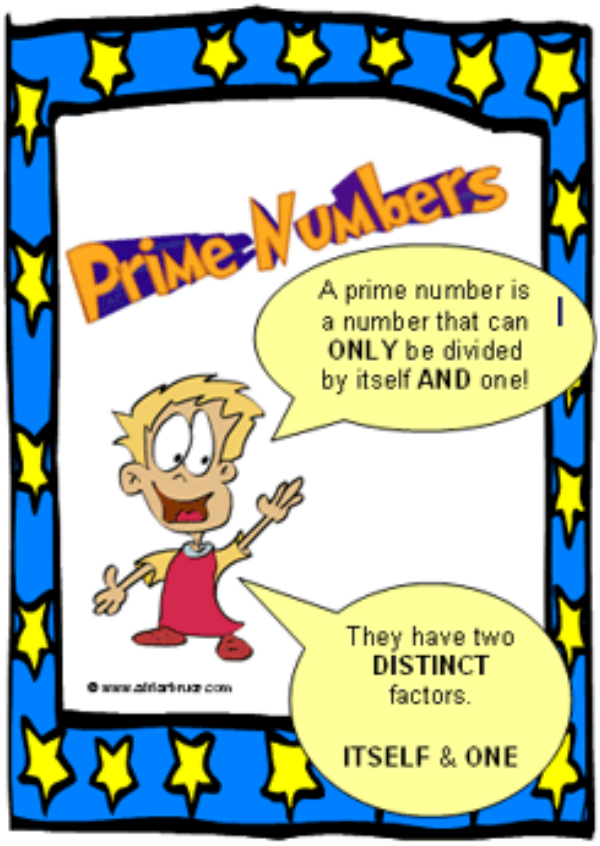
Prime Numbers

Prime Numbers

A Prime Number can be divided evenly **only** by 1 & itself.
And it must be a whole number greater than 1.

Activity to find the prime numbers between 1 and 100.

The first few prime numbers are 2, 3, 5, 7, 11, 13, 17 etc.....


Prime Numbers
A prime number is a number that can ONLY be divided by itself AND one!
They have two DISTINCT factors.
ITSELF & ONE

Prime Numbers

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

1) Write out the numbers from 1 to 100 in ten rows 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
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) Cross off number 1, because all primes are greater than 1.

3) Number 2 is a prime, so we can keep it, but we need to cross off the multiples of 2 (i.e. even numbers).

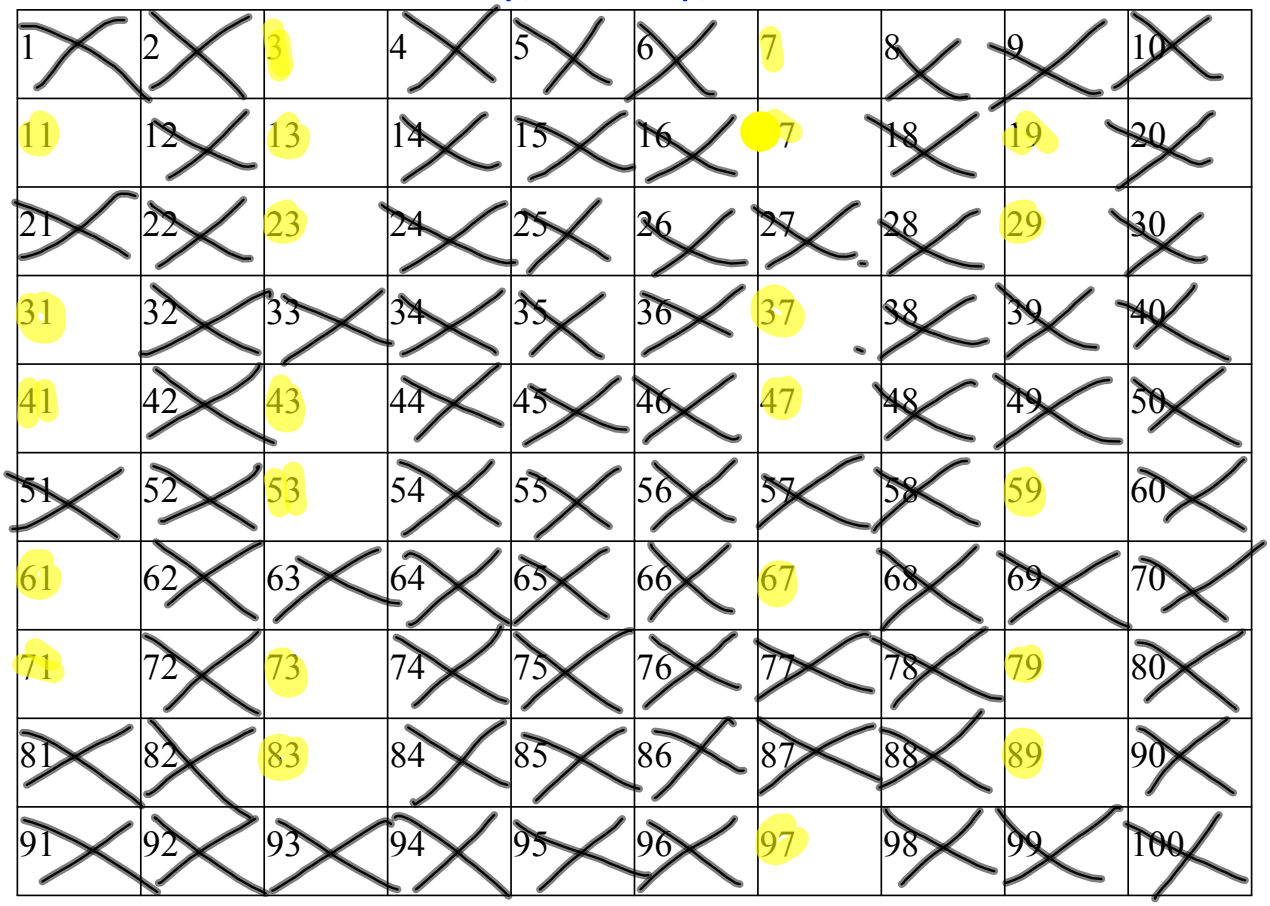
4) Number 3 is also a prime, so again we keep it and cross off the multiples of 3.

