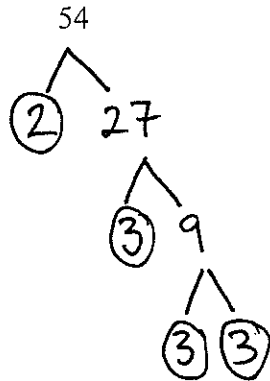


Math Workshop – FRACTIONS

1. *Prime Factorization* is key! Let's review how to write out the prime factorization of a number.



$$54 = 2 \cdot 3 \cdot 3 \cdot 3$$

2. *Reducing Fractions.* Use the prime factorization of a number to reduce a fraction. Write out the prime factors of the numerator and then the prime factors of the denominator. Cancel out all the numbers that are common between the numerator and the denominator.

$$\frac{54}{66} = \frac{\cancel{2} \cdot \cancel{2} \cdot 3 \cdot 3}{\cancel{2} \cdot \cancel{2} \cdot 11} = \frac{3 \cdot 3}{11} = \frac{9}{11}$$

Now try to reduce the following fractions:

$$\frac{27}{63}$$

$$\frac{21}{56}$$

$$\frac{32}{48}$$

$$\frac{210}{112}$$

$$\frac{120}{98}$$

3. *Multiplying fractions.* This is the easiest operation. Multiply straight across and then use the same process as above to reduce the fraction to lowest terms. OR you can write the prime factorization of both the numerator and denominator first, and then cancel out terms before you multiply.

$$\frac{15}{8} \cdot \frac{20}{21} = \frac{\cancel{3} \cdot 5}{2 \cdot 2 \cdot 2} \cdot \frac{\cancel{2} \cdot \cancel{2} \cdot 5}{\cancel{3} \cdot 7} = \frac{5 \cdot 5}{2 \cdot 7} = \frac{25}{14}$$

Now try the following:

$$\frac{18}{20} \cdot \frac{36}{99}$$

$$20 \cdot \frac{11}{12}$$

$$\frac{6}{15} \cdot \frac{5}{16}$$

4. *Dividing fraction.* A little harder than multiplying, but very similar. Multiply by the reciprocal of the second fraction and then use the same process as above to reduce the fraction to lowest terms.

$$\frac{33}{20} \div \frac{22}{15} = \frac{33}{20} \cdot \frac{15}{22} = \frac{3 \cdot \cancel{11}}{2 \cdot 2 \cdot \cancel{2}} \cdot \frac{3 \cdot \cancel{5}}{2 \cdot \cancel{11}} = \frac{3 \cdot 3}{2 \cdot 2 \cdot 2} = \frac{9}{8}$$

Now try the following:

$$\frac{4}{15} \div \frac{8}{13}$$

$$\frac{13}{84} \div \frac{3}{16}$$

$$\frac{25}{128} \div \frac{5}{32}$$

5. *Adding & Subtracting Fractions.* These are the hardest types of fraction problems.

Follow these steps:

- Write the denominator of both fractions as the product of its prime factors.
- From there, determine the LCD (Least Common Denominator).
- Multiply by a version of one (a number over itself) in order to make both denominators look like your LCD.
- Multiply the numerators together and write the sum or difference over one denominator.
- Add or subtract your new numerators.
- Reduce the fraction using the same process as above.

$$\frac{25}{28} - \frac{55}{42} = \frac{25}{2 \cdot 2 \cdot 7} - \frac{55}{2 \cdot 3 \cdot 7} \overset{\boxed{3}}{\underset{\boxed{3}}{=}} \frac{25}{2 \cdot 2 \cdot 7} - \frac{55}{2 \cdot 3 \cdot 7} \overset{\boxed{2}}{\underset{\boxed{2}}{=}} \frac{75 - 110}{2 \cdot 2 \cdot 3 \cdot 7}$$

$$\boxed{LCD: 2 \cdot 2 \cdot 3 \cdot 7}$$

$$= \frac{-35}{2 \cdot 2 \cdot 3 \cdot 7} = \frac{-1 \cdot 5 \cdot \cancel{7}}{2 \cdot 2 \cdot 3 \cdot \cancel{7}} = \frac{-1 \cdot 5}{2 \cdot 2 \cdot 3} = -\frac{5}{12}$$

Now try the following:

$$\frac{7}{12} + \frac{5}{18}$$

$$\frac{5}{8} - \frac{3}{20}$$

$$\frac{9}{28} - \frac{3}{40}$$

$$\frac{2}{3} + \frac{4}{45} + \frac{4}{5}$$

$$\frac{13}{24} - \frac{1}{6}$$

$$4 - \frac{3}{16}$$