A new look for the hundreds chart

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For many years the hundreds chart has been used in a variety of ways to help develop mathematical ideas with children—it is quite possible that many children formulate their initial ideas about number through experiences with the chart. The typical hundreds chart, however, shows numerals going downward as they go "up" in number value. This causes a directional conflict in the minds of some children; it would seem that a different arrangement of the chart could help overcome this conflict. Rather than starting in the upper left hand corner and progressing to the lower right, the chart could originate in the lower left hand corner and terminate in the upper right as illustrated in figure 1. In this arrangement, number values increase as we progress "upward" through the chart.

A child's mental picture of the position of a number in relation to other numbers is relatively easily formulated by most children. For the slow learner or mentally retarded child, it is difficult, perhaps impossible, to form this picture, especially when numbers are seen in so many different arrangements. Hundred charts in the form shown in figure 1 have proved very helpful with classes of educable-mentally-retarded children at the primary level. In the author's class, each child is provided with a chart drawn on oaktag cardboard and covered with clear contact paper. Duplicated sheets could be used but they would not have the permanence.

Armed with this chart, even slow-learning children can take numerous mathematical excursions that will aid in developing understandings and competencies, especially in counting and addition.

Learning to count

When the child learns to say the counting words, a large, 10-by-10, blank wall chart may be presented. As the child says the number, point to the corresponding square by starting at the bottom left hand corner and moving from left to right. When the position of the bottom row of numbers is learned, the numerals are placed on the chart. At this point the child should be given a similar desk size chart with the bottom row (one through ten) filled in. As the child continues to count orally through the chart, the multiples of ten are accented and subsequently added to the

chart. In this way a few numbers are learned at a time and the child doesn't need to face a full chart of numbers.

When skill in counting progresses, intervals of five are accented and recorded on the chart. Eventually the child will be able to count to one hundred by ones, fives, and tens and point to their respective positions. At the same time the following concepts are also taught with the chart: *before, after, next, between, below, above, to the right, to the left, less, more,* and *zero.* (Zero has not been used before since it is not a counting number.)

Other counting experiences with the chart are much as they would be on a standard hundreds chart. Sequence of numbers, relationships, and so on, may be studied. A number line can be drawn under the bottom row of the chart. The chart can also be sliced up; the rows can be placed end-to-end to demonstrate a number line to one hundred and then placed back in tiers for convenience of compactness. Markers, such as pinto beans, can be placed on each numeral as the child counts to demonstrate one-to-one correspondence between the elements of the sets and the positions on the number line. This activity also involves the use of other senses in the learning situation.

Learning about money

The chart may also be used in learning the value of the basic pieces of money, a skill especially vital for the mentally retarded child. After each child is able to differentiate between penny, nickel, dime, quarter, half-dollar, and dollar, start to count with pennies by placing real money on the chart. It is easy for the child to see that one hundred pennies make one dollar. In a similar manner nickels, dimes, quarters, and half-dollars are used to demon-

91	92	93	94	95	96	97	98	99	100
81	82	83	84	85	86	87	88	89	90
71	72	73	74	75	76	77	78	79	80
61	62	63	64	65	66	67	68	69	70
51	52	53	54	55	56	57	58	59	60
41	42	43	44	45	46	47	48	49	50
31	32	33	34	35	36	37	38	39	40
21	22	23	24	25	26	27	28	29	30
11	12	13	14	15	16	17	18	19	20
1	2	3	4	5	6	7	8	9	10

Fig. 1

strate the numbers of each of those coins in one dollar.

A further step is the making of change. By use of the chart, making change to one dollar can be shown by always counting up—one step is a penny, five steps a nickel, and so on. A child has a picture of the actual operation. For example, change from one dollar for an eighty-seven cent purchase would appear as shown in figure 2. (Pennies would cover chart spaces 88, 89, 90 and either one dime or two nickels would fill the remainder of space to 100 or one dollar.)

