

## 9.2. Advanced Algebra

### Rational Expressions: Add & Subtract

DATE: 3/24

*Target 8C. Perform operations and simplify rational expressions: add, subtract, multiply, and divide*

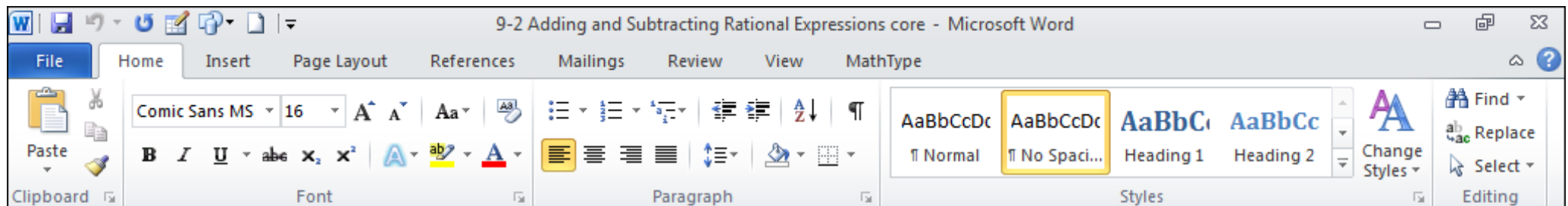
#### Add and Subtract Rational Expressions

As with fractions, to add or subtract rational expressions, you must have common denominators. If you do not already have common denominators, find the lowest common denominator first.

Example:  $\frac{2}{3} + \frac{3}{5} = ?$  Need a common denominator

$$\frac{2 \leftrightarrow 5}{3 \leftrightarrow 5} + \frac{3 \leftrightarrow 3}{5 \leftrightarrow 3} = \frac{10}{15} + \frac{9}{15} = \frac{10+9}{15} = \frac{19}{15}$$

Simplify each expression. Remember, to add or subtract rational expressions, you must have common denominators (just like with fractions)



***Simplify each expression. Remember, to add or subtract rational expressions, you must have common denominators (just like with fractions).***

$$\begin{aligned}
 & 1. \frac{(x+10)}{3x-15} - \frac{(3x-15)}{6x-30} \\
 & = \frac{(x+10)}{3(x-5)} - \frac{(3x-15)}{6(x-5)} \\
 & = \frac{\overset{2}{\cancel{2}}(x+10)}{\overset{2}{\cancel{2}}3(x-5)} - \frac{(3x-15)}{2 \cdot 3(x-5)} \\
 & = \frac{2x+20}{6(x-5)} - \frac{(3x-15)}{6(x-5)} \\
 & = \frac{2x+20-3x+15}{6(x-5)} = \boxed{\frac{-1x+35}{6(x-5)}}
 \end{aligned}$$

$$\begin{aligned}
 & 2. \frac{2}{x^2y} - \frac{x}{y} \\
 & = \frac{2}{x \cdot x \cdot y} - \frac{\overset{x \leftrightarrow x \cdot x}{\cancel{x}}}{\overset{x \leftrightarrow x \cdot x}{\cancel{y}}} = \boxed{\frac{2-x^3}{x^2y}}
 \end{aligned}$$

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$$3. \frac{5}{3m} - \frac{2}{7m} - \frac{1}{2m}$$

$$\frac{5}{3m} \cdot \frac{7 \cdot 2}{7 \cdot 2} - \frac{2}{7m} \cdot \frac{3 \cdot 2}{3 \cdot 2} - \frac{1}{2m} \cdot \frac{3 \cdot 7}{3 \cdot 7}$$

$$\frac{60 - 12 - 21}{42m} = \frac{27}{42m} = \boxed{\frac{9}{14m}}$$

$$4. \frac{6}{d^2 + 4d + 4} + \frac{5}{d + 2}$$

$$\frac{6}{(d+2)(d+2)} + \frac{5}{(d+2)} \cdot \frac{(d+2)}{(d+2)}$$

$$= \frac{6 + 5d + 10}{(d+2)(d+2)} = \boxed{\frac{5d + 16}{(d+2)(d+2)}}$$

$$5. \frac{x-2}{x-1} + \frac{6}{7x-7}$$

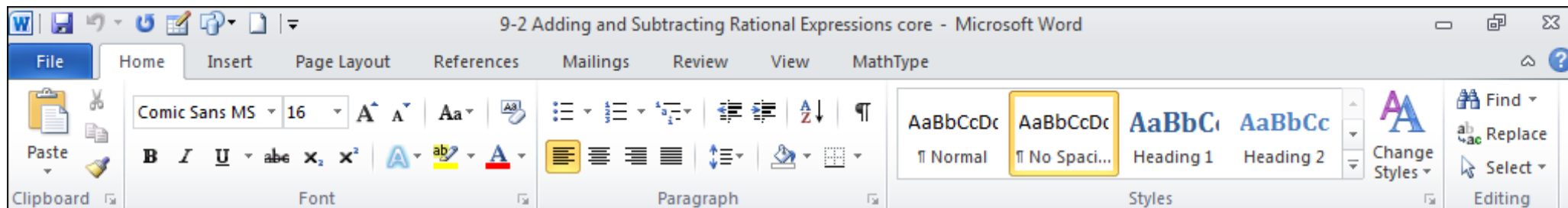
$$\frac{7 \cdot (x-2)}{7 \cdot (x-1)} + \frac{6}{7(x-1)}$$

$$= \frac{7x - 14 + 6}{7(x-1)} = \boxed{\frac{7x - 8}{7(x-1)}}$$

$$6. \frac{3}{2a} - \frac{1}{5a} - \frac{2}{4a}$$

$$= \frac{3 \cdot 2 \cdot 5}{2a \cdot 2 \cdot 5} - \frac{1 \cdot 2 \cdot 2}{5a \cdot 2 \cdot 2} - \frac{2 \cdot 5}{2 \cdot 2a \cdot 5}$$

$$= \frac{30 - 6 - 10}{20a} = \frac{14}{20a} = \boxed{\frac{7}{10a}}$$



$$7. \frac{x+8}{x+5} + \frac{x+7}{x+5} \rightarrow \text{Common denominator} \checkmark$$

$$\boxed{\frac{2x + 15}{x+5}}$$

$$8. \frac{2}{x-1} + \frac{3}{x-5}$$

$$\frac{2}{x-1} \cdot \frac{(x+5)}{(x+5)} + \frac{3}{x-5} \cdot \frac{(x-1)}{(x-1)}$$

$$\frac{2x+10 + 3x-3}{(x-1)(x+5)} = \boxed{\frac{5x+7}{(x-1)(x+5)}}$$

