MATH EXPRESSIONS*

MULTIPLICATION & DIVISION

"Basic Facts"

Strategies

- Count by n for multiplication and division
- Square numbers (the product of a whole # and itself)
  (ex. 4 x 4 = 16, 16 is a square #)
- commutativity
  8 x 4 = 4 x 8
- Inverse operations—think to unmultiply or to find a missing factor
  8 x 4 = 32 so
  32 ÷ 4 = 8
  32 ÷ 8 = 4

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

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

Basic multiplication & division facts are extended to larger numbers:

```
 4 x  8   =   32
 4 x  8   x   10  =   320   so
   40     x    8  =   320
    4     x   80  =   320
 4 x  8   x  100  =  3200
   40     x   80  =  3200   so
    4     x  800  =  3200
  400     x    8  =  3200
```

Multiplication problems can be shown as 4 x 3 or 4 • 3 or 4 * 3.

Division problems can be shown as 50 ÷ 5 or $\frac{50}{5}$ or 50/5 or $5\overline{)50}$

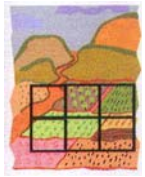
Multiplication & Division Situations: Problem Types

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?

Array
(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?

Combinations
(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 x 36 = 828

	30	6	
20	20 X 30 = 600	20 X 6 = 120	600 120
3	3 X 30 = 90	3 X 6 = 18	90 + 18 828

Expanded Notation

```
 36 =  30  +  6
X 23 =  20  +  3
      20  x  30  =  600
      20  x   6  =  120
       3  x  30  =   90
       3  x   6  =   18
                 =  828
```

Algebraic Notation

23 x 36 = (20 + 3) x (30 + 6)

= 600 + 120 + 90 + 18
= 828

Shortcut Notation
(common U.S.)

```
    1
    1
   36
x  23
  108
 72
828
```

Division of Whole Numbers:

Partial Quotients
(at least or the big 7)

```
      19R3
12 | 231
   - 120   10
     111
   -  60    5
      51
   -  48    4
       3   19
```

Expanded Notation

```
      6
     40
    500      546
7 | 3,822
- 3,500
    322
    280
     42
     42
      0
```

Digit by Digit

```
      546
7 | 3,822
  - 3 5
    322
     28
     42
    -42
      0
```

Vocabulary Review

"Product" is the answer to a multiplication problem.

"Quotient" is the answer to a division problem.

MATH EXPRESSIONS*

ADDITION & SUBTRACTION

"Basic Facts"

General Strategies

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

Specific Strategies

- Doubles
  4 + 4 = 8
- Doubles +/- 1
  7 + 6 = 6 + 6 + 1 = 13
  7 + 6 = 7 + 7 - 1 = 13
- 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**

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?

More information is available on the district website:

http://www.district279.org/departments/curriculum/Subjects/Math/resources.cfm

Additional NCTM Websites

http://figurethis.org/
http://illuminations.nctm.org/
(activities, lessons, games)

ISD 279
Osseo Area Schools
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Algorithms

Addition of Whole Numbers

Show All Totals/Partial Sums

237	237
+ 59	+ 59
200	16
80	80
+ 16	+ 200
296	296

New Groups Below

```
  237
+  59
 ---
  1
  296
```

New Groups Above (common U.S.)

```
  1
  237
+  59
  296
```

Subtraction of Whole Numbers

Expanded Method

```
      120
     -130  16
136 = -100 + 30 + 6
- 47 =   -  40 + 7
        80 + 9 = 89
```

Ungroup First Then Subtract Everywhere Method/ Trades First

```
    12                  12
  0 13 16             0  2 16
  1  3  6             1  3  6
-    4  7           -    4  7
     8  9                8  9
```

left to right or right to left

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

```
    2                  12
  1 3 16             1 3 16
-   4  7           -   4  7
      9                8  9
```

step one step two

= 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."

Vocabulary Review

"Sum" is the answer to an addition problem.

"Difference" is the answer to a subtraction problem.