



Fractions

ID1050– Quantitative & Qualitative Reasoning

Fractional Form vs. Rational/Irrational Types

- A number's *type* is either rational or irrational
- Any type of number can be expressed in different forms: Decimal, fractional, graphical, etc.
- Examples
 - 'one half': A rational fraction
 - Decimal form: 0.5 (Whole number part separated from fractional part by a decimal point)
 - Fractional form: $\frac{1}{2}$ (A real number over another real number other than zero)
 - 'Square root of two over two': An irrational fraction
 - Decimal form: 0.7071067811865475244008...
 - Fractional form: $\frac{\sqrt{2}}{2}$
- The general form of a fraction: $\frac{A}{B}$ where A and B are any real number (except $B=0$)
- Fractions can also be positive or negative

Fractional Form

- A number in fractional form looks like this: $\frac{A}{B}$
 - The top number is called the *numerator*, the bottom number is called the *denominator*
 - Use the example of coins to remember these.
 - The denominator is the *denomination* or value of the coin: a nickel is worth $\frac{1}{20}$ of a dollar
 - The *number* of coins is the numerator, so three nickels is $\frac{3}{20}$ of a dollar
- You can easily convert *fractional form* to *decimal form* by dividing the *numerator* by the *denominator* on a calculator
- You can also express a number in *mixed form* with a whole number part and a fractional part
 - 'One and two thirds' could be written: $1 \frac{2}{3}$
 - Most fraction calculators can convert mixed form to fractional form
- The decimal form of a number is unique
 - A number has many different fractional forms: 'one half' = $\frac{1}{2} = \frac{2}{4} = \frac{50}{100}$...
 - ...but only one decimal form: 0.5

Operations with Fractions: Addition

- Formula

- When adding fractions $\frac{A}{B}$ and $\frac{C}{D}$, where A , B , C , and D are any real number (except $B=0$ and $D=0$), you can use the following formula:

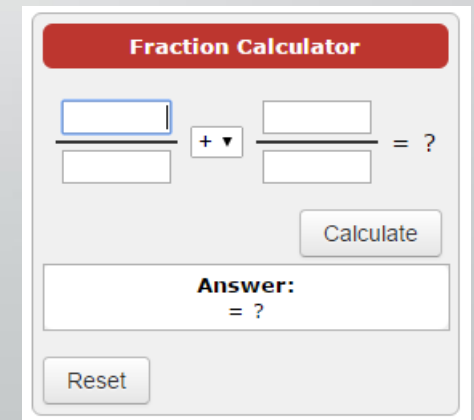
- $$\frac{A}{B} + \frac{C}{D} = \frac{A*D+C*B}{B*D}$$

- TI-30Xa calculator

- This calculator has easy-to-use fraction capabilities. Watch this tutorial to learn how to use these features: <https://www.youtube.com/watch?v=Q32aZTookwk&feature=youtu.be>

- On-line calculator

- There are several fraction calculators available on-line. Here is one:
- <http://www.calculatorsoup.com/calculators/math/fractions.php>
- This is what it looks like ->. Enter the fraction parts and choose the '+' Then press 'Calculate'



The screenshot shows a web-based 'Fraction Calculator' interface. At the top, there is a red header with the text 'Fraction Calculator'. Below the header, there are two input fields for the numerators and two for the denominators, arranged as $\frac{\text{[]}}{\text{[]}} + \frac{\text{[]}}{\text{[]}} = ?$. A dropdown menu with a plus sign and a downward arrow is positioned between the two fractions. To the right of the second fraction is an equals sign followed by a question mark. Below the input fields is a 'Calculate' button. Underneath the 'Calculate' button is a box labeled 'Answer:' followed by '= ?'. At the bottom left of the interface is a 'Reset' button.

