Sec 2.3: Simplifying Fractions

- Equivalent Fractions: Fractions that look different, but actually represent the same number
- Suppose we cut a pizza into 8 slices, and then eat 4 of the slices. What fraction of the slices have we eaten (show this visually on the board)? \(\frac{4}{8}\). Can you also see that we have eaten \(\frac{2}{4}\) of the pizza if we split it into four sections and \(\frac{1}{2}\) the pizza if we split it into 2? So, \(\frac{4}{8}, \frac{2}{4}\) and \(\frac{1}{2}\) must be equivalent fractions.
- Diagram:

- A fraction has an infinite number of equivalent fractions.
- One way to generate equivalent fractions is we multiply both the top and bottom by the same number. They stay the same, because we’ve done the same thing to both the numerator and denominator.
- Let’s generate equivalent fractions to \(\frac{1}{4}\) by multiplying by the whole numbers (remember, we cannot use 0, because division by 0 is undefined).
  - \(\frac{1}{4} = \frac{2}{8} = \frac{3}{12} = \frac{4}{16} \ldots\)
- To find an equivalent fraction with a given denominator, we have to figure out what number we would multiply the denominator by to get the new denominator, then multiply that same number by the numerator
  - EX: Find and equivalent fraction to \(\frac{2}{3}\) with denominator 15: \(\frac{2}{3} = \frac{?}{15}\) Well, we know that \(3 \times 5 = 15\), so we have to multiply \(2 \times 5\) to get our numerator. We end up with:\(\frac{10}{15}\)
- You can always tell whether two fractions are equivalent by cross-multiplying. If their cross-products are equal, they are equivalent fractions.
Example

\[
\frac{1}{3} \times \frac{2}{6}
\]

We want to know if \( \frac{1}{3} = \frac{2}{6} \), so we cross multiply the numerators and denominators.

\[
1 \cdot 6 = 3 \cdot 2? \quad \text{YES!} \quad 6 = 6
\]

So they are equivalent.

Classwork: Find out if the following fractions are equivalent or not:

\[
\frac{4}{5} \quad \text{and} \quad \frac{12}{15}
\]

\[
\frac{3}{4} \quad \text{and} \quad \frac{9}{10}
\]

Another way to tell whether fractions are equivalent is to write each fraction in its simplest form and see if they are the same. So let’s see how to simplify fractions.

- **Simplifying fractions**
  - To simplify a fraction, you must divide the numerator and denominator by the same non-zero number (remind them again about dividing by 0).
  - The simplest form of a fraction is a fraction whose N and D have no factors in common.
    - **EX:**
      \[
      \frac{14}{21} = \frac{2 \cdot 7}{3 \cdot 7} = \frac{2}{3}
      \]
    - The easiest way to do this is to factor both to their prime factors, then “cancel” out the factors they have in common, leaving you with the simplest fraction.
    - Let’s do \( \frac{45}{18} \) like that:
      \[
      \frac{45}{18} = \frac{5 \cdot 9}{3 \cdot 6} = \frac{5 \cdot 3 \cdot 3}{3 \cdot 3 \cdot 2} = \frac{5}{2}
      \]
    - This does not mean we are always left with prime numbers in our fractions, just that there are no more prime numbers in common.

- **Class Work:** Simplify the following fractions by factoring and cancelling:

<table>
<thead>
<tr>
<th>34</th>
<th>15</th>
<th>24</th>
<th>49</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>50</td>
<td>68</td>
<td>112</td>
</tr>
</tbody>
</table>

Practice with flashcards.