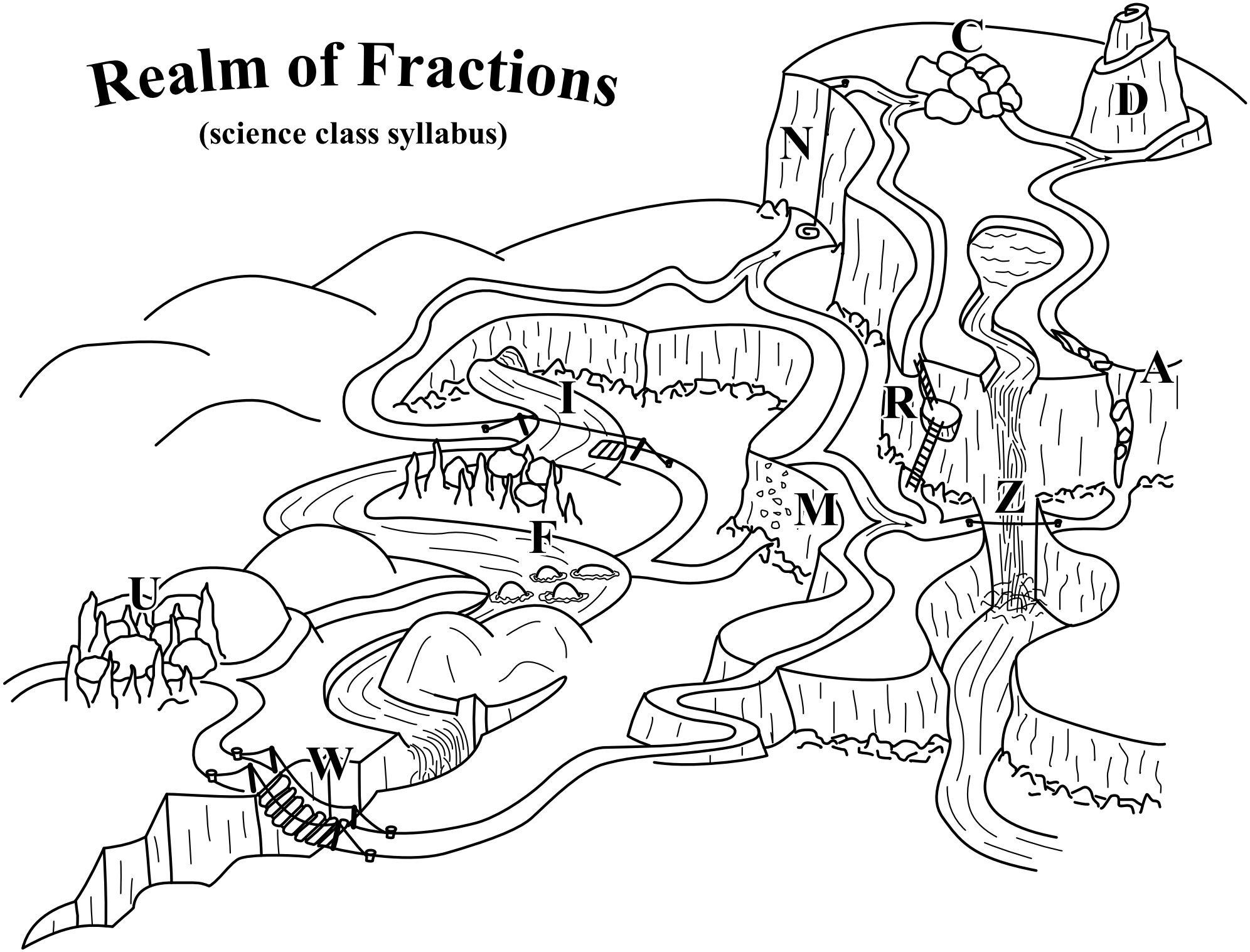
Realm of Fractions

(science class syllabus)



Realm of Fractions

Each obstacle on the map shows one particular skill that we need to learn in this unit. The map shows that we must get through some of the obstacles in order to reach others. In the same way, there are some skills for dealing with fractions that we need to master before we can move on to others. Where a pair of arrows come together in the road, this means that it is necessary to open up the road coming from both directions before we can continue on.

We start our journey by finding our way through the **Forest of Unit Parts**. Here, we learn what is meant by a "third" or a "fifth" of something, and figure out how to split up both picture and number units into equal parts. The number that gives the parts their name is called a "denominator", Latin for "namer."

Next, we will cross the **Ford of Fractions**. When a measurement takes more than one of a particular unit part, it is a **fraction**. An example would be "five eighths of a gallon" - that is, a gallon split into eight parts, of which five are filled. The number of pieces is called the "numerator", Latin for "numberer."

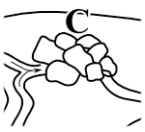
To cross the **Rift of Parts of Parts**, we need to be able to figure out what happens when I split a unit into parts, and then split each of those parts again. What does a half of a third of a unit mean? Once I know the secret, the prime factorization of the denominator tells me how to split up a unit as accurately as possible.

As we scramble up the **Crags of Mixed Numbers**, we will add one more number to our way of writing fractional measurements. A whole number written before the fraction means that I have that many whole units, followed by some fraction of a unit. A "mixed number" like this is our most general-purpose way of writing measurements.

Crossing back over the river on the **Improper Fraction Ferry**, we will discover that a fraction need not always be smaller than its unit. If the numerator is larger than the denominator, then I have more parts than I get out of one unit, and so I need to split up more than one unit in order to create that fraction. Each unit still splits into the number of pieces named by the denominator.

Now it is time to tackle the **Mixed Improper Cliffs**, putting together what we learned about both mixed numbers and improper fractions. We can bring our understanding of mixed numbers closer to perfection by allowing the fraction part to be improper. The challenge then is figuring out what that would look like and how it would be used.

Connecting back at last to the purpose of the unit, we make our way up the **Ascent of Measurement**. Here we discover that breaking up a unit into fractional parts allows us to accurately measure real-world things - things that don't line up nicely with the end of a unit. We also learn why halves, quarters, and eighths are preferred as the most accurate way to break down units.



As we squeeze our cautious way through the caves under the **Boulders of Conversion**, we will discover tricks for changing the form of mixed numbers. We can rewrite it with a different whole number or denominator, without changing its size. Using a picture of what a mixed number looks like, we change how the units are broken up, while being careful not to change how much is filled in.

A side trip now takes us across the perilous **Crazy Fraction Canyon**, where we encounter - and defeat - such monsters as $2\,^{5\,3}/_{2}/_{3}$ foot. Replacing the numerator with a mixed number challenges and broadens our understanding of the meaning of a mixed number. This also prepares us to apply what we know about mixed numbers to combine units as we did in the Measurement unit.

Climbing up through the **Cleft of Addition** is a bit like caving in the open air, as we squeeze past the jumble of lodged boulders and inch our way up between opposing cliffs. We learn that any combination of related units can be assembled into a single number. Of course, that number might still be a little crazy.

Our journey ends at the **Spire of Common Denominators**, where we learn how to add together any set of fractions and combine any measurements. The trick is to convert all the fractions into a form where their denominator, the size of parts they are made up of, is the same. They can then be added just like any measurements that have the same units.