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Lesson Plan

Multiplying 3-Digit by 1-Digit numbers using the standard Algorithm

Age group:

Online resources: Multiplication Algorithm



- Say: Today, we are going to learn how to multiply 3-digits by 1-digit, using *the Standard Algorithm*. This method is a way of multiplying in columns, which means the numbers to be multiplied are placed vertically, with the digits aligned.
- Say: Remember that this method is similar to multiplying 2-digits by 1-digit, where you had two columns to multiply, the ones column and the tens column. In this case, the difference is that it has a third column to multiply, the hundreds place. So, before starting the lesson, let's review your understanding of multiplying 2-digits by 1-digit numbers, so far.

Print and bring to class the attached handout MULTI - BINGO.

You should cut each bingo card (A, B, C, and D) separately and put all together into an envelope. Remember to print enough cards to have one bingo card for each student. The handout provided has a copy for yourself of each bingo card "*MULTI - BINGO (Teacher answer sheet)*". Also, print the answer numbers "*MULTI - BINGO (Numbers)*. "Cut each number separately, fold each into a half following the dashed line, and put all together into another envelope.

• Say: Let's play the following game:

Have students prepared at their seats, with a pencil, and explain the rules of the game, before distributing the Bingo cards.

Say: Now, we are going to play MULTI-BINGO, which is a variation of the traditional Bingo game. I will give you one Bingo Card with 9 multiplication problems. Your challenge is to calculate all these problems as fast and accurate as you can, and write the answer in the box below each problem. I will give you 10 minutes to do that. Then, I will start to say the numbers of the answers of some of those problems randomly. If I say a number that matches with any of the answers you have on your bingo card you should mark it with an "X". The first to complete a full line (three "X") either vertical, horizontal, or oblique line, should say "BINGO," and bring his/her bingo card with me to verify the answers.

Pass-out a copy to each student and continue playing this game until some of the students have won.

• Say: Let's watch the episode to see the steps involved in multiplying a 3-digit number by a 1-digit number, using the standard algorithm.

Teacher presents Math game Multiplication Algorithm - Multiply three-digit by one-digit numbers (vertical algorithm) | 15 min

Present *Matific*'s episode Multiplication Algorithm - Multiply three-digit by one-digit numbers (vertical algorithm) to the class, using the projector or interactive whiteboard, in preset mode.

This episode provides practice in solving 3-digit by 1-digit multiplication problems. You have to find the correct product, utilizing the standard algorithm.

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Multiplication Algorithm - 3-Digit by 1-Digit

- Say: While you are playing this episode, imagine you are solving, in your notebook, 3-digit by 1-digit multiplication problems, utilizing the standard algorithm.
- Ask: What problem do we need to solve first?
 - We have to evaluate the product of 410 times 2.
- Say: Look at the problem, a first step to solving the problem is to figure out what 410 times 2 is. We will start with the 2 down, and we are going to multiply it by each of the digits in the number above, in this case 410. So, we will start by multiplying the ones column, 2 times 0.
- Ask: What is 2 times 0?
 - 2 times 0 equals 0.
- Say: Perfect! I will write 0 in the ones place, as the product of the ones. We have to place the answer in the blank spaces that have question marks, and use the numeric keyboard to enter the numbers.

Click on the ? to enter 0.

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- Say: Now, we need to multiply the tens column. So, 2 times 1.
- Ask: What is 2 times 1?
 - 2 times 1 equals 2.
- Say: Excellent! Let's type 2 in the tens place on the left-hand side of the 0, as a product of the tens. Remember that the 1, in the multiplicand, represents 1 ten which is 10, and the 2 in our answer represent 2 tens, which means 20.

	0		
Click on the	18	to enter	2.

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R R							~)	D	ONE)

- Say: Then, to finish the problem we need to multiply the hundreds column. So, 2 times 4.
- Ask: What is 2 times 4?
 - 2 times 4 equals 8.
- Say: Good! Let's type 8 in the hundreds place on the left-hand side of the 2, as a product of the hundreds. Remember that the 4, in the multiplicand, represent 4 hundreds which is 400, and the 8 in our answer represent 8 hundreds, which means 800.

Click on the ? to enter 8.

