

# Factor Trees, GCF and LCM

## Prime Numbers

A **prime number** is a

### Prime Numbers from 1-100

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

**Factors** are numbers that you multiply to get the given number.

Ex. Factors of 12

$$1 \times 12$$

$$2 \times 6$$

$$3 \times 4$$

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

Common Factors are factors that are the same in "both" numbers.

The greatest common factor (also called GCF) is the largest common factor.

List the factors for 24 and 32, then find the GCF

24

32

Factors of 24 - 1,2,3,4,6,8,12,24

Factors fo 32 - 1,2,4,8,16,32

GCF 8

Find the GCF for the following

pairs of numbers:

1) 6 and 12

$$\begin{array}{l} 6 \\ 1 \times 6 \\ 2 \times 3 \end{array} \quad \begin{array}{l} 12 \\ 1 \times 12 \\ 2 \times 6 \\ 3 \times 4 \end{array}$$

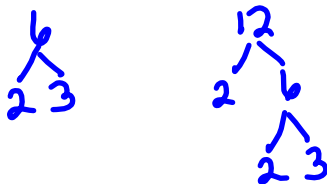
Factors

$$6 - 1, 2, 3, 6$$

$$12 - 1, 2, 3, 4, 6, 12$$

$$\text{GCF} = 6$$

with factor trees



$$\begin{aligned} 6 &= 2 \times 3 \\ 12 &= 2 \times 2 \times 3 \\ \text{GCF} &= 2 \times 3 \\ &= 6 \end{aligned}$$

2) 6 and 21

$$\begin{array}{l} 21 \\ 1 \times 21 \\ 3 \times 7 \end{array}$$

Factors

$$6 - 1, 2, 3, 6$$

$$21 - 1, 3, 7, 21$$

$$\text{GCF} = 3$$

with factor trees



$$\begin{aligned} 6 &= 2 \times 3 \\ 21 &= 3 \times 7 \\ \text{GCF} &= 3 \end{aligned}$$

3) 30 and 21

$$\begin{array}{l} 30 \\ 1 \times 30 \\ 2 \times 15 \\ 3 \times 10 \\ 5 \times 6 \end{array}$$

with factor trees



Factors

$$30 \quad 1, 2, 3, 5, 6, 10, 15, 30$$

$$21 \quad 1, 3, 7, 21$$

$$\text{GCF} = 3$$

$$21 = 3 \times 7$$

$$30 = 2 \times 3 \times 5$$

$$\text{GCF} = 3$$

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

Multiples of :

10 - 10, 20, 30, 40, 50, 60, 70, 80

12, 24, 36, 48, 60, 72, 84

LCM = 60

Find the LCM for 15 and 20

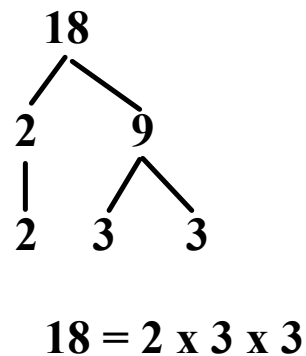
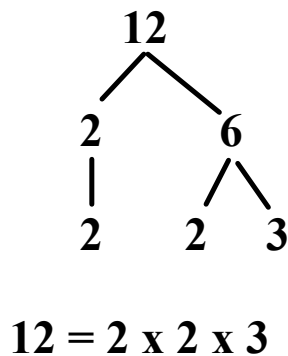
15 - 15, 30, 45, 60, 75, 90, 105

20 - 20, 40, 60, 80, 100

LCM = 60

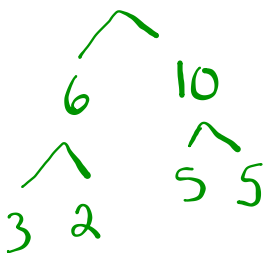
Another way of finding GCF and LCM is by using Factor Trees.

A Factor Tree is a way to write a number as a product of prime numbers.



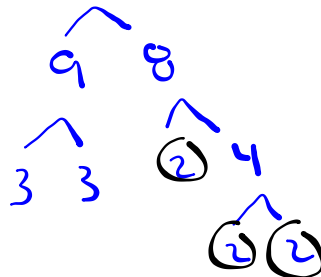
Use a factor tree to write the following as a product of prime numbers:

(a) 60



$$60 = 2 \times 3 \times 5 \times 5$$

(b) 72

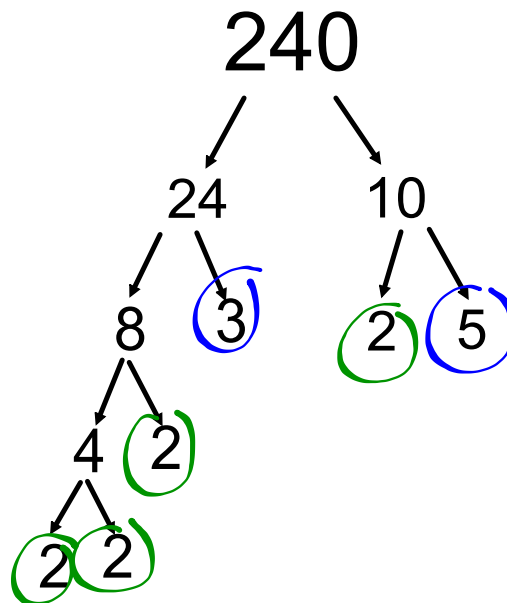


$$72 = 2 \times 2 \times 2 \times 3 \times 3$$

## Determining the Prime Factors of a Whole Number

Write the prime factorization of 240

Draw a Factor  
Tree !!



