

## **Array/ Area Model for Division**

**5.NBT.6** Find whole number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and /or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and /or area models.

Rather than teaching students the standard long division algorithm, students can use an array model to solve division problems. This model is a visual representation of the “sharing”/ “grouping” meaning of division.

Students can use different factors, so they will be subtracting different amounts. For students who struggle with their multiplication facts, they may choose to use groups of 10 repeatedly. Higher-level students will be able to subtract larger amounts by using multiples of 10.

It may be helpful to have students prepare first a table of some easy multiples of the divisor; say twice and five times the divisor. Then these facts can be used to work up towards the answer.

Here is a video you can watch as a teaching resource. It uses a one-digit divisor, but it is the same strategy.

**[http://teachertube.com/viewVideo.php?video\\_id=256484&title=Long\\_Division\\_\\_\\_Non\\_traditional\\_\\_1&ref=bbrown](http://teachertube.com/viewVideo.php?video_id=256484&title=Long_Division___Non_traditional__1&ref=bbrown)**

The following are examples to help you model the method for the students. These examples are on the Student Practice Sheet for them to follow along with you. Work through the problems on the Student Practice Sheet. The problems in the beginning will have much of the arrays filled out for the students, so that they can eventually progress to doing them on their own.

## EXAMPLES:

Jimmy is saving up to buy a trumpet that costs \$585. He plans to save \$45 a month. How many months will it take him to save enough to buy his trumpet?

**Problem:**  $585 \div 45$

	10	2	1
45	450	90	45
	$\begin{array}{r} 585 \\ - 450 \\ \hline 135 \end{array}$	$\begin{array}{r} 135 \\ - 90 \\ \hline 45 \end{array}$	$\begin{array}{r} 45 \\ - 45 \\ \hline 0 \end{array}$

$45 \times 2 = 90$ $45 \times 5 = 225$ $45 \times 10 = 450$
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1. Jimmy has to save 585 dollars, and he is going to save \$45 each month. If he saves for 10 months, he will have 450 dollars and he will still need 135 dollars. He needs to save more.
2. If Jimmy saves for 2 more months, he will have 90 more dollars and he will still need 45 dollars. He needs to save more.
3. If Jimmy saves for 1 more month, he will have 45 more dollars, and will have enough to buy the trumpet.
4. When you add  $10 + 2 + 1$ , you get 13, so  $540 \div 45 = 13$ . Since the question asks how many months will it take him to save enough to buy the trumpet, the answer is 13 months.

Shana has 1,220 beads. She needs to make 16 matching necklaces for her Girl Scout Troop. How many beads can she put on each necklace?

**Problem:**  $1,220 \div 16$

$$16 \times 2 = 32$$

$$16 \times 5 = 80$$

$$16 \times 10 = 160$$

	50	20	5	1
16	800	320	80	16
	$\begin{array}{r} 1220 \\ - 800 \\ \hline 420 \end{array}$	$\begin{array}{r} 420 \\ - 320 \\ \hline 100 \end{array}$	$\begin{array}{r} 100 \\ - 80 \\ \hline 20 \end{array}$	$\begin{array}{r} 20 \\ - 16 \\ \hline 4 \end{array}$

1. Shana has 1220 beads to divide among 16 necklaces. If she puts 50 beads on each necklace, she would use 800 of the beads and she would still have 420 beads left. More can go on the necklaces.
2. If Shana put 20 more beads on each necklace, she would use 320 more beads and she would still have 100 beads left. More can go on the necklaces.
3. If Shana put 5 more beads on each necklace, she would use 80 more beads and she would still have 20 beads left. More can go on the necklaces.
4. Shana could put 1 more bead on each necklace, which would use 16 more beads and she would have 4 beads left. This is not enough to put more on each necklace.
5. When you add  $50 + 20 + 5 + 1$ , you get 76, so  $1,220 \div 16 = 76r4$ . Since the question asks how many beads can she put on each necklace, the answer is 76 beads.

