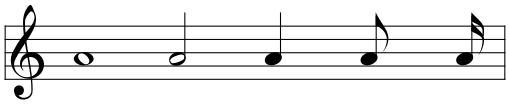
# Rhythmetic

Sheet Music Basics for Mathematics Teachers

**What is Rhythmetic?** Fractions you can hear. Rhythm you can calculate. Rhythmetic turns sheet music into mathematics, and mathematics into music — no musical training required. By reading rhythm as fraction arithmetic, every bar of sheet music becomes an equation to solve, and every note value becomes a fraction with meaning. This sheet gives you the minimum musical background needed to bring Rhythmetic into your classroom.

## Note Values

Every note has a **shape** that determines how long it is held. Durations are always expressed relative to the *whole note*, which is the longest standard note. Each step down the table halves the duration.



| | Whole | Half | Quarter | Eighth | Sixteenth |
|---|---|---|---|---|---|
| **Beats** | 4 | 2 | 1 | $\frac{1}{2}$ | $\frac{1}{4}$ |
| **Fraction** | 1 | $\frac{1}{2}$ | $\frac{1}{4}$ | $\frac{1}{8}$ | $\frac{1}{16}$ |

The key arithmetic relationship is:

$$1 \text{ whole} = 2 \text{ halves} = 4 \text{ quarters} = 8 \text{ eighths} = 16 \text{ sixteenths}.$$

## The Staff and Barlines

Music is written on a **staff** of five horizontal lines. The staff is divided into **bars** (also called measures) by vertical **barlines**. Every bar must contain *exactly* the number of beats specified by the time signature. This is the central rule that makes bar-completion exercises work as fraction problems.

## The Time Signature

At the start of a piece, two numbers are stacked vertically (like a fraction, but without a dividing line). This is the **time signature**.

| Number | Meaning |
|---|---|
| Top number | How many beats are in each bar |
| Bottom number | Which note value gets one beat (4 = quarter note, 8 = eighth note) |

**Examples.**

- $\frac{4}{4}$: four quarter-note beats per bar — the most common time signature.
- $\frac{3}{4}$: three quarter-note beats per bar — characteristic of a waltz.
- $\frac{6}{8}$: six eighth-note beats per bar — each bar totals $\frac{6}{8} = \frac{3}{4}$ of a whole note.

## Dotted Notes

A **dot** placed after a note increases its duration by half:

$$\text{dotted note} = \text{note} + \tfrac{1}{2} \times \text{note} = \tfrac{3}{2} \times \text{note}.$$

| Note | Duration | Calculation |
|---|---|---|
| Dotted half | 3 beats | $2 + 1 = 3$ |
| Dotted quarter | $\frac{3}{2}$ beats | $1 + \frac{1}{2} = \frac{3}{2}$ |
| Dotted eighth | $\frac{3}{4}$ beats | $\frac{1}{2} + \frac{1}{4} = \frac{3}{4}$ |

## The Mathematical Core

Every bar is a fraction equation. Given a time signature $\frac{n}{d}$, the sum of all note and rest values in a bar must satisfy:

$$\sum_i n_i = \frac{n}{d}$$

where each $n_i$ is the $i$-th note value. Bar-completion exercises ask students to find a missing term in this sum — making sheet music a direct and visual context for fraction arithmetic.