REDUCE fractions to a simpler form.

\[
\frac{8}{12}
\]

The factors of a number are numbers that another number is divisible by.
The factors of 8 are 1, 2, 4, 8
The factors of 12 are 1, 2, 3, 4, 6, 12

The biggest factor in common between 8 and 12 is 4.
\( \text{GCF} = 4 \) Divide both the numerator and denominator by 4 to reduce the fraction.

\[
\frac{8 \div 4}{12 \div 4} = \frac{2}{3}
\]

The LCM is used to BUILD UP a fraction to a "less simple" form. This is sometimes necessary when comparing two fractions or when adding and subtracting fractions.
Comparing Fractions

To compare fractions with different denominators, rewrite the fractions as equivalent fractions with the least common denominator.

Example 10
Which fraction is larger? \( \frac{5}{6} \) or \( \frac{7}{8} \)

What is the LCD of 6 and 8?

**METHOD 1:** Remember, the LCD is AT LEAST as BIG as the Biggest Denominator.

1) Start taking multiples of 8.
   - \( 8 \cdot 1 = 8 \) Does 6 go into 8? No
   - \( 8 \cdot 2 = 16 \) Does 6 go into 16? No
   - \( 8 \cdot 3 = 24 \) Does 6 go into 24? Yes. LCD = 24

2) Rewrite the fractions as equivalent fractions with the least common denominator.

\[
\frac{5}{6} \quad \frac{7}{8}
\]

Which one is bigger?
METHOD 2: Birthday Cake Method

What is the LCD of 6 and 8

\[
\begin{align*}
2 & \quad 6 \\
3 & \quad 4 \\
8
\end{align*}
\]

Do 3 and 4 have any factors in common? If no, STOP

Then make a big L by circling the side and bottom of the cake.

LCD = \(2 \times 3 \times 4 = 24\)

Our original fractions were \(\frac{5}{6}\) and \(\frac{7}{8}\)

Each of those can be built up to an equivalent fraction with 24 as the SAME DENOMINATOR. The numbers on the bottom of the cake if you a clue of how to change each fraction.

\[
\begin{align*}
\frac{5}{6} & = \_ \\
\frac{7}{8} & = \_
\end{align*}
\]

Which one is bigger?
Rule for Adding Fractions:

1) In order to add fractions, their denominators (bottom numbers) must be the same.

2) Once the fractions have been rewritten (if necessary) with a "least common denominator", add them by ADDING the NUMERATORS (top numbers) and KEEPING THE DENOMINATOR the SAME.

Example 1

\[
\frac{1}{8} + \frac{5}{8} = \frac{1+5}{8} = \frac{6}{8}
\]

Can be \(\frac{6}{8}\) reduced? Yes. \(\frac{6}{8} = \frac{2 \cdot 3}{2 \cdot 4} = \frac{3}{4}\)
What if they don't have the same denominators?

**Example**

\[
\frac{1}{4} + \frac{2}{3}
\]

The denominators, 4 and 3, are not the same, so we have to find the LCD (Least Common Denominator) in order to rewrite these fractions into equivalent fractions with the same denominator.

The LCD is the “smallest box that both 4 and 3 will go into.”

**ADDING FRACTIONS WITH DIFFERENT DENOMINATORS**

**FINDING LCD METHOD 1:**

1) Start making multiples of the larger denominator until the smaller denominator can go into it.

\[
4 \times 1 = 4 \quad \text{Does 3 go into 4? No}
\]
\[
4 \times 2 = 8 \quad \text{Does 3 go into 8? No}
\]
\[
4 \times 3 = 12 \quad \text{Does 3 go into 12? YES... STOP}
\]

12 is the LCD of 4 and 3

Now rewrite each fraction with 12 as the denominator, then add.

\[
\frac{1}{4} = \frac{3}{12}
\]
\[
\frac{2}{3} = \frac{8}{12}
\]
\[
\frac{1}{4} + \frac{2}{3} = \frac{3}{12} + \frac{8}{12} = \frac{11}{12}
\]
How do you use the birthday cake when finding the LCD of 3 or more denominators?

\[ \frac{1}{6} + \frac{3}{8} + \frac{7}{12} = ? \]

What factor do all three have in common?

