Grade 4 Advanced Math

Unit 3: Reasoning About Multiplication and Division

Dear Families,

We want to make sure that you understand the mathematics your child will be learning this year. Below you will find the standards we will be learning in Unit 3.

Each standard is in bold print, and below each one is an explanation with examples. Please let your teacher know if you have any questions. We appreciate your partnership and support.

4.NR.2.2: Interpret, model, and solve problems involving multiplicative comparison.

Students should be able to...

- solve relevant mathematical problems involving multiplicative comparison. Multiplicative comparison is a comparison situation based on one set of a quantity being a particular multiple of the other set within the comparison.
- distinguish multiplicative comparison from additive comparison. Additive comparison involves two distinct quantities and the difference between them.
- demonstrate an understanding of simple multiplicative relationships by using concrete materials, drawings, and equations with a variable for the unknown number to represent the problem.

Example:

Mara has four pencils. Josh has three times as many pencils as Mara. How many pencils does Josh have?

Answer:

Josh has 12 pencils

4.NR2.3: Solve real-life problems involving multiplication of a number with up to four digits by a 1-digit whole number or involving multiplication of two two-digit numbers using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

Students should be able to…

- solve relevant mathematical problems involving the multiplication of a number with up to four digits by a 1-digit whole number or two two-digit numbers.
- illustrate and explain their calculations using equations, rectangular arrays, and/or area models.
- solve relevant word problems that are meaningful to a student's real-life environment.

Examples:

1. There are 7 boxes of chocolates. Each box contains 16 chocolates. How many chocolates are there all together?
2. The school bought thirty-nine cases of popcorn for the school carnival. Each case contained 15 bags of popcorn. How many bags of popcorn is that all together?

Answers:

1. 16

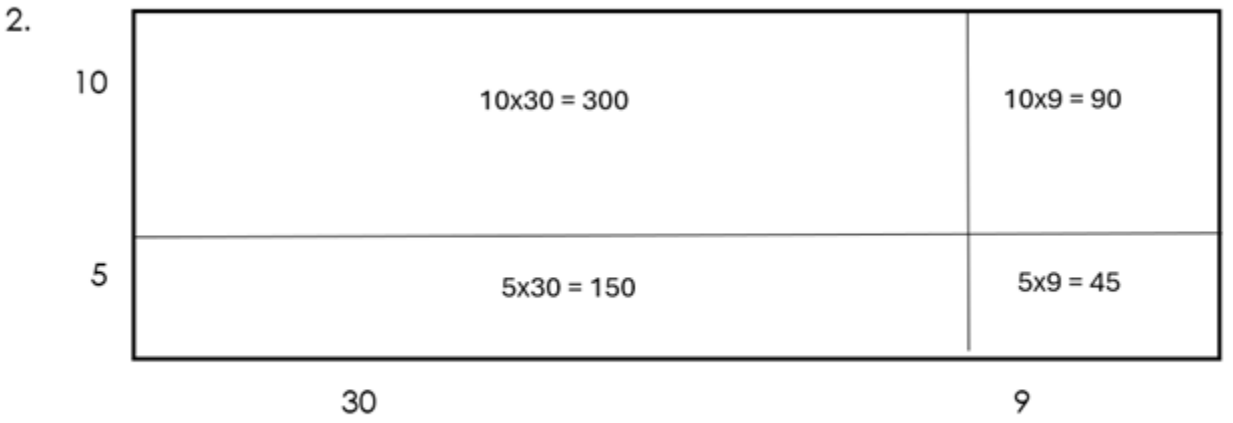
   x 7

   42 → 7x6 ones

   +70 → 7x1 ten

   112 So, 16x7=112

2.



Add the partial products to find the product: 300 + 150 + 90 + 45 = 580

4.NR.2.4: Solve real-life division problems involving up to 4-digit dividends and 1-digit divisors (including whole number quotients with remainders) using strategies based on place-value understanding, properties of operations, and the relationships between operations. Use place value understanding to round multi-digit whole numbers.

Students should be able to...

- solve mathematical problems related to everyday life involving division of whole numbers.
- illustrate and explain their calculations using equations, rectangular arrays, and/or area models.

Note: Long division is *not* an expectation at this grade level.

Example:

A total of 468 tickets are sold for a play. An equal number of tickets is sold at each of 4 ticket windows. How many tickets are sold at each window?

