Name: .... Date ....

GAYAZA HIGH SCHOOL

S.2 MATH WORKSHEET THREE

ALGEBRAIC FRACTIONS (EXPRESSIONS AND EQUATIONS)

Difference between an expression and an equation

An **expression** can include numbers, variables, operators, sets, matrices, and other single things that can all be evaluated to one thing.

An **equation** is two **expressions** that are equal to each other or an **equation** is two **expressions** that are equal to each other.

PREREQUISITE KNOWLEDGE

- LCM
- Opening of brackets
- Operations of fractions

SECTION 1: ADDITION AND SUBTRACTION OF ALGEBRAIC FRACTIONS (EXPRESSIONS).

NOTE: Calculations using algebraic functions are similar to calculations involving fractions. So when adding/subtracting fractions with different denominators, we must first find the lowest common multiple**.**

Example 1

$$\frac{a+b}{2}-\frac{2a}{5}=\frac{5(a+b)-2(2a)}{10}$$

$$=\frac{5a+5b-4a}{10}$$

$$=\frac{5a-4a+5b}{10}$$

$$=\frac{a+5b}{10}$$

LCM of 2 and 5 is 10 and then you proceed the way you dealt with fractions.

Caution should be taken while multiplying 5 with numerator $a+b$, it's a two in one term therefore, it should be put in brackets such the distributive property i.e. $5(\mathrm{a}+\mathrm{b})=5\mathrm{a}+5\mathrm{b}$ would be carefully applied.

Common mistake made when brackets are not used; $5\times a+b=5a+$

Collect like terms

Example 2

$$\frac{3x}{4}-\frac{x-1}{3}=\frac{3(3x)-4(x-1)}{12}$$

$$=\frac{9x-4x+4}{12}$$

$$=\frac{5x+4}{12}$$

$$=\frac{a+5b}{10}$$

LCM of 4 and 3 is 12 and then you proceed the way you dealt with fractions.

Caution should be taken while multiplying -4 with numerator $x-1$, it's a two in one term therefore, it should be put in brackets such the distributive property i.e. $-4(x-1)=-4\mathrm{x}+4$ would be carefully applied.

Common mistake made; $-4(x-1)=-4x-4$. Students forget that when opening brackets $-\times-=+$ and $-\times+=-$

Collect like terms

1. Simplify the following expressions

(a) $\frac{m+1}{2}+\frac{m-3}{2}$	(b) $\frac{2w+1}{2}-\frac{6w-2}{4}$
(c) $\frac{y+6}{5}+\frac{2y-5}{15}$	(d) $\frac{5-2n}{4}+\frac{3p-1}{2}$
(e) $\frac{3x+4}{11}+\frac{2x}{33}$	(f) $\frac{v}{2}-\frac{v+1}{4}$
(g) $x+2a-\frac{3x-1}{4}-\frac{2a}{5}$	(h) $\frac{x-1}{2}-\frac{1}{3}+\frac{x}{3}$
(i) $\frac{4a}{7}+\frac{3a+5}{2}-\frac{3(a+2)}{3}$	(j) $\frac{3p}{12}-\left(\frac{p}{2}-\frac{p}{4}+\frac{5p}{6}\right)$

SECTION 2: SOLVING EQUATIONS INVOLVING ALGEBRAIC FRACTIONS (EQUATIONS)

Sometimes we are asked to solve an equation for a particular variable. This means that only the variable should be on one side of an equality sign and the other information in the equation should be on the other side.

NOTE: knowledge of section 1 can be used very well.

Solve the following equations.

Example 3

$\frac{x-2}{3}+\frac{x+1}{5}=3$

$15\times\left(\frac{x-2}{3}+\frac{x+1}{3}\right)=\frac{3}{1}\times 15$

Multiply each side by 15 (LCM of denominators 3, 5 and 1) - this will eliminate the fractions:

$15\times\frac{x-2}{3}+15\times\frac{x+1}{5}=\frac{3}{1}\times 15$

$5\times\frac{x-2}{1}+3\times\frac{x+1}{1}=\frac{3}{1}\times 15$

Reducing the fractions

$5(x-2)+3(x+1)=3\times 15$

Opening brackets

$5x-10+3x+3=45$

$5x+3x-10+3=45$

Collecting like terms

$8x-7=45$

$8x=45+7$

When -7 crosses equal signs its sign changes to $+7$

$8x=52$

$\frac{8}{8}x=\frac{52}{8}$

Divide by 8 on both sides

$x=\frac{13}{2}=6\frac{1}{2}$

Always reduce your fractions to the simplest form

Example 4

$\frac{3(x-2)}{4}-\frac{2(x+1)}{5}=\frac{1}{10}$

$20\times\left(\frac{3(x-2)}{4}-\frac{2(x+1)}{5}\right)=\frac{1}{10}\times 20$

Multiply each side by 20 (LCM of denominators 4, 5 and 10) - this will eliminate the fractions:

$20\times\frac{3(x-2)}{4}-20\times\frac{2(x+1)}{5}=\frac{1}{10}\times 20$

$5\times\frac{3(x-2)}{1}-4\times\frac{2(x+1)}{1}=\frac{1}{1}\times 2$

Reducing the fractions

$15(x-2)-8(x+1)=2$

Opening brackets

$15x-30-8x-8=2$

Collecting like terms

$15x-8x-30-8=2$

$7x-38=2$

$7x=2+38$

When -38 crosses equal signs its sign changes to $+38$

$7x=40$

$\frac{7}{7}x=\frac{40}{7}$

Divide by 7 on both sides

$x=5\frac{5}{7}$

Always reduce your fractions to the simplest form

2. Solve the following equations

(a) $\frac{5x+2}{3} - \frac{7x+2}{5} = 2$	(b) $\frac{3}{4}(2a+1) = \frac{5}{6}(a+5)$
(c) $\frac{n-1}{2} - \frac{n-3}{4} = \frac{1}{2}$	(d) $\frac{2}{2} - \frac{x+1}{4} = \frac{x}{3} + 2$
(e) $\frac{n+1}{2} - \frac{n-3}{4} = \frac{n+2}{3}$	(f) $\frac{4p-1}{3} - \frac{3p-1}{2} = \frac{5-2p}{4}$
(g) $\frac{1}{5}(w+6) - \frac{1}{15}(2w-5) = \frac{1}{3}(1-w)$	(h) $\frac{1}{2} - \frac{x}{6} = -\frac{5}{2}$
(i) $\frac{4p-1}{3} - \frac{3p-1}{2} = 1$	(j) $\frac{x+1}{3} + \frac{x-4}{2} = 5$

END.