**Helping students understand the place-value features of the Secret Code Cards and use these to compare, add, and subtract multidigit numbers**

The first section of this paper contains the directions of how to make the Secret Code Cards. The second section describes how to help students discover and describe the place-value features of the Secret Code Cards and how students can connect the Secret Code Cards to math drawings they make of hundreds, tens, and ones. See the file How to make math drawings for hundreds, tens, and ones on the Math Expressions Users page of karenfusonmath.com or karenfusonmath.net for how to help students learn to make math drawings rapidly. The final section describes other understandings that can be supported by the Secret Code Cards and gives references to pursue.

1. **Directions to make the Secret Code Cards**

We call these Secret Code Cards because they show the secret code of numbers. These cards can be layered on top of each other to show the number as it is written in single digits (on the right below) or taken apart to see the place values in the expanded notation of the number (on the left below). The numeral side has tiny numbers on the top left so that the place-value expanded notation version is shown even when the cards are layered to just show single digits. The Secret Code Cards help students use both names for groups of ten, the English word *eighty* for 80 and the tens word *8 tens*. The backs of the cards show hundred-boxes, ten-sticks, and ones-circles so that when these backs are layered they show math drawings such as those students draw.

*A blue rectangular box with black numbers

Description automatically generated with medium confidence*

On pages 6 to 9 are Secret Code Cards for ones, tens, and hundreds. The ones and tens are on pages 6 and 7, and the hundreds are on pages 8 and 9. You will need to make two-sided copies from pages 6 and 7 and also two-sided copies from pages 8 and 9. Select **Print Actual Size** (not **Fit to Page**) to print out pages 3 to 6 and select **2-sided Printing** and **Long Edge Binding** if you have such a choice. **These cards last longer if you can make them from card stock. You can print on paper or cardstock of any color.**

On the cards on pages 6 to 9, we have taken out the cut lines around each card (like those shown on page 2) because it is so difficult to align the front and the back exactly and not have the cut lines show after cutting. So instead the pages have marks that show the cut lines but are outside the cards. There are small horizontal cut lines on each side of the page, and small vertical cut lines on the top and the bottom of the page. When printing 2-sided, you will align the corners of the small reverse corner marks that are at each corner of the rectangle making the cards and outside the cards.

Cutting the cards apart works best if you make all of the horizontal cuts and then make the vertical cuts because the bottom row has the vertical cuts in a different place than the rows above. **Be sure that the small numbers at the top left of each card show clearly on the cut cards.**

The Secret Code Cards are from the PK to Grade 6 math program *Math Expressions, Common Core*. Copyright © by Houghton Mifflin Harcourt Publishing Company. Available by permission of the Publisher. All rights reserved.

The pictures below are smaller than the actual cards and are here to show how the cards lay out on a page. The small cut marks outside the space of the cards on pages 6 to 9 will let you cut the cards apart where the lines are on these pages.

A blue square with black numbers

Description automatically generated A blue grid with black dots

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A blue rectangular box with numbers

Description automatically generated A blue rectangular object with black lines

Description automatically generated with medium confidence

1. **Making numbers with the Secret Code Cards and**

**connecting the cards to student math drawings**

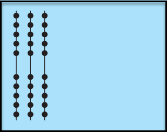
**Students make 2-digit numbers**

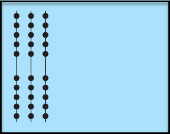
* Have students make 38 with their Secret Code Cards and then make a math drawing on blank paper to show 38.
* Have students discuss how they drew 8 using 5-groups (two ways, vertical or horizontal) are shown below).
* Then have students discuss the 0 on the tens card 30 that is hiding under the ones card 8 and what that 0 shows and why it is there (it shows that the 3 is three tens and so the 0 needs to be in the tens place).
* Have students turn over the Secret Code Cards to discuss any other relationships they see between their math drawing and the Secret Code Card tens and ones drawings (shown below). During this discussion have students use *thirty* and *three tens* for 30 to help *thirty* mean *three tens*.

A math equations and symbols

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Description automatically generatedA blue sign with black numbers

Description automatically generatedA blue and black number

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A blue rectangle with black dots

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* Have students make more 2-digit numbers with the Secret Code Cards and make math drawings for the same number and discuss all of the relationships they see.
* For the tens cards and for the ten-stick drawings, have student use English decade words like *twenty, thirty, forty,* etc. and also tens words like *two tens, three tens, four tens*, etc. to describe the numbers and help the English words take on tens meanings. Using both kinds of words helps build place-value understanding about operations on multidigit numbers. Students need to think of the value of the place a digit is in (the hundreds, or tens, or ones place) because that changes the value of the digit. Having students (and you) say these values frequently as they work with multidigit numbers helps students remember the different quantities that are represented.
* Continue helping your students describe all of these connections as they make more 2-digit numbers with the cards and with math drawings.

**Students make 3-digit numbers**

Move on to making and discussing 3-digit numbers when your students can say and explain 2-digit numbers as being composed of tens and of ones. You can put aside the cards for 200 through 900 and start with students using only the 100 card to reduce the number of cards and permit students to focus on the relationships. Begin by having students make 38 again and then use the 100 card to make 138 by putting the 38 cards on the 00 of the 100 card. Have students discuss what each zero on the 100 card means and how the zeros are shown on the back of the 100 card (there are no drawings of tens and ones).

A blue and black number

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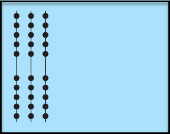
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A blue sign with black numbers

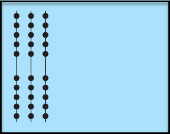
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A blue rectangle with black dots

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Have students put different tens and ones cards on the 100 card to make different numbers and make a math drawing for each number they make with the cards. It is important for students to discuss all of the relationships they see between the Secret Code Cards and their math drawings and also discuss relationships with the drawings on the back of the Secret Code Cards.

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A blue and black number

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Description automatically generatedA blue line drawing of a square and a number

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Students should see and discuss relationships on the front and the backs of the cards with the cards expanded separately and also layered on top of each other to show the 3-digit number. Students can notice and discuss how the drawings on the back of the cards show all of the ten tens on each 10-stick and all of the ten ten-sticks inside the hundred-box. This can help them remember the meanings of the quick hundred-boxes and quick ten-sticks they are making in their math drawings.

A blue line drawing of a square and bar code

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A blue rectangular object with a black circle

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Description automatically generatedA blue sign with black numbers

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A blue rectangular object with a black circle

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Then make and discuss numbers between 200 and 1000 by using all of the hundreds cards. For later grades students can make Secret Code Cards for thousands and even ten thousands if they want to make larger numbers. They can discuss what drawing they will use for each thousand and each ten thousand.

A blue sign with a black number three

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Description automatically generatedA blue and black number

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A blue and black number

Description automatically generatedA blue sign with black numbers

Description automatically generatedA blue sign with a black number three

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A blue line drawn on a white surface

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**Using Secret Code Cards and student math drawings**

**to understand other important math topics**

**How to understand comparing multidigit numbers**

See the file Comparing multidigit numbers using math drawings and Secret Code Cards on the Math Expressions Users page of karenfusonmath.com or karenfusonmath.net for how to help students learn to understand how to compare multidigit numbers.

**How to understand adding and subtracting multidigit numbers**

See the file Adding and subtracting numbers using math drawings and Secret Code Cards on the Math Expressions Users page of karenfusonmath.com or karenfusonmath.net for how to help students learn to understand how to add and subtract multidigit numbers.