$4,308 \div 23$  (4,308 is being put into 23 groups, or 4,308 is being put into groups of 23)

$23 \times 2 = 46$
$23 \times 5 = 115$
$23 \times 10 = 230$

	100	50	10	10	10	5	2
23	2300	1150	230	230	230	115	46

$\begin{array}{r} 4308 \\ - 2300 \\ \hline 2008 \end{array}$	$\begin{array}{r} 2008 \\ - 1150 \\ \hline 858 \end{array}$	$\begin{array}{r} 858 \\ - 230 \\ \hline 628 \end{array}$	$\begin{array}{r} 628 \\ - 230 \\ \hline 398 \end{array}$	$\begin{array}{r} 398 \\ - 230 \\ \hline 168 \end{array}$	$\begin{array}{r} 168 \\ - 115 \\ \hline 53 \end{array}$	$\begin{array}{r} 53 \\ - 46 \\ \hline 7 \end{array}$
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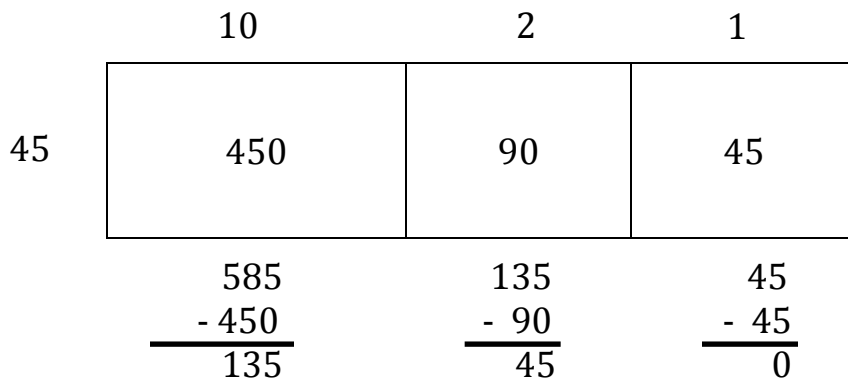
1. You have 4,308 and you are dividing it into 23 equal groups. If you put 100 in each of the groups, you would use 2,300 and you would still have 2008 left. More can go into each group.
2. If you put 50 more in each of the groups, you would use 1,150 and you would still have 858 left. More can go into each group.
3. If you put 10 more in each of the groups, you would use 230 and you would still have 628 left. More can go into each group.
4. If you put 10 more in each of the groups, you would use 230 and you would still have 398 left. More can go into each group.
5. If you put 10 more in each of the groups, you would use 230 and you would still have 168 left. More can go into each group.
6. If you put 5 more in each of the groups, you would use 115 and you would still have 53 left. More can go into each group.
7. If you put 2 more in each of the groups, you would use 46 and you would still have 7 left. That is not enough to put more in each group.
8. When you add  $100 + 50 + 10 + 10 + 10 + 5 + 2$ , you get 187, so  $4,308 \div 23 = 187r7$ .

## Array/ Area Model for Division Student Practice Sheet

**EXAMPLES:**

1. Jimmy is saving up to buy a trumpet that costs \$585. He plans to save \$45 a month. How many months will it take him to save enough to buy his trumpet?

**Problem:**  $585 \div 45$



$$45 \times 2 = 90$$

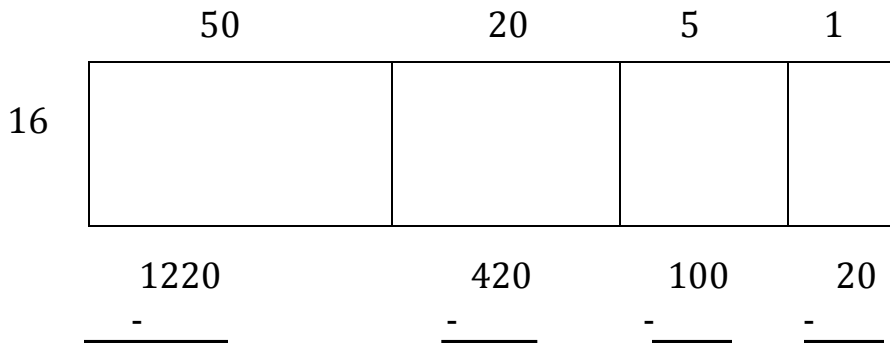
$$45 \times 5 = 225$$

$$45 \times 10 = 450$$

Answer: 13 months

2. Shana has 1,220 beads. She needs to make 16 matching necklaces for her Girl Scout Troop. How many beads can she put on each necklace?

