Multiple Murray

Multiples

Multiples are integers formed by multiplying a base factor by a series of factors.

Base × Series = Multiples

$2 \times 1 = 2$

$2 \times 2 = 4$

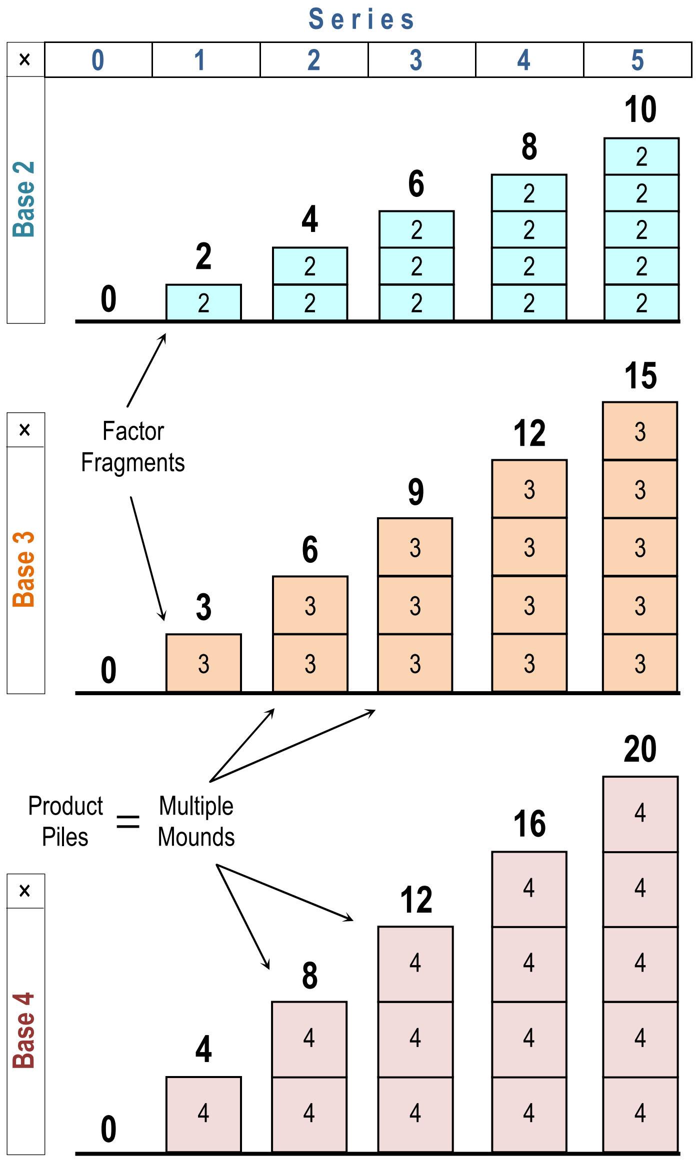
$2 \times 3 = 6$

Factor × Factor = Product

↓ ↓ ↓

Base × Series = Multiples

Base = constant
Series = 1, 2, 3…



Zero is a multiple of *every* Base and 0.

Base × 0 = 0

Every Base is a multiple of itself and 1.

Base × 1 = Base

All in the Family!

If M_1 and M_2 are multiples of a base, then $M_1 + M_2$ and $M_1 - M_2$ are also multiples.

Example: **12** and **8** are multiples of base 4. Therefore, [12+8 =] **20** and [12–8=] **4** are multiples of 4.

BrainAids

Multiple Mounds are Product Piles built from Factor Fragments.

Multiples are More than the factors they're built from (providing the factors are > 1).

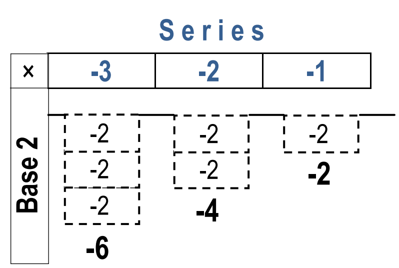
BaSeM

Base×Series=Multiple

When building Multiple Mounds, BaSeM (base them) on the *same* base factor.

