Literature Vocabulary
mystery
clever
invention
wire
spring (3 different meanings)
mattress
brave

Math Vocabulary
(repeated vocabulary)
factors
products
multiplication
division
fact family
area model
array model

Materials
If possible, have two different color base ten sets per the following:
- Base ten sets (product, or inside the frame) – 1 flat, 18 longs, 35 units per student
- Base ten sets (factors, or frame) – 5 longs, 18 units per student

If you do not have two colors, make sure your students have a total of both sets in the color that you do have.
- **BLM**– Monster Problems – 1 per student
- **BLM –** Division Description 1 for teacher

Time Clue
BB = 1 minutes
CI = 26 minutes
AC = **1** minute

ELPS (*English Language Proficiency Standards*)
2A, 2C, 2F, 2I, 3H, 3I, 3J, 4C

CCRS *(College and Career Readiness Standards)*
Math
VIII.A.1,2,3,4,5; VII.B.1,2; VIII.C.1,3; IX.C.1,2,3.
Cross-Discplinary
I.D.1,2,3,4; I.E.1,2.
ELA
II.A.4.6,7, 10; II.B.1; II.D.1; IV.A.3

Unit 3, Lesson 2 3-4

TV Lesson

Read objectives while pointing to the words in the math lesson objectives. After each math objective, show children what that means.

Math Objectives:
- Model factors and products using area and array models.
- Represent multiplication and division situations in pictures, word and number form.
- Relate the model to the partial product and traditional algorithm.

Language Objectives:
- Use the math vocabulary during the activity.
- Discuss solution strategies.
- Explain the relationship of the array model to the number representation of multiplication and division.

Building Background, Math
Let's use what we've learned about multiplying 2-digit by 2-digit numbers to solve word problems. We've also taken a look at finding the missing factor, or dividing, using the array model. Some of the problems we'll solve will be multiplication; others will be division. As with all word problems, there is a math movie to see which will guide you to the action in the problem – join or separate. I'll ask you to tell your teacher what math movie you saw. Use my brief pause to quickly discuss the action.

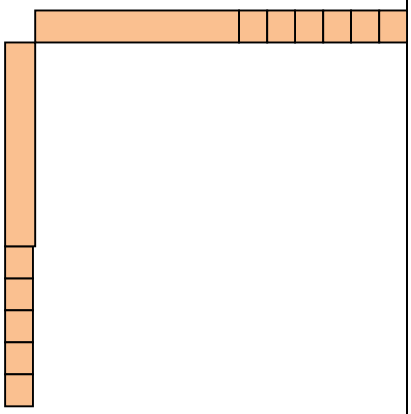
So here is our process:
- Read through the problem with me and watch for the math movie.
- Describe the math movie to your Classroom Teacher and class.
- Create an array or area model to solve the problem.
- Regroup as needed to write a numerical representation of the product.
- Connect the model to the traditional algorithm.

PIRATE: Hey, wait a minute! We haven't really connected the model to the, the, the, al-go-ri-thm. What is that anyway?

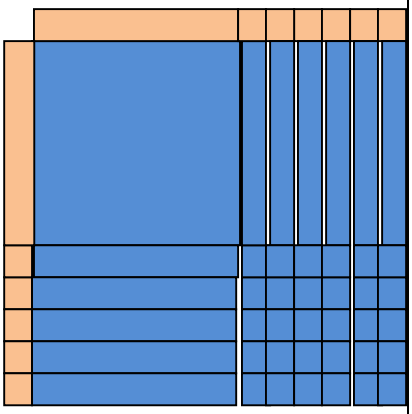
SMART BOARD
Show models of arrays and corresponding algorithms.

Classroom Teachers
Please circulate the room to see that students are not having difficulty representing the problems.

MAKING THE FRAME



FILLNG THE FRAME



Unit 3, Lesson 2 3-4

TV Lesson - continued

Comprehensible Input
TEACHER: Good question and good place to start. First of all, the "algorithm" is the process by which we use numbers to compute. That is, any time we add, subtract, multiply or divide, we have certain steps that we go through to accomplish the computation. Those steps are the algorithm.