Learning the fundamental operations

The use of the chart for addition exercises can be especially rewarding. Initially, simple basic facts for addition are presented by giving the children sets of objects to be counted and added. For example, a set of three beans placed in proper sequence on the chart together with a set of two beans will result in a set of five beans. This may be equated with placing the members of two sets in one-to-one correspondence with numerals on a number line to find the cardinal number resulting from the union of two sets. As children acquire experience working with the chart, they may proceed through an addition problem in one of two ways. If adding eight plus five, the child could place eight beans on the chart and then place five more, resulting in beans covering the first thirteen spaces on the chart. Or, more abstractly, the child might place a bean on the eight and then count forward five spaces and place the second bean on the thirteen.

The discovery of patterns and relationships, together with experiences in working with the chart, leads to the presentation of higher level addition situations. Decade addition, bridging the decade, adding two-digit numbers without regrouping, and adding two-digit numbers with regrouping provide a convenient sequence that will extend the skill and competency of the children in working with addition.

Using the chart throughout to solve a simple addition problem, the following procedure might be used:

$$\begin{array}{r} 46 \\ +\underline{23} \end{array}$$

1. Locate 46 on the chart.
2. Count off 3 ones to the right (49).
3. Count "up" 2 tens (69).

or

1. Locate 46 on the chart.
2. Count "up" 2 tens (66).
3. Count off 3 ones to the right (69).

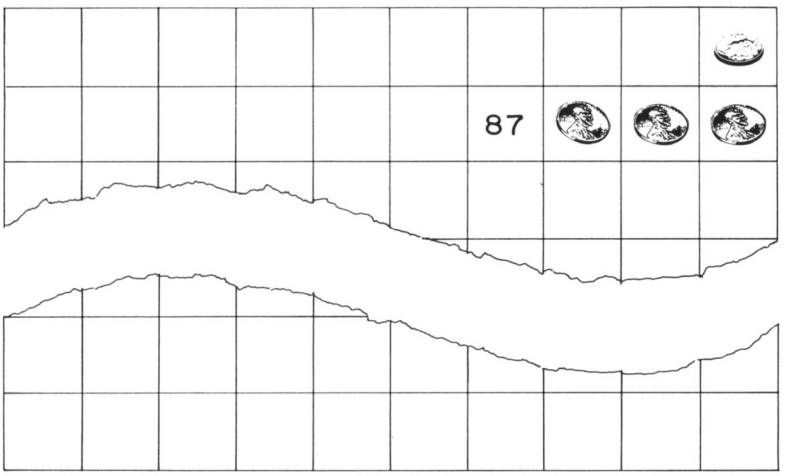


Fig. 2

Bean markers may be used to keep track of the starting place and the result of the operation.

The procedure can be extended to include addition with regrouping. For example, to find the sum of 57 and 38, take the following steps:

$$\begin{array}{r} 57 \\ +38 \end{array}$$

1. Locate 57 on the chart.
2. Count forward 8 spaces (65).
3. Count up 3 spaces (95).

The chart in figure 3 illustrates this procedure:

1. Start at 58.
2. Count back 4 to 54.
3. Count "down" 2 to 34.

or

1. Start at 58.
2. Count "down" 2 to 38.
3. Count back 4 to 34.

Subtraction involving regrouping works as follows:

$$\begin{array}{r} 62 \\ -35 \end{array}$$

1. Start at 62.
2. Count back 5 to 57.
3. Count down 3 to 27.

91	92	93	94	95 3	96	97	98	99	100
81	82	83	84	85 2	86	87	88	89	90
71	72	73	74	75 1	76	77	78	79	80
61	62	63	64	65	66	67	68	69	70
4	5	6	7	8					
51	52	53	54	55	56	57	58	59	60
							1	2	3
41	42	43	44	45	46	47	48	49	50

•
•
•

Fig. 3

Any addition situation, including column addition, with sums up to one hundred can be solved with this chart. Sums greater than one hundred can be derived by merely adding more hundreds charts as they are needed.

Subtraction can also be computed by using the chart. The inverse relationship between addition and subtraction is evidenced when counting backward on the chart. To subtract, you could take the following steps:

$$\begin{array}{r} 58 \\ -24 \end{array}$$

or

1. Start at 62.
2. Count down 3 to 32.
3. Count back 5 to 27.

The former is illustrated in figure 4.

