

MA 130 SECTION 4.3 PRIME AND COMPOSITE NUMBERS
HOMEWORK: 1 – 19 odd

OBJECTIVES: Use several methods for finding the prime factorization of whole numbers.

Recall Number Systems:

Whole Numbers $\{ 0, 1, 2, 3, 4, 5, \dots \}$

Counting Numbers $\{ 1, 2, 3, 4, 5, \dots \}$

Integers $\{ \dots -4, -3, -2, -1, 0, 1, 2, 3, 4, \dots \}$

1. Write a definition that gives the property of a counting number that makes it a prime number.
2. Write a definition that gives the property of a counting number that makes it a composite number.
3. How should we classify the number 1?
4. The Pythagoreans (over 2500 years ago) studied prime and composite numbers geometrically.

For example: The number 4 is composite. If you have 4 squares, how many rectangles can you build (using all four squares)?

The number 5 is prime. If you have 5 squares, how many rectangles can you build (using all 5 squares)?

Repeat this exercise for 6, 7, 8, and 11 squares.

5. From your experimentation, how is the number of possible rectangles related to whether or not the number is prime?

What type of reasoning did you use?

6. The Prime Number Test.
It is fairly easy to determine that numbers 2, 3, 5, 7, 11, 13, 17, 19, 23 are primes.
How would you determine if a larger number is prime?

Is 577 prime?

There are several observations that can provide short cuts.

- A. Use the divisibility rules to determine if 2, 3, 5, or 7 divides the number.
- B. Note that if 2, 3, 5, or 7 do not divide the number, then neither will any multiple of 2, 3, 5, or 7.
- C. Every composite number has a prime factor that is less than or equal to the square root of the number.

Thus, we need only test whether or not primes less than or equal to $\sqrt{\text{number}}$ are divisors of the number.

Test 577.

D. Is 91 prime?

E. Is 1,523 prime?

6. The Fundamental Theorem of Arithmetic: Every composite number has exactly one prime factorization.

A. Method One: Factor-Tree Method

Use the Factor-Tree method to find the prime factorization of 90

B. Method Two: Prime-Divisor Method

Use the Prime-Divisor method to find the prime factorization of 90

7. Use both methods to find the prime factorizations of 60, 120, and 3155.