5) The next number left is 5 (because four has been crossed off), so we keep it and cross of the multiples of this number.

6) The final number left in the first row is number 7, so cross off its multiples.

7) You have finished. All of the "surviving" numbers (coloured in white below) on your grid are prime numbers.

Prime Numbers



A prime number can only be divided evenly by one and itself.

The following are NOT Prime Numbers

1 x 0
2 x 0
3 x 0
etc.

Zero has one an infinite number of factors.

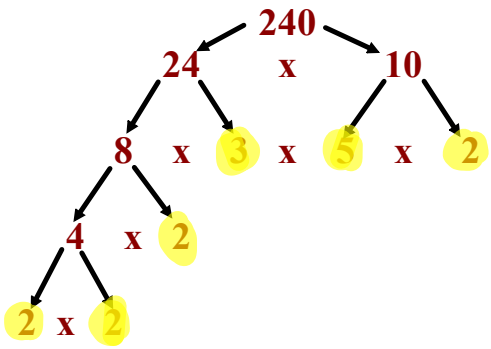
1 x 1

One only has one factor... 1

Determining the Prime Factors of a Whole Number

Write the prime factorization of 240

Draw a Factor Tree !!

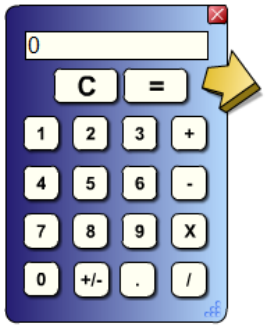


The Prime Factorization of 240 is:
2 x 2 x 2 x 3 x 5 x 2 or 2^4 x 3 x 5

The Prime Factors of 240 are:
2, 3, & 5

Determining the Prime Factors of a Whole Number

Write the prime factorization of 240.

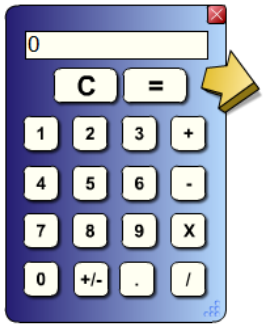


The Prime Factorization of 240 is:
$2 \times 2 \times 2 \times 3 \times 5 \times 2$ or $2^4 \times 3 \times 5$

The Prime Factors of 240 are:
2, 3, & 5

Write the prime factorization of 3300.

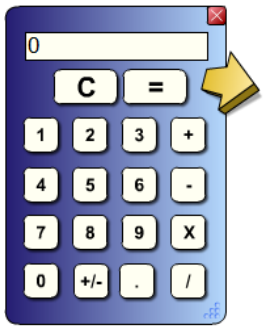
3300 ⟶



The prime factors of 3300 are 2, 3, 5, and 11.
The prime factorization of 3300 is: $2 \cdot 2 \cdot 3 \cdot 5 \cdot 5 \cdot 11$,
or $2^2 \cdot 3 \cdot 5^2 \cdot 11$

Write the prime factorization of 12600.

