Find Least Common Multiple (LCM)

Example: Find the LCM of this set of numbers: 20 and 30.

The **L**east **C**ommon **M**ultiple (**LCM**) of two numbers is the smallest possible value that both numbers can divide into. Thus, the LCM is either the biggest of the two numbers, or bigger. A common mistake is to think of the LCM as the smallest value that divides into the two numbers. But it is the other way around.

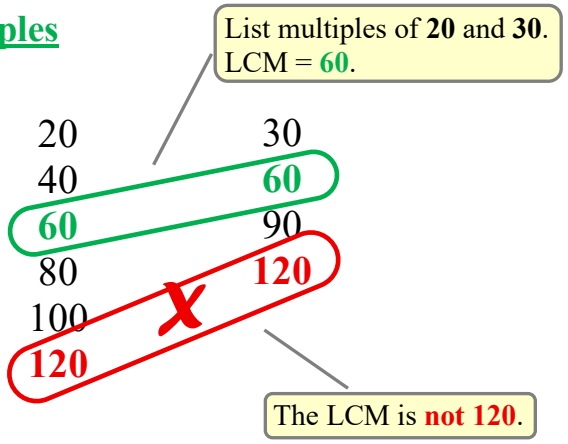
Method 1 – List of Multiples

STEP 1: Write multiples of 20 and 30.

Note: A *multiple* means to repeatedly add a number. But here is another way to think of multiples:

$1 \bullet 20 = 20$
$2 \bullet 20 = 40$
$3 \bullet 20 = \mathbf{60}$
Etc.

$1 \bullet 30 = 30$
$2 \bullet 30 = \mathbf{60}$
Etc.



STEP 2: Look for the smallest number that is common to both multiples. That number is 60 and represents the *least common multiple* of 20 and 30. Notice that 120 also is a common multiple of 20 and 30. However, it is not the least common multiple. Start your list of multiples with the smaller (20) number to see if you get a quick match with the bigger number (30). If there is no quick match, then do multiples – back and forth between 20 and 30 – until you get a match. This alternating listing of multiples, although optional, helps to avoid creating unnecessary multiples.

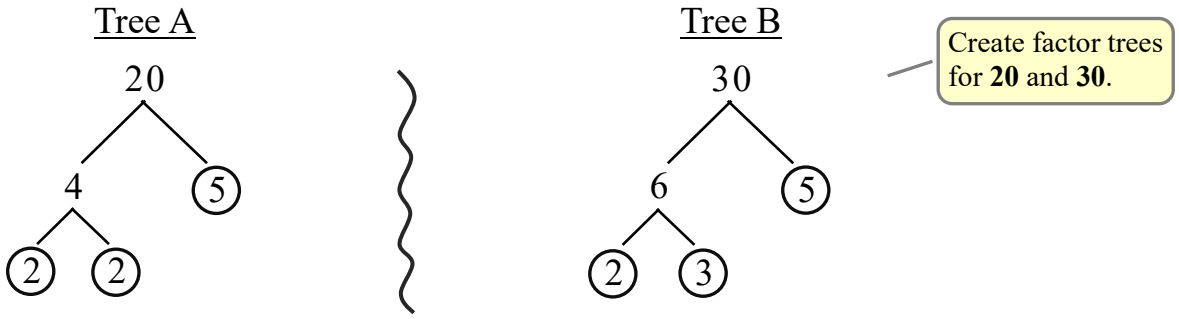
LCM: 60

Notes:

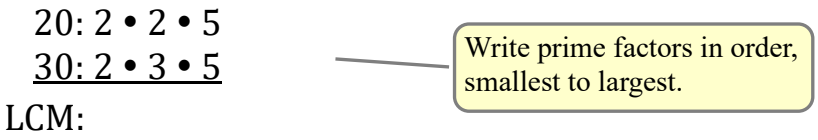
- Another method called *Shares & Leftovers* is explained next. Use the following guidance for determining which method to use.
  - When finding the LCM of relatively easy multiples, such as 20 and 30, it is easier to use the *List of Multiples* method.
  - When finding the LCM of difficult multiples, such as 27 and 45, it is easier to use the *Shares & Leftovers* method.
- When explaining the *Shares & Leftovers* method, we will use the LCM of 20 and 30 again to illustrate the difference between the two methods.

Method 2 – Shares & Leftovers

STEP 1: Complete a *factor tree* for both 20 and 30 to obtain their *prime factorization*. Draw a vertical separator line between the two factor trees to emphasize they are unrelated.



STEP 2: List prime factorization for 20 and 30 in a horizontal row. Write the factor lists in order, from smallest to largest. Under the bottom row, draw a line and write "LCM: ".



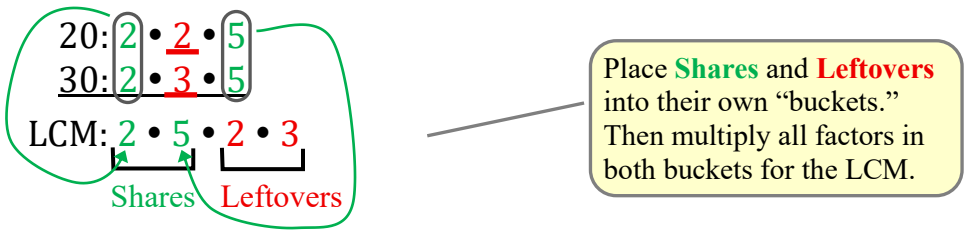
STEP 3: Use the *Shares & Leftovers* technique to determine which factors to include as part of the LCM.

Shares:

- Draw an oval shape around the shared factors (2s and 5s) between the two rows.
  - Shared factors are not required to be directly over each other.
  - Shared factors could be listed offset, resulting in a slanted oval shape.
- Since 2 is shared within the oval shape, we bring down only *one* of the 2s.
- Since 5 is shared within the oval shape, we bring down only *one* of the 5s.

Leftovers:

- These factors are not enclosed in an oval shape since they are different (2 and 3).
- Underline all leftover factors and bring down *all* of them (2 and 3).



STEP 4: Multiply the *Shares* and the *Leftovers* together 2 • 5 • 2 • 3 for LCM = 60.

Shares & Leftovers borrowed from **Professor Vernamonti**