Find All the Factors of a Number

Example: Find *all* the factors of 250.

STEP 1: Start with the number 1 as a factor.

$1 \bullet 250 = 250$ — Two factors listed.

STEP 2: Using *divisibility rules,* ask yourself if 250 is divisible by 2. Yes, it is because 250 is an even number. Use long division to find out how many times 2 divides into 250. The answer to long division (quotient) will be the other factor (125). So far, we have four factors: $1, 2, 125, 250$. But there could be more, so we continue.

$1 \bullet 250 = 250$
$2 \bullet 125 = 250$ — Four factors listed.

STEP 3: Using divisibility rules, ask yourself if 250 is divisible by 3. No, it is not because the sum of the digits of 250 is not divisible by 3. Skip the factor 3.

STEP 4: Although there is a divisibility rule for the number 4, we do not cover it in this course. Use long division to see if 4 divides *evenly* into 250. If it does, then the quotient is the other factor. However, 4 does not divide evenly into 250. Skip the factor 4.

STEP 5: Using divisibility rules, ask yourself if 250 is divisible by 5. Yes, it is because the ones place value digit of 250 is 0 (divisible if ones is either 0 or 5). Use long division to find out how many times 5 divides into 250. The quotient for long division is 50. Therefore, 50 will be the other factor. We are up to six factors: $1, 2, 5, 50, 125, 250$. But there could be *two more* factors, so we continue.

$1 \bullet 250 = 250$
$2 \bullet 125 = 250$
$5 \bullet \ 50 = 250$ — Six factors listed.

STEP 6: While we can proceed sequentially checking the numbers 6, 7, 8, and 9, notice that the number 250 ends in 0. And divisibility rules states that if the ones place value digit is 0, then 10 will divide into that number evenly. Use long division to find out how many times 10 divides into 250. The quotient is 25. Therefore, 25 will be the other factor. We have reached *eight factors,* so we are done: $1, 2, 5, 10, 25, 50, 125, 250$.

$1 \bullet 250 = 250$
$2 \bullet 125 = 250$
$5 \bullet \ 50 = 250$
$10 \bullet \ 25 = 250$ — Eight factors listed. Done.

Answer: $1, 2, 5, 10, 25, 50, 125, 250$

See Notes on next page.

Notes for Finding All the Factors of a Number:

- Notice that the directions say to find *all* the factors of 250. That includes prime numbers, composite numbers, and the number 1 (neither prime nor composite).
- Do not use *prime factorization* (factor tree) for this type of problem. The factor tree will be shown next for a different type of problem.
- Instead, create a list using a systematic process to find all the factors. Start with the factor 1 and continue up in sequential numerical order.
- *Divisibility rules* played a pivotal role in helping us to find all the factors.
- It is helpful to know that for this course there will be 8 total factors, or fewer. Thus, if you list 8 factors, do not look for more. However, there could be fewer than 8 factors.
- If the number is large, such as 250 or 375, it can be useful to think of it as money. For example, 250 would be equivalent to $2.50 and then you can use your knowledge of money coins to help you find some factors. If you had enough of a particular coin, could you get $2.50? You could with these coins: 1¢, 5¢, 10¢, and 25¢. Similarly, 1, 5, 10, and 25 are factors of 250.