Can Multiples be Negative?

Yes, but the result is negative holes instead of positive piles.



LCM: Least Common Multiple

The LCM is the *smallest* multiple shared by the given bases.

Paradox!
The ***Least*** Common Multiple is ***larger*** than the bases it's derived from!

This holds true for positive LCMs. However, if the larger base is a multiple of the smaller base, the LCM *equals* the larger base. Example: For bases 2 and 4, the LCM = 4.

LCM from Table

List several multiples for each desired base, then circle the multiples they have in common.

The *smallest* common multiple is the LCM.

Series (columns) / Bases (rows)

×	2	3	4	5	6
2	4	6	8	10	12
3	6	9	12	15	18

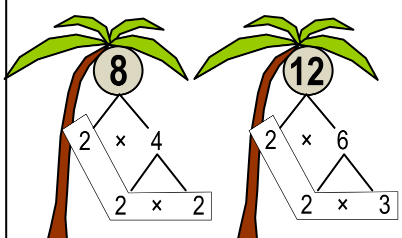
LCM = 6

Least Common Multiple of bases 2 and 3 is **6**.

Common Multiples
6, 12

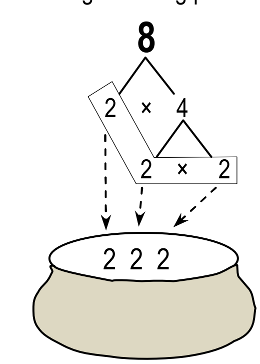
LCMs from Primes

Load, Crush, Mix, Scoop

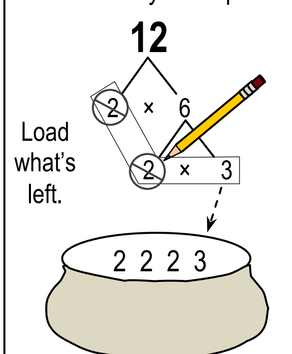


Factor each Base product coconut into its prime nutrients.

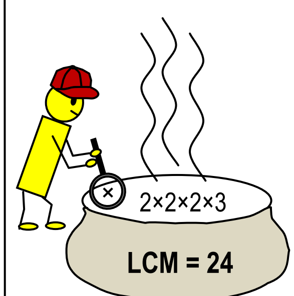
Load *all* of the prime factors from the 1st coconut into a large cooking pot.



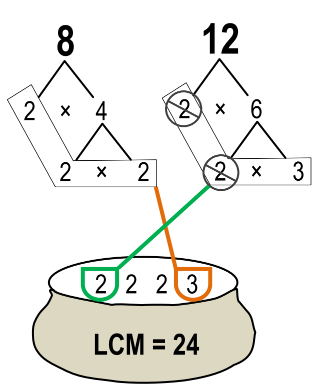
Crush (cross out) any prime factors in the 2nd coconut that are *already* in the pot.



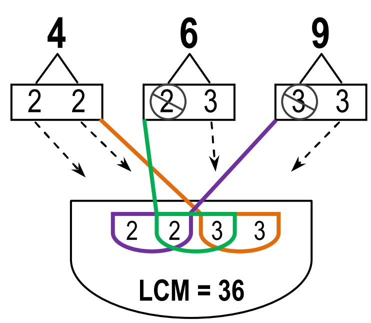
Mix (magnify/multiply) the factor nutrients into an LCM stew.



Scoop out and multiply each Base by the prime nutrient/s it lacks to make it into the LCM.



8 × **3** = **24**
12 × **2** = **24**



When you get to the 9, a 3 is already in the pot (from the 6), so you must crush the 9's first 3.

But there isn't another 3 in the pot, so you must load the 9's second 3.