If none, do at least 2 have a factor in common?

Yes, you can use the fact that 3 and 6 have a common factor of 3, or the fact that 4 and 6 have a common factor of 2. If I choose 3 & 6, then just bring down the 4 and do nothing with it.

Now do at least 2 numbers have a common factor?

Yes 2 is a common factor of 4 and 2.

Now we are done. Make a big L.
Example
Subtract: \[ \frac{2}{y} - \frac{5}{18} \]

Are the denominators, \( y \) and 18, the same?
Then, find the LCD of \( y \) and 18.

But we don't know what \( y \) is, so how could we know if it goes into 18?

When you have denominators where one is a variable term and the other is a constant term, find the Least Common Multiple of the coefficient and the constant, and then find the Least Common Multiple of the variables.

The coefficient of \( y \) is 1. The other denominator is just 18.
What is the LCM of 1 and 18?
Remember, LCM means what's the smallest number that both 1 and 18 will go into?
\[ \text{LCM} = 18 \]

However, the Least Common Denominator will have to include the LCM of the variables. Since the other denominator doesn't have a variable, the LCD of the variables is just \( y \).
So the LCD is \( 18y \)
Now rewrite each fraction so that the denominator is \( \frac{2}{y} \cdot \frac{18}{18} = \frac{36}{18y} \)
\[ \frac{5}{y} \cdot \frac{18}{18} = \frac{5y}{18y} \]
The new expression which now has like terms is:
Example

Subtract: \( \frac{2}{3y} - \frac{5}{6y^2} \)

Are the denominators, \(3y\) and \(6y^2\), the same?
Then, find the LCD of \(3y\) and \(6y^2\).

The coefficient of \(3y\) is 3. The coefficient of \(6y^2\) is 6.
What is the LCM of 3 and 6?
Remember, LCM means what’s the smallest number that both 3 and 6 will go into?
LCM = \(\_6\)\(\_\)

However, the Least Common Denominator will have to include the
the LCM of the variables. What’s the LCM of \(y\) and \(y^2\)? \(y^2\)
So the LCD is \(\_6y^2\)\(\_\)
Now rewrite each fraction so that the denominator is ____

The new expression which now has like terms is:
\[
\frac{2}{3y} \cdot \_ = \_ \quad \frac{5}{6} \cdot \_ = \_
\]
Why Was the Zoo Worker Fired for Feeding the Monkeys?

Do each exercise and find your answer to the right. Write the letter of the answer in the box containing the number of the exercise. If the answer has a ●, shade it in the box instead of writing a letter in it.

I. Write each fraction in lowest terms.

<table>
<thead>
<tr>
<th></th>
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<th>Answers</th>
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<tbody>
<tr>
<td>1</td>
<td>9 / 12</td>
<td>O 4 / 5</td>
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<tr>
<td>2</td>
<td>8 / 18</td>
<td>E 4 / 9</td>
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<tr>
<td>3</td>
<td>25 / 40</td>
<td>C 2 / 5</td>
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<td>4</td>
<td>12 / 36</td>
<td>H 5 / 8</td>
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<td>8</td>
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II. Write each improper fraction as a mixed number and each mixed number as an improper fraction.

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>9</td>
<td>23 / 5</td>
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<td>10</td>
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<td>20 / 12</td>
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<td>14</td>
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III. Write a > or < in each ●. Then choose the SMALLER fraction and find it among the answers.

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<td>2 / 3</td>
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3 13 10 22 8 15 19 1 17 2 20 4 24 6 14 12 9 18 7 23 5 16 21 11

TOPIC 2-1: Review: Simplifying and Comparing Fractions
### What Happens If You Watch TV All Day?

For each exercise, write the missing numerator(s). Then compare the fractions. Write > or < in each circle.

Circle the letter in the corresponding column and write this letter in the box containing the exercise number.

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TOPIC 2-k: Comparing and Ordering Fractions

MIDDLE SCHOOL MATH WITH PIZZAZZ! BOOK C
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