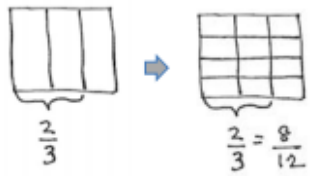
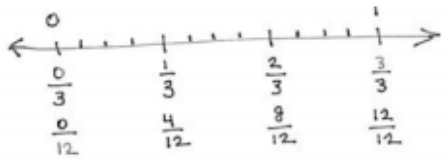
Grade 5 Module 3
Addition and Subtraction of Fractions

TOPIC A: Equivalent Fractions

- students revisit the foundational Grade 4 standards addressing equivalence. When equivalent, fractions represent the same amount of area of a rectangle, the same point on the number line. These equivalencies can also be represented symbolically





$$\frac{2}{3}=\frac{2\times 4}{3\times 4}=\frac{8}{12}$$

- Furthermore, equivalence is evidenced when adding fractions with the same denominator. The sum may be decomposed into parts (or re-composed into an equal sum). For example:

$$\frac{2}{3}=\frac{1}{3}+\frac{1}{3}$$

$$\frac{7}{8}=\frac{3}{8}+\frac{3}{8}+\frac{1}{8}$$

$$\frac{6}{2}=\frac{2}{2}+\frac{2}{2}+\frac{2}{2}=1+1+1=3$$

$$\frac{8}{5}=\frac{5}{5}+\frac{3}{5}=1\frac{3}{5}$$

$$\frac{7}{3}=\frac{6}{3}+\frac{1}{3}=2\times\frac{3}{3}+\frac{1}{3}=2+\frac{1}{3}=2\frac{1}{3}$$

- This is also carrying forward work with decimal place value from Modules 1 and 2, confirming that like units can be composed and decomposed.

5 tenths + 7 tenths = 12 tenths = 1 and 2 tenths
5 eighths + 7 eighths = 12 eighths = 1 and 4 eighths

TOPIC B: Making Like Units Pictorial

- students move forward to see that fraction addition and subtraction is analogous to whole number addition and subtraction. Students add and subtract fractions with unlike denominators by replacing different fractional units with an equivalent fraction or like unit.

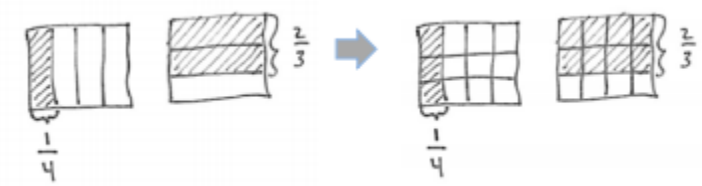
1 fourth + 2 thirds = 3 twelfths + 8 twelfths = 11 twelfths

$$\frac{1}{4}+\frac{2}{3}=\frac{3}{12}+\frac{8}{12}=\frac{11}{12}$$

- This is not a new concept but certainly a new level of complexity. Students have added equivalent or like units since kindergarten, adding frogs to frogs, ones to ones, tens to tens, etc.

1 boy + 2 girls = 1 child + 2 children = 3 children
1 liter – 375 mL = 1,000 mL – 375 mL = 625 mL

- uses the rectangular fractional model because it is useful for creating smaller like units via partitioning (e.g., thirds and fourths are changed to twelfths to create equivalent fractions as in the diagram below.)

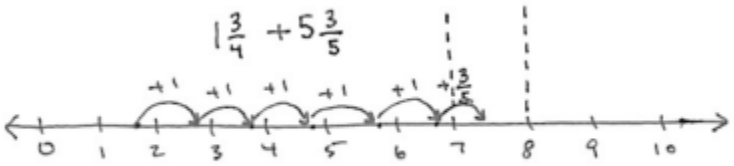


TOPIC C: Making Like Units Numerically

- students move away from the pictorial altogether as they are empowered to write equations clarified by the model

$$\frac{1}{4}+\frac{2}{3}=\left(\frac{1\times 3}{4\times 3}\right)+\left(\frac{2\times 4}{3\times 4}\right)=\frac{3}{12}+\frac{8}{12}=\frac{11}{12}$$

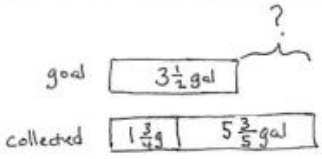
- also uses the number line when adding and subtracting fractions greater than or equal to 1 so that students begin to see and manipulate fractions in relation to larger whole numbers and to each other. The number line takes fractions into the larger set of whole numbers. For example, “Between what two whole numbers will the sum of 1 ¾ and 5 3/5 lie?”



$\_\_\_ < 1\frac{3}{4} + 5\frac{3}{5} < \_\_\_$

This leads to understanding of and skill with solving more interesting problems, often embedded within multi-step word problems:

Cristina and Matt’s goal is to collect a total of 3 ½ gallons of sap from the maple trees. Cristina collected 1 ¾ gallons. Matt collected 5 $^{3}/_{5}$ gallons. By how much did they beat their goal?



$$1\frac{3}{4}\ \text{gal} + 5\frac{3}{5}\ \text{gal} - 3\frac{1}{2}\ \text{gal} = 3 + \left(\frac{3\times 5}{4\times 5}\right) + \left(\frac{3\times 4}{5\times 4}\right) - \left(\frac{1\times 10}{2\times 10}\right)$$

$$= 3 + \frac{15}{20} + \frac{12}{20} - \frac{10}{20} = 3\frac{17}{20}\ \text{gal}$$

Cristina and Matt beat their goal by 3 $^{17}/_{20}$ gallons.

Word problems are part of every lesson. Students are encouraged to draw bar diagrams, which allow analysis of the same part–whole relationships they have worked with since Grade 1.

TOPIC D: Further Applications

- students strategize to solve multi-term problems and more intensely assess the reasonableness both of their solutions to word problems and their answers to fraction equations
    - “I know my answer makes sense because the total amount of sap they collected is going to be about 7 and a half gallons. Then, when we subtract 3 gallons, that is about 4 and a half. Then, 1 half less than that is about 4. 3 17/20 is just a little less than 4.”