4 scoops out (3 × 3) ⟶ **4** × **9** = **36**
6 scoops out (2 × 3) ⟶ **6** × **6** = **36**
9 scoops out (2 × 2) ⟶ **9** × **4** = **36**

Multiplying each Base by the product of its scooped out factors yields the LCM.

The goal is to have all factors of each Base represented in the pot, *without* duplicating factors.

Why crush? So you don't add excess calories to the stew, which would make the LCM too large and require a Division Diet.

Why Multiples?

To Create Times Table

Multiplication Table = Multiples.

Series (across the top) · Bases (down the left side) · Multiples (the table body)

×	2	3	4	5	6	7	8	9	10	11	12
2	4	6	8	10	12	14	16	18	20	22	24
3	6	9	12	15	18	21	24	27	30	33	36
4	8	12	16	20	24	28	32	36	40	44	48
5	10	15	20	25	30	35	40	45	50	55	60
6	12	18	24	30	36	42	48	54	60	66	72
7	14	21	28	35	42	49	56	63	70	77	84
8	16	24	32	40	48	56	64	72	80	88	96
9	18	27	36	45	54	63	72	81	90	99	108
10	20	30	40	50	60	70	80	90	100	110	120
11	22	33	44	55	66	77	88	99	110	121	132
12	24	36	48	60	72	84	96	108	120	132	144

To Create Equivalent Fractions

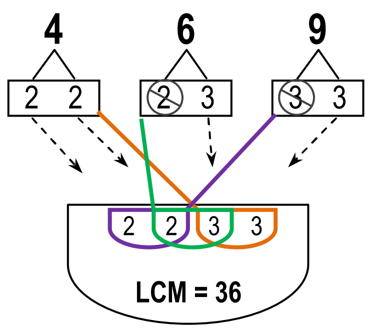
Multiply the numerator and denominator by the same Base (Multiply Muscles).

$$\frac{1 \times 2}{2 \times 2} = \frac{2}{4} \qquad \frac{1 \times 3}{2 \times 3} = \frac{3}{6} \qquad \frac{1 \times 4}{2 \times 4} = \frac{4}{8}$$

Base   Base   Base

To Find the LCD

When adding or subtracting unlike fractions, the LCM is the LCD (Least Common Denominator).



$4 \times 9 = 36$
$6 \times 6 = 36$
$9 \times 4 = 36$

LCD = 36

$$\frac{3}{4} + \frac{5}{6} + \frac{7}{9}$$

$$\frac{3 \times 9}{4 \times 9} + \frac{5 \times 6}{6 \times 6} + \frac{7 \times 4}{9 \times 4}$$

$$\frac{27}{36} + \frac{30}{36} + \frac{28}{36}$$

To Clear Denominators

When an equation has denominators, multiplying by the LCM can make it easier to solve.

$$\frac{z}{6} + \frac{1}{2} = \frac{2}{3} \longrightarrow 6\left[\frac{z}{6} + \frac{1}{2} = \frac{2}{3}\right] \longrightarrow z + 3 = 4$$

LCM

Your Turn!

Matching

1) ___ Multiple	a. Smallest multiple shared by bases.

2) ___ Base	b. Multiples shared by bases.

3) ___ Common multiples	c. Constant on which multiples are built.

4) ___ LCM	d. Product formed from Base × Series.

5) ___ LCD	e. Smallest multiple shared by denominators.

True or False

6) ________ A multiple is an integer.

7) ________ Zero is a multiple of every base.

8) ________ Since 16 and 24 are multiples of 8, then 16+24 is a multiple of 8.

9) ________ The Times Table is composed of multiples.

10) _______ A positive LCM is smaller than the bases it's derived from.

11) Create a table to find the LCM of 3 and 4.

12) Use primes to find the LCM of 15 and 25.

13) Find the LCM of 5, 8, and 12.

14) Scoop out factors that make 5, 8, 12 = LCM.

Answers: 1d, 2c, 3b, 4a, 5e, 6T, 7T, 8T, 9T, 10F, 11)12, 12)75, 13)120, 14)24,15,10