



Multiplication Facts to 9 x 9

Mathematical Ideas

Composing, decomposing, and addition of numbers are foundations of multiplication.

The following are properties of multiplication:

1. Identity Property (multiplication by one)

$$3 \times 1 = 3 \text{ and } 1 \times 3 = 3$$

The product (result) is the same as the original amount.

2. Commutative Property

$$3 \times 2 = 6$$

$$2 \times 3 = 6$$



The product is the same regardless of the order of the numbers.

3. Associative Property

$$3 \times 2 \times 4 = ?$$

$$(3 \times 2) \times 4 = 6 \times 4 = 24 \quad \text{and} \quad 3 \times (2 \times 4) = 3 \times 8 = 24$$

The product is the same regardless of the order the numbers are multiplied.

4. Distributive Property

$$7 \times 9 \text{ is the same as } 5 \times 9 + 2 \times 9$$

The product is the same as the sum of the partial products.

Using known multiplication facts and applying the multiplication properties can help determine other multiplication facts.

- For 7×9 , 7 is decomposed into 5 and 2. The multiplication facts 5×9 and 2×9 are then added together to determine the final product. Determining the product this way uses the distributive property.
- For 8×7 , knowing the multiplication facts for 4, it can be thought of as $4 \times 7 \times 2$. Determining the product this way uses the associative property.



Multiplication Facts to 9 x 9

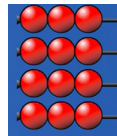
Helpful Information

Tips

- There are many strategies to do develop math facts.
- Learning tools can be used to develop and apply foundational skills and concepts.
 - » the way your child interacts with the tool can reveal your child's thinking
 - » they can be used for your children to communicate their thinking
 - » encourage your child to take the time to use the learning tools in each activity

Mathematical Words/Symbols

Array- is a set of objects, symbols, or numbers organized in rows and columns.



Equation – a mathematical statement that shows that two expressions are equal

Expression – is made up of numbers and operators. For example, 4×3 , $4 + 3$ are numeric expressions.

Product – is the result of multiplying, for example 6 is the product of 2×3 .

X multiplication symbol

3×2 has many interpretations including:

- three times two
- three, two times
- three groups of two

Materials

Activity 1:

- Rekenrek
- Number Cards

Activity 2:

- Rekenrek
- Number Cards

Activity 3:

- Colour Tiles

Activity 4:

- Colour Tiles
- Number Cards

Activity 5:

- Whole Number Rods
- Number Cards

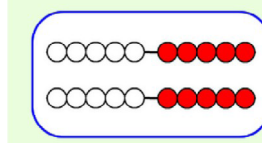
Activity 6:

- Number Chart
- Number Cards

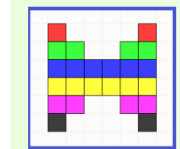
Activity 7:

- Catch a Bouncing Ball - Whole Number Operations game

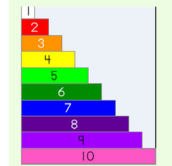
Rekenrek



Colour Tiles



Whole Number Rods



x	1	2	3
1	1	2	3
2	2	4	6
3	3	6	9

Catch a Bouncing Ball - Operations (Whole Numbers)





Multiplication Facts to 9 x 9

Exploring Adding One or Two More Groups on the Rekenrek

Activity 1

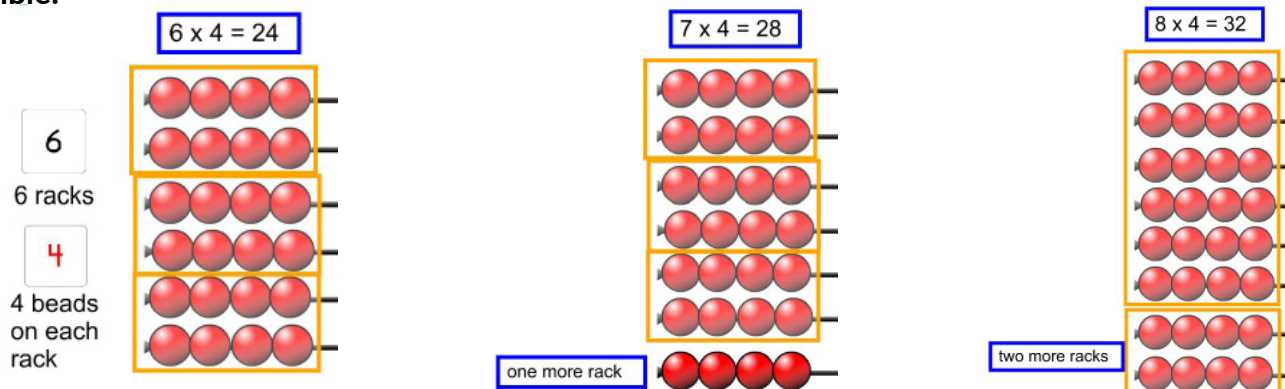
Set Up for the Activity:

