Fractions

ID1050– Quantitative & Qualitative Reasoning

Fractional Form vs. Rational/Irrational Types

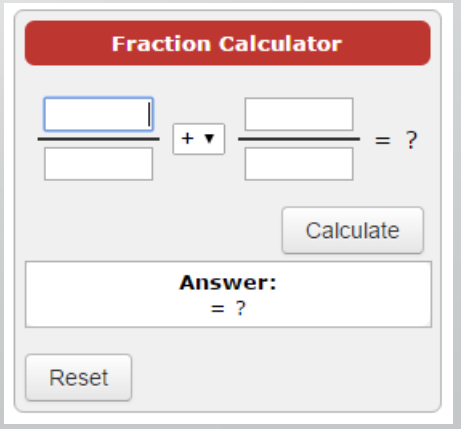
- A number's *type* is either rational or irrational
- Any type of number can be expressed in different forms: Decimal, fractional, graphical, etc.
- Examples
  - 'one half': A rational fraction
    - Decimal form: 0.5 (Whole number part separated from fractional part by a decimal point)
    - Fractional form: ½ (A real number over another real number other than zero)
  - 'Square root of two over two': An irrational fraction
    - Decimal form: 0.70710678118654752440 08…
    - Fractional form: $\frac{\sqrt{2}}{2}$
- The general form of a fraction: $\frac{A}{B}$ where A and B are <u>any</u> 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, t*he 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 1/20 of a dollar
    - The *number* of coins is the numerator, so three nickels is 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' = ½ = 2/4 = 50/100 …
  - …but only one decimal form: 0.5

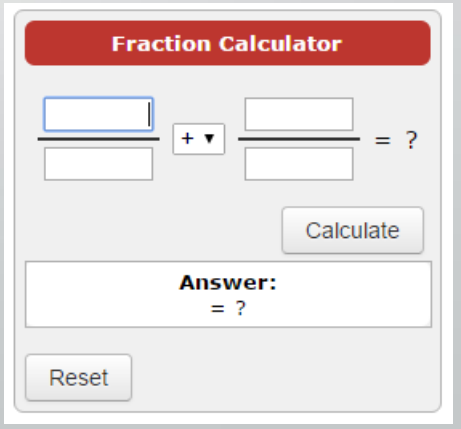
Operations with Fractions: Addition

- 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'



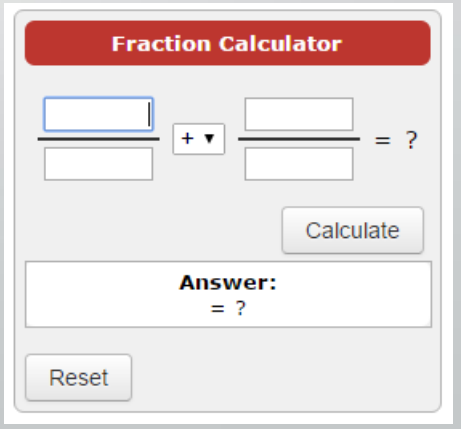
Operations with Fractions: Subtraction

- 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



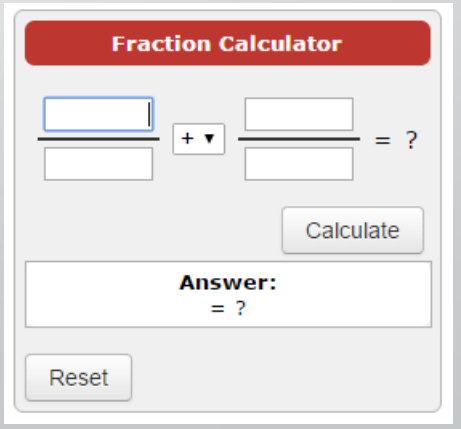
Operations with Fractions: Multiplication

- 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



Operations with Fractions: Division

- Formula
  - When dividing fractions $\frac{A}{B}$ and $\frac{C}{D}$, you can use the division formula:
  - $\frac{A}{B} \div \frac{C}{D} = \frac{A*D}{B*C}$
  - 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: $\frac{A}{B} \cdot \frac{D}{C} = \frac{A*D}{B*C}$
- 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 '÷' operation between the numbers



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