Note: This game treats subtraction as addition of the opposite: $a - b = a + {}^{-}b$.

The Distributive Property of Multiplication over Addition

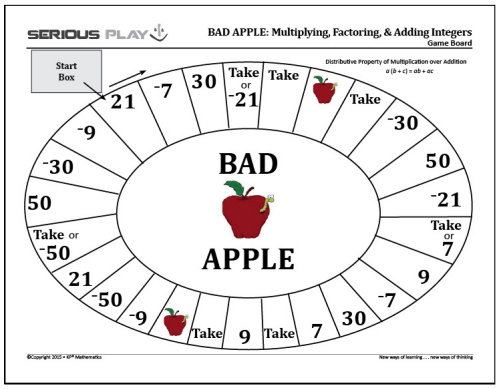
The **distributive property of multiplication over addition**, $a(b + c) = ab + ac$, says that when a number multiplies an indicated sum (addition expression enclosed in parentheses), the result is the same as when the number multiplies each addend in that sum; for example, $6 \times ({}^{-}3 + 5) = 6 \times {}^{-}3 + 6 \times 5$.

Game Description and Materials

Bad Apple is a game for two players that uses the distributive property to give students mental math practice multiplying, factoring, and adding integers. Players match cards with equivalent expressions $ab + ac$ and $a(b + c)$ and then match the Cards with their common sum.

Game materials include a Game Board and Cards. Each player needs one die and a game token (not included).

The **object of the game** is to score more points than the other player.



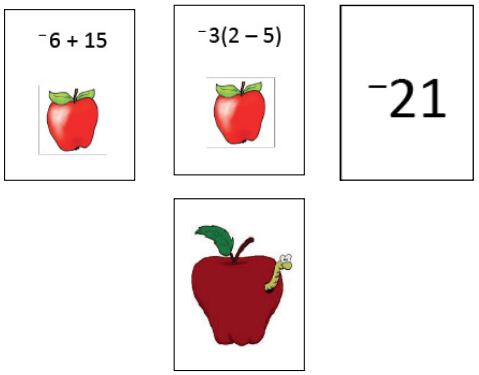
Game Board

The Game Board is a pathway of **spaces** that signal actions:

- Sums only (if possible, match to the corresponding Sum Card)
- Take (take a Card from your opponent)
- Take or sum (choose either)
- Bad Apple (take/keep the Bad Apple Card)

Cards

There are 31 cards. 30 cards represent ten trios --- three Cards of equivalent expressions: $ab + ac$, $a(b + c)$, and the common sum. The remaining Card is the Bad Apple.

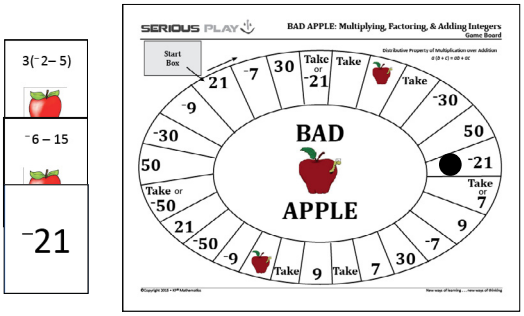


Getting Ready to Play

Players spread the Sum Cards out on the table to the side of the game space so the sums are clearly visible. The dealer shuffles the remaining 21 Cards and deals them out to each player. Players organize their Cards on the table in front of them, visible to both players, pairing Cards that show equivalent expressions $a(b + c)$ and $ab + ac$. Players place their game tokens in the Start Box.

Let's Play!

1. Player 1 rolls the die and moves the indicated number of spaces.



- If she lands on a **Sum** space, she must have the pair of Cards with that sum in order to play. In that case, she selects and uses the corresponding Sum Card to complete the trio of Cards with the same sum. She puts the three Cards together and places the trio aside, with the Sum Card on top, until the end of the game. Each trio will earn one point.

