*Adding Fractions With Unlike Denominator*

### There are 3 Simple Steps to add fractions:

* Step 1: Make sure the bottom numbers (the denominators) are the same
* Step 2: Add the top numbers (the numerators), put the answer over the denominator.
* Step 3: Simplify the fraction (if needed).

## *Example:*

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | | | | **+** | | | | | | 1 |
|  | | | |  |
| 3 | | | | 6 |
|  |  |  | |  |  |  |  |

**Step 1**: The bottom numbers are different. We need to make them **the same** before we can continue, because we **can't** add them like that.

The number "6" is twice as big as "3", so to make the bottom numbers the same we can multiply the top and bottom of the first fraction by **2**, like this:

|  |
| --- |
| × 2 |
| http://www.mathsisfun.com/images/left-up-over-arrow.gif |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1 | | **=** | 2 | |
|  | |  | |
| 3 | | 6 | |
| http://www.mathsisfun.com/images/left-under-over-arrow.gif | | |
| × 2 | | |
|  | | |

Important: you multiply **both top and bottom** by the same amount, to keep the value of the fraction the same.

Now the fractions have the same bottom number ("6").

|  |  |  |
| --- | --- | --- |
|  |  |  |
|  |  |  |

The bottom numbers are now the same, so:

**Step 2**: Add the top numbers and put them over the same denominator:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 2 | | | + | | 1 | = | | | 2 + 1 | | | = | | 3 |
|  | | |  |  | | |  |
| 6 | | | 6 | 6 | | | 6 |
|  |  | |  | | | |  | |  | | |
|  |  | |  | | |  | | | |  | | | | |

**Step 3**: Simplify the fraction:

|  |  |  |
| --- | --- | --- |
| 3 | = | 1 |
|  |  |
| 6 | 2 |

* 1. Add: =

=

=

=

=

=

=

*Subtracting Fractions**With Unlike Denominator*

### There are 3 simple steps to subtract fractions

* Step 1. Make sure the bottom numbers (the denominators) are the same
* Step 2. Subtract the top numbers (the numerators). Put the answer over the same denominator.
* Step 3. Simplify the fraction (if needed).

*Example:*

**Step 1**. The bottom numbers are different. We need to make them **the same** before we can continue, because we **can't** subtract them like that.

|  |  |  |
| --- | --- | --- |
| 1 | – | 1 |
|  |  |
| 2 | 6 |

To make the bottom numbers the same, multiply the top and bottom of the first fraction (1/2) by **3** like this:

|  |
| --- |
| × 3 |
| http://www.mathsisfun.com/images/left-up-over-arrow.gif |

|  |  |  |
| --- | --- | --- |
| 1 | = | 3 |
|  |  |
| 2 | 6 |

|  |
| --- |
| http://www.mathsisfun.com/images/left-under-over-arrow.gif |
| × 3 |

**Step 2**. Subtract the top numbers and put the answer over the same denominator:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 3 | – | 1 | = | 3 – 1 | = | 2 |
|  |  |  |  |
| 6 | 6 | 6 | 6 |

**Step 3**. Simplify the fraction:

|  |  |  |
| --- | --- | --- |
| 2 | = | 1 |
|  |  |
| 6 | 3 |

* 1. Subtract:

=

=

=

=

=

*Multiplying Fractions*

### There are 3 simple steps to multiply fractions

1. Multiply the top numbers (the *numerators*).

2. Multiply the bottom numbers (the *denominators*).

3. [Simplify](http://www.mathsisfun.com/simplifying-fractions.html) the fraction if needed.

### *Example*:

|  |  |  |
| --- | --- | --- |
| 1 | × | 2 |
|  |  |
| 2 | 5 |

**Step 1**. Multiply the **top** numbers:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **1** | × | **2** | = | **1 × 2** | = | **2** |
|  |  |  |  |
| 2 | 5 |  |  |

**Step 2**. Multiply the **bottom** numbers:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 1 | × | 2 | = | 1 × 2 | = | 2 |
|  |  |  |  |
| **2** | **5** | **2 × 5** | **10** |

**Step 3**. [Simplify the fraction](http://www.mathsisfun.com/simplifying-fractions.html):

|  |  |  |
| --- | --- | --- |
| 2 | = | 1 |
|  |  |
| 10 | 5 |

* 1. Multiply:

=

=

=

=

=

=

=

=

*Dividing Fractions*

## There are 3 Simple Steps to Divide Fractions:

|  |  |  |
| --- | --- | --- |
| Step 1. Turn the second fraction *(the one you want to divide by)* upside-down  (this is now a [reciprocal](http://www.mathsisfun.com/reciprocal-fraction.html) (*зворотній*)). | | |
| Step 2. [Multiply](http://www.mathsisfun.com/fractions_multiplication.html) the first fraction by that reciprocal  Step 3. [Simplify](http://www.mathsisfun.com/simplifying-fractions.html) the fraction (if needed) |  |  |

### *Example*:

|  |  |  |
| --- | --- | --- |
| 1 | ÷ | 1 |
|  |  |
| 2 | 6 |

Step 1. Turn the second fraction upside-down (it becomes a **reciprocal**):

|  |  |  |
| --- | --- | --- |
| 1 | becomes | 6 |
|  |  |
| 6 | 1 |

Step 2. Multiply the first fraction by that **reciprocal**:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 1 | × | 6 | = | 1 × 6 | = | 6 |
|  |  |  |  |
| 2 | 1 | 2 × 1 | 2 |

Step 3. Simplify the fraction:

|  |  |  |
| --- | --- | --- |
| 6 | = | **3** |
|  |
| 2 |

* 1. Divide:

=

=

=

=

=

=

=

=