

The Commutative and Associative Properties

The **commutative property of multiplication** ($a \times b = b \times a$) says that when two numbers are multiplied, changing the order of the factors does not change the product; for example, $6 \times 9 = 9 \times 6$.

The **associative property of multiplication** says that $(a \times b) \times c = a \times (b \times c)$. This property allows us to multiply a sequence of more than two numbers. Because only two numbers at one time can be multiplied, we use the associative property to associate the two numbers we want to multiply at each step. No matter which two numbers we multiply, the product will be the same; for example, $(7 \times 5) \times 8 = 7 \times (5 \times 8)$.

Game Description and Materials

Pairing Up is a game for up to four players that uses the commutative and associative properties of addition to give students mental math practice multiplying within 81.

Game materials include 52 cards.

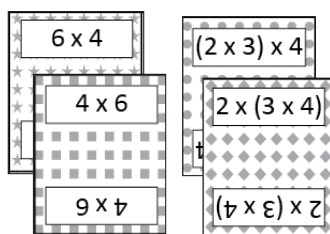
The **object of the game** is to earn more points by matching cards in pairs that have the same product.

Cards

- **40 Cards** (ten 4-card sets) contain multiplication expressions. Two cards in each set are two-factor commutative matches; the other two cards in the set are three-factor associative matches.

★
The expressions on each four-card set have the **same sum**.

Commutative Pair



Double Pair

Associative Pair

★
The expressions on each four-card set have the **same sum**.

- **12 Chance Cards** tell players to take an unmatched card (a card that is not part of a Commutative Pair or an Associative Pair) from one of their opponents. If no opponent has an unmatched card, the Chance Card cannot be played and is discarded. Chance Cards must be used and discarded at the time they are drawn and can not be saved to be used at a later turn.



Getting Ready to Play

The dealer shuffles the cards and places them face down on the table to form a draw pile. Players decide who takes the first turn.

Let's Play!

Round 1: Making Commutative Pairs

1. Players alternate turns picking the top card from the draw pile and following the “directions” below. As they collect cards, they place them on the table, visible to all players.
 - If the card contains a two-factor expression, the player keeps it, trying to make a Commutative Pair with one of her other two-factor expressions. When she makes a Commutative Pair, she puts the cards together. Commutative Pairs are “safe;” neither card in the pair may be taken by the opponent.
 - If the card contains a three-factor expression, the player discards it. (Those cards will be used in Round 2.)
 - If the card is a Chance Card, the player takes an unmatched card of her choice from one of her opponents (*she may not break up a Commutative Pair*) and then discards the Chance Card. If there is no unmatched card to take, she discards the Chance Card.
2. Play continues until the draw pile is gone. Players turn the discard pile upside down to begin Round 2.

Round 2: Making Associative Pairs and Double Pairs

3. Players alternate turns following the “directions” below.
 - If the card contains a three-factor expression, the player keeps it, placing it with any two-term card that has the **same product**.
 - If the card is a Chance Card, the player takes an unmatched card of her choice from her opponent (*she may not break up a Commutative Pair or an Associative Pair*).
4. As play continues, players try to make Associative Pairs with their three-factor cards in the same way they made Commutative Pairs with their two-factor cards. In addition, they try to make Double Pairs (4-card sets made up of a Commutative Pair and an Associative Pair with the **same product**).
5. The game is over when no cards are left in the draw pile.

Scoring

6 points for each Double Pair

2 points for each Commutative Pair or Associative Pair that is not part of a Double Pair

The winner is the player with more points.





PAIRING UP

Commutative Property (x)

$$a \times b = b \times a$$

Associative Property (x)

$$(a \times b) \times c = a \times (b \times c)$$

GOAL: Collect more pairs.

In Order

Round 1: Making Commutative Pairs

1. **Pick** a card.
 - Keep two-term card.. Discard three-term card.
 - For Chance Card, take unpaired card from other player.
2. **Make** Commutative Pairs.

Round 2: Making Associative Pairs and Double Pairs

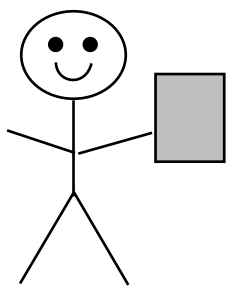
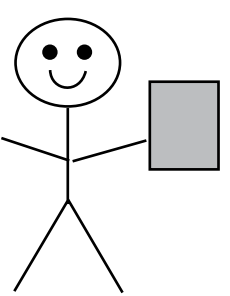
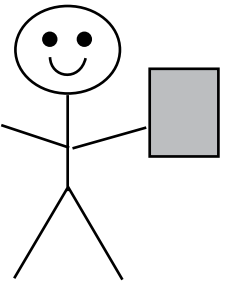
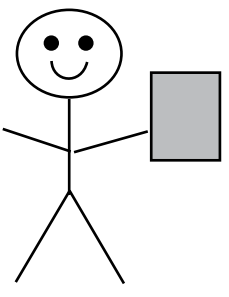
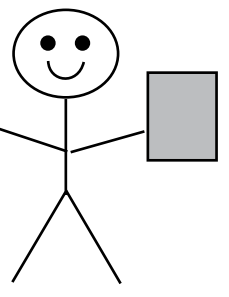
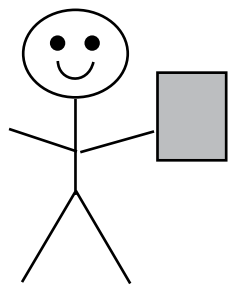
3. **Pick** a card.
 - Match three-term card with two-term card having same sum.
 - For Chance Card, take unpaired card from other player.
4. **Make** Associative Pairs and, if possible, Double Pairs (4 cards).