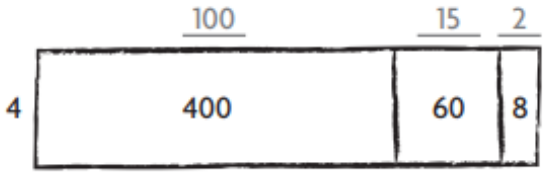
Answer and Possible Strategy:

Find 468 ÷ 4.

A. Break apart 468 into addends that are multiples of 4.

468 = 400 + 60 + 8

B. Draw an area model to represent 468 ÷ 4. Find the partial quotients.



400 ÷ 4 = 100
60 ÷ 4 = 15
8 ÷ 4 = 2

C. Add all the partial quotients.

100 + 15 + 2 = 117 468 ÷ 4 = 117

So, 117 tickets were sold at each window.

4.NR.2.5: Solve multi-step problems using addition, subtraction, multiplication, and division involving whole numbers. Use mental computation and estimation strategies to justify the reasonableness of solutions.

Students should be able to…

- use the four operations with whole numbers to solve authentic, mathematical problems.
- interpret any remainders.
- represent and model problems using equations and diagrams with a variable for the unknown quantity.

Example and 3 Reads Strategy for interpreting story problems:

A baker makes 18 batches of cupcakes. Each batch consists of 32 cupcakes. The bakery sells 500 cupcakes. How many cupcakes are left?

A. Determine a solution strategy.

Multiply 18 and 32 to determine the number of cupcakes made. Subtract 500 to determine how many are left.

B. Multiply.

$$\begin{array}{r} 32 \\ \times\ 18 \\ \hline 256 \\ +\ 320 \\ \hline 576 \end{array}$$

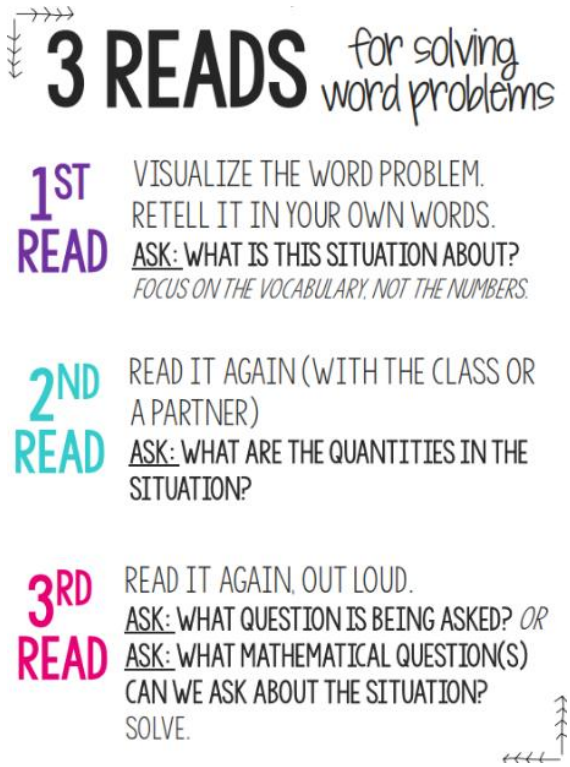
C. Subtract.

$576 - 500 =$ 76

D. Check that your answer is reasonable.

18×32 is about $20 \times 30 = 600$.
$600 - 500$ is 100, which is close to 76. The answer is reasonable.

So, the bakery has 76 cupcakes left.



4.MDR.6.1*: Use the four operations to solve problems involving elapsed time to the nearest minute, intervals of time, metric measurements of liquid volumes, lengths, distances, and masses of objects, including problems involving fractions with like denominators, and also problems that require expressing measurements given in a larger unit in terms of a smaller unit, and expressing a smaller unit in terms of a larger unit based on the idea of equivalence (*only elapsed time to the nearest minute and intervals of time).

Students should be able to…

- represent measurement quantities, such as time, using number line diagrams that feature a measurement scale.
- reason about the relative sizes of measurement units within the metric system.
- accurately record measurement equivalents in a two-column table.

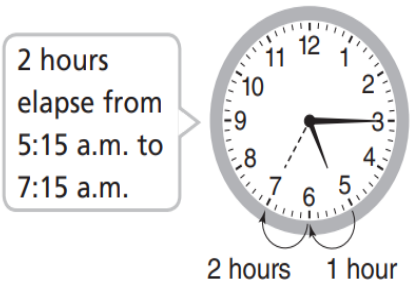
Example:

Counting can help you find elapsed time. How much time will elapse from 5:15 a.m. to 7:45 a.m.?

