Manipulative Mathematics

Using Manipulatives to Promote Understanding of Math Concepts

Multiples and Primes

Multiples
Prime Numbers

Manipulatives used:
Hundreds Charts

Multiples

Resources Needed:

Each student needs the worksheets and a highlighter pen.

Background Information:

Students often rely on rote memorization of definitions and have little understanding of the concept of a multiple of a number. They often confuse multiples with factors. This hands-on activity reinforces the definition of multiple and helps students develop the skills needed in future work with multiples in topics such as least common multiple and lowest common denominator.

Directions:

- This activity may be done by individual students or in a small group.
- Give each student the worksheets and ask them to take out a highlighter pen.
- Introduce the definition of a multiple of a number. You may wish to note that when counting by 5's, for example, you are listing multiples of 5. Then help students start highlighting the multiples of 2. You may want to project a copy of the number chart and show the class how to begin highlighting multiples of 2 in the first row.
- Let students proceed through the worksheet on their own or in groups. Circulate around the class to make sure everyone is on task and to offer clarification when needed.
- When most students have finished the worksheet, bring the class together for discussion. Solicit input from the students about the patterns they discovered and the rules they created. Test their rules on some numbers other than those on the worksheet.
- There is a good online hundreds chart at http://nlvm.usu.edu/en/nav/frames_asid_158_g_3_t_1.html?open=instructions&from=topic_t_1.html . Click 'Show Multiples' to highlight the multiples of each number you choose.

Multiple of a Number
A number is a multiple of n if it is the product of a counting number and n .

1) **Multiples of 2**
(a) This table lists the counting numbers from 1 to 50. Highlight all the multiples of 2.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50

(b) Now look at all the numbers that you highlighted. Describe a pattern you notice.

(c) Create a rule you could use to determine if a number larger than 50 is a multiple of 2.

(d) Use your rule to decide if 497 is a multiple of 2.

(e) Is 846 a multiple of 2?

2) **Multiples of 5**
(a) This table lists the counting numbers from 1 to 50. Highlight all the multiples of 5.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50

(b) Now look at all the numbers that you highlighted. Describe a pattern you notice.

(c) Create a rule you could use to determine if a number larger than 50 is a multiple of 5.

(d) Use your rule to decide if 741 is a multiple of 5.

(e) Is 940 a multiple of 5?

3) **Multiples of 10**

(a) The table lists the counting numbers from 1 to 50. Highlight all the multiples of 10.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50

(b) Now look at all the numbers that you highlighted. Describe a pattern you notice.

(c) Create a rule you could use to determine if a number larger than 50 is a multiple of 10.

(d) Use your rule to decide if 690 is a multiple of 10.

(e) Is 875 a multiple of 10?

4) **Multiples of 3**

(a) The table lists the counting numbers from 1 to 50. Highlight all the multiples of 3.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50

(b) List the multiples of 3.

(c) Under each multiple of 3, find the sum of the digits of that number. For example, 42 is a multiple of 3, and $4+2=6$. What do you notice about all the multiples of 3?

	3,	6,	9,	12,	15,	18,	.....,		42,...
sum of digits	3	6	9	$1+2$ = 3	$1+5$ = 6	$1+8$ = 9			$4+2$ = 6

(d) Use these results to create a rule to determine if a number is a multiple of 3.

(e) Use your rule to decide if 375 is a multiple of 3.

(f) Is 1488 a multiple of 3?

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Multiples – Extra Practice

1) State a rule you can use to determine if a number is a multiple of:

(a) 2 _____

(b) 3 _____

(c) 5 _____

(d) 10 _____

For each number, determine if it is a multiple of 2, 3, 5, and/or 10, and indicate your answers by writing 'yes' or 'no' in the spaces below.