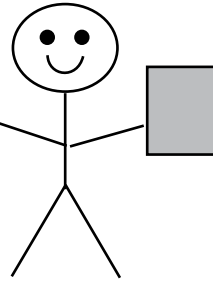
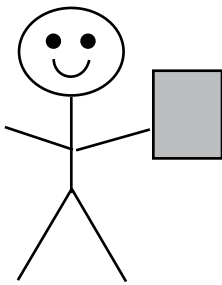
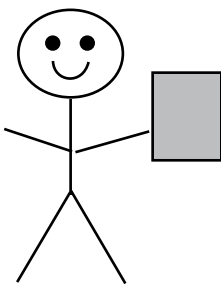
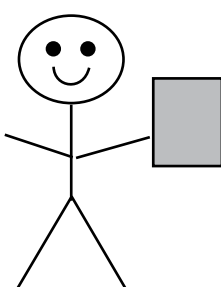
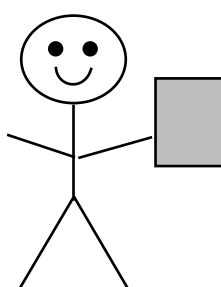
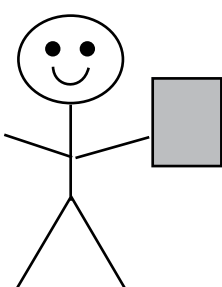
Always

Take turns.

Discard Chance Cards after use.

The WINNER has more Pairs.

6×4	6×5	4×7	4×5
7×9	5×9	7×4	5×4
6×8	4×9	9×8	6×7
8×9	6×7	8×6	7×9
4×8	9×3	Take an unmatched card from your opponent.	Take an unmatched card from your opponent.
8×7	3×9		
Take an unmatched card from your opponent.	Take an unmatched card from your opponent.	Take an unmatched card from your opponent.	Take an unmatched card from your opponent.
			

4×6	5×6	7×4	5×4
9×4	9×5	7×4	5×4
8×6	9×4	8×9	7×6
9×8	4×9	6×8	9×7
8×4	3×9	Take an unmatched card from your opponent.	Take an unmatched card from your opponent.
4×8	6×3		
Take an unmatched card from your opponent.	Take an unmatched card from your opponent.	Take an unmatched card from your opponent.	Take an unmatched card from your opponent.
			

$(2 \times 3) \times 4$	$(2 \times 3) \times 5$	$(2 \times 2) \times 7$	$(2 \times 2) \times 5$
$(2 \times 3) \times 4$	$(2 \times 3) \times 5$	$(2 \times 2) \times 7$	$(2 \times 2) \times 5$
$(2 \times 3) \times 8$	$(4 \times 3) \times 3$	$(3 \times 3) \times 8$	$(2 \times 3) \times 7$
$(2 \times 3) \times 8$	$(4 \times 3) \times 3$	$(3 \times 3) \times 8$	$(3 \times 2) \times 7$
$(4 \times 2) \times 4$	$(3 \times 3) \times 3$		
$(4 \times 2) \times 4$	$(3 \times 3) \times 3$		

$2 \times (3 \times 4)$	$2 \times (3 \times 5)$	$2 \times (2 \times 7)$	$2 \times (2 \times 5)$
$2 \times (3 \times 4)$	$2 \times (3 \times 5)$	$2 \times (2 \times 7)$	$2 \times (2 \times 5)$
$2 \times (3 \times 8)$	$4 \times (3 \times 3)$	$3 \times (3 \times 8)$	$2 \times (3 \times 7)$
$2 \times (3 \times 8)$	$4 \times (3 \times 3)$	$3 \times (3 \times 8)$	$2 \times (3 \times 7)$
$4 \times (2 \times 4)$	$3 \times (3 \times 3)$		
$4 \times (2 \times 4)$	$3 \times (3 \times 3)$		