Let's take a look at our first problem. First we'll solve it using our base ten blocks. Then we'll solve it using just numbers and the "algorithm," or computation steps.

Problem:
There were 15 monsters at the Monster Mash. Each monster ate 16 monster snack cookies. How many cookies did they eat?

What is the **math movie** you saw in your mind when we read the first problem? *(Pause to discuss – then pirate can answer.)*

Looks like we have multiple sets of the same number of cookies. That tells me I can short-cut repeated addition and multiply.

Using our blocks, we need our two **factors**. What are they? *(pause to gather)*

15 monsters – that would be the groups of
16 cookies each – that's the number in each group.

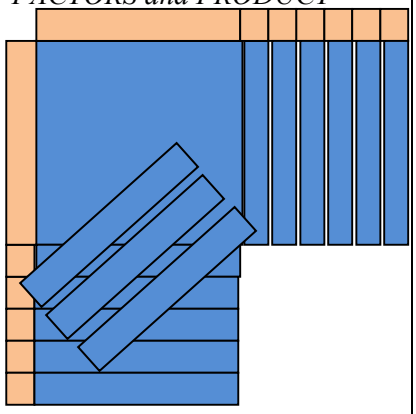
MAKING THE FRAME
What are the fewest number of base ten blocks I can use to make 15? *(quick pause) (One ten and five ones)* Let's make that our "rows" factor.

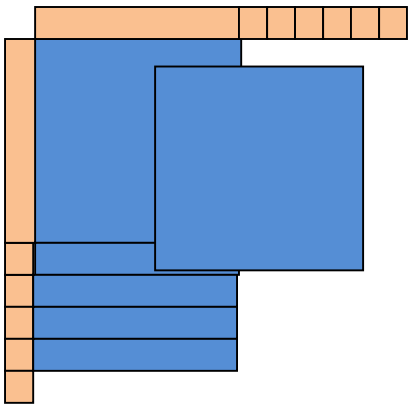
And what are the fewest blocks we can use to make 16? *(pause) (one ten and six ones)* Let's make the columns factor.

FILLNG THE FRAME
What is the largest base ten block you can use to start filling in the frame? *(pause)* This looks like a 10 times 10 space here – we can start with a 100 flat. *(do so)* Can we use any more hundred flats in this array? (*No – demonstrate that another hundred would simply spill outside of the frame boundaries.*)

What's the next block we can use? *(pause) (a ten rod)* Where do they go? *(pause) (six up at the top, and five running down the bottom)*

FACTORS and PRODUCT





Product represented numerically

2 4 0

TV Lesson - continued

FACTORS AND PRODUCT

We have our two factors, 15 and 16. And we have our product which is the filling of the frame.

Let's count up our product.

First of all, are there any exchanges that we can make? *(Pause to discuss.)*

I see a whole big bunch of ones. Let' count them (*count by 5s*). There are 30 ones. What shall we do? (*pause*) Trade them in sets of ten for tens. *(Model trading ten units at a time until you have three tens.)*

We still have THIRTY. We just have them in a different form – three tens instead of 30 ones.

How many ones do we have now? *(none, zero)* Let's start representing our product in numbers. *(See illustration – just write the zero now.)*

What about the tens? Can we regroup any of the tens? *(pause)* Yes, we have 14 tens or 140, so we can trade 10 tens for one hundred *(do so)*.

We still have 140, we just have it in a different form – one hundred and four tens instead of 14 tens.

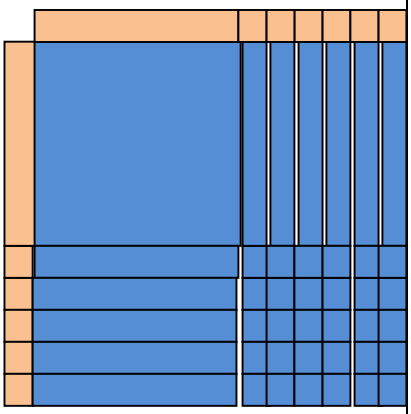
How many tens do we have now? *(pause – 4)* Let's record that in our numerical representation *(write four in the tens place)*.

