

Primes, Factorization, Greatest Common Factor, Least Common Multiple

1. Draw all rectangular grids composed of 12 squares. What is the number of rows used in each grid?
2. Draw all rectangular grids composed of 11 squares. What is the number of rows used in each grid?
3. What concept can you explain to young children using rectangular grids like the ones above?
4. Is 1 prime? Why or why not? Does this conflict with your explanation for how the rectangular grids are used in the first two problems?
5. List in increasing order all primes less than 100. What do we call positive integers which are not prime? What about 1 – is it prime, composite or neither?
6. Explain how the *Prime Number Test* or the *Sieve of Eratosthenes* can help determine which numbers are prime.
7. Which of your list of primes would you have to consider as possible factors of 391 in order to determine whether 391 is a prime or composite number? Is 391 prime or composite?
8. Is 223 prime or composite?
9. Which one of the following numbers is prime?
(a) 209 (b) 267 (c) 317 (d) 341
10. Which one of the following numbers is prime?
(a) 119 (b) 211 (c) 221 (d) 253
11. What is the *Fundamental Theorem of Arithmetic* ?
12. Use a factor tree to determine the prime factorization of the following numbers.
(a) 84
(b) 300
(c) 90
(d) 72
(e) 140
(f) 1200
13. Explain how you can use rods of different lengths to convey the concept of *Least Common Multiple* to children. How can the number line be used to explain this concept?
14. (a) List all the factors of 48.
(b) List all the factors of 36.
(c) What are the common factors of 48 and 36?
(d) What is the greatest common factor (GCF) of 48 and 36?

15. (a) List all the factors of 140.
 (b) List all the factors of 150.
 (c) What are the common factors of 140 and 150?
 (d) Determine $GCF(140, 150)$.
16. (a) List the beginning of the sequence of multiples of 30.
 (b) List the beginning of the sequence of multiples of 12.
 (c) List the beginning of the sequence of common multiples of 30 and 12.
 (d) What is the least common multiple (LCM) of 30 and 12.
17. (a) List the beginning of the sequence of multiples of 55.
 (b) List the beginning of the sequence of multiples of 20.
 (c) List the beginning of the sequence of common multiples of 55 and 20.
 (d) Determine $LCM(55, 20)$.
18. The numbers 15359 and 17041 are each prime. Determine $GCF(15359, 17041)$.
19. The numbers 97 and 101 are each prime. Determine $LCM(97, 101)$.
20. Todd and Nancy each have one bookcase. Each shelf in Todd's bookcase contains the same number of books as any other shelf in his bookcase. Each shelf in Nancy's bookcase contains the same number of books as any other shelf in her bookcase. Furthermore, Todd's bookcase has the same number of shelves as Nancy's bookcase. If Todd has 252 books and Nancy has 330 books, then what is the largest number of shelves they could possibly have in each of their bookcases?
21. Midas has 120 gold coins and 96 silver coins. He wants to place his gold coins and his silver coins in stacks so that there are the same number of coins in each stack. What is the greatest number of coins that he can place in each stack?
22. Use any method to evaluate the following.
- (a) $GCF(12, 30)$
 (b) $LCM(12, 30)$
 (c) $GCF(45, 30)$
 (d) $LCM(45, 30)$
 (e) $GCF(2016, 548800)$ Hint: $2016 = 2^5 \cdot 3^2 \cdot 7$ and $548800 = 2^6 \cdot 5^2 \cdot 7^3$
 (f) $LCM(2016, 548800)$
 (g) $GCF(121500, 1148175)$ Hint: $121500 = 2^2 \cdot 3^5 \cdot 5^3$ and $1148175 = 3^8 \cdot 5^2 \cdot 7$
 (h) $LCM(121500, 1148175)$
 (i) $GCF(2^3 \cdot 3 \cdot 5, 2 \cdot 3^2, 2^2 \cdot 3 \cdot 5^2)$
 (j) $LCM(2^3 \cdot 3 \cdot 5, 2 \cdot 3^2, 2^2 \cdot 3 \cdot 5^2)$
23. Two positive integers a and b satisfy $GCF(a, b) = 150$ and $a \cdot b = 1350000$. Compute the value of $LCM(a, b)$.