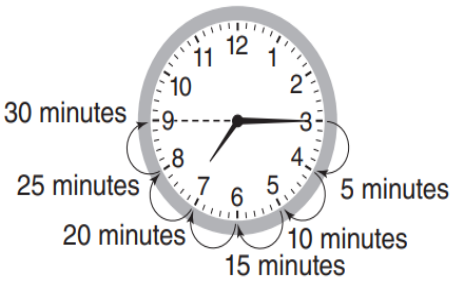
Answer with Possible Strategies:

A. Use a clock.

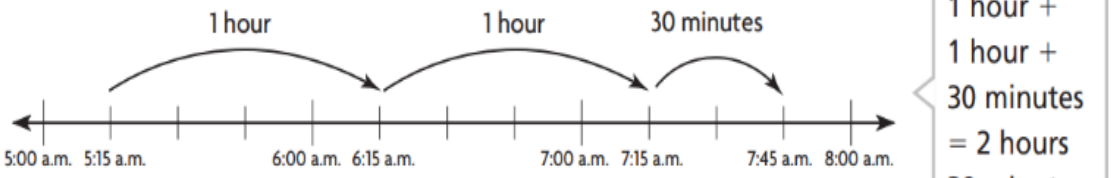
Count the hours.



Count the minutes.



B. Use a number line.



So, 2 hours 30 minutes will elapse.

Advanced Math Standards

5.NR.2.1: Fluently multiply multi-digit (up to 3-digit by 2-digit) whole numbers to solve real-life problems.

Students should be able to…

- flexibly, accurately, and efficiently multiply to solve practice, mathematical problems using efficient strategies that are based on knowledge of place value and properties of operations.
- use but are not limited to partial products (area model).
- use a standard algorithm by making connections from previous part-whole strategies.
- choose a strategy that makes sense to them based on the problem, focusing on efficiency.

Example:

One way to find 124 × 25 is to set up the problem vertically to find partial products that can be added to find the total product.

First, multiply each digit in 124 by the 5 ones in 25.

$$\begin{array}{r} 124 \\ \times\ \ 5 \\ \hline 20 \\ 100 \\ +\ 500 \\ \hline 620 \end{array}$$

Then multiply each digit in 124 by the 2 tens in 25.

$$\begin{array}{r} 124 \\ \times\ 20 \\ \hline 80 \\ 400 \\ +\ 2{,}000 \\ \hline 2{,}480 \end{array}$$

partial product

Lastly, add the partial products to find the product: 124 × 25 = 620 + 2,480 = **3,100**.

5.NR.2.2: Fluently divide multi-digit whole numbers (up to 4-digit dividends and 2-digit divisors no greater than 25) to solve real-life problems.

Students should be able to…

- explain partial quotients prior to beginning to use a more formal algorithm.
- use but are not limited to partial quotients (area model).
- flexibly, accurately, and efficiently divide to solve practical, mathematical problems.
- choose a strategy that makes sense to them based on the problem and/or the numbers involved, focusing on efficiency.

Example Problem and Strategy:

Use partial quotients to divide 1,968 ÷ 16.

$16\overline{)1{,}968}$

To divide using partial quotients, subtract multiples of 16 (the divisor) from 1,968 (the dividend). Then add the partial quotients.

A. Subtract a larger multiple of 16 from 1,968. Use easy numbers to work with. The multiple should be less than 1,968. One possible multiple would be 100 × 16 = 1,600.

$$\begin{array}{r} -1{,}600 \\ \hline 368 \end{array} \leftarrow 100 \times 16$$

B. Subtract another multiple of 16 from the 368 that is remaining. One possible multiple would be 10 × 16 = 160.

$$\begin{array}{r} -160 \\ \hline 208 \end{array} \leftarrow 10 \times 16$$

C. Subtract another multiple of 16 from the 208 remaining. One possible multiple would be 10 × 16 = 160 again!

$$\begin{array}{r} -160 \\ \hline 48 \end{array} \leftarrow 10 \times 16$$

D. Subtract another multiple of 16 from the 48 remaining.

$$\begin{array}{r} -48 \\ \hline 0 \end{array} \leftarrow \begin{array}{r} 3 \\ \hline 123 \end{array} \times 16$$

E. Add together all the partial quotients to find the quotient.

1,968 ÷ 16 = 123