- Open the Rekenrek learning tool
- Shuffle one set of black number cards 6 to 9 and place them face down in a pile.
- Shuffle one set of red number cards 0 to 5 and place them face down in a pile.

How to Do the Activity:

1. Have your child pick 1 black card and move that number of racks onto the workspace. All the beads should be on the right.
2. Have your child pick a red card and move that many beads to the left on each rack from step 1.
3. Have your child determine the multiplication expression represented by the beads on the left of the Rekenrek, and determine the product (total number of beads in the array).
4. Have your child use the annotation tool to record the multiplication equation represented.
5. Have your child predict the total number of beads that will be in the array if one more rack of beads is added.
6. Verify by adding the rack with the appropriate number of beads.
7. Have your child use the annotation tool to record the multiplication equation represented.
8. Have your child predict the total number of beads that will be in the array if another rack of beads are added.
9. Verify by adding the rack with the appropriate number of beads.
10. Repeat as desired.

Example:



Your child may determine 8×4 by adding 2×4 onto 6×4 .

Let's Talk About It

How does an array of beads help you with your multiplication facts?
How did you predict the product when we added one or two racks of beads?



Multiplication Facts to 9 x 9

Using Multiplication Facts of Ten on the Rekenrek

Activity 2

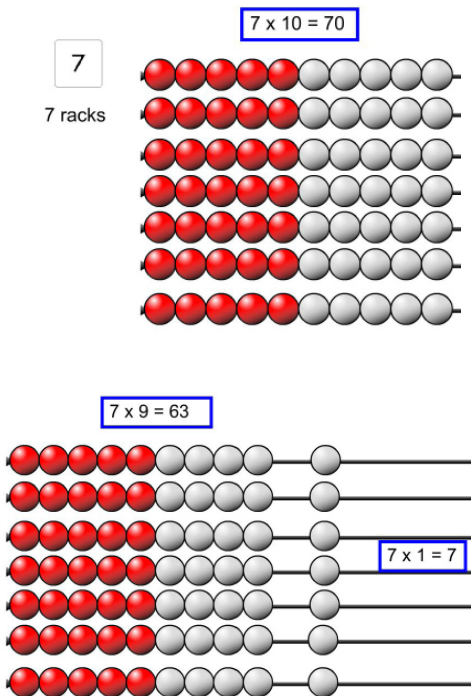
Set Up for the Activity:

- Open the Rekenrek learning tool.
- Shuffle one set of number cards 6 to 9 and place them face down in a pile.

How to Do the Activity:

1. Have your child pick a card from the pile and show this number of racks of ten beads on the workspace.
2. Have your child determine the multiplication expression represented on the beads and determine the product (total number of beads in the array).
3. Have your child use the annotation tool to record the multiplication equation represented.
4. Have your child remove one bead from each rack.
5. Have your child use the annotation tool to record the multiplication equation that represents the beads that have been subtracted.
6. Have your child determine the total number of beads that are in the array now. Verify.
7. Have your child write the multiplication equation represented by the new array.
8. Slide the white beads back to the right and repeat steps 4 to 7 subtracting two beads from each rack.

Example:



Your child may know the ten facts automatically and not need to count all the beads.

Let's Talk About It

How are we using the 10 facts to figure out facts for 8 and 9?
How can we use the five facts to figure out facts for 8 and 9?



