Student Learning Centre

Properties of Whole Numbers

Flinders University
inspiring achievement

This sheet will assist your understanding of: ***Factors***, ***Multiples***, ***Primes*** and ***Divisibility***

FACTORS

The factors of a number are the numbers that divide into itself *exactly* with no remainders or fractions. *What does this mean?* Lets look at an example. What are the factors of 18? What two numbers multiplied together give 18?

6 x 3 = 18
18 x 1=18
9 x 2 = 18

The factors of 18 are 1, 2, 3, 6, 9 & 18; why? Because they divide into 18 *exactly*

MULTIPLES

A multiple of a number is a product of that whole number with any other whole number. *What does that mean?* Lets take another example:

The multiples of 4 can be found by counting in fours. 0, 4, 8, 12, 16, 20, 24…

The multiples of 5 can be obtained by counting in fives. 0, 5, 10, 15, 20, 25…

5 divides *exactly* into 20 hence: 5 is a **factor** of 20

20 is a **multiple** of 5

PRIME NUMBERS

A whole number greater than 1 that has only two factors, 1 and itself, is known as a *Prime Number.* What does this mean? For example:

The factors of 2 are only 2 & 1; itself and 1, hence 2 is a Prime Number
What about 5? The only factors of 5 are itself and 1, so yes it is. Ok how about 6? NO, why? Because the factors of 6 are 1, 2, 3 & 6. This is known as a composite as there is more than 2 factors.

POWERS OF 10

So we know 10 x10 = 100 and 10 x 10 x 10 = 1000, but is there an easier way of writing this expression? Yes, let's look at the factors of 10; so there is 1 factor of 10 in 10, 2 factors of 10 in 100, 3 factors in 1000… So we can express them as a power of 10.

$$10 = 10^1$$
$$100 = 10^2$$
$$1{,}000 = 10^3$$
$$10{,}000 = 10^4$$

What if it is not to the power of 10? We apply the same principle when considering the factors of a number. For instance we can write 16 as a product of 2s:

$$16 = 2 \times 2 \times 2 \times 2 = 2^4$$

multiplied 4 times

So 4 is the exponent

FACTOR TREES AND PRIME FACTORISATION

Because prime numbers are the building blocks of all whole numbers, any number can be expressed as a product of powers of prime numbers, through multiplication.

What does this mean? It means that any and every whole number greater than 1, is either prime or a product of prime numbers; known as the **fundamental theorem of arithmetic.**

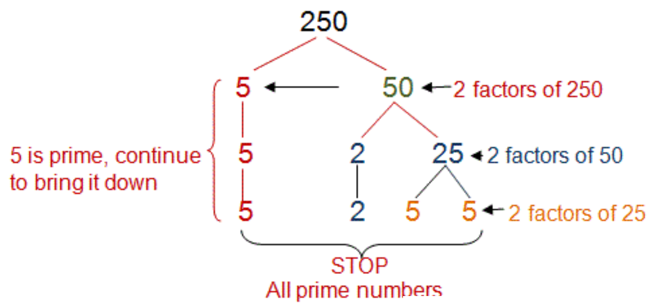
$12 = 3 \times 4$
$= 3 \times 2^2$
$= 2^2 \bullet 3$

$72 = 8 \times 9$
$= 2^3 \bullet 3^2$

Hence $=2^2 \bullet 3$ & $2^3 \bullet 3^2$ are the **prime factorisation** of 12 & 72 as they are in increasing order.

How do you figure out the prime factorisation of a number?

One method is by using Factor Trees:



The prime factorisation for 250 is: $\mathbf{5^3 \bullet 2}$ **or** $\mathbf{(5 \bullet 5 \bullet 5 \bullet 2)}$

DIVISIBILITY

A number is divisible by a second number if the second number divides into the first with no remainder. Here are some tests to help you…

A number is divisible by		Divisible	Not Divisible
2	if last digit is even (0, 2, 4, 6, 8)	2,378 = Yes	3,845 = No
3	if the sum of digits is divisible by 3	225: 2+2+5=9 can be divided by 3 = Yes	146 =1+4+6=11 can't be divided by 3 = No
4	if the last two digits are divisible by 4	4, 312: 12 can by divided by 4 = Yes	6,313: 13 can't be divided by 4 = No
5	if the last digit is 0 or a 5	15,865 or 1560 = Yes	11,948: does end with 0 or 5 = No
6	if number is divisible by both 2 & 3	24 = Yes	20 = No
7	no easy rule		
8	no easy rule		
9	if the sum of digits are divisible by 9	954: 9+5+4 = 18 can be divided by 9 = Yes	73: 7+3 = 10 can't be divided by 9 = No
10	if the last digit is 0	1,670	1345

For more information see: www.math.tutorvista.com

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