**Problem:**  $1,220 \div 16$



$$16 \times 2 = 32$$

$$16 \times 5 = 80$$

$$16 \times 10 = 160$$

$1,220 \div 16 = 76r4$ . Since the question asks how many beads can she put on each necklace, the answer is 76 beads.

3.  $4,308 \div 23$   
 (4,308 is being put into 23 groups, or 4,308 is being put into groups of 23)

$23 \times 2 = 46$ $23 \times 5 = 115$ $23 \times 10 = 230$
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	100	50	10	10	10	5	2
23							
	4308	2008	858	628	398	168	53
	- -----	- -----	- -----	- -----	- -----	- -----	- -----

Answer: 187r7

**LET'S TRY IT:**

1. Ashton's Girl Scout Troop sold 3,456 Thin Mints last year. If there are 18 cookies in a box, how many boxes of Thin Mints did they sell?

**Problem:**  $3,456 \div 18$

$18 \times 2 =$ $18 \times 5 =$ $18 \times 10 =$
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	100	50	20	20	2
18		900			
	3456				
	- -----				

Answer:

2. The theater has 352 seats. If there are 22 equal rows of seats, how many seats are in each row?

**Problem:**  $352 \div 22$

$22 \times 2 = 44$ $22 \times 5 = 110$ $22 \times 10 = 220$
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	10	
22		
	352	
	-	

Answer:

3. Priscilla earned 781 dollars babysitting last year. If she charges \$11 per hour, how many hours did she babysit?

**Problem:**

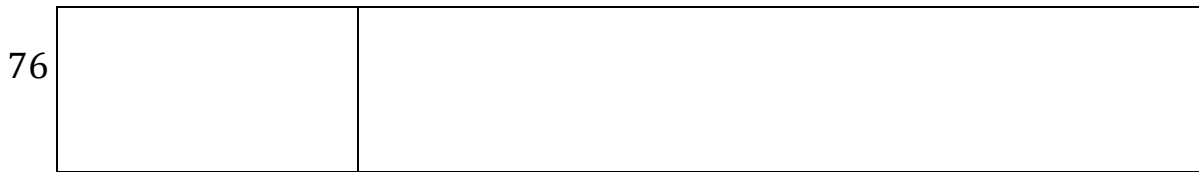


11		
	781	
	-	

Answer:

4. The area of the gym floor is 6,536 square feet. The length of the floor is 76 feet. What is the width?

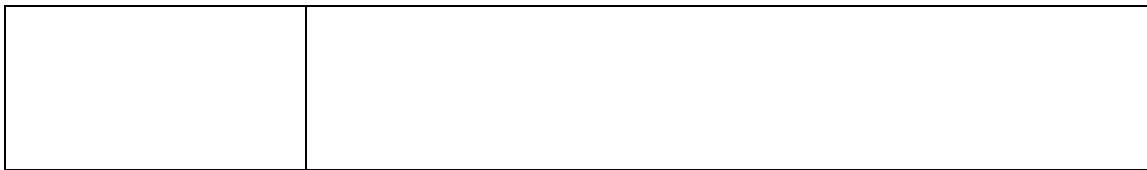
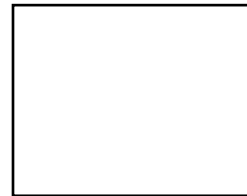
**Problem:**



Answer:

5. All 1,482 students from Woodland Intermediate School are going on a Field Trip. If each bus holds 43 students, how many buses are needed for the Field Trip?

**Problem:**



Answer:



6. If a space shuttle is traveling at 8,280 miles per hour, how fast is it moving per minute?

**Problem:**

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Answer:

7. The orchard sold 7,440 ounces of cherries last month. If there are 16 ounces in a pound, how many pounds of cherries did they sell?

**Problem:**

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Answer: