The **least common multiple (LCM)** of a given set of numbers is the *smallest* positive number divisible by the numbers in the set. For example, if we list the multiples of 4 and 6, we can see these numbers share common multiples of 12, 24, 36, and 48 to name a few.

- **Multiples of 4:** 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, …
- **Multiples of 6:** 6, 12, 18, 24, 30, 36, 42, 48, …

Even though 24, 36 and 48 are multiples of 4 and 6, the **LCM** is 12 because 12 is the *smallest* number divisible by 4 and 6.

When we need to find a common denominator for a given set of fractions, the **LCM** is called the **least common denominator (LCD)**. To find the **LCD** of a given set of fractions, check the denominators of the fractions:

### STRATEGIES

1) *Do the smaller denominators divide the larger?* If they do, the larger denominator is the LCD.

**EXAMPLE 1:** Find the LCD of $\frac{3}{4}$, $\frac{1}{2}$, and $\frac{5}{8}$

Because 8 is divisible by 4 and 2, the LCD = 8.

2) *Are the denominators prime or relatively prime numbers?* (Prime numbers are numbers divisible only by themselves and 1; relatively prime numbers share no common factor.) When the denominators are prime or relatively prime, multiply the denominators to find the LCD.

**EXAMPLE 2:** Find the LCD of $\frac{2}{3}$, $\frac{4}{5}$, and $\frac{1}{2}$

The denominators of the fractions are *prime* numbers. To find the LCD, multiply the denominators:

$$\text{LCD} = 2 \cdot 3 \cdot 5 = 30.$$  

**EXAMPLE 3:** Find the LCD of $\frac{3}{4}$ and $\frac{5}{7}$

The denominators of the fractions are *relatively prime* numbers because they share no common factors: $4 = 2 \cdot 2$ and $7 = 1 \cdot 7$. To find the LCD, multiply the denominators:

$$\text{LCD} = 4 \cdot 7 = 28.$$
**EXAMPLE 4:** Find the LCD of $\frac{2}{x}$ and $\frac{4}{9}$

Because the value of "x" is unknown, the only factors of x are "1" and "x." This means that 9 and "x" share no common factors, so the LCD = $9 \times x$.

3) If the largest denominator is not divisible by the smaller denominators, list the multiples of the largest to find the LCD.

**EXAMPLE 5:** Find the LCD of $\frac{5}{4}$, $\frac{1}{6}$, $\frac{7}{10}$, and $\frac{8}{15}$

The smaller denominators do not divide the larger. As shown below, we find the LCD sooner when we list the multiples of the largest denominator.

- Multiples of 4: 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, 60, …
- Multiples of 6: 6, 12, 18, 24, 30, 36, 42, 48, 64, 60, …
- Multiples of 10: 10, 20, 30, 40, 50, 60, …
- Multiples of 15: 15, 30, 45, 60, …

LCD = 60

4) If the LCD is not among the first 5 or 6 multiples you list, try prime factorization and a factor box.

**EXAMPLE 6:** Find the LCD of $\frac{5}{12}$, $\frac{2}{15}$, and $\frac{7}{18}$

**Step 1:** Write the prime factorization of each denominator and list the factors in a table of primes, as shown:

<table>
<thead>
<tr>
<th></th>
<th>2</th>
<th>3</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>$2^2 \cdot 3$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>3 · 5</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>18</td>
<td>$2 \cdot 3^2$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Step 2:** Take the highest power of any factor the numbers share in common and any factor the numbers do not share in common. The LCD is the product of these factors:

$$LCD = 2^2 \cdot 3^2 \cdot 5 = 180$$