

0.1a Class Activity: Arithmetics Operations with Whole Numbers

 Prior to 6th grade a big part of multi-digit arithmetic has been done with modeling. This section reviews how models connect to the basic algorithms for addition, subtraction and multiplication. Throughout this section encourage your student to estimate their answers before calculating as this will give them a sense of whether or not their answer makes sense.

Roxy is ordering candy to re-stock some items at her candy shop. Answer each of her questions below without using a calculator. Show your work and be ready to discuss how you answered each question.

This task gives students the opportunity to review what they know about operations with multi-digit numbers. It also allows the teacher to assess their students understanding of how the algorithms for these operations work. In 4th and 5th grade students performed operations with multi-digit whole numbers and with decimals to hundredths. They used strategies based on place value, the properties of operations, and/or the relationship between inverse operations to find sums, differences, products, and quotients. As students work through these problems review with them how you can relate these strategies to the standard algorithms. If needed you can use base ten models to aide in and assess a student's understanding. These models will be used in later sections to extend their understanding to operations with multi-digit decimals that extend beyond hundredths.



1. A case of Mega Mania Jaw Breakers cost \$12 each, how much will 26 cases Mega Mania Jaw Breakers cost?

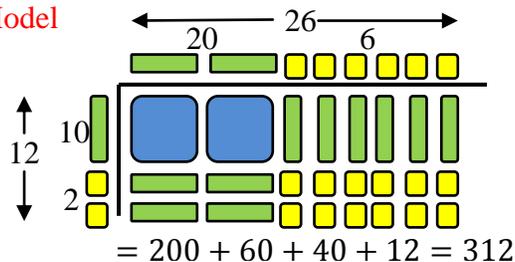
Algorithm

$$\begin{array}{r} 12 \\ \times 26 \\ \hline 72 \\ +240 \\ \hline 312 \end{array}$$

Partial Product

$$\begin{aligned} 12 \times 26 &= (10 + 2) \times (20 + 6) \\ &= 200 + 60 + 40 + 12 \\ &= 312 \end{aligned}$$

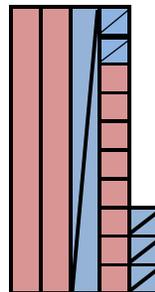
Area Model



Encourage students to estimate the product first. We are multiplying 26 and 12. You can round 26 to 25, so how much is 12 groups of 25? We know that 4 groups of 25 is 100 (think quarters and dollars) and there are 3 of these 4 group bundles in 12. $3 \times 100 = 300$. The answer should be around 300. As you are reviewing the multiplication algorithm discuss how place value plays a role in the placement of each number. If needed, review how to multiply multi-digit numbers using area models or partial products and how these strategies relate to the algorithm. It is recommended that you reference pages 4 and 8 in Mathematical Foundation for this appendix for a detailed explanation of how partial products and area models relate to the algorithm.

2. An entire case of Old Fashion Root Beer is \$43. If Roxy gets a discount of \$15 off, how much will the case of root beer cost?

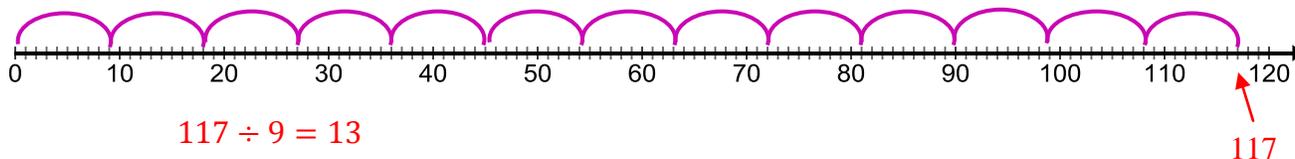
$$\begin{array}{r} 43 \\ -15 \\ \hline 28 \end{array}$$



Students might estimate this difference by rounding 43 to 45. The difference of 45 and 15 is 30 so the answer should be a little bit less than 30 because we rounded up. This is a model with base ten blocks that represents $43 - 15 = 28$. The entire model represents the minuend and the subtrahend is shaded blue. In the model you can observe unbounding and borrowing of a ten as used in the algorithm.

3. I spent \$117 on boxes of Tangy Licorice Ropes, each box costs \$9. How many boxes of licorice ropes did I buy?

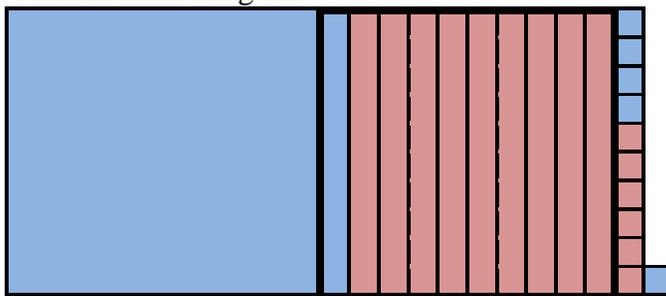
117 can be split into 13 groups of 9.



You can round 117 to 120, how many times will 9 go into 120? We know that 9 goes into 100 about 11 times and it goes into 20 about 2 times. $11 + 2 = 13$, so our answer should be around 13. Students have been exposed to, but have not yet solidified an algorithm for division of multi-digit numbers in previous grades. In 5th grade they used place value strategies related to equations, rectangular arrays, and/or area models to perform division operations. This is an example of using number line model to find the quotient. The division algorithm will be solidified in the next lesson.

