



Patterns in the table

<http://topdrawer.aamt.edu.au/Patterns/Good-teaching/Concrete-to-abstract/Making-number-sequences-real/Folding-patterns>

The folding activity should result in the following table, although there may be more rows:

No. of times folded	No. of equal parts	Name of each part	No. of folds
1	2	half	1
2	4	quarter	3
3	8	eighth	7
4	16	sixteenth	15

There are many interesting patterns hidden in this table, and explaining them can be very educational. How far the teacher takes these in class depends on the age, ability and interests of the students, but here are some ideas:

- The number of equal parts doubles each time, because each part is folded into two equal parts.
 - It is easy to continue this sequence as far as you like; for example, after 10 foldings, there are 1024 equal parts. Some students even like to memorise this sequence, since it arises in other common contexts.
 - Notice that $4 = 2 \times 2$, $8 = 2 \times 2 \times 2$, $16 = 2 \times 2 \times 2 \times 2$ and so on: the number of parts is 2 multiplied by itself the number of times the strip has been folded. Students could be asked to invent a name for $2 \times 2 \times 2 \times 2$, for example '2 hop 4'. Then there are '2 hop 10' equal parts after folding 10 times. The official term is '2 to the power 10', written 2^{10} . It can be calculated by pressing 2^{10} on a calculator (or entering it in Google).
- The name for each part of the strip is the word for the number of equal parts with 'th' at the end. Half and quarter are exceptions: they should be called twoth and fourth. ('Fourth' is in fact used in American English.)
 - This convention extends to all fractions resulting from division into a number of equal parts. Particularly important in arithmetic are tenth, hundredth and thousandth.
 - There are some linguistically interesting exceptions to this convention. For example, third and fifth are further exceptions; they should be called 'threeth' and 'fiveth'. Students may have met 'thirty-second' (instead of 'thirty-twoth' or 'thirty-half') in constructing the table, but it is unlikely they would ever meet 'twenty first' (instead of 'thirty-oneth') in the context of fractions.
 - Note that, except for half, the fraction words are also the ordinal words. For example, 'fifth' could refer either to a fraction or the last person in a 5-person race.



- The number of folds is one less than the number of parts.
 - You only need folds between the parts, rather than one for each part.
 - A similar situation arises when a number of objects are placed on a line at the end as well as along the line (e.g., fence posts or marks on a ruler). In this case, the number of objects (posts or marks) is one more than the number of spaces between them.
 - Students often confuse these relationships. In fact, they only need to make a simple sketch to find the correct relationship.