The Prime Factorization of 240 is:

$$2 \times 2 \times 2 \times 3 \times \cancel{5} \times \cancel{2} \quad \text{or} \quad 2^4 \times 3 \times 5$$

*2 × 3 × 5*

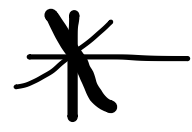
The Prime Factors of 240 are:  
2, 3, & 5

# Using Prime Factors to Solve GCF of Numbers



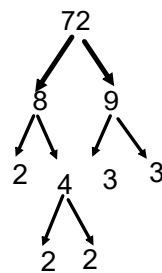
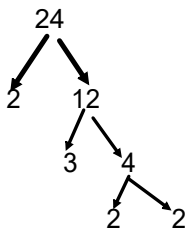
Steps:

- 1) Find the prime factors of each number
- 2) Compare the prime factors of each number
- 3) Circle the prime factors that each number has in common
- 4) Multiply common prime factors together to get GCF of #'s



Example:

Find the GCF of 24 and 72



$$24 = 2 \times 2 \times 2 \times 3$$

$$72 = 2 \times 2 \times 2 \times 3 \times 3$$

$$\text{GCF} = 2 \times 2 \times 2 \times 3 = 24$$



# \* The Least Common Multiple \*

Determine the least common multiple of 18, 20, and 30

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

$$18 = 2 \times 3 \times 3$$

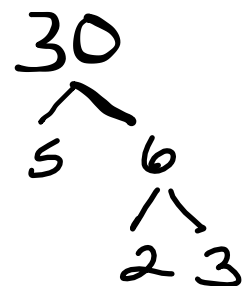
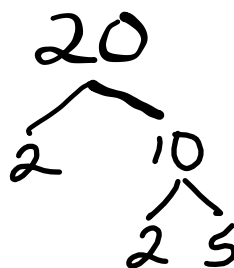
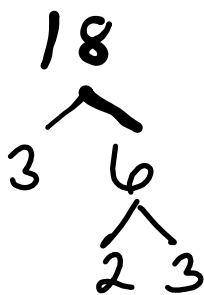
$$20 = 2 \times \underline{2} \times 5$$

$$30 = 2 \times 3 \times 5$$

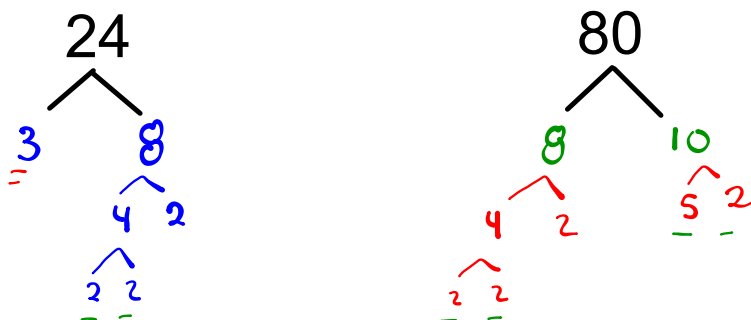
LCM

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

$$= 180$$



Find the GCF and LCM for 24 and 80



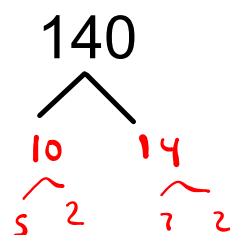
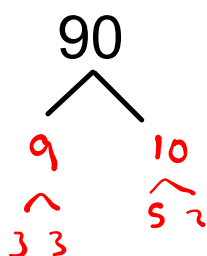
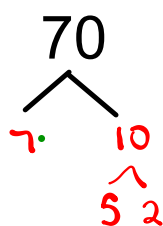
$$24 = 2 \times 2 \times 2 \times 3 \times 4$$

$$80 = 2 \times 2 \times 2 \times 5 \times 5$$

$$\text{GCF} = 6$$

$$\text{LCM} = 240$$

Find the GCF and LCM for 70, 90 and 140



$$70 = 2 \times 5 \times 7$$

$$90 = 2 \times 3 \times 3 \times 5$$

$$140 = 2 \times 2 \times 7 \times 5$$

$$\text{GCF} = 10$$

$$\text{LCM} = 1260$$

Use a factor tree to write each number as a product of prime numbers, then find the GCF and LCM for each :

(a) 16, 40

(b) 64, 80

(c) 24, 36

(d) 12, 50

(e) 72, 125

(f) 12, 60, 88

6. Use powers to write each number as a product of its prime factors.

- a) 600                      b) 1150  
 c) 1022                     d) 2250  
 e) 4500                      f) 6125

Probably not  
needed

8. Determine the greatest common factor of each pair of numbers.

- a) 46, 84                       b) 64, 120  
c) 81, 216                     d) 180, 224  
e) 160, 672                    f) 220, 860

10. Determine the least common multiple of each pair of numbers.

- a) 12, 14                      b) 21, 45  
 c) 45, 60                     d) 38, 42  
 e) 32, 45                      f) 28, 52

11. Determine the least common multiple and GCF for each set of numbers.

- a) 20, 36, 38                b) 15, 32, 44  
 c) 12, 18, 25, 30            d) 15, 20, 24, 27