

# Prime Factorization

1/2/18  
Key

A prime number is a whole number greater than 1 that has exactly two factors, 1 and itself.

A composite number is a whole number greater than 1 that has more than two factors.

Whole Numbers	Factors
2	1, 2
3	1, 3
5	1, 5
7	1, 7
4	1, 2, 4
6	1, 2, 3, 6
8	1, 2, 4, 8
9	1, 3, 9
10	1, 2, 5, 10
0	many
1	1

The numbers 0 and 1 are neither prime nor composite.

1 is NOT prime!

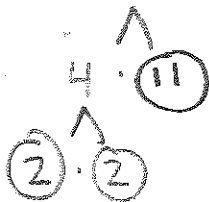
Find the prime factorization of each number.

Product of primes

Example 1:

44

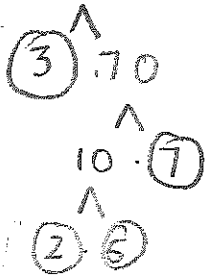
\*circle prime numbers



$44 = 2 \cdot 2 \cdot 11$

Example 2:

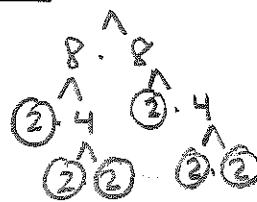
210



$210 = 2 \cdot 3 \cdot 5 \cdot 7$

Example 3:

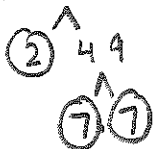
64



$64 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$   
 $64 = 2^6$

Example 4:

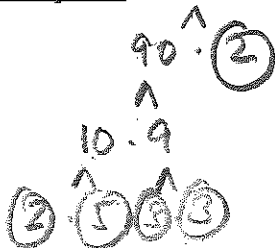
98



$98 = 2 \cdot 7 \cdot 7$  OR  
 $98 = 2 \cdot 7^2$

Example 5:

180



$180 = 2 \cdot 2 \cdot 3 \cdot 3 \cdot 5$  OR  
 $180 = 2^2 \cdot 3^2 \cdot 5$

Example 6:

23

This is a prime number, so the answer is 23.

Replace each  $\square$  with prime factors to make a true sentence.

35.  $2^3 \cdot \square \cdot 11 = 616$

36.  $2 \cdot \square \cdot 5^2 = 450$

37.  $3 \cdot 2^4 \cdot \square = 1,200$

38.  $2^2 \cdot \square \cdot 3 = 1,500$

## 4-1

## Skills Practice

## Prime Factorization

Determine whether each number is *prime* or *composite*.

① 36

2. 71

3. 18

Composite

4. 27

⑤ 37

6. 61

prime

7. 32

8. 21

9. 40

Find the prime factorization of each number.

10. 425

⑪ 82    2 · 41

12. 93

13. 142

14. 45

⑮ 56    2 · 2 · 2 · 7  
or  $2^3 \cdot 7$

16. 63

17. 236

18. 12

⑲ 110

20. 46

21. 84

2 · 5 · 11

Name: \_\_\_\_\_

Date: 1/2/18

Key

# Greatest Common Factor

Remember...

The greatest common factor (GCF) is the greatest of the common factors of 2 or more numbers.

Example 1: Find the GCF of 18 and 48.

## Method 1: Listing Factors

18 (1, 2, 3, 6, 9, 18)

48 (1, 2, 3, 4, 6, 8, 12, 16, 24, 48)

When writing, go in order & write matching pairs (ex (1 → 18))

GCF = 6

Write the prime factorization of each number. Then find the product of the common prime factors!



- Steps
- list factors
  - circle #s in common
  - find largest/greatest # in common

## Method 2: Prime Factorization

18

9 · 2

3 · 3

48

6 · 8

2 · 3 · 2 · 2

2 · 2

18 = 2 · 3 · 3

48 = 2 · 2 · 2 · 2 · 3

- Steps
- factor trees + write as product of primes
  - find primes they have in common & box them
  - multiply the primes they have in common

2 · 3 = 6  
GCF = 6

Example 2: Find the greatest common factor of 16, 24, and 36.

16

8 · 2

2 · 4

2 · 2

24

12 · 2

2 · 6

2 · 3

36

6 · 6

2 · 3 · 2 · 3

16 = 2 · 2 · 2 · 2

24 = 2 · 2 · 2 · 3

36 = 2 · 2 · 3 · 3

GCF = 4

Now you try! Find the greatest common factor of each set of numbers.

a) 14 and 63

$$\begin{array}{l} 14 \\ \uparrow \\ (2) \cdot (7) \end{array} \quad \begin{array}{l} 63 \\ \uparrow \\ 9 \cdot (7) \\ \uparrow \\ (3) \cdot (3) \end{array}$$

$$\begin{array}{l} 14 = 2 \cdot 7 \\ 63 = 3 \cdot 3 \cdot 7 \end{array}$$

**GCF = 7**

b) 15, 45 and 60

$$\begin{array}{l} 15 = 3 \cdot 5 \\ 45 = 3 \cdot 3 \cdot 5 \\ 60 = 2 \cdot 2 \cdot 3 \cdot 5 \end{array}$$

$$3 \cdot 5$$

**GCF = 15**

c) 24 and 35

$$\begin{array}{l} 24 \\ \uparrow \\ 6 \cdot 4 \\ \uparrow \uparrow \\ (2) \cdot (3) \cdot (2) \cdot (2) \end{array} \quad \begin{array}{l} 35 \\ \uparrow \\ 7 \cdot 5 \end{array}$$

$$\begin{array}{l} 24 = 2 \cdot 2 \cdot 2 \cdot 3 \\ 35 = 5 \cdot 7 \end{array}$$

**GCF = 1**

Let's try some word problems!

- 1) Volunteers at a bake sale want to sell slices of banana nut bread and raisin bread packaged together. They have 63 slices of banana nut bread and 42 slices of raisin bread, and they plan to use all the bread. If they want to make the greatest number of equal packages possible, how many slices of each type of bread would there be in each package?
  
  
  
  
  
  
  
  
  
  
- 2) Lauren wants to give her dog a special treat. She has 81 dog bones and 54 pieces of beef jerky. She wants to give her dog the same number of treats every day and wants the treats to last for as long as possible. How many of each type of treat should she give her dog?