12600 ⟶

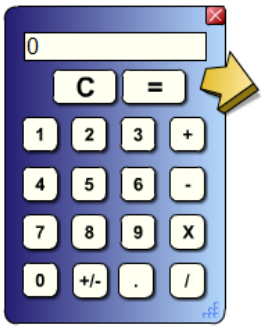


The prime factors of 3300 are 2, 3, 5, and 11.
The prime factorization of 3300 is: $2 \cdot 2 \cdot 3 \cdot 5 \cdot 5 \cdot 11$,
or $2^2 \cdot 3 \cdot 5^2 \cdot 11$

You Try...

Write the prime factorization of 6615.

6615 ⟶ 3 x 3 x 3 x 5 x 7 x 7



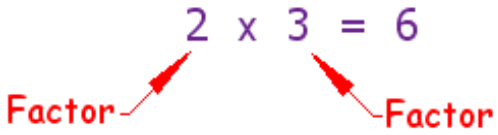
Don't forget to check your answer!!

The prime factors of 3300 are 2, 3, 5, and 11.
The prime factorization of 3300 is: $2 \cdot 2 \cdot 3 \cdot 5 \cdot 5 \cdot 11$, or $2^2 \cdot 3 \cdot 5^2 \cdot 11$

Finding Factors

What is a "Factor" ?

Factors are the numbers you multiply together to get another number:



Sometimes we need to find all of the factors of a number:

Find all the factors of 12:
the factors of 12 are 1, 2, 3, 4, 6, 12

Because: **1 x 12 = 12**
2 x 6 = 12
3 x 4 = 12


What is a Common Factor?

What is a Common Factor?

We said that .....

The Factors of 132 are : 1, 2, 3, 4, 6, 11, 12, 22, 33, 44, 66, 132

The Factors of 162 are : 1, 2, 3, 6, 9, 18, 27, 54, 81, 162

The common factors are the ones found in both lists.

Therefore: The common factors of 132 & 162 are
1, 2, 3, 6

What is the Greatest Common Factor?

The Greatest Common Factor is simply the greatest of the common factors.

The common factors of 132 & 162 are: 1, 2, 3, 6

The Greatest Common Factor of 132 & 162 is 6.

Using prime factorization find the GCF of ...

18 → 2 x 3 x 3

24 → 2 x 2 x 2 x 3

2 x 3 = 6

GCF = 6

Using prime factorization find the GCF of ...

12 → 2 x 2 x 3

36 → 2 x 2 x 3 x 3

90 → 2 x 3 x 3 x 5

GCF = 2 x 3

= 6

What is the Least Common Multiple?

The least common multiple is the smallest multiple that is the same for two or more numbers.

The Least Common Multiple

Determine the least common multiple of 18, 20, and 30 using prime factorization

Step #1 **Write the prime factorization of each number.**

Step #2 **Express each number as a product of powers.**

Step #3 **Circle the greatest power of each prime number.**

Step #1 **Write the prime factorization of each number.**

18 ⇒ $2 \times 3 \times 3$ $2^1 \times 3^2$

20 ⇒ $2 \times 2 \times 5$ $2^2 \times 5^1$

30 ⇒ $2 \times 3 \times 5$ $2^1 \times 3^1 \times 5^1$

$2^2 \times 3^2 \times 5$

$4 \times 9 \times 5 = 180$

Step #2 **Express each number as a product of powers.**

$$18 \Rightarrow 2 \cdot 3 \cdot 3 =$$

$$20 \Rightarrow 2 \cdot 2 \cdot 5 =$$

$$30 \Rightarrow 2 \cdot 3 \cdot \mathbf{5}$$

Step #3 **Circle the greatest power of each prime number.**

$$18 \Rightarrow 2 \cdot 3 \cdot 3 = 2 \cdot \mathbf{3}^2$$
$$20 \Rightarrow 2 \cdot 2 \cdot 5 = \mathbf{2}^2 \cdot 5$$
$$30 \Rightarrow 2 \cdot 3 \cdot \mathbf{5} = 2 \cdot 3 \cdot \mathbf{5}$$

Solution:

$$2^2 \cdot 3^2 \cdot 5 = 4 \cdot 9 \cdot 5$$
$$= 180$$

Determine the least common multiple of 120 & 309

Determine the least common multiple of 70, 90 & 140

Questions:
4 a,c,f
5 a,c,f
6 a,c,e
7
8 a,c,e,f
9 a,b,c
10 a,c,e,f
11 a,c
12

Solving Problems that Involve Greatest Common Factor and Least Common Multiple

a) What is the side length of the smallest square that could be tiled with rectangles that measure 16 cm by 40 cm? Assume the rectangles cannot be cut. Sketch the square and rectangles.

b) What is the side length of the largest square that could be used to tile a rectangle that measures 16 cm by 40 cm? Assume that the squares cannot be cut. Sketch the rectangle and squares.