Grade 9

NUMBER SENSE AND NUMERATION: RATIONALS

Play the **Fish Tank** game first! Levels 2 and 3 are recommended.
Click on *http://www.bbc.co.uk/education/mathsfile/shockwave/games/fish.html* or
go to *www.wiredmath.ca* for the link.

> **Remember...**
> $$\frac{-m}{n} = \frac{m}{-n} = -\frac{m}{n} = -\frac{-m}{-n}$$
> where $n \neq 0$.

1. List the rational numbers $-1\frac{1}{4}, \frac{-3}{-5}, \frac{-13}{10}, \frac{-11}{10}$ in ascending order.

2. Mark the location of each of the rational numbers $-1\frac{1}{8}, \frac{-3}{-4}, -\frac{17}{2}, -1, \frac{-11}{16}$ on a number line.

3. Write either > or < between each pair of fractions.

    a. $\frac{7}{8} \quad \frac{9}{10}$

    b. $\frac{21}{12} \quad \frac{17}{10}$

    c. $\frac{-6}{7} \quad -\frac{-5}{-6}$

    d. $-\frac{42}{35} \quad -\frac{4}{3}$

4. Determine which of the fractions $\frac{3}{8}, \frac{4}{5}, \frac{31}{40}, \frac{9}{20}, \frac{7}{10}$ is greater than $\frac{1}{2}$ and less than $\frac{3}{4}$.

5. Simplify each of the following. Reduce to lowest terms.

    a. $\frac{1}{3} \times \frac{1}{4}$

    b. $\frac{7}{8} \times 16$

    c. $3\frac{2}{3} \times \left(-4\frac{1}{11}\right)$

    d. $\frac{-24}{5} \times \frac{15}{-16} \times \frac{-12}{-8}$

    e. $\frac{8}{15} \div \frac{4}{9}$

    f. $-8 \div \frac{2}{3}$

    g. $6\frac{3}{4} \div \frac{-1}{4}$

    h. $\left(-5\frac{1}{4}\right) \div 3\frac{3}{8}$

    i. $\frac{7}{3} - \frac{3}{4}$

    j. $\frac{18}{7} - \frac{16}{5}$

    k. $\frac{-3}{4} + \frac{5}{12} - \frac{7}{6}$

    l. $2\frac{3}{4} - \frac{-3}{5} + \frac{-7}{-8}$

Expectation: simplify numerical expressions involving rational numbers. *For more activities and resources from the University of Waterloo's Faculty of Mathematics, please visit* www.cemc.uwaterloo.ca.

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6. A sign painter is to centre a 12-letter word on a 15-foot signboard. Each letter is to be three-fifths of a foot wide and there is to be one-fifth of a foot between consecutive letters. Determine the number of feet left at each end of the board.

7. The sum of the numbers in each row, column, and diagonal is $-\dfrac{1}{4}$.

   Complete the magic square.

$\dfrac{1}{6}$	$-\dfrac{5}{12}$	
	$\dfrac{1}{4}$	

8. Simplify each of the following.

   a. $\dfrac{\dfrac{3}{5}+\dfrac{2}{15}}{\dfrac{3}{4}+\dfrac{3}{10}}$

   b. $\dfrac{\dfrac{2}{3}-\dfrac{1}{6}+\dfrac{5}{8}}{\dfrac{5}{3}-\dfrac{3}{2}}$

   c. $\dfrac{\dfrac{-3}{8}-\dfrac{5}{-6}}{\dfrac{-2}{-3}+\dfrac{1}{6}-\dfrac{3}{-4}}$

9. Use the order of operations to simplify the following.

   a. $\dfrac{-3}{4}\left(-\dfrac{2}{9}-\dfrac{1}{2}\right)$

   b. $-\dfrac{5}{8}-1\dfrac{1}{3}\div\left(\dfrac{-5}{6}\right)$

   c. $\dfrac{5}{-9}\div 2\dfrac{1}{2}+\left(-\dfrac{3}{14}\right)\times 3\dfrac{1}{2}$

   d. $\dfrac{4}{21}\times\left(\dfrac{3}{8}+\dfrac{1}{2}\right)+8\dfrac{1}{4}\div\left(\dfrac{5}{2}-\dfrac{2}{3}\right)$

   e. $3\dfrac{1}{4}\times\dfrac{-12}{39}\div\left[\dfrac{2}{3}+\left(-1\dfrac{5}{6}\right)\right]$

10. Your investment club shares its earnings. The president receives half of the money. The vice-president gets a quarter of the remainder. Then, the secretary gets one-third of what is left. Finally, the treasurer and you share what is left equally. Your share is $300. Calculate the investment club's total earnings.

TRY THESE!

Adding mixed numbers with the same denominator
www.aaamath.com/B/fra66dx2.htm#pgtp

Dividing Fractions
http://www.aaamath.com/B/fra66ox2.htm

SKILLS CHALLENGE!

11.   If $a \wp b = \dfrac{a}{b} + \dfrac{b-a}{a}$ where $a \neq 0$, $b \neq 0$, then determine the value of $5 \wp 3$.

12.   Simplify $\dfrac{\dfrac{4}{3} - \dfrac{5}{4} + \dfrac{\dfrac{5}{6} - \dfrac{3}{4}}{\dfrac{1}{2}}}{\dfrac{3}{\dfrac{1}{2} + \dfrac{1}{4}} - 2}$.

Did You Know?

The number of days in a year isn't exactly 365. In fact, it's closer to…

$$365 + \frac{1}{4} - \frac{1}{300} - \frac{29}{6498}$$
$$= 365.242\,203\,8 \text{ days}$$

13.

TRY THIS FRACTIONS PROBLEM!

There are many numbers from 1 to 1000 whose sum of its digits is 4. For example, 310, has a sum of 4 for its digits $(3 + 1 + 0 = 4)$. If there are b numbers with this property and a of these are prime numbers, then determine the value of $\dfrac{a}{b}$.

EXTENSION!

14.   The fraction $\dfrac{37}{13}$ can be written in the form $2 + \dfrac{1}{x + \dfrac{1}{y + \dfrac{1}{z}}}$. Determine the value of $x + y + z$.