Properties of Rational Numbers

1) **Associative property**: While multiplying, any three rational numbers can be _____ in any order, and yet their _____ remains the same.

2) Which of the following demonstrates the associative property of **multiplication** for any three rational numbers $\frac{a}{b}$, $\frac{c}{d}$ and $\frac{e}{f}$?

a) $\frac{a}{b} \times \left(\frac{c}{d} \times \frac{e}{f}\right) = \frac{c}{d} \div \left(\frac{a}{b} \div \frac{e}{f}\right)$

b) $\frac{a}{b} \div \left(\frac{c}{d} \times \frac{e}{f}\right) = \left(\frac{a}{b} \div \frac{c}{d}\right) \times \frac{e}{f}$

c) $\frac{a}{b} \times \left(\frac{c}{d} \times \frac{e}{f}\right) = \left(\frac{a}{b} \times \frac{c}{d}\right) \times \frac{e}{f}$

d) $\frac{a}{b} \times \frac{c}{d} = \frac{e}{f} \div \frac{a}{b}$

3) Which expression demonstrates the associative property of multiplication for rational numbers $\frac{-2}{3}$, $\frac{5}{9}$ and $\frac{8}{11}$?

a) $\left(\frac{-2}{3} \times \frac{5}{9}\right) \times \frac{8}{11} = \frac{5}{9} \div \left(\frac{-2}{3} \div \frac{8}{11}\right)$

b) $\left(\frac{-2}{3} \times \frac{5}{9}\right) \times \frac{8}{11} = \left(\frac{-2}{3}\right) \times \left(\frac{5}{9} \times \frac{8}{11}\right)$

c) $\left(\frac{-2}{3} \div \frac{5}{9}\right) \times \frac{8}{11} = \frac{5}{9} \times \left(\frac{-2}{3} \div \frac{8}{11}\right)$

d) $\frac{-2}{3} \times \frac{5}{9} = \frac{5}{9} \times \frac{8}{11}$

4) Verify: $\frac{1}{3}, \frac{2}{7}, \frac{4}{5}$ follows the associative property of **multiplication**

$\frac{1}{3} \times \left(\frac{2}{7} \times \frac{4}{5} \right) = \frac{1}{3} \times \frac{(2 \times 4)}{(7 \times 5)}$ $= \frac{1}{3} \times \frac{8}{35}$ $\quad$ = ---------	$\left(\frac{1}{3} \times \frac{2}{7} \right) \times \frac{4}{5} = \frac{(1 \times 2)}{(3 \times 7)} \times \frac{4}{5}$ $= \frac{2}{21} \times \frac{4}{5}$ $\quad$ = ---------
Product = ---------	*Product =* ---------
associative property of **multiplication** *is verified* _____	

5) *For every non-zero rational number* $\frac{a}{b}$ *has its* **multiplicative**

inverse $\frac{b}{a}$. *Thus,* $\frac{a}{b} \times \frac{b}{a} = \frac{b}{a} \times \frac{a}{b} =$ _____ .

6) *The multiplicative inverse is also known as* **reciprocal** *of a number.*

Thus, the **reciprocal** *of* $\frac{a}{b}$ *is* $\qquad$ a) 1 $\qquad$ b) $\frac{-a}{b}$ $\qquad$ c) 0 $\qquad$ d) $\frac{b}{a}$

7) *Zero has* **no** *reciprocal* $\qquad$ a) yes $\qquad$ b) no

8) *Match the following* **multiplicative inverse** *for rational number*

a) **0** $\qquad\qquad\qquad\qquad$ $\frac{11}{19}$

b) $\frac{-4}{7}$ $\qquad\qquad\qquad\qquad$ $\frac{1}{0}$ (*unknown*)

c) $\frac{19}{11}$ $\qquad\qquad\qquad\qquad$ $\frac{-7}{4}$