# Developing Conceptual Understanding Of <br> <br> Number 

 <br> <br> Number}

## Introduction

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Number

## General Information

- Number sense is the primary focus of this project. Estimation will be developed throughout.
- The aim is to create sets of mental mathematics questions (to be answered orally) that review critical concepts taught previously.
- Each set consists of seven sheets designed to encourage students to think mathematically.
- The first three sheets are compulsory. Each one involves discussion and student explanation of their solution strategies. Teachers are expected to stop at the dotted lines to discuss student understanding of the concept(s).
- The last four sheets are intended for beginning consolidation of the concepts and are arranged in order of difficulty with sheets 4 and 5 being easier than sheets 5 and 7 . Sheets 4 and 6 as well as 5 and 7 are roughly parallel. Teachers are expected to choose two of these four sheets for immediate use.
- Application sets focus on checking and reinforcing understanding. Activities in these sets are not intended to repeat previous ones, but rather to encourage students to demonstrate their understanding in a slightly different context.
- Teachers are asked to take no more than $10-12$ minutes including discussion time at the beginning of each class period to work on these activities. Some sheets may require more than one 10 -minute session.
- These materials have been designed assuming Sets A, B and C are completed first. Teachers can then choose from the three remaining groups (DE or FG or HIJ). Questions from Sets A, B and C may appear in the remaining sets.
A.

B. Comparing Numbers

C. Representing Numbers



## Applications A, B, C


D. Number Theory
E. Whole Number Operations

Applications A, B, C, D, E
F. Geometry
G. Decimal, Fraction and Percent

Applications A, B, C, F, G
Applications A, B, C, D, E, F, G
H. Coordinate Geometry
I. Pre-Algebra Patterns
J. Perimeter and Area

Applications A, B, C, H, I, J
Applications A, B, C, D, E, H, I, J
Applications A, B, C, F, G, H, I, J
Applications A, B, C, D, E, F, G, H, I, J

Applications 5, 6
Applications 7, 8
Applications 3, 4

Applications 9, 10
Applications 11, 12
Applications 13, 14
Applications 15, 16

## Teaching Suggestions

The following suggestions are from teachers who have tried these materials in their classrooms.

- When deciding which of the last four sheets to use, consider the following options:
$>$ split the class into two groups - one using sheet 4 and one using sheet 6 . The teacher can work with one group while the other groups works independently.
$>$ If the students struggled in the first three sheets, use sheet 4 and sheet 5 . If the students found the first three sheets relatively easy, use sheet 6 and sheet 7 .
- For each set, provide students with an $11^{\prime \prime}$ x $17^{\prime \prime}$ sheet of paper. Have students fold the paper to make an $8.5^{\prime \prime} \times 11^{\prime \prime}$ booklet. (see diagrams below).
$>$ On the cover (page 1), have students construct a visual representation of the concepts with the name of the set as the central phrase.
$>$ On the inside of the cover (page 2), have students construct a chart using a Three-Point Approach for vocabulary. As new vocabulary is introduced throughout the set, have students add to their chart. On the facing page (page 3), have students write notes and/or answers to the questions from Sheets 1,2 and 3 as they are discussed in class.
$>$ On the back (page 4), have students record their answers from the fourth and fifth sheets used. After the set is finished, students could retain the booklet for reference later in the year.


| Day 4 | Day 5 |
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| Page 4 |  |

- Some questions are appropriate for students to create posters demonstrating their answers. This could be done in groups or as an individual activity.
- A classroom word wall for the vocabulary would be appropriate. Students should be encouraged to create the word wall or at the very least to determine which words go on the wall.
- Pencil and paper jottings are appropriate for some questions. This will be necessary for some students on a regular basis. Student participation is more important that an undue emphasis on mental process.


## Assessment Suggestions

- Several teachers found that students participated more readily in the discussion on sheets 1,2 and 3 if explicit evaluation was not used.
- Some teachers used the $4^{\text {th }}$ and $5^{\text {th }}$ sheet for evaluation purposes. Others did not explicitly evaluate until the Applications sheets.
- Other teachers evaluated the $11^{\prime \prime} \times 17^{\prime \prime}$ sheet of paper using a rubric emphasizing effort.


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