Math
Beijing

Finding Common Denominators

To add or subtract fractions with different denominators, first rewrite the fractions to equivalent fractions with **a common denominator**. The common denominator is found by identifying **the least common multiple of the denominators** of the fractions.

Example 1

Rewrite the fractions as equivalent fractions with a common denominator.

$\dfrac{3}{5}$ and $\dfrac{2}{3}$

🔵 **Explanation**

Step 1: Identify the least common multiple of the denominators (5 and 3), which is **15**.

Multiple of 5: 5, 10, **15**, 20, 25, **30**, 35 …

Multiple of 3: 3, 6, 9, 12, **15**, 18, 21, 24, 27, **30**…

The LCM of 5 and 3 is 15.

Multiple of 5 and 3: **15, 30** …

Step 2: Rewrite two fractions as equivalent fractions with a **common denominator**.

$$\dfrac{3}{5} = \dfrac{3 \times 3}{5 \times 3} = \dfrac{9}{15}$$

$$\dfrac{2}{3} = \dfrac{2 \times 5}{3 \times 5} = \dfrac{10}{15}$$

Find Common Denominators:
- Identify the least common multiple of the denominators.
- Rewrite the fractions as equivalent fractions with a **common denominator**.

Therefore the equivalent fractions with a common denominator of $\dfrac{3}{5}$ and $\dfrac{2}{3}$ are $\dfrac{9}{15}$ and $\dfrac{10}{15}$.

Example 2

Rewrite the fractions as equivalent fractions with a common denominator.

$\dfrac{1}{6}$ and $\dfrac{5}{42}$

🔵 **Explanation**

Step 1: Identify the least common multiple of the denominators.

Since 42 is a multiple of 6, therefore **42 is the least common multiple of 42 and 6.**

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Step 2: Rewrite two fractions as equivalent fractions with a **common denominator.**

$$\frac{1}{6} = \frac{1 \times 7}{6 \times 7} = \frac{7}{42}$$

$$\frac{5}{42} = \frac{5}{42}$$

Therefore the equivalent fractions with a common denominator of $\frac{1}{6}$ and $\frac{5}{42}$ are $\frac{7}{42}$ and $\frac{5}{42}$.

Example 3

Rewrite the fractions as equivalent fractions with a common denominator.

$$\frac{5}{12}, \frac{7}{15}, \frac{5}{6}$$

◉ Explanation

Step 1: Identify the least common multiple of the denominators.

Method 1: The least common multiple (LCM) of the numbers 12, 15 and 6 is **60**.

12 × 1 = 12	15 × 1 = 15	6 × 1 = 6
12 × 2 = 24	15 × 2 = 30	6 × 2 = 12
12 × 3 = 36	15 × 3 = 45	6 × 3 = 18
12 × 4 = 48	**15 × 4 = 60 (lowest)**	6 × 4 = 24
12 × 5 = 60 (lowest)	15 × 5 = 75	6 × 5 = 30
12 × 6 = 72	15 × 6 = 90	6 × 6 = 36
12 × 7 = 84	15 × 7 = 105	6 × 7 = 42
12 × 8 = 96	15 × 8 = 120	6 × 8 = 48
12 × 9 = 108	15 × 9 = 135	6 × 9 = 54
12 × 10 = 120	15 × 10 = 150	**6 × 10 = 60 (lowest)**

Method 2: To find LCM, you can also do a factorization to prime factors, with the factors lined up according to occurrence.

Factors of 12 = 2 × 2 × **3**
Factors of 15 =   **3** × 5
Factors of 6 = 2   × **3**

$$2 \times 2 \times 3 \times 5 = 60$$

You carry down **all** the factors and then multiply.

The LCM of 12, 15, and 6 is **60**.

Step 2: Rewrite two fractions as equivalent fractions with a **common denominator.**

$$\frac{5}{12} = \frac{5 \times 5}{12 \times 5} = \frac{25}{60}$$

$$\frac{7}{15} = \frac{7 \times 4}{15 \times 4} = \frac{28}{60}$$

$$\frac{5}{6} = \frac{5 \times 10}{6 \times 10} = \frac{50}{60}$$

Therefore the equivalent fractions with a common denominator of $\frac{5}{12}, \frac{7}{15}, \frac{5}{6}$ **are** $\frac{25}{60}, \frac{28}{60}, \frac{50}{60}$.

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