- If she lands on a **Take** space, she may take any Card from her opponent (but she may not break a three-Card set). She must ask for the Card, using the correct mathematical language; for example, "Give me three times the quantity negative two minus five" for $[a(b + c)]$ or "Give me negative six minus fifteen" for $(ab + ac)$.*
- If she lands on a **Take of Sum** space, she follows the directions for the Take space **or** the Sum space.
- If she lands on a **Bad Apple** space, she either keeps the Bad Apple Card, if she already has it or, if she does not have it, she receives it from her opponent.
- If she lands on a Sum Space and that Sum Card has been taken, she rolls again.

2. Players alternate turns until one player is out of cards or has only Bad Apple left. Then, the game is over.

Scoring

Each correct trio of Cards earns one point. The Bad Apple Card has a value of $^{-}3$; the player with the Bad Apple Card subtracts three points from her score.

The winner is the player with the higher score.

* Players may recognize that there are two equivalent possibilities for the factored form of a two-term expression, one in which a positive number is factored out and the other in which a negative number is factored out. If a player asks for one and the opponent doesn't have it, she may want to ask for the other form. However, since all Cards are visible to both players, a player may simply look at the opponent's Cards and read off the desired expression.

SERIOUS PLAY

BAD APPLE: Multiplying, Factoring, & Adding Integers

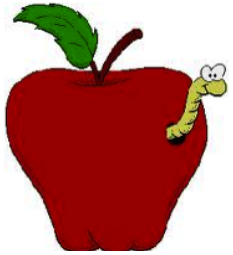
Game Board

Start Box

Distributive Property of Multiplication over Addition

$a(b + c) = ab + ac$

BAD

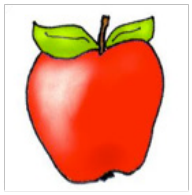
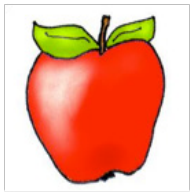
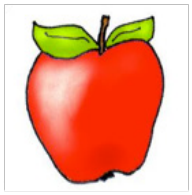
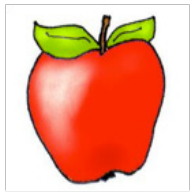
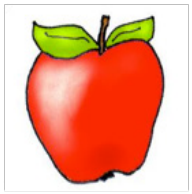
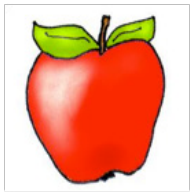
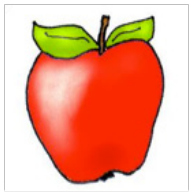
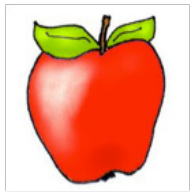
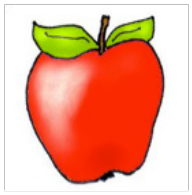
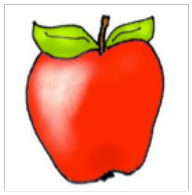


APPLE

21 | -7 | 30 | Take or -21 | Take | Take | -30 | 50 | -21 | Take or 7 | 9 | -7 | 30 | 7 | Take | 9 | Take | -9 | -50 | 21 | Take or -50 | 50 | -30 | -9

BAD APPLE: Multiplying, Factoring, & Adding Integers

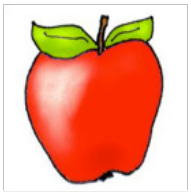
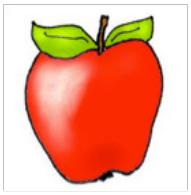
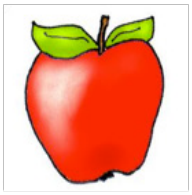
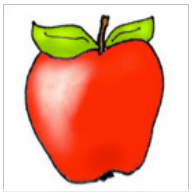
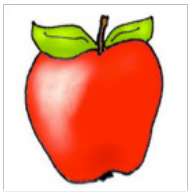
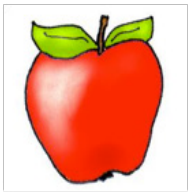
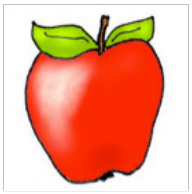
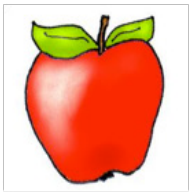
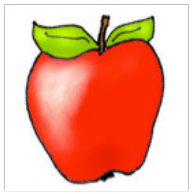
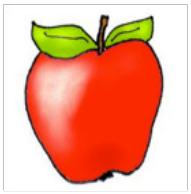
Cards