Do we have any more trades we can make? *(pause)* No, we do not. We have not yet recorded our hundreds. How many hundreds do we have? *(pause) (2)* Let's write two in the hundreds place to represent our two hundreds blocks *(do so)*.

According to our model, our product is 240. What does that 240 represent in our word problem? Read problem #1 again to see what 240 represents *(pause)*. It's the total number of cookies all those monsters ate – whew, that's a bunch!

Now, let's connect what we did with our blocks to the algorithm, or the steps we would take with numbers to multiply 15 x 16.

SMART BOARD
Really handy as a Ppt presentation for this correlation.



Unit 3, Lesson 2 3-4

TV Lesson - continued

First we'll compute using a very old process called "Partial Products."
Let's set up our standard 2-digit multiplication format.

Partial Products

16
x15
30
50
60
100
240

Every time we multiply, we are going to record the product, and we are going to check our base ten model to see how that product is represented in the model. Let's go. Please be sure you are working along with me.

5 x 6 = 30
Notice that I am writing the entire product in my algorithm – partial products, remember. Now, can you see the 30 in our model? Sure, the 30 units.

What does this one represent? *(the one ten in 16*) The one in this place in 16 tells me that I have one ten. So I'm really multiplying 10 by 5, and that equals 50. Can you find the 50 in our model? Yes, these five tens.

Now, what does this one in the 15 represent? *(10)* So when I multiply by this one, I'm really multiplying by 10. 10 x 6 = 60. And where are these six tens in our model? Sure, these vertical tens at the top of the model.

Finally, I have 10 x 10 and that is 100. That's obvious where that is in the model, isn't it?

Let's add up our partial products to see what our total is *(do so aloud)*. Yes! 240, just like we modeled!!!

You can use partial products anytime you want as a strategy to multiply numbers. Just remember the place value of the digits in each number.

PIRATE: But I know a shorter way to multiply. Where did that come from, and how does that relate to the model?

Unit 3, Lesson 2 3-4

TV Lesson - continued

TEACHER: Good question, Capt. Portio! You know, mathematicians are lazy – they want to find the quickest most efficient way to work with numbers. A long time ago some very smart mathematician saw that you could condense the partial product process by regrouping in the algorithm. Let's check that out.

Arthimus Portio's Corner
Lesson 2 –Graphing
Which monster did your class select as the fiercest monster? Why do you think that is so? What makes the choice scarier than others on the graph?

16 x15 30 50 60 100 240	3 16 x15 180 160 240	Because we know how to regroup, trade, exchange, we can combine steps. 5 x 6 = 30. That is 0 ones and three tens. Let me put those tens in the tens place in the algorithm. And five times 10 is 50 add the 30 and we have 80. Our answer for multiplying 5 x 16 is 80. Now we're multiplying by 10. 10 times six is 60. Let me record that. And 10 x 10 = 100; this is the hundreds place. *(Repeat the same process for multiplying by the 10 in 15.)*

(If you have time, work through problem #2 which is division. If you do not have time to work through the entire process, at least set up the base ten model.)

PIRATE: *(Close the lesson and discuss the Pirate's Corner task.)*

Objectives: And now before we go, let's review what we have learned today! *(do so)*

BLM Unit 3, TV and Follow-up Lesson 2 **Monster Math**
(One page per student)

1. There were 15 monsters at the Monster Mash. Each monster ate 16 monster snack cookies. How many cookies did they eat?

2. Master Chef Moonie Monster baked 132 dozen Monster Mash snack cookies. If each of his baking pans baked 12 dozen cookies, how many pans of cookies did he bake?

3. Claris Coppertop, County Clerk of Copperton County, counted 143 copper-colored eyes at the Monster Mash. Each monster had 14 copper-colored eyes. How many monsters were there?

4. Pinky Fuzz was trucking snails to the Monster Mash. His truck carried 14 tons, and he carried 17 full truck loads of snails to the Mash. How many tons of snails did Pinky Fuzz truck to the Monster Mash?

BLM Unidad 3, TV Lección de seguimiento 2 **Matemáticas "Monster"**

(1 página por estudiante)

1. Habían 15 monstruos en el Monster Mash. Cada monstruo se comió 16 galletitas de monstruos. ¿Cuántas galletitas se comieron?