Multiplication Facts to 9 x 9

Exploring Perfect Squares Using Colour Tiles

Activity 3

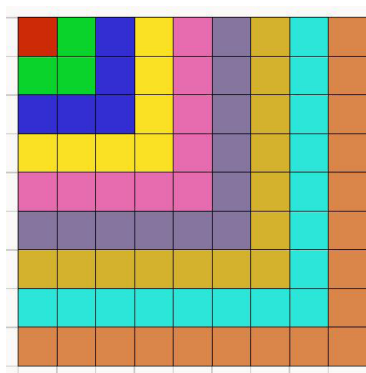
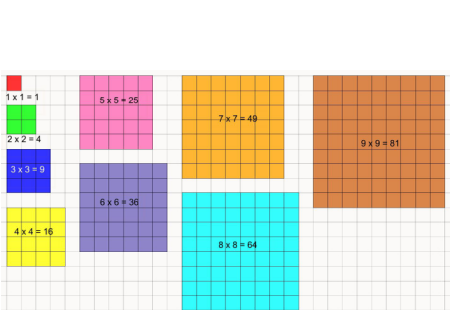
Set Up for the Activity:

- Open the Colour Tiles learning tool.
 - » select square tiles
 - » place one square on the workspace
 - » write the equation $1 \times 1 = 1$ using the annotation tool

How to Do the Activity:

1. Have your child make a 2 by 2 square as follows:
 - » make a row of 2 tiles
 - » select the 2 tiles and copy
 - » move the copy to form a square
2. Have your child make a 3 by 3 square using a new colour:
 - » make a row of 3 tiles
 - » select the 3 tiles and copy twice
 - » move the copies to form a square
3. Repeat this process to create squares up to 9 by 9. You can create a 7th, 8th and 9th colour by using the colour palette.
4. Ask your child to determine the number of tiles in each square.
5. Use the annotation tool to write the multiplication equation for each perfect square.
6. Ask your child to identify any patterns between the squares.
7. Have your child select the 8 by 8 square and move it onto the 9 by 9 square so that they overlap in the upper left corner.
8. Move each of the other squares onto the 9 by 9 square in descending order (layering them so the smaller squares are on top of the larger squares).
9. Ask your child to identify any new patterns between the squares.

Example:



Your child may compare the 8 by 8 and 9 by 9 and notice that there were two more 8s plus a one.

Let's Talk About It

How did you determine the number of tiles in each square?

How could you use the facts from one square to help you know the total number of tiles in another square?



Multiplication Facts to 9 x 9

Using Perfect Square Facts with Colour Tiles

Activity 4

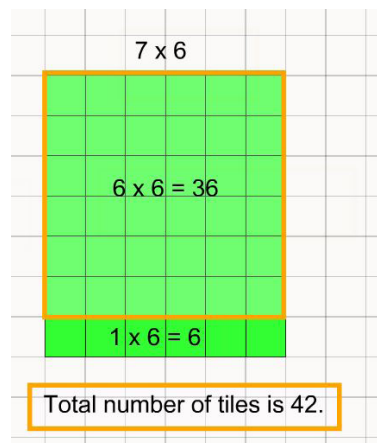
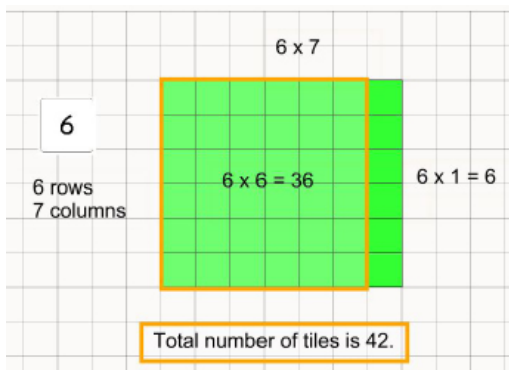
Set Up for the Activity:

- Open the Colour Tiles learning tool.
 - » select square tiles
- Shuffle number cards 5 to 9 and place face down in a pile.

How to Play the Activity:

1. Pick a card. Create a rectangle such that the number of rows matches the card and the number of columns is 1 more than the number on the card.
2. Have your child write the multiplication expression for the rectangle.
3. Have your child use the square in the annotation tool to outline the largest possible square inside the rectangle.
4. Ask your child to write the multiplication equation for the square.
5. Ask your child to write the multiplication equation for the part of the rectangle that is outside of the square.
6. Ask your child to add the products of the two equations to determine the number of tiles in the original rectangle.
7. Create a new rectangle such that the number of columns matches the card picked in step 1 and the number of rows is 1 more than the number on the card.
8. Repeat steps 2 to 6.

Example:



Your child may know the facts for perfect squares and then add 1 more column or row.

Let's Talk About It

How can you determine the largest square without using the annotation tool to draw it?

How are the two rectangles and sets of equations the same and different?

If you are multiplying two numbers that are one number apart, can you always use a perfect square to help find the product? Why or why not?



