

MATH

MULTIPLICATION & DIVISION

“Basic Facts”

Strategies

- o count by n for multiplication and division
- o square numbers (the product of a whole # and itself)
(ex. $4 \times 4 = 16$, 16 is a square #)
- o commutativity

$$8 \times 4 = 4 \times 8$$

- o inverse operations – think to unmultiply or to find a missing factor

$$32 \div 4 = 8$$

$$32 \div 8 = 4$$

Derived Facts—using facts you know to figure out those you don’t

- o Start with a known, count by n and then add on
 $4 \times 6 = 4 \times 5$ plus 4
- o Start with a known fact and double
 $4 \times 8 = 4 \times 4$ then double
- o Combine 2 known facts
 $4 \times 6 = 4 \times 4 + 4 \times 2$

Basic Multiplication & Division Facts are extended to larger numbers:

$$4 \times 8 \times 10 = 320 \quad \text{so}$$

$$40 \times 8 = 320$$

$$4 \times 80 = 320$$

$$4 \times 8 \times 100 = 3200$$

$$4 \times 800 = 3200$$

$$400 \times 8 = 3200$$

Multiplication problems can be shown as 4×3 or $4 \cdot 3$ or $4 * 3$.
Division problems can be shown as $50 \div 5$ or $\frac{50}{5}$ or $50/5$ or $5 \overline{)50}$.

Multiplication & Division Situations: Problem Types

Equal Groups – unknown total

I have 3 bowls. There are 2 oranges in each bowl. How many oranges in all?

Equal Groups – unknown number of groups (measurement division)

(think: breaking off a chunk or repeated subtraction)

I have 6 oranges. I give 2 to each person who comes in. How many people get oranges?

Equal Groups – unknown group size (fraction division)

(think: fair share or dealing)

I have 6 oranges. I share them equally between Tom, Sue, and Maria. How many oranges does each get?

(think: things in natural rows & columns)

In my album I have 3 rows of pictures with 2 pictures in each row. How many pictures?



Area

(think: clear grid overlaying a region)

Our family owns a piece of land that is 3 miles wide and 2 miles long. How much land do we own?

(think: total # of possible outcomes)

For your ice cream sundae you may choose 1 of 3 ice cream flavors and 1 of 2 toppings. How many different sundaes could you make?

comparison

(think: a comparison using multiplication)

I have a dog who is 2 feet tall. My big brother is three times as tall as my dog. How tall is he?

Algorithms

Multiplication of Whole Numbers:

Rectangle Sections/ Partial Products

$$23 \times 36 = 828$$

	30	6	
20	$20 \times 30 = 600$	$20 \times 6 = 120$	600 120 90 + 18 828
3	$3 \times 30 = 90$	$3 \times 6 = 18$	

Expanded Notation

$$\begin{array}{r} \times 23 = \quad 20 + 3 \\ \hline 20 \times 30 = 600 \\ 20 \times 6 = 120 \\ 3 \times 30 = 90 \\ 3 \times 6 = 18 \\ \hline = 828 \end{array}$$

Algebraic Notation

$$\begin{aligned} 23 \times 36 &= (20 + 3) \times (30 + 6) \\ &= 828 \end{aligned}$$

Shortcut Notation (common U.S.)

$$\begin{array}{r} 1 \\ \times 23 \\ \hline 69 \\ 460 \\ \hline 528 \end{array}$$

Division of Whole Numbers:

Partial Quotients (at least or the big 7)

$$\begin{array}{r} 19R3 \\ \downarrow \\ 12 \overline{)231} \\ - 120 \\ \hline 111 \\ - 60 \\ \hline 51 \\ - 48 \\ \hline 3 \end{array}$$

Expanded Notation

$$\begin{array}{r} 6 \\ 40 \rangle 546 \\ \hline 7 \overline{)3,822} \\ - 3,500 \\ \hline 322 \\ \underline{280} \\ 42 \\ - 42 \\ \hline 0 \end{array}$$

Digit by Digit (traditional)

$$\begin{array}{r} 546 \\ 7 \overline{)3,822} \\ - 35 \\ \hline 322 \\ \underline{28} \\ 42 \\ - 42 \\ \hline 0 \end{array}$$

vocabulary Review

“Product” is the answer to a multiplication problem.
“Quotient” is the answer to a division problem.

MATH

ADDiTiON & SUBTRAcTiON

“Basic Facts”

General Strategies

- o Counting on...
- o Make a 10
 $8 + 5 = 8 + 2 + 3 = 13$
- o Partners & Switch Partners
 $6 = 5 + 1 = 4 + 2 = 3 + 3$ etc.
 $6 = 5 + 1 = 1 + 5$

Specific Strategies

- o Doubles
 $4 + 4 = 8$
- o Doubles +/- 1
 $7 + 6 = 6 + 6 + 1 = 13$
 $7 + 6 = 7 + 7 - 1 = 13$
- o Teens as 10 plus n
 $13 = 10 + 3$

Basic Addition & Subtraction Facts are extended to larger numbers:

$$6 + 7 = 13$$

$$60 + 70 = 130$$

$$600 + 700 = 1300$$

*Developed from Math Expressions
(Houghton Mifflin Harcourt, 2009)
*Based on the work of Edmonds
School District #15, Lynnwood, WA
* <http://math.mpls.k12.mn.us>



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Addition & Subtraction Situations: Problem Types

change Plus/Join

Chris has 6 books on animals. Her parents give her 7 more animal books. How many does she have in total?

change Minus/Separate

Mike has 13 tickets to the zoo and he gives 6 of them to his cousins. How many does he have left?

comparison

Carlos has 7 beautiful sea shells. Lee has 13 beautiful shells. How many more does Lee have than Carlos?

collection: Part-Part-Whole

In her bedroom, Lynn has a shelf full of stuffed animals. Six are red and 7 are purple. How many does she have in all?

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Algorithms

Addition of Whole Numbers

Show All Totals/Partial Sums

$$\begin{array}{r} 237 \\ + 59 \\ \hline 200 \\ 80 \\ + 16 \\ \hline 296 \end{array}$$

New Groups Below

$$\begin{array}{r} 237 \\ + 59 \\ \hline 296 \end{array}$$

New Groups Above (common U.S.)

$$\begin{array}{r} 1 \\ 237 \\ + 59 \\ \hline 296 \end{array}$$

= Sign Review

= can also be read as “the same value as” or “is” or “is the same as”

* The equals sign does not mean “the answer comes next.”

Subtraction of Whole Numbers

Expanded Method

$$\begin{array}{r} 120 \\ 130 \quad 16 \\ 136 = 100 + 30 + 6 \\ - 47 = - \quad 40 + 7 \\ \hline 80 + 9 = 89 \end{array}$$

Ungroup First then Subtract Everywhere Method/ Trades First

$$\begin{array}{r} 12 \\ 0 \neq 16 \\ \hline 136 \\ - 47 \\ \hline 89 \end{array}$$

left to right or right to left

Alternating Ungroup & Subtract Method (common U.S.)

$$\begin{array}{r} 2 \\ 1 \neq 16 \\ \hline 136 \\ - 47 \\ \hline 9 \end{array}$$

step one

vocabulary Review

“Sum” is the answer to an addition problem.

“Difference” is the answer to a subtraction problem.