***Pre-Calculus 11***

***Unit 7: Rational Expressions and Equations***

***Worksheet 7.2—Multiplying and Dividing Rational Expressions***

1. Simplify the following expressions.

 a) $\frac{5}{8}×\frac{2a}{3}$ b) $\frac{m^{2}}{4}×\frac{2}{m}$ c) $\frac{9x^{2}}{4y^{3}}×\frac{8y}{-3x}$

 d) $-4×\frac{9b^{2}}{6a}$ e) $\frac{3m^{2}n}{6mn}×\frac{4mn}{5m^{2}n^{2}}$ f) $\frac{-5x^{2}y}{\left(2xy\right)^{3}}×\frac{-12x^{2}y^{2}}{-6x^{2}y}$

2. Simplify the following expressions.

 a) $\frac{x^{2}}{14}÷\frac{x}{7}$ b) $\frac{-6xy}{15}÷\frac{2x^{2}}{5}$ c) $\frac{2m}{9n}÷\frac{-4m}{3n^{2}}$

 d) $\frac{5a^{2}}{12b}÷25a$ e) $\frac{4c^{2}d}{8cd}÷\frac{3c^{2}d^{3}}{6cd^{3}}$ f) $\frac{12mn^{2}}{9mn}÷\frac{\left(3mn\right)^{2}}{6mn^{2}}$

3. Simplify the following expressions. State the non-permissible values

 a) $\frac{6x}{x+1}×\frac{2(x+1)}{3x^{2}}$ b) $\frac{2\left(4a+3\right)^{2}}{4a}×\frac{12a^{3}}{3(4a+3) }$ c) $\frac{3(5-c)}{4c}×\frac{4c+1}{6(c-5)}$

 d) $\frac{3(x-2)}{4(x+5)}÷\frac{6(x-2)}{x+5}$ e) $\frac{\left(a-3\right)^{2}}{14(a-1)}÷\frac{2(a-3)}{7(1-a)}$ f) $\frac{50(x-6)}{24(y-2)}÷\frac{-25(x-6)}{12(2-y)}$

4. Simplify the following expressions.

 a) $\frac{3a^{3}}{a^{2}-9}×\frac{2a-6}{2a^{2}}$ b) $\frac{x^{2}-121}{x^{2}-4}×\frac{x+2}{x-11}$ c) $\frac{15m}{2m+6}÷\frac{10m}{3m+9}$

d) $\frac{\frac{5x-10}{6x+6}}{\frac{2x-4}{x+1}}$ e) $\frac{\frac{4a^{2}-10}{a-3b}}{\frac{6a^{2}-15}{2a^{2}-18b^{2}}}$ f) $\frac{\frac{y+2}{ay-by}}{\frac{y^{2}+2y}{ay^{2}-by^{2}}}$

5. Simplify the following expressions.

1. $\frac{a^{2}-3a-10}{25-a^{2}}÷\frac{a+2}{a+5}$ b) $\frac{x^{2}+x-2}{x^{2}-x}×\frac{x^{2}+x}{x^{2}-1}$ c) $\frac{x^{2}-2x-15}{x^{2}-9}×\frac{3-x}{x-5}$

d)$ \frac{a^{2}+11ab+30b^{2}}{a^{2}-25b^{2}}×\frac{3a^{2}-15ab}{6a^{2}+36ab}$ e) $\frac{x^{2}+5xy+6y^{2}}{x^{2}+4xy-5y^{2}}×\frac{x^{2}+3xy-10y^{2}}{x^{2}+xy-6y^{2}}$ f) $\frac{m^{2}-9mn+14n^{2}}{m^{2}+7mn+12n^{2}}÷\frac{3m^{2}-21mn}{4m^{3}+16m^{2}n}$

6. Simplify the following expressions.

1. $\frac{x+2y}{x-3y}×\frac{x^{2}-9y^{2}}{x^{2}-4y^{2}}÷\frac{x+3y}{x-2y}$ b) $\frac{\left(3a+7b\right)^{2}}{2a-5b}×\frac{4a^{2}-25b^{2}}{9a^{2}-49b^{2}}÷\frac{2a+5b}{3a-7b}$

c) $\frac{3x+6}{5-x}÷\frac{x^{2}-4}{x^{2}-8x+15}×\frac{x^{2}-x-2}{x^{2}+x-12}$ d) $\frac{3x^{2}+3x-6}{x^{2}y-7xy}÷\frac{x^{2}-6x}{x^{2}}×\frac{x^{2}y-13xy+42y}{6x^{2}+12x}$

e) $\frac{2m^{2}-7m-15}{2m^{2}-10m}÷\frac{4m^{2}-9}{6}×\left(3-2m\right)$ f) $\frac{8x^{2}-2x-3}{x^{2}-1}÷\frac{2x^{2}-3x-2}{2x-2}÷\frac{3-4x}{x+1}$