Multiplication is also possible on the hundreds chart, especially as related to the basic facts. Have the child pick a factor (for example 6). Place a marker on "6" and continue placing markers on every sixth place until all have been covered. (See fig. 5.) This can be accomplished by merely counting and placing markers at

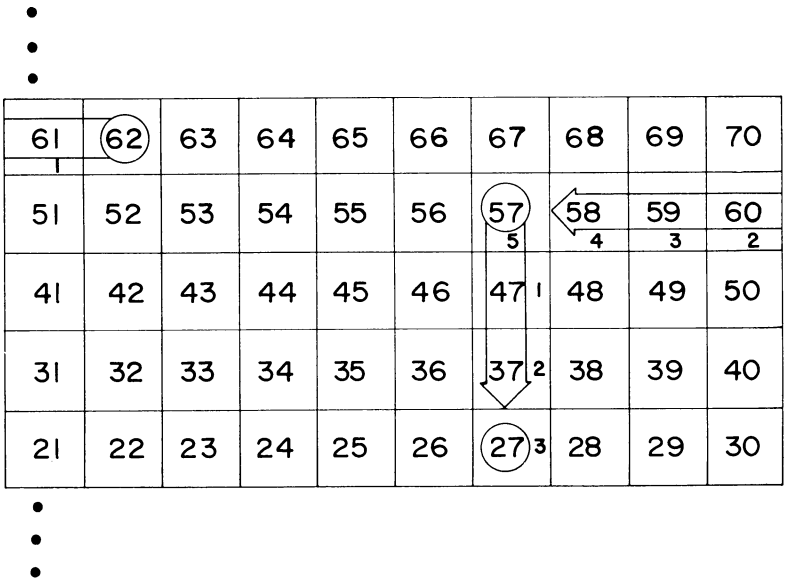


Fig. 4

proper intervals. Once the markers are placed, all products in which one factor is six show on the chart. To find the result of 7×6 the child needs to count 7 sixes, or

91	92	93	94	95	96	97	98	99	100
81	82	83	84	85	86	87	88	89	90
71	72	73	74	75	76	77	78	79	80
61	62	63	64	65	66	67	68	69	70
51	52	53	54	55	56	57	58	59	60
41	42	43	44	45	46	47	48	49	50
31	32	33	34	35	36	37	38	39	40
21	22	23	24	25	26	27	28	29	30
11	12	13	14	15	16	17	18	19	20
1	2	3	4	5	6	7	8	9	10

Fig. 5

7 of the markers in proper sequence. Other products can be determined simply by changing the intervals to correspond to the appropriate factor.

Further understandings may be possible by looking for patterns and relationships. For instance, on the table in figure 5 the following relationships can be seen:

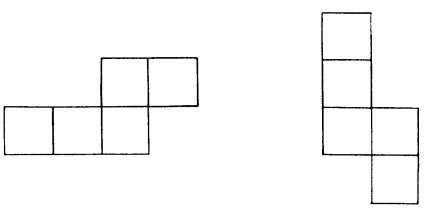
1. All products are represented by even numbers.
2. Products read on the diagonals are in intervals of two. (2, 4, 6, 8, 0)
3. A repeating pattern emerges from the number of products per row. (1 2 2 1 2 2 1 2 2)

The chart can also be used for simple division by treating division as the "opposite" of multiplication. In figure 5, for example, you find the quotient for 72 ÷ 6, by counting sixes *back* from 72.

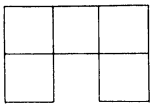
The hundred chart when rearranged as described represents one more approach that may help children to a better understanding of mathematical operations. Special education children on the primary level have been successful in performing addition through the use of the chart. Certainly many children in regular classroom situations could derive better understanding through this approach. It would seem reasonable to assume that other uses of this hundred chart can be found so that more children will enjoy success.

Correction

Two errors in the article "Geometric Activities for Later Childhood Education" by George L. Henderson and C. Patrick Collier in the October 1973 issue of the ARITHMETIC TEACHER have been brought to our attention. In figure 9, on page 449, two of the pictured pentominoes are equivalent,



The missing pentominoe is



In activity 9, under "Information for the Teacher" at the top of the first column on page 451, the second sentence in the first paragraph should read as follows: If a polygon has exactly two lines of symmetry, then both are type (i) or both are type (ii) *or there is one type (i) and one type (ii).*