

Algebra I  
11.4 Worksheet #1  
algebraic factorization

NAME: \_\_\_\_\_  
DATE: \_\_\_\_\_ HOUR: \_\_\_\_\_

A whole number that has exactly two factors is called a **prime number**.

Here are the first few prime numbers:

2 3 5 7 11 13

A whole number (other than 0) that has more than two factors is called a **composite number**.

Here are the first few composite numbers:

4 6 8 9 10 12

*You can also think of a prime number as a number greater than 1 that is only divisible by 1 and itself.*

Every composite number can be factored into a product of prime numbers. To express a composite number as a product of prime numbers is to give the **prime factorization** of the number.

► **Here's how to give the prime factorization of a composite number.**

$$18 = 2 \cdot 9$$

Factor. Since 9 is not prime, factor again.

$$= 2 \cdot 3 \cdot 3$$

All factors are prime!

$$60 = 6 \cdot 10$$

$$= 2 \cdot 3 \cdot 2 \cdot 5$$

1. Look at the first example above. The prime factorization of 18 is  $2 \cdot 3 \cdot \underline{\quad}$

2. Complete these examples.

a.  $52 = 2 \cdot 26$   
 $= 2 \cdot 2 \cdot \underline{\quad}$

b.  $72 = 8 \cdot 9$   
 $= 2 \cdot 2 \cdot \underline{\quad} \cdot 3 \cdot 3$

c.  $50 = 2 \cdot 25$   
 $= 2 \cdot \underline{\quad} \cdot 5$

► **Here's how to give the algebraic factorization of an expression.**

First write the prime factorization of the whole number, and then write the variables in alphabetical order.

$$6a^2 = 2 \cdot 3 \cdot a \cdot a$$

$$10b^3 = 2 \cdot 5 \cdot b \cdot b \cdot b$$

$$20c^2d = 2 \cdot 2 \cdot 5 \cdot c \cdot c \cdot d$$

$$5e^3f^2 = 5 \cdot e \cdot e \cdot e \cdot f \cdot f$$

3. Look at the examples above. The algebraic factorization of  $6a^2$  is  $2 \cdot \underline{\quad} \cdot a \cdot a$

4. Complete these examples.

a.  $20c^2 = 2 \cdot 2 \cdot 5 \cdot c \cdot \underline{\quad}$

b.  $9f^3 = 3 \cdot \underline{\quad} \cdot f \cdot f \cdot f$

c.  $7r^2s^3 = 7 \cdot r \cdot \underline{\quad} \cdot s \cdot s \cdot s$

► Give the prime factorization of each number. *Example: 4*  $2 \cdot 2$

5. 35

6. 9

7. 10

8. 6

9. 15

10. 14

11. 24

12. 18

13. 22

14. 20

15. 8

16. 25

► Give the algebraic factorization. *Example:  $9b^2$*   $3 \cdot 3 \cdot b \cdot b$

1.  $7ab^3$

2.  $38a^2b$

3.  $54a^2b^2$

4.  $22xy^2$

5.  $15g^2$

6.  $42w^2$

7.  $36y$

8.  $40x$

9.  $2a^2b$

10.  $56ab$

The product of the factors that two or more numbers have in common is called the \_\_\_\_\_ of those numbers.

State whether each number is *prime* or *composite*. If the number is composite, find its prime factorization.

13. 91  
*factor tree*  
 $7 \wedge$

14. 304  
*factor tree*

15. 97

16. 17

17. 63  
*factor tree*

18. 25

19. 67

20. 36

21. 80  
*factor tree*

22. 40

► Give the greatest common factor.

23. 2,  $4a$

24. 6,  $9c$

25.  $3d$ ,  $12d$

26.  $d$ ,  $15d$

27.  $6x$ ,  $8x$

28.  $9y$ ,  $5y$

29.  $4xy$ ,  $x$

30.  $10e$ ,  $14e$

31.  $10u^2$ ,  $5u$

32.  $16a^2b$ ,  $20ab$

33.  $6c^2d$ ,  $15c^2$

34.  $18y^2$ ,  $6y$

35.  $11y^2z$ ,  $25yz$

36.  $35m^3n$ ,  $25m^2n^2$

37.  $20ab^2$ ,  $24a^2$

38.  $27rs$ ,  $36r^2s$