7. Simplify the following expressions.

1. $\frac{\frac{1}{x}+4}{\frac{1}{x}-4}$ b) $\frac{x-\frac{1}{4}}{x+\frac{1}{4}}$ c) $\frac{\frac{8}{x}+2}{\frac{4}{x^{2}}-1}$ d) $\frac{5+\frac{2}{5x}}{3-\frac{3}{2x}}$

8. Suppose $x=a+b$ and$ y=a-b$. Write each expression in terms of $a$ and$ b$, and simplify.

1. $\frac{x^{2}-xy-12y^{2}}{x^{2}-2xy-3y^{2}}×\frac{x^{2}+5xy+4y^{2}}{x^{2}-16y^{2}}$ b) $\left(\frac{3x-21y}{6x+12y}\right)^{2}÷\frac{x^{2}-49y^{2}}{2x^{2}+8xy+8y^{2}}$

9. Two points on a coordinate grid are represented by $M(p-1, 2p+3)$ and $N(2p-5, p+1)$.

 a) What is a simplified rational expression for the slope of the line passing through *M* and *N*?

 b) Write a rational expression for the slope of any line that is perpendicular to *MN*.

10. Consider $∆ABC$ as shown.

 A

 c

 b

 C a B

1. What is an expression for tan B?
2. What is an expression for $\frac{\sin(B)}{\cos(B)}$? Use your knowledge of rational expressions to help you write the answer in simplest form.
3. How do your expressions for $\tan(B)$ and $\frac{\sin(B)}{\cos(B)}$ compare? What can you conclude from this exercise?

***Solutions***

1. a) $\frac{5a}{12}$ b) $\frac{m}{2}$ c) $\frac{-6x}{y^{2}}$ d) $\frac{-6b^{2}}{a}$ e) $\frac{2}{5n}$ f) $\frac{-5}{4xy}$

2. a) $\frac{x}{2}$ b) $\frac{y}{x}$ c) $\frac{-1n}{6}$ d) $\frac{a}{60b}$ e) $1$ f) $\frac{8n}{9m}$

3. a) $\frac{4}{x}; x\ne 0, x\ne -1$

 b) $2a^{2}\left(4a+3\right); a\ne 0, a\ne -\frac{3}{4}$

 c) $\frac{-12c-3}{4c}; c\ne 0, c\ne 5$

 d) $\frac{1}{8}; x\ne -5, x\ne 2$

 e) $\frac{-\left(a-3\right)}{4}=\frac{-a+3}{4}; a\ne 1, a\ne 3$

 f) $1; y\ne 2, x\ne 6$

4. a) $\frac{3a}{a+3}$ b) $\frac{x+11}{x-2}$ c) $\frac{9}{4}$ d) $\frac{5}{12}$ e) $\frac{4a+12b}{3}$ f) $1$

5. a) $-1$ b) $\frac{x+2}{x-1}$ c) $-1$ d) $\frac{1}{2}$ e) $\frac{x+2y}{x-y}$ f) $\frac{4m\left(m-2n\right)}{3\left(m+3n\right)}$

6. a) $1$ b) $3a+7b$ c) $\frac{-3\left(x+1\right)}{x+4}$ d) $\frac{x-1}{2x}$ e) $\frac{-3}{m}$ f) $\frac{-2}{x-2}$

7. a) $\frac{1+4x}{1-4x}$ b) $\frac{4x-1}{4x+1}$ c) $\frac{8x+2x^{2}}{4-x^{2}}$ d) $\frac{50x+4}{30x+15}$

8. a) $\frac{2a-b}{2b-a}$ b) $\frac{4b-3a}{8a-6b}$

9. a) m=$\frac{-p-2}{p-4}$ b) $\frac{p-4}{p+2}$

10. a) $\frac{b}{a}$ b) $\frac{b}{a}$ c) $tanB=\frac{\sin(B)}{\cos(B)}$