Printables for “Quick Images”

KNPIG ID # M 4435.6 – ORANGE

This file contains printables for a small group of students.

For each additional group of students print Mental Math Problem Strings Instructions, Teacher Resources, & Additional Examples.

- Mental Math Problem Strings Instructions - 2 pages.

- Teacher Resources & Additional Examples.

Teacher Notes: See the print link for more information about using problem strings and examples. Listen carefully to the students as they justify their answers. Are they using known or related facts? Are they using properties of multiplication and division? Are they counting? Do students see connections and use the earlier problems in the string to think about later problems in the string?

MENTAL MATH PROBLEM STRINGS

(Multiplication and Division)

What is a *Mental Math Problem String*?

A problem string is a *sequence of related arithmetic tasks* (typically 5-10 problems presented horizontally) that are designed to call attention to a particular mathematical feature. They can be posed with materials, such as showing arrays, or posed with just numerals. The tasks are presented one at a time. Often, the previous tasks and their solutions remain visible as each successive task is presented.

Problem strings create opportunities for students to discover and strengthen composite arithmetical strategies and foster number sense. The types of tasks and the way successive tasks build on preceding tasks will influence which strategies students will discover and use. Teacher questioning, student think time and student discussions are critical to the process.

Some examples of multiplication and division problem strings are:

Doubling

2 x 7 =

4 x 7 =

8 x 7 =

3 x 8 =

6 x 8 =

Inverse relationship of multiplication and division

6 x 4 =

24 ÷ 6 =

7 x 4 =

28 ÷ 4 =

28 ÷ __ = 4

Distributive property

5 x 8 =

2 x 8 =

7 x 8 =

5 x 9 =

6 x 9 =

7 x 6 =

Fostering student thinking

Use open-ended questions to prompt student thinking, such as

- How did you work that out?
- Why does that work?
- Does anyone have another way to work that out?
- What did you know that helped you work that out?
- Do you see a pattern? What is it?
- What is a new problem that is similar to these?
- Can you use the previous problem(s) to help with this problem?

Allow think time before students respond. A "thumbs up" or other hand single can be used by students to indicate their readiness to answer. Foster an expectation that students listen to each other and may ask questions about each other's strategies. Students might show agreement through a waggling "hang ten" gesture or other agreed upon signal. At times, ask one student to paraphrase another student's explanation or use another student's method. Invite multiple strategies for a single task.

Modeling Student Strategies

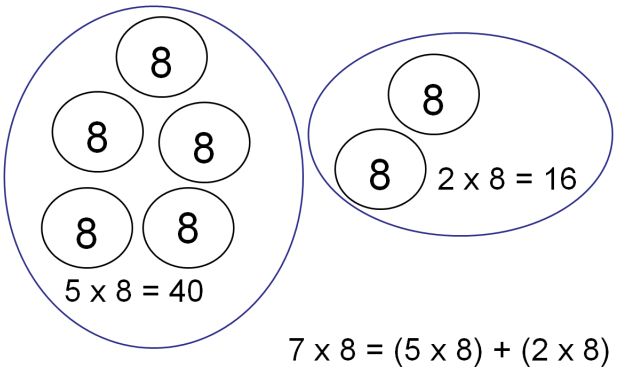
When leading activities involving mental problem strings, the teacher can support student thinking and student discussion by acting out and/or recording the students' explanations. For example, the teacher might draw a set model or array model to match an explanation.

Written methods like those shown below can be used to record student thinking. Match the recording model to the strategy used. As students become more familiar with investigating and discussing strings, transition from teacher modeling to the students recording their own thinking and sharing those recordings with the class. (A class document camera is very helpful for these kinds of discussions!)

The teacher's role is to keep the mathematical discussion focused, help student express and record their own thinking and support the students in listening to and understanding each other. Be careful not to show a "teacher" way of solving or thinking - this will discourage students from pursuing their own ideas and listening to peers. Be open - students may come up with ideas you did not anticipate but contain wonderful mathematics!

Equations with pictures **7 x 8 = 56**

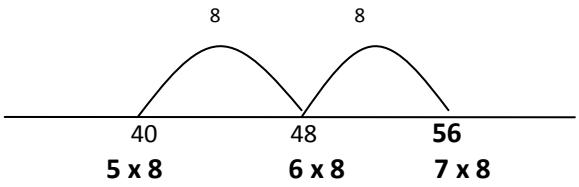
"I split the 7 apart into 5 and 2. 5 sets of 8 is 40, 2 sets of 8 is 16, 40 + 16 = 56."



7 x 8 = (5 x 8) + (2 x 8)
= 40 + 16
= 56

JUMP MODEL **7 x 8 = 56**
(Empty Number Line)

"I knew that 5 x 8 = 40 and then counted by 8 two more times... 40, 48, 56"



Teacher Resources

The following two teacher resources use a series of problem strings over the course of 1-3 years to develop multiplication and division ideas. Copy the URL below the title for sample information. Copy the final link for ordering information.

Minilessons for Early Multiplication and Division; A Yearlong Resource, Fosnot, C. T. & Uittenbogaard, W Portsomouth, (2007) NH: Heinemann

http://www.contextsforlearning.com/samples/RG35EarlyMultDivConSum.pdf

Minilessons for Extending Multiplication and Division; A Yearlong Resource, Fosnot, C. T. & Uittenbogaard, W Portsomouth, (2007) NH: Heinemann

http://www.contextsforlearning.com/samples/RG35ExtMultDivConSum.pdf

Ordering Information:

http://www.heinemann.com/search/searchResults.aspx?s=all&q=minilessons%20multiplication%20and%20division

Additional Examples of Mental Math Problem Strings

Inverse relationship of multiplication and division and Doubles

2 x 3 =

4 x 3 =

12 ÷ 2 =

2 x 4 =

4 x 4 =

Doubling and Halving

2 x 7 =

14 ÷ ____ = 7

4 x 7 =

8 x 7 =

28 ÷ 4 =

28 ÷ 2 =

Using related facts

5 x 4 =

6 x ____ = 24

24 ÷ ____ = 4

4 x 7 =

28 ÷ 4 =

___ x 8 = 32

Doubling and Halving

4 x 3 =

__ x 3 = 24

8 x 6 =

4 x 6 =

2 x 6 =

Commutative property of multiplication and inverse relationship of mult. & div.

20 ÷ 10 =

20 ÷ 5 =

20 ÷ 4 =

16 ÷ 2 =

16 ÷ 8 =

Doubling

2 x 6 =

4 x 6 =

6 x 6 =

4 x 8 =

8 x 8 =