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Comparing Products of Whole Number Rods

Activity 5

Set Up for the Game:

Number of Players: 2

- Open the Whole Number Rods tool.
 - » use the annotation tool to create a scorecard (see example)
- Shuffle two sets of black number cards 6 to 9 and place face down in a pile.
- Shuffle two sets of red number cards 1 to 9 and place them face down in a pile.

How to Play the Game:

1. Player 1 picks a black card and identifies the rod of this length. This will be the rod used for step 2.
2. Player 1 picks a red card and places this number of rods onto the workspace to form a train.
3. Player 1 writes the multiplication expression.
4. Player 2 repeats steps 1 to 3.
5. Players determine their products.
6. The player with the greatest product earns the points for this round. The total number of points is the difference between the products. Players keep track of their points.
7. Play five rounds. The player with the greatest number of points wins.

Example:

Player 1: 6, 7, $6 \times 7 = ?$

6 rods, 7 rods

$6 \times 7 = 5 \times 7 + 1 \times 7 = 35 + 7 = 42$

$5 \times 7 = 35$, $1 \times 7 = 7$

Player 2: 9, 3, $9 \times 3 = ?$

9 rods, 3 rods

$9 \times 3 = 10 \times 3 - 1 \times 3 = 30 - 3 = 27$

$10 \times 3 = 30$, remove $1 \times 3 = 3$

Player 1 earns (42-27) points = 42 - 27 - 5 = 20 - 5 = 15

Your child may determine the product by using known facts.

Let's Talk About It

How did you determine the length (product) of your train?
How did you determine the difference between the products?
Is it better to have a longer rod or more rods? Why? Why not?



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Hidden Multiplication Facts

Activity 6

Set Up for the Game:

Number of Players: 2 or more

- Open the Number Chart learning tool
 - » Select multiplication
 - » Select Hide All
 - » Hide the columns 10 to 12 and the rows 10 to 12 using sticky notes.
- Shuffle a set of number cards 0 to 9 and place face down in a pile.

How to Play the Game:

1. Decide who goes first.
2. Players take turns:
 - » picking one card from the pile; and
 - » flipping over all the products in the Number Chart that has a digit in its product that matches the number on the card.
3. Flip any incorrect products back over.
4. One point is awarded for every correct product. One point is lost for every incorrect product.
5. Play until the pile of cards is finished. The player with the most points wins the game.

Example:

6

Need to flip any products that have the digit 6 in them.

x	1	2	3	4	5	6	7	8	9
1	mathies	mathies	mathies	mathies	mathies	6	mathies	mathies	mathies
2	mathies	mathies	6	mathies	mathies	mathies	mathies	16	mathies
3	mathies	6	mathies	mathies	mathies	mathies	mathies	mathies	mathies
4	mathies	mathies	mathies	16	mathies	mathies	mathies	mathies	36
5	mathies	mathies	mathies	mathies	mathies	mathies	mathies	mathies	mathies
6	6	mathies	mathies	mathies	mathies	36	mathies	mathies	mathies
7	mathies	mathies	mathies	mathies	mathies	mathies	mathies	56	63
8	mathies	16	mathies	mathies	mathies	mathies	56	64	mathies
9	mathies	mathies	mathies	36	mathies	mathies	63	mathies	mathies

Your child may use known facts to identify the initial products and then use those facts to help find the others.

Let's Talk About It

Which products were not turned? Why?

Which number(s) will never be turned over in this game? Why?



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Catch a Bouncing Ball - Multiplication

Activity 7

Set Up for the Game:





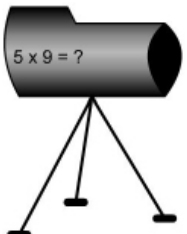

- Open the Catch a Bouncing Ball – Whole Number Operations game.
 - » Select multiplication and then select both the rows and columns 1 to 9.

How to Play the Game:

1. A multiplication expression will appear on the baseball.
2. Move the baseball glove to the location on the number line that represents the product of the expression.
3. If the location is correct, a new expression will appear. If the location is incorrect, try again.
4. Game is played until ten balls have been caught.
5. Review any mismatches at the end of the game.

Example:

Where will the ball land?
Move the glove to catch the ball.



Your child may use a variety of strategies to determine the product of the expression. For example: skip counting, repeat addition, using known facts, doubling or repeated doubling.

Let's Talk About It

How did you find the product of the expression?
What is another way to figure out the product?