6×4

6×5

4×7

4×5

4×6

5×6

7×4

5×4

$(2 \times 3) \times 4$

$(2 \times 3) \times 5$

$(2 \times 2) \times 7$

$(2 \times 2) \times 5$

$2 \times (3 \times 4)$

$2 \times (3 \times 5)$

$2 \times (2 \times 7)$

$2 \times (2 \times 5)$

6×8

4×9

9×8

6×7

8×6

9×4

8×9

7×6

$(2 \times 3) \times 8$

$(4 \times 3) \times 3$

$(3 \times 3) \times 8$

$(2 \times 3) \times 7$

$2 \times (3 \times 8)$

$4 \times (3 \times 3)$

$3 \times (3 \times 8)$

$2 \times (3 \times 7)$

4×8

9×3

8×4




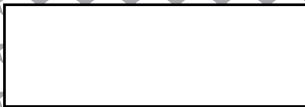
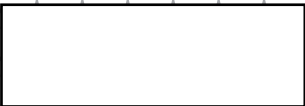
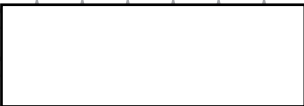
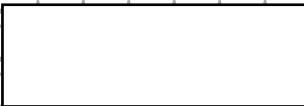
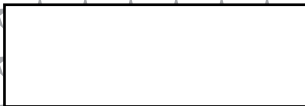




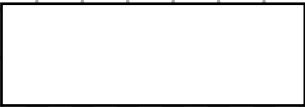
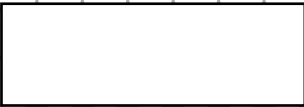
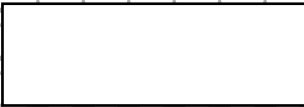
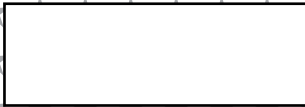
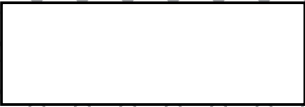
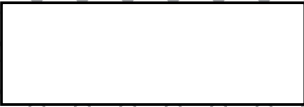
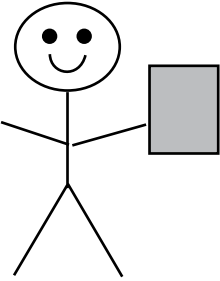
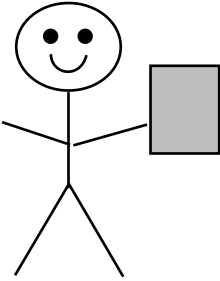
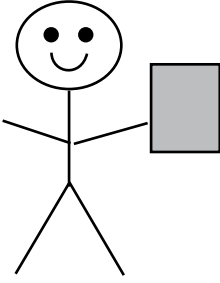
3×9



















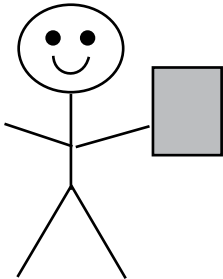
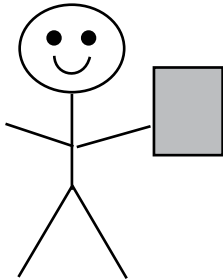


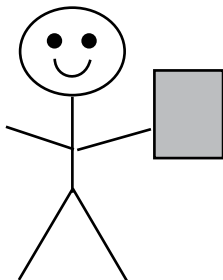
$(4 \times 2) \times 4$



















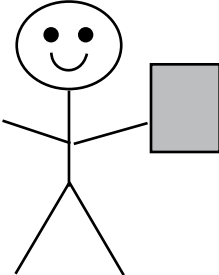
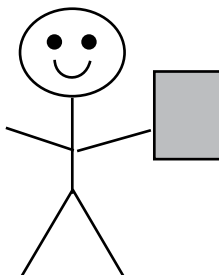


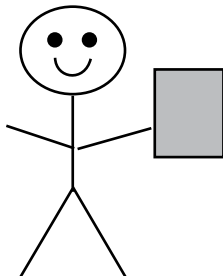
$(3 \times 3) \times 3$





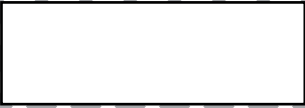
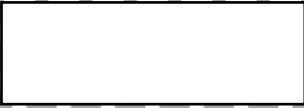
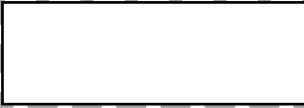
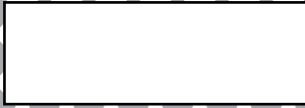
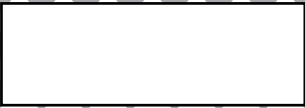
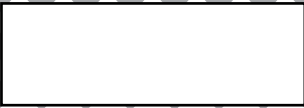
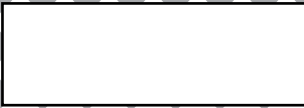
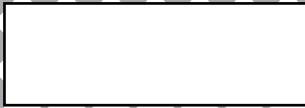





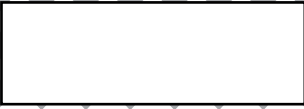
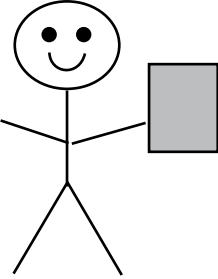
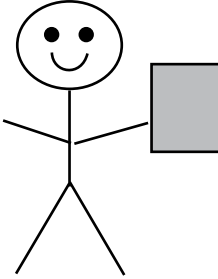
$4 \times (2 \times 4)$

$3 \times (3 \times 3)$

			
			
			
			
		<p>Take an unmatched card from your opponent.</p> 	<p>Take an unmatched card from your opponent.</p> 
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