Use this chart to record each hand, expression and solution.

Notes to the designer:

- When writing quotients with exponents, make them in the vertical form with a top and bottom, in the form $\frac{1}{x}$ (not a backslash)
- Students do not need to name the cards they play, but here is an example of a hand, along with the variable product and exponents. Provide room for students to write their equations to show their work. Students need a separate record sheet for each round - one for Product of Powers round and another one for Quotient of Powers round.

Cards on Hand	Expression	Solution
	$\frac{x^{11}}{x^{-13}}$	$x^{11-(-13)}$ $= x^{11+13}$ $= x^{24}$

Name: _____ Period: _____ Date: _____

Integer Exponent Card Game: Properties of integer exponents **Math 8**

Reflection Questions and Practice

1.) In the Product of Powers round, would you rather have played a RED card, or a BLACK card? Why?

2.) In the Product of Powers round, was it better to play 2 RED cards or 2 BLACK cards? Why?

3.) In the Quotient of Powers round, would you rather have played a BLACK card or a RED card as your divisor (denominator)? Why?

4.) In the Quotient of Powers game, what happened if you had 2 RED cards? Justify your answer by showing a model or expressing it in expanded form.

5.) Complete the table below:

Note to the designer: When writing quotients with exponents, make them in the vertical form with a top and bottom, in the form $\frac{1}{x}$ (not a backslash)

STANDARD FORM	EXPANDED FORM	POSITIVE EXPONENT FORM
x^{-7}	$\frac{1}{x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x}$	$\frac{1}{x^7}$
$x^{-2}x^{-4}$		
$x^{3}x^{-8}$		
$\frac{x^{-9}}{x^{-5}}$		
$\frac{1}{x^{3}x^{-6}}$		