FRACTIONS

Math Teaching for Learning:

Comparing Fractions across the K-12 Mathematics Curriculum

Within the *Fractions Learning Pathways*, five cells specify the foundational actions that support student understanding of comparing fractions. This support document is intended to provide a K-12 perspective on the role of comparing fractions in students' learning.

Comparing fractions involves determining which fraction is greater (or less) than others, determining whether fractions are equal and placing a group of fractions in order. Density and equivalency and are important concepts included in comparing fractions.

Beyond direct compare and order tasks, students use their knowledge of comparing fractions in contexts across the strands and grades. Students compare fractions when they compare slopes of lines or probabilities. Other examples of comparing fractions occur in trigonometry when students learn that there are relationships between the value of the trigonometric ratio and the size of the angle. The exploration of limits includes consideration of the impact of decreasing denominators.

What does this look like in the Ontario Curriculum?

Grade 2: tell and write time to the quarter-hour, using demonstration digital and analogue clocks.

Grade 7: use fractions to describe reductions in dilatation and in reducing two-dimensional shapes to create similar figures.

Grade 10: determine, through investigation, the relationship between the ratio for two sides in a right triangle and the ratio of the two corresponding sides in a similar triangle, and define the sine, cosine, and tangent ratios.(MFM 2P, MPM 2D; and related concepts in MAP 4C)

Typically, when students compare with fractions with unlike units, such as $\frac{2}{5}$ and $\frac{4}{3}$, they might have been told that they need to find a common denominator. However, students can use a range of strategies to compare fractions, including representations, benchmarks, unit fractions, common numerators or common denominators. For example, a student may reason that $\frac{4}{3}$ is greater than 1 and $\frac{2}{5}$ is less than 1 so $\frac{4}{3}$ must be greater than $\frac{2}{5}$. For more information about the range of strategies for comparing fractions, see *Math Teaching for Learning: Building Understanding of Equivalence*.

What does this look like in the Ontario Curriculum?

Grade 2: compare fractions using concrete materials.

Grade 4: compare and order fractions by considering the size and the number of fractional parts.

Grade 9: identify, through investigation, properties of the slopes of lines and line segments, using graphing technology to facilitate investigations, where appropriate.

Grade 11: determine if two given algebraic expressions are equivalent (MCR 3U)

Density of Fractions

Unlike whole numbers, there are an infinite number of fractions between any two numbers. This is referred to as density of fractions. Students apply this when they further partition a unit fraction to create a smaller unit fraction.

What does this look like in the Ontario Curriculum?

Grade 2: determine, through investigation using concrete materials, the relationship between the number of fractional parts of a whole and the size of the fractional parts.

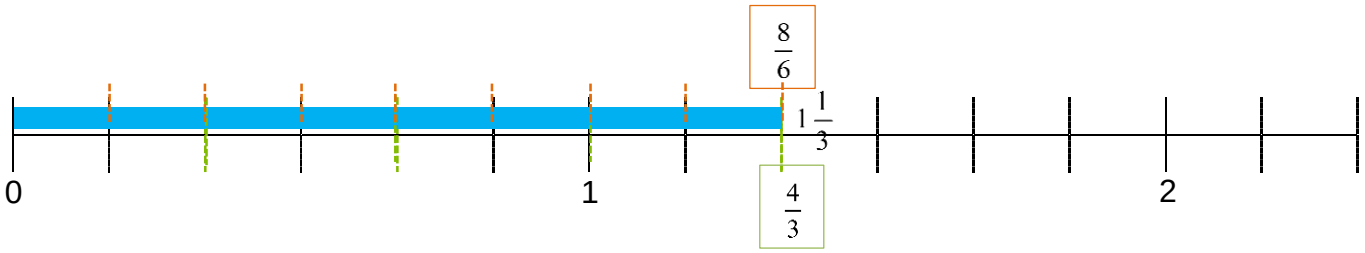
Grade 7: determine and explain, through investigation using concrete materials, drawings and calculators, the relationships among fractions, decimal numbers, and percents.

Grade 12: recognize, through investigation with or without technology, graphical and numerical examples of limits, and explain the reasoning involved. (MCV 4U)

Recognizing Equivalent Fractions

Equivalent fractions are merely different ways of describing the same quantity. Since any fraction can be further partitioned into smaller fractions, different fractional units (denominators) can be used to name the same quantity.

Students should have ample experience with equi-partitioning models using a variety of fractional units to name the same quantity before they become reliant solely on manipulation of symbolic representations. For example, students can see that the following fractions are all equal:



In junior and intermediate grades, students extend beyond equivalence of fractions to equivalence across number systems, including decimals and integers. In secondary school, students extend this knowledge to ratios and algebraic expressions. In senior grades, students learn about radian measure, where the whole is 2π. In a similar fashion to the number line example above, they will partition 2π into halves, thirds, fourths, and sixths on a Cartesian Plane.

What does this look like in the Ontario Curriculum?

Grade 1: divide whole objects into parts and identify and describe, through investigation, equal-sized part of the whole, using fractional names.

Grade 4: demonstrate and explain the relationship between equivalent fractions, using concrete materials and drawings

Grade 8: translate between equivalent forms of a number

Grade 11: determine if two given algebraic expressions are equivalent (MCR 3U)

For further information, visit *fractionsteaching.ca*

- *Math Teaching for Learning: Building Understanding of Equivalence*
- *Fractions Learning Pathways* (comparing fractions tasks and supporting documents)
- *Paying Attention to K-12 Fractions*