Operations with Fractions: Subtraction

- Formula

- When subtracting fractions $\frac{A}{B}$ and $\frac{C}{D}$, you can use the addition formula, but replace the *addition* in the numerator with *subtraction*:

- $$\frac{A}{B} - \frac{C}{D} = \frac{A*D - C*B}{B*D}$$

- TI-30Xa calculator

- Same as addition, but use the subtraction button instead of the addition button

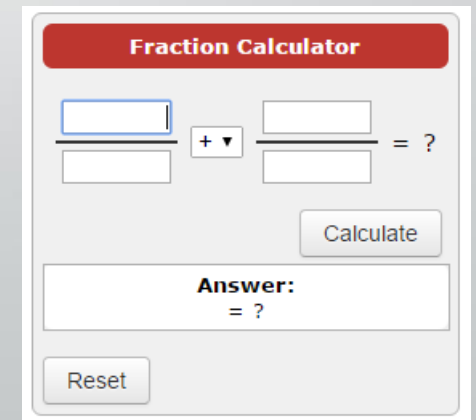
- On-line calculator

- Same as addition, but choose the '-' operation between the numbers

The image shows a screenshot of an online "Fraction Calculator" interface. At the top, there is a red header with the text "Fraction Calculator". Below the header, there are two input fields for fractions, each consisting of a numerator box and a denominator box. Between these two fraction inputs is a dropdown menu currently showing a plus sign (+). To the right of the second fraction input is an equals sign followed by a question mark. Below the input fields is a "Calculate" button. Underneath the "Calculate" button is a box labeled "Answer:" followed by an equals sign and a question mark. At the bottom left of the interface is a "Reset" button.

Operations with Fractions: Multiplication

- Formula
 - When multiplying fractions $\frac{A}{B}$ and $\frac{C}{D}$, you can use the multiplication formula:
 - $\frac{A}{B} * \frac{C}{D} = \frac{A*C}{B*D}$
- TI-30Xa calculator
 - Same as addition, but use the multiplication button instead of the addition button
- On-line calculator
 - Same as addition, but choose the 'x' operation between the numbers



The image shows a screenshot of an online "Fraction Calculator" interface. At the top, there is a red header with the text "Fraction Calculator". Below the header, there are two fraction input fields. The first field has a numerator box and a denominator box. Between the two fraction fields is a dropdown menu currently showing a plus sign (+) and a downward arrow. To the right of the second fraction field is an equals sign followed by a question mark. Below the input fields is a "Calculate" button. At the bottom of the interface, there is a box labeled "Answer:" followed by an equals sign and a question mark. Below that is a "Reset" button.

Operations with Fractions: Division

- Formula

- When dividing fractions $\frac{A}{B}$ and $\frac{C}{D}$, you can use the division formula:

- $$\frac{A}{B} \div \frac{C}{D} = \frac{A \cdot D}{B \cdot C}$$

- Another method is 'copy-dot-flip'. 'Copy', or write down, the first fraction. 'Dot', or multiply it, by the 'flip' of the second fraction with numerator and denominator reversed.

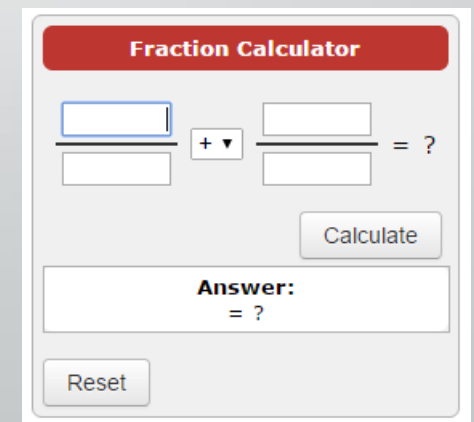
- Like this:
$$\frac{A}{B} \cdot \frac{D}{C} = \frac{A \cdot D}{B \cdot C}$$

- TI-30Xa calculator

- Same as addition, but use the division button instead of the addition button

- On-line calculator

- Same as addition, but choose the ' \div ' operation between the numbers



The image shows a digital interface for a fraction calculator. At the top, there is a red header with the text "Fraction Calculator". Below this, there are two input fields for fractions, each consisting of a numerator box and a denominator box. Between these two fraction inputs is a dropdown menu currently showing a plus sign (+) and a downward arrow. To the right of the second fraction is an equals sign followed by a question mark. Below the input fields is a "Calculate" button. At the bottom of the interface, there is a box labeled "Answer:" followed by an equals sign and a question mark. Below the answer box is a "Reset" button.

Conclusion

- Fractions are just a form of expressing any real number
- Fractions can be either rational or irrational, positive or negative
- There are many tools to find the result of mathematical operations with fractions
- There are many fractional forms of a number but only one decimal form