For example:

1111	1955	×	4	1	0		2 3 7 8	4 9	5
111			8	2	0				
111							2	B	
11							•	D	ONE

- Ask: What is the product of 410 x 2?
 - The product is 820.
- Say: Very good! We solved that 410 times 2 is 820. Let's think about why this method worked. Remember that 410 times 2 is the same as multiplying 400 times 2 plus 10 times 2, which is 820. Therefore, (400 x 2) + (10 x 2) = ?

800 + 20 = 820

- Ask: What would be a way to check our solution for this problem?
 - We know that 400 times 2 is 800. So, it makes sense that 410 times 2 is just over 800. In other words, 410 times 2 could be rewritten as 400 + 400 + 10 + 10, which equals 820.
- Say: Now, let's review another multiplication problem, with regrouping.

Click on to continue to the next problem.

Multiplication Algorith	nm -	3-D	igit	by	1-Di	git		×
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=		5	2	4			<i>~~ ~</i>	
	×			3				
-	?	?	?	?				
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=							64.43	
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-								
				_	-	- ×	DONE	

- Ask: What problem do we need to solve?
 - We have to evaluate the product of 524 times 3.
- Ask: Look at the problem, Which column should we start to multiply first?
 - The ones column. So, 3 x 4 equals 12.
- Say: Perfect! However, in this case, we do not just write the 12 right way, we only write the 2 in the ones place, because now we are calculating only the ones. The "1" digit represents tens, so we will regroup the 1 ten to the tens column. As a result, we carry the 1 up to the tens place, to be added later, when we calculate tens.

In this episode, it's possible to write anywhere on the screen if needed. So, write the "1" above the two to demonstrate this. Repeat this process in every case where you need to regroup.

• Say: Remember that when you are solving multiplication problems in your notebooks, you can write the tens digit (in this case 1) above the tens column, as a little memory note.

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		5	2	4	67890
	~			3	
-	?	?	?	2	
5					
-					-a
=					64.47
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			-		

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Click on the *click* on the *click*

- Say: Now, we have to multiply the tens column. So, 3 times 2.
- Ask: What is 3 times 2?
 - 3 times 2 equals 6.
- Ask: Should we put 6 in the tens place? or do we need to do something else before?
 - No we should not. First, we have to add the 1 regrouping ten, to the 6 producing 7.

7

• Say: Great! Let's type 7 in the tens place instead of 6. Note that 7 tens means 70!

Click on the *c* to enter 7.

- Say: Then, to finish the problem we have to multiply the hundreds column. So, 3 times 5.
- Ask: What is 3 times 5?
 - 3 times 5 equals 15.
- Say: Good! Let's type 15 on the left-hand side of the 7, as a product of the hundreds. Remember that 15 hundreds means 1500!

Click on each

to enter 15, begin sure to put the 5 in the hundreds place and the 1 in the one thousands place.

- Say: What is the product of 524 x 3?
 - The product is 1572.
- Say: Very Good!, we solved that 524 times 3 is 1572. Let's think about why this method worked. Remember that 524 times 3 is the same as multiplying 500 times 3 plus 20 times 3 plus 4 times 3 which is 1572. Therefore, (500 x 3) + (20 x 3) + (4 x 3) = ?

1500 + 60 + 12 = 1572

- Ask: What would be a way to check our solution for this problem?
 - We know that 500 times 3 is 1500. So, it make sense that 524 times 3 is just over 1500. In other words, 500 + 500 + 500 + 24 + 24 + 24 which is 1572.

Click on **DONE** to continue to the next problem.

A new multiplication problem appears.

Continue solving problems, asking students for the steps required to multiply 3-digits by 1-digit, using the standard algorithm.

If the answer is correct, the episode will proceed to the next problem and the answer will turn green.

If the answer is incorrect, the answer will turn pink.

The episode will present a total of three problems.

Students practice Math game Multiplication Algorithm - Multiply three-digit by one-digit numbers (vertical algorithm) | 8 min

Have students play Matific's episode Multiplication Algorithm - Multiply three-digit by one-digit numbers (vertical algorithm) on their personal devices. Circulate, answering questions as necessary.

Advanced students can move on to play another variant of this episode: Multiplication Algorithm - Multiply four-digit by one-digit numbers (algorithm). This episode practices the same concepts as in the first episode, but one factor is a 2 to 4 digit number and the other factor is a 1-digit number. So practice, if 4-digit numbers are appropriate for the current grade level.

Assign the following game Birds in Hand - Multiply Tens, as homework.