$3(^{-}2-5)$ 	$^{-}3(2-5)$ 	$3(2+5)$ 	$^{-}3(5-2)$ 
$^{-}7(^{-}2+3)$ 	$7(3+2)$ 	$^{-}7(2-3)$ 	$^{-}7(2+3)$ 
$5(^{-}3-7)$ 	$5(3+7)$ 		

SERIOUS PLAY

BAD APPLE: Multiplying, Factoring, & Adding Integers

Cards

$^{-}6 - 15$ 	$^{-}6 + 15$ 	$6 + 15$ 	$^{-}15 + 6$ 
$14 - 21$ 	$21 + 14$ 	$^{-}14 + 21$ 	$^{-}14 - 21$ 
$^{-}15 - 35$ 	$15 + 35$ 		

-21	$\frac{9}{-}$	21	-9
-7	35	7	-35
-50	50		

SERIOUS PLAY

BAD APPLE: Multiplying, Factoring, & Adding Integers

Answer Key

$3(^{-}2-5)$ $^{-}6-15$ $^{-}21$	$^{-}3(2-5)$ $^{-}6+15$ 9	$3(2+5)$ $6+15$ 21	$^{-}3(5-2)$ $^{-}15+6$ $^{-}9$
$^{-}7(^{-}2+3)$ $14-21$ $^{-}7$	$7(3+2)$ $21+14$ 35	$^{-}7(2-3)$ $^{-}14+21$ 7	$^{-}7(2+3)$ $^{-}14-21$ $^{-}35$
$5(^{-}3-4)$ $^{-}15-20$ $^{-}35$	$5(3+4)$ $15+20$ 35		

SERIOUS PLAY

BAD APPLE: Multiplying, Factoring, & Adding Integers

Blank Game Board

Start Box

Distributive Property of Multiplication over Addition

$a(b + c) = ab + ac$

Give

Take

Take

Take

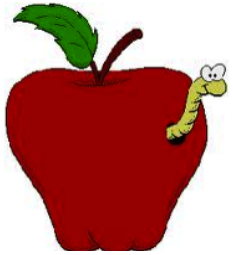
Take

Give

Take

Take

BAD

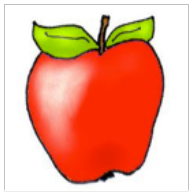
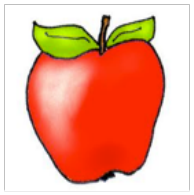
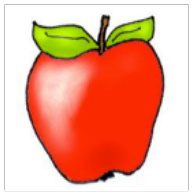
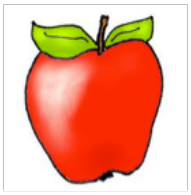
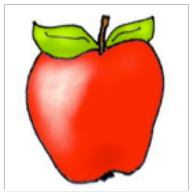
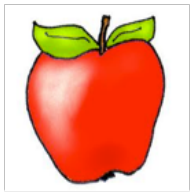
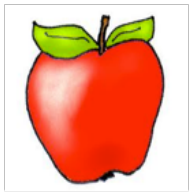
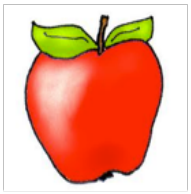
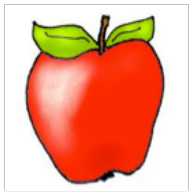
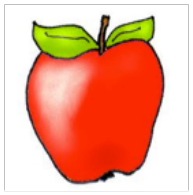


APPLE

SERIOUS PLAY

BAD APPLE: Multiplying, Factoring, & Adding Integers

Blank Cards

SERIOUS PLAY

BAD APPLE: Multiplying, Factoring, & Adding Integers

Blank Cards