

The Bracket Method

Pull out common factors until nothing is left - GCF and LCM fall out together

Page 1 of 3

The notation

Write the two numbers stacked inside square brackets. A number in front of the bracket **multiplies both** numbers inside - it's a factor you've pulled out of each of them.

$$\begin{bmatrix} 36 \\ 24 \end{bmatrix} = 12 \begin{bmatrix} 3 \\ 2 \end{bmatrix} \quad \text{means } 36 = 12 \times 3 \text{ and } 24 = 12 \times 2. \\ \text{The 12 was hiding in both numbers.}$$

The method: pull out, pull out, pull out... until you can't

Don't look for the biggest factor right away. Pull out **any** common factor you can see - 2, 3, 5, whatever - and keep going. Each time, the number in front gets multiplied by what you pulled.

$$\begin{bmatrix} 36 \\ 24 \end{bmatrix} = 2 \begin{bmatrix} 18 \\ 12 \end{bmatrix} = 2 \times 2 \begin{bmatrix} 9 \\ 6 \end{bmatrix} = 2 \times 2 \times 3 \begin{bmatrix} 3 \\ 2 \end{bmatrix}$$

both even both even again both have a 3 nothing left to pull

Stop when the two numbers inside share nothing (their only common factor is 1). 3 and 2 share nothing, so we're done. Now multiply up the front: $2 \times 2 \times 3 = 12$.

$$\text{So: } \begin{bmatrix} 36 \\ 24 \end{bmatrix} = 12 \begin{bmatrix} 3 \\ 2 \end{bmatrix}$$

Now read off BOTH answers

GCF = the number in front. Everything the two numbers had in common got pulled out to the front. Nothing common is left inside, so the front IS the greatest common factor: **GCF(36, 24) = 12**.

LCM = front x top x bottom. A common multiple needs all of the 12, AND a 3 (for 36), AND a 2 (for 24): $12 \times 3 \times 2 = \text{LCM}(36, 24) = 72$. Check: $72 / 36 = 2$, $72 / 24 = 3$. Both whole.

GCF = front

LCM = front x top x bottom

TIP Order doesn't matter. Pull out 3 first, or 6, or 12 in one go - you always end at 12 [3 / 2]. Small steps are just safer.

The Bracket Method: More Examples

Page 2 of 3

Including the special cases

Example: 18 and 30

$$\begin{bmatrix} 18 \\ 30 \end{bmatrix} = 2 \begin{bmatrix} 9 \\ 15 \end{bmatrix} = 2 \times 3 \begin{bmatrix} 3 \\ 5 \end{bmatrix}$$

both even both have a 3 3 and 5 share nothing

Front = $2 \times 3 = 6 \rightarrow$ **GCF = 6**. LCM = $6 \times 3 \times 5 = 90$.

Example: 12 and 60 (one divides the other)

$$\begin{bmatrix} 12 \\ 60 \end{bmatrix} = 2 \begin{bmatrix} 6 \\ 30 \end{bmatrix} = 2 \times 2 \begin{bmatrix} 3 \\ 15 \end{bmatrix} = 2 \times 2 \times 3 \begin{bmatrix} 1 \\ 5 \end{bmatrix}$$

a 1 appears - done

Front = **12** = GCF. LCM = $12 \times 1 \times 5 = 60$. When a 1 shows up inside, the other number's factors are all that's left - the GCF is the smaller number and the LCM is the bigger.

Example: 8 and 15 (nothing to pull)

$$\begin{bmatrix} 8 \\ 15 \end{bmatrix} = 1 \begin{bmatrix} 8 \\ 15 \end{bmatrix}$$

$8 = 2 \times 2 \times 2$ and $15 = 3 \times 5$ share nothing. You can't pull anything out, so the front is just **1**: GCF = 1. LCM = $1 \times 8 \times 15 = 120$ - the whole product.

Why does this work?

Every time you pull a factor out front, you're factoring it out of **both** numbers at once. When nothing common is left inside, the front holds **all** the shared factors - that's exactly what the GCF is.

For the LCM: the top number still needs its leftover (the 3 in $36 = 12 \times 3$) and the bottom needs its leftover (the 2 in $24 = 12 \times 2$). The smallest number that has the 12 and the 3 and the 2 is $12 \times 3 \times 2$. Nothing is double-counted because the leftovers share nothing.

Bonus: it also proves $GCF \times LCM = 36 \times 24$, since $(12) \times (12 \times 3 \times 2) = (12 \times 3) \times (12 \times 2)$.

TIP Stuck on what to pull? Try 2 if both are even, 3 if both digit-sums are multiples of 3, 5 if both end in 0 or 5.

Your Turn: The Bracket Method

Page 3 of 3

Pull out factors until the inside shares nothing. Then GCF = front, LCM = front x top x bottom.

Name: _____

1

$$\begin{bmatrix} 12 \\ 18 \end{bmatrix} =$$

GCF = _____ LCM = _____

2

$$\begin{bmatrix} 20 \\ 30 \end{bmatrix} =$$

GCF = _____ LCM = _____

3

$$\begin{bmatrix} 16 \\ 24 \end{bmatrix} =$$

GCF = _____ LCM = _____

4

$$\begin{bmatrix} 9 \\ 15 \end{bmatrix} =$$

GCF = _____ LCM = _____

5

$$\begin{bmatrix} 24 \\ 40 \end{bmatrix} =$$

GCF = _____ LCM = _____

6

$$\begin{bmatrix} 14 \\ 35 \end{bmatrix} =$$

GCF = _____ LCM = _____

7

$$\begin{bmatrix} 36 \\ 48 \end{bmatrix} =$$

GCF = _____ LCM = _____

8

$$\begin{bmatrix} 7 \\ 12 \end{bmatrix} =$$

GCF = _____ LCM = _____

9

$$\begin{bmatrix} 45 \\ 60 \end{bmatrix} =$$

GCF = _____ LCM = _____

10

$$\begin{bmatrix} 32 \\ 80 \end{bmatrix} =$$

GCF = _____ LCM = _____

TIP Check: GCF x LCM should equal the two numbers multiplied together.