Class discussion | 12 min

Display the following problem on the board:

• 789 x 5 =



- Invite one student to solve this problem.
- Ask: Now that we have practiced multiplying 3-digit by 1-digit numbers, using the standard algorithm, please show your classmates how to solve this multiplication problem and indicate the steps involved in solving it.
 - First, we multiply the ones place, 5 times 9, which is 45. Then, we write 5 in the ones place and regroup the 4 tens to the tens column.



• After that, we multiply the tens, 5 times 8, which is 40, add the 4, that we previously regrouped, to obtain 44, and put 4 in the tens place, regrouping the 4 to the hundreds column.



• Finally, we multiply the hundreds, 5 times 7, which is 35, and we add the 4, that we previously regrouped, to obtain 39, and put it on the left-hand side of the 4 to get the product, which is 3945.

	789
	× 5
	3945
0	

- Say: Very good! So rather than solving multiplication problems using the standard algorithm, another way to solve these problems is to multiply applying the *Distributive Property*, as a we did before. If you want to multiply 789 by 5, you can think of 789 as 700 plus 80 plus 9. Then you multiply 700 by 5 to get 3500, 80 by 5 to get 400, and 9 by 5 to get 45. Finally, you add 3500, 400 and 45 to get 3945, which is the answer to 789 times 5.
- Write on the board the following:

789 x 5 = (700 + 80 + 9) x 5 = (700 x 5) + (80 x 5) + (9 x 5) = 3500 + 400 + 45 = 3945

When you have finished the discussion, students should write the problems in their notebooks.

Discuss any questions the students may have.

Math Worksheet Practice | 8 min

Have your students work on the worksheet on their personal devices, in order to help them build their skills on solving 3-digit by 1-digit multiplication problems using strategies of multiplication.



Circulate among them answering questions.

Closing | 10 min

Ask students to solve the following 3-digits by 1 digit number word problems in their notebooks, using the standard algorithm of multiplication.

1) Daniel earns \$536 per week walking dogs. How much will Daniel earn in 9 weeks?

2) Miriam wants to buy a new bicycle. She has saved \$194. Her mom tells her she needs to save 6 times that amount. How much money does Miriam need in order to buy a new bicycle?

Have students work independently. When the students are done, they should share their answers.

Printable Handout: MULTI BINGO - The Standard Algorithm

MULTI - BINGO (Students bingo cards)

Please cut along the dotted lines. $q\rho$

MULT	I – BIN	GO A	MULT	MULTI – BINGO B MULTI – BINGO C				MULT	MULTI – BINGO D			
26	94	97	93	11	38	53	96	17	87	28	<mark>89</mark>	
x 3	x 7	x 9	x 4	x 7	x 2	x 7	x 8	x 9	x 9	x 9	x 6	
89	37	72	28	76	94	41	25	36	65	91	97	
× 6	x 2	x 8	x 9	x 4	x 7	× 5	x 3	x 8	x 5	x 6	x 9	
49	41	65	25	97	53	72	68	27	34	36	96	
× 7	x 5	x 5	x 3	x 9	x 7	x 8	x 9	x 7	× 9	x 8	x 8	

MULT	I – BIN	GO A	N	/IULT	I – BINO	GO B	MULT	I – BIN	GO C	MULTI – BINGO D			
26	94	97	9	93	11	38	53	96	17	87	28	89	
x 3	x 7	x 9	×	(<mark>4</mark>	x 7	x 2	x 7	x 8	x 9	x 9	x 9	x 6	
78	658	873	3	372	77	76	371	768	153	783	252	534	
89	37	72		28	76	94	41	25	36	65	91	97	
x 6	x 2	x 8	×	(9	x 4	x 7	x 5	х З	x 8	x 5	x 6	x 9	
534	74	576		252	304	658	205	75	288	325	546	873	
49	41	65		25	97	53	72	68	27	34	36	96	
x 7	x 5	x 5	×	(3	x 9	x 7	x 8	x 9	x 7	x 9	x 8	x 8	
343	205	325		75	873	371	576	612	189	306	288	768	

MULTI – BINGO (Numbers)

78	76	612
658	304	189
534	873	783
74	371	252
576	153	325
343	205	306
372	75	546
77	288	768

Please cut along the dotted lines and fold along the red dashed lines to hide the numbers. $_{\rm q,\rho}$