		(a) multiple of 2	(b) multiple of 3	(c) multiple of 5	(d) multiple of 10
2)	130	(a)_____	(b) _____	(c) _____	(d) _____
3)	165	(a) _____	(b) _____	(c) _____	(d) _____
4)	225	(a) _____	(b) _____	(c) _____	(d) _____
5)	234	(a) _____	(b) _____	(c) _____	(d) _____
6)	255	(a) _____	(b) _____	(c) _____	(d) _____
7)	270	(a) _____	(b) _____	(c) _____	(d) _____
8)	625	(a) _____	(b) _____	(c) _____	(d) _____
9)	1155	(a) _____	(b) _____	(c) _____	(d) _____
10)	1650	(a) _____	(b) _____	(c) _____	(d) _____

Prime Numbers

Resources Needed:

Each student needs the worksheets and a highlighter pen.

Background Information:

Students often rely on rote memorization of definitions and have little understanding of the concept of prime numbers. This hands-on activity reinforces the definition of prime numbers as students cross out multiples of numbers on a hundreds chart, and eventually are left with only primes. (This is the 'Sieve of Eratosthenes'.) The activity demonstrates that prime numbers have no factors other than themselves and one. It helps students develop a clearer understanding of prime numbers and a confidence in their own ability to recognize whether a number is prime.

Directions:

- This activity may be done by individual students or in a small group.
- Give each student the worksheets and ask them to take out a highlighter pen.
- Review the definitions of prime and composite numbers. To illustrate the definitions, give an example of a prime number and of a composite number.
- Help the class get started. You might show the class the number chart and begin by drawing a circle around 2 and then crossing out the multiples of 2 in the first row. Then repeat this process for 3, so students get the idea.
- Let students proceed through the worksheet on their own or in groups. Circulate around the class to make sure everyone is on task and to offer clarification when needed.
- Class discussion afterward will help reinforce the concepts. List all the primes less than 50, and have the students talk about their answers to the last question.
- An online version of the the Sieve of Eratosthenes activity can be found at http://nlvm.usu.edu/en/nav/frames_asid_158_g_3_t_1.html?open=instructions&from=topic_t_1.html. Click 'Remove Multiples' at the bottom of the workspace, and then you'll end up with only the primes showing.

Prime Numbers

Prime Number
A prime number is a counting number greater than 1, whose only factors are one and itself.
A counting number that is not prime is **composite**.

1) Use this table to find the primes less than 50. Remember a prime number is a number whose only factors are 1 and itself. The number 1 is not considered prime, so the smallest prime number is 2.

   (a) On the table, circle 2 and then cross out all the multiples of 2. All multiples of 2, greater than 2, have two as a factor and so are not prime.

   (b) Next, circle 3 and then cross out all the multiples of 3. All multiples of 3, greater that 3, have three as a factor and so are not prime.

   (c) Go to the next number that has not been crossed out. Circle it—it is prime—and then cross out all its multiples.

   (d) Continue this routine until all the numbers in the table have been crossed out or circled.

~~1~~	(2)	3	~~4~~	5	~~6~~	7	~~8~~	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50

2) The numbers that have been crossed out are not prime. Counting numbers that are not prime are called _____.

3) The circled numbers are prime. List the primes less than 50.

4) What are the only factors of each prime you listed?

5) State one fact you notice about the primes.

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Prime Numbers – Extra Practice

1) Use this table to find the primes less than 100. Remember a prime number is a number whose only factors are 1 and itself. The number 1 is not considered prime, so the smallest prime number is 2.

   (a) On the table, circle 2 and then cross out all the multiples of 2. All multiples of 2, greater than 2, have two as a factor and so are not prime.

   (b) Next, circle 3 and then cross out all the multiples of 3. All multiples of 3, greater that 3, have three as a factor and so are not prime.

   (c) Go to the next number that has not been crossed out. Circle it—-it is prime—and then cross out all its multiples.

   (d) Continue this routine until all the numbers in the table have been crossed out or circled.

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

2) The circled numbers are prime. List the primes less than 100.

For more practice online, you can use the hundreds chart at http://nlvm.usu.edu/en/nav/frames_asid_158_g_3_t_1.html?open=instructions&hidepanel=true&from=topic_t_1.html. Display 10 rows to show the numbers 1 to 100 and click 'Remove Multiples' at the bottom of the workspace to remove (instead of crossing out) the multiples of each prime.