

FACTORS AND MULTIPLES

These two related words are very important in any work that involves multiplying or dividing.

They are not difficult for young children to learn because children already understand brother and sister, mom and son, dad and daughter.

A factor is like these since a number can't be a factor, except to a multiple.

The same is true for a multiple: it is related directly to a factor.



There are 7 shapes here.

If you have read about prime and composite numbers you know 7 is a prime number.

This means it can't be made in any equal groups, other than groups of 1, or one group of itself.

A factor is the number in an equal group, or the number of groups.

A multiple counts the whole amount being worked with.

Factors make multiples, multiples are made of factors.

7 can be made of 7 groups of 1, or 1 group of 7.
7 is a multiple of 1 and 7. 1 and 7 are factors of 7.

Prime numbers all work alike if you think about it.

3:1,3. 5:1,5. 17:1,17. 23:1,23. prime: 1, same multiple.

Prime numbers are not important as multiples, only as factors of composite numbers, ones that can be made of other equal groups.



6 is a composite number. It can be made in groups of 2 or 3.

6 is unlike any other number.

It can be made of 3 groups of 2, or 2 groups of 3.

6 is the multiple of the related factors, 2 and 3.



If there are groups of 2, there will be 3 groups if there are 6 shapes.

If there are groups of 3, there will be 2 groups if there are 6 shapes.

**The multiple 6 is locked into a relationship with its factors 2 and 3.
6:1,6 is not important to remember, but 6:2,3 is.**

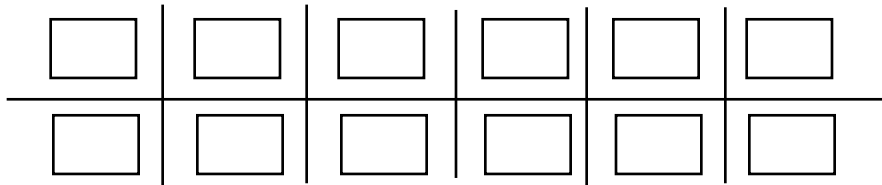
2 and 3 are important factors of their multiple 6, and

2 and 3 are always related to each other, inside 6.

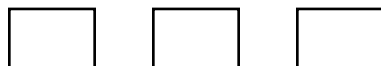
**Composite numbers have sets of related factors, and for some,
factors work with themselves.**

4: 2,2. 6: 2,3. 8: 2,4. 9: 3,3. 10: 2,5.

12 is a composite number that breaks into equal groups in two ways.



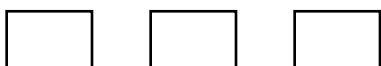
12 can be made of 2 groups of 6 or 6 groups of 2.



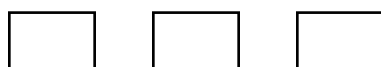
12 can be made of 3 groups of 4



or 4 groups of 3.



**The multiple 12 has two sets
of related factors,
2 and 6, as well as 3 and 4.**



12: 2,6; 3,4.

When children first learn to multiply and divide they are limited to whole numbers, no fractions, and mainly composite numbers.

They may be expected to learn facts, like

$$2 \times 3 = 6, \quad 3 \times 2 = 6, \quad 6 \div 3 = 2, \quad 6 \div 2 = 3 .$$

They may be expected to remember these as parts of multiplication and division tables.

→ Compare this to 6: 2, 3.

This one fact yields the four facts above once a child has learned how factors and multiples work together.

I believe it is easier to learn one fact, and how to use it.

24: 2,12; 3, 8; 4, 6.

To handle all this one needs to remember 12 different facts in the multiplication and division tables, without any understanding.

If a child can learn how 6: 2, 3 can create the four number sentences at the top of this page, then they can take what they know about the related factors of 24 (2,12; 3,8; 4,6) and create all 12 facts.

Knowing how to do this is made much simpler when children learn about addition and subtraction as being, in their simplest form, about two parts inside a whole.

In my Simple Math booklet I describe how addition and subtraction can also be about two related numbers inside another, as 5 is made from 2 and 3.

(Multiples can be prime or composite numbers, and so can factors, in fact, any composite multiple can be made completely of prime factors, as 12: $2 \times 2 \times 3$.

This can become very useful in later years in simplifying working with + or - of fractions having different denominators.

Do you remember the work of finding the LCD, lowest common denominator?)