Name: ..... Date .....

GAYAZA HIGH SCHOOL

S.2 MATH WORKSHEET TWO

ORDER OF OPERATIONS WITH FRACTIONS

(BODMAS)

PREREQUISITE KNOWLEDGE

- LCM OR EQUIVALENT FRACTIONS
- ADDITION AND SUBTRACTION OF FRACTIONS
- MULTIPLICATION AND DIVISION OF FRACTIONS

Order of Operations (BODMAS)

1. Do all operations inside parentheses (brackets) and other grouping symbols.

2. Evaluate orders e.g. exponents, powers, etc. commonly known as **"of"**

3. Multiply and divide from left to right.

4. Add and subtract from left to right.

Example 1

Solve: $\frac{1}{3} \times \left(\frac{2}{3}\right)^2 - \frac{1}{9}$

There are no operations inside parentheses so evaluate the exponents first.

$= \frac{1}{3} \times \left(\frac{2}{3} \times \frac{2}{3}\right) - \frac{1}{9}$

$= \frac{1}{3} \times \frac{4}{9} - \frac{1}{9}$

Multiply next

$= \frac{4}{27} - \frac{1}{9}$

Always multiply before adding or subtracting.

LCM $= 27$

Now subtract. Remember to get a common denominator when subtracting OR LCM of the denominators.

$= \frac{4 - 3}{27}$

$= \frac{1}{27}$

Example 2

Solve: $\frac{3}{5} - \frac{1}{2} \times \frac{1}{3}$

Always multiply before adding or subtracting.

$= \frac{3}{5} - \frac{1}{6}$

LCM of 5 and 6 is 30

$= \frac{3 \times 6 - 1 \times 5}{30}$

$= \frac{18 - 5}{30}$

Subtracting fractions

$= \frac{13}{30}$

Example 3

Solve: $\frac{1}{3} \div \frac{7}{5} - \frac{1}{7}$ Always divide before adding or subtracting.

$= \frac{1}{3} \times \frac{5}{7} - \frac{1}{7}$ When dividing, invert and multiply.

$= \frac{5}{21} - \frac{1}{7}$ LCM of 21 and 7 is 21

$= \frac{5-3}{21}$ Subtracting fractions

$= \frac{2}{21}$

Example 4

Solve: $\frac{3}{5} + \frac{2}{3} - \left(\frac{1}{5} + \frac{1}{3}\right)$ Perform operations inside parentheses first.

$= \frac{3}{5} + \frac{2}{3} - \left(\frac{3+5}{15}\right)$ LCM of 5 and 3 is 15

$= \frac{3}{5} + \frac{2}{3} - \frac{8}{15}$ Now add and subtract from left to right.

$= \frac{3 \times 3 + 2 \times 5 - 8 \times 1}{15}$ LCM of 5, 3 and 15 is 15

$= \frac{9 + 10 - 8}{15}$

$= \frac{19 - 8}{15}$

$= \frac{11}{15}$

Example 5

Solve: $9 \div \frac{1}{3} \times \frac{1}{3} \times \frac{1}{3} + \frac{1}{2} - 1$ Multiply and divide from left to right.

$= \frac{9}{1} \times \frac{3}{1} \times \frac{1}{3} \times \frac{1}{3} + \frac{1}{2} - 1$ When dividing, invert (reciprocate) and multiply.

$= \frac{27}{1} \times \frac{1}{3} \times \frac{1}{3} + \frac{1}{2} - 1$

$= \frac{27}{3} \times \frac{1}{3} + \frac{1}{2} - 1$

$= \frac{27}{9} + \frac{1}{2} - 1$ Add and subtract from left to right.

$= \frac{27}{9} + \frac{1}{2} - \frac{1}{1}$ LCM of 9 and 2 is 18

$= \frac{27 \times 2 + 1 \times 9}{18} - \frac{1}{1}$

$= \frac{54 + 9 - 18}{18}$

$= \frac{63 - 18}{18}$

$= \frac{45}{18}$

$= 2\frac{9}{18}$

Always simplify your fractions

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

Example 4

Solve:

$$= \frac{\frac{3}{5} + \frac{2}{3}}{\frac{1}{4} \times 9\frac{1}{9}}$$

You can first work out the numerator and the denominator separately and then combine them with the division operation.

OR

$$= \left(\frac{3}{5} + \frac{2}{3}\right) \div \left(\frac{1}{4} \times 9\frac{1}{9}\right)$$

Put numerator in brackets and divide with denominator also in brackets, then follow BODMAS

$$= \left(\frac{9 + 10}{15}\right) \div \left(\frac{1}{4} \times \frac{82}{9}\right)$$

Adding in the 1st brackets and in reducing 82 and 4 by 2 in the 2nd brackets

$$= \left(\frac{19}{15}\right) \div \left(\frac{1}{2} \times \frac{41}{9}\right)$$

$$= \frac{19}{15} \div \frac{41}{18}$$

Reducing 18 and 15 by 3

$$= \frac{19}{15} \times \frac{18}{41}$$

Multiply the fractions

$$= \frac{19}{5} \times \frac{6}{41}$$

$$= \frac{114}{205}$$

1. Evaluate the following fractions.

(a) $1\frac{1}{4} + 2\frac{1}{2} - 1\frac{3}{4}$	(b) $2\frac{1}{2} \times 3\frac{2}{3} \div 1\frac{5}{6}$
(c) $3\frac{1}{5}\ of\left(2\frac{1}{2} + 7\frac{5}{8}\right)$	(d) $\frac{3^{1}/_{8} + 1^{2}/_{3}}{^{2}/_{3} \times ^{5}/_{12}}$

2. Simplify: $\frac{1\frac{1}{2}-(8\frac{1}{3}\div 2\frac{1}{2})}{1\frac{1}{5}\ of\ (1\frac{1}{4}+1\frac{2}{3})}$ (UNEB 2008) (6 marks)

3. Evaluate; $\frac{1\frac{1}{5}+4\frac{1}{2}\div 1\frac{1}{2}}{3\frac{3}{5}-2\frac{2}{5}\times 1\frac{1}{4}}$ (6 marks)

4. Simplify: $\frac{\left(3\frac{5}{6}\div 2\frac{2}{15}\right)\times\frac{3}{23}}{5\frac{1}{3}-2\frac{7}{12}}$ (UNEB 2017) (6 marks)

5. Evaluate $\frac{2\frac{1}{2}+\left(\frac{3}{5}\times 1\frac{1}{4}\right)}{1\frac{1}{8}-\frac{3}{4}}$ (UNEB 2016) (6 marks)

END.