2. El Chef Magistral Moonie Monster horneó 132 docenas de galletitas Monster Mash. Si en cada uno de sus moldes de hornear se horneaban 12 docenas de galletitas, ¿cuántos moldes de galletitas él horneó?

3. Claris Coppertop, Secretario del Condado de Copperton, contó 143 ojos color cobre en el Monster Mash. Cada monstruo tenía 14 ojos color cobre. ¿Cuántos monstruos había allí?

4. Pinky Fuzz transportaba caracoles en su camión al Monster Mash. Su camión llevaba 14 toneladas y llevó 17 cargas completas de caracoles al Mash. ¿Cuántas toneladas de caracoles llevó Pinky Fuzz en su camión al Monster Mash?

BLM Unit 3, TV and Follow-up Lesson 2 **Division Description**
(One page per student)

Work through Problem #2 to show how to divide using base ten blocks and how to relate the model to the algorithm. (NOTE: The two division problems given are purposely simple – there are no regroupings necessary, and no remainders.)

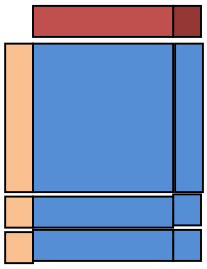
Master Chef Moonie Monster baked 132 dozen Monster Mash snack cookies. If each of his baking pans baked 12 dozen cookies, how many pans of cookies did he bake?

Process Using Base Ten

- Read the problem, looking for the math movie.
- Decide on the factors and product. This time, the product is known.
  Factor 12
  Factor *x*
  Product 132

- Begin with the first factor, then arrange the product inside the incomplete frame so that the ones match the known factor. The missing factor is then filled in to match the product.

1. Known factor



2. The missing factor is then filled in to match the product.

3. Product arranged so that the two units in the product will match the two units in the known factor, 12.

4. Fill in with tens to complete the array.

Process of Partial Products

Just remember you are working in place value. Partial Product division is just like partial product multiplication. Ever y time you divide in the place value, write down the factor

$12\overline{)132}$ $\underline{-120}$ 12	10 $\underline{+\ 1}$ 11	• 132 divided by 12 – I know that 10 x 12 = 120. That's close enough for my first division. • When I subtract 120 from 132, I have a remainder of 12. • 12 divided by 12 is 1. My missing factor is 11. As you work with the traditional algorithm, be sure that you are STILL dividing in place value. So, when you divide the 12 into "13," you are really dividing into 130. Be sure that you MULTIPLY back by 10 so that your traditional algorithm still shows 132 – 120.

BLM Unidad 3, TV y Lección de seguimiento 2 **Descripción de división**
(1 página por estudiante)

Trabajaremos con el Problema #2 para mostrar cómo dividir usando los bloques base 10 y cómo relacionar el modelo con el algoritmo. (NOTA: Los 2 problemas de división proporcionados son sencillos a propósito – no hay que hacer reagrupamientos ni hay residuales.)

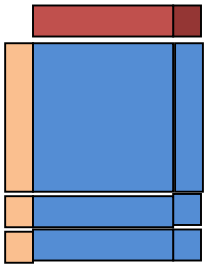
El Chef Magistral Moonie Monster horneó 132 docenas de galletitas Monster Mash. Si en cada uno de sus moldes de hornear cabían 12 docenas de galletitas, ¿cuántos moldes de galletitas horneó?

Procedimiento usando Base 10

- Lee el problema, buscando la película de matemáticas.
- Decide cuáles son los factores y el producto. Esta vez se conoce el producto.
  Factor 12
  Factor *x*
  Producto 132

- Empieza con el primer factor, luego ordena el producto dentro del marco incompleto para que los unos igualen el factor conocido. Luego, se llena el factor que falta para que iguale el producto.

1. Factor conocido



4. El factor que falta entonces se llena para que iguale el producto.

2. El producto se ordena de manera que las dos unidades en el producto igualarán las 2 unidades en el factor conocido, 12.
3. Llena con bloques de 10 completar el conjunto.