McNuggets Chart

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

Adapted from Algebra: Themes, Tools, Concepts

McNuggets Extension

Recall *The McNuggets Problem.* As a follow-up, let's generalize it. To make this manageable, we will start with two numbers, not three.

1. You have an unlimited supply of dimes (10 cents) and quarters (25 cents). What amounts can be obtained, and what amounts cannot be obtained by combining them?

2. At Fred's Kitchen Supply, cabinets are available in two lengths: 3 feet and 5 feet. By putting cabinets end to end, Fred can accommodate walls of different lengths. Imagining that kitchens can be arbitrarily large, what length walls are possible to line exactly with cabinets? What lengths are impossible?

3. What numbers can be obtained by adding the numbers 6 and 9 as many times as you want? What numbers cannot be obtained?

4. In 1958, it cost 4 cents to mail a letter in the United States. In 1963, it cost 5 cents. Imagine you have an unlimited supply of 4 and 5-cent stamps. What amounts can you make? What is the largest amount you cannot make?

Generalizing

5. By now, you are probably aware that some pairs of building block numbers work better than others.
   a. Which types of pairs allow us to build every number beyond a certain point?
   b. For the other pairs, what do they allow us to build?

6. Let us use p and q as our numbers, with $p < q$. To find the largest impossible number, use the strategy we used for the McNuggets.

   Organize numbers in p columns.
   Circle p and all the numbers below it.
   Circle q and all the numbers below it.
   Circle 2q and all the numbers below it.
   Circle 3q and all the numbers below it.
   …

   Continue until you have reached all the columns.

7. Explain why this is true:
   a. The last multiple of q you circled is $(p-1)q$.
   b. The last uncircled number is $(p-1)q-p = pq - (p+q)$.