4. I would like to buy a case of Chocolate Nut Clusters for \$115 and a case of Whopper Hoppers for \$86. How much will these two items cost altogether?

$$\begin{array}{r} 11 \\ 115 \\ +86 \\ \hline 201 \end{array}$$



Round 86 to 90 and 115 to 110. $90 + 110 = 200$. Our answer should be around 200. This base ten model shows that the sum of 115 and 86 is 201. In the model each addend is shaded a different color and the sum is represented by the entire model. You can see how the ones form a group of 10 that is carried to the tens place in the algorithm. You can also see how there are ten rods of ten that form a hundred cube. This relates to carrying the one into the hundreds place in the algorithm.

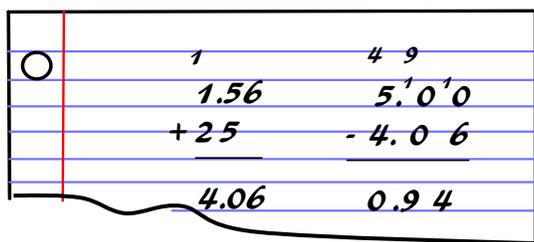
Find, Fix, and Justify



As students examine each transaction below they are critiquing the work of others, they must find the flaw in the mathematical argument and correct it.

Roxy's cashier has made some calculations for some of the purchases at the candy store and has made some mistakes, his work is shown below. For problems 5, 6, and 7 go through each transaction and determine the mistake, explain how to perform the calculation correctly and fix the mistake.

5. Corey buys two different candies at Roxy's store. One is a box of Fruity Frogs for \$1.56 and the other is a piece of Tangy Taffy for \$0.25. Corey has a 5-dollar bill. How much money does Corey owe the cashier and how much money should he get back?



Corey should get \$0.94 back in change.

The cashier did not line up the decimals when adding. You have to make sure you line up the decimals when adding and subtracting to ensure that you are combining numbers within the same place value. Corey owes the cashier \$1.81 and should get back \$3.19.

Find, Fix, and Justify Continued

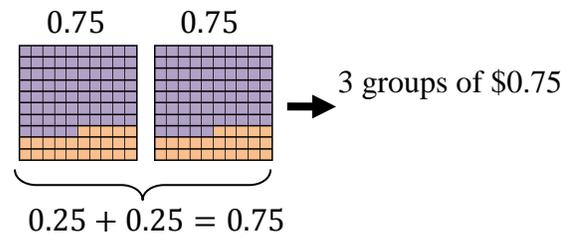
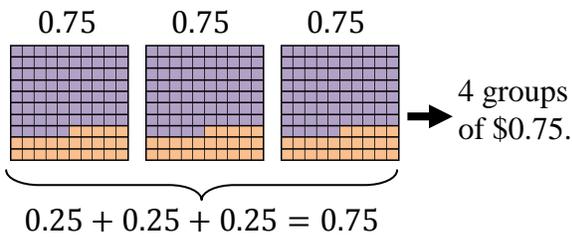
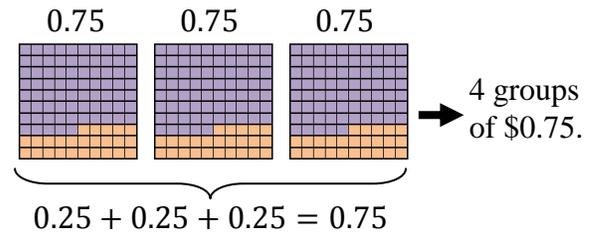
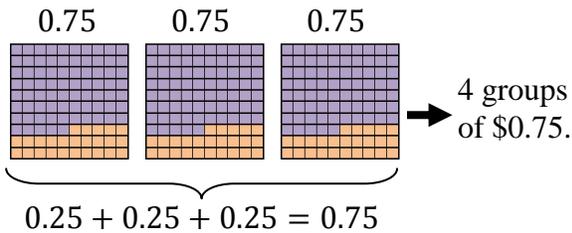
6. Lola is buying Goey Glow Worms for each of her 12 cousins. The worms cost \$0.75 each. How much will all the worms cost together?

| | |
|---|--------|
| | 1 |
| ○ | 12.00 |
| | × 0.75 |
| | 6000 |
| | +84000 |
| | 90000 |

Altogether the worms will cost \$90,000.

The cashier made the mistake of thinking they needed to line up the decimals when multiplying. He also did not take into account where the decimal needs to go in the product. Obviously \$90,000 is way too much if the worms only cost \$.75 each. The cost of the worms is \$9.00, you must consider where to put the decimal point in the product either by deducing that when multiplying by a decimal your product will be smaller than your beginning factor and or by reasoning about the position the decimal point is in the factors and how that effects the placement of the decimal point in the product.

7. Lola decides to just spend all the money she has on the \$0.75 Goey Glow Worms. She has \$11, how many worms can she get?



$$4 + 4 + 4 + 3 = 15 \text{ Goey Glow Worms}$$

Lola can buy 15 Goey Glow Worms.

On Lola's last two dollars he states that there are 3 groups of \$0.75 this is not correct. He is reasoning that she can buy half a glow worm but it is actually $\frac{2}{3}$ of a glow worm. You cannot buy partial glow worms. There are two groups of 0.75 with \$0.50 leftover. That means that she can buy 14 worms and will have \$0.50 leftover.