

## 2.16 ADDING & SUBTRACTING FRACTIONS

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To Review:

To ADD FRACTIONS, USE A COMMON DENOM.

$$\text{ex) } \frac{4}{5} \overset{\times 7}{\phantom{}} + \frac{1}{7} \overset{\times 5}{\phantom{}} = \frac{28}{35} + \frac{5}{35}$$

$$= \frac{28 + 5}{35} \quad \leftarrow \text{ADD NUMERATORS}$$

$$= \frac{33}{35} \quad \leftarrow \text{KEEP THE DENOMINATOR}$$

To CHANGE IMPROPER FRACTIONS  $\rightarrow$  MIXED #S

ex)  $\frac{32}{7} \Rightarrow 4 \frac{4}{7}$

$7 \overline{) 32}$

$\begin{array}{r} 4 \\ 7 \overline{) 32} \\ \underline{-28} \\ 4 \end{array}$

$\frac{4}{7}$

Annotations: "DENOM." with an arrow pointing to the 7 in the denominator of the division; "NUMERATOR" with an arrow pointing to the 4 in the numerator of the division; "COEFFICIENT" with an arrow pointing to the 4 in the mixed number.

To CHANGE MIXED #  $\rightarrow$  IMPROPER FRACTION

ex)  $3 \frac{4}{5} = \frac{5 \times 3 + 4}{5} = \frac{19}{5}$

Annotations: "KEEP THE DENOM." with an arrow pointing to the 5 in the denominator of the final fraction.

## ADDING RATIONAL NUMBERS (FRACTIONS)

$$1) \frac{4}{5} \overset{x3}{x3} + \left( \frac{-2}{3} \right) \overset{x5}{x5}$$

• COMMON DENOM.

$$\frac{12}{15} + \left( \frac{-10}{15} \right)$$

• KEEP DENOM. &  
ADD ACROSS THE TOP

$$\frac{12 + (-10)}{15}$$

" AND LEFT " } → YOU ARE AT THE 12 &  
YOU GO LEFT 10 "

$$= \frac{2}{15}$$

$$\frac{12}{15} \xleftarrow{10} \frac{2}{15}$$

OR

$$\frac{12 + (-10)}{15} = \frac{12 - 10}{15}$$

$$2) \quad -\frac{2}{3} + \frac{1\frac{3}{4}}{\times 4} = -\frac{2}{3} \times 4 + \frac{7}{4} \times 3$$

• CHANGE MIXED # → IMPROPER

$$= \frac{-8}{12} + \frac{21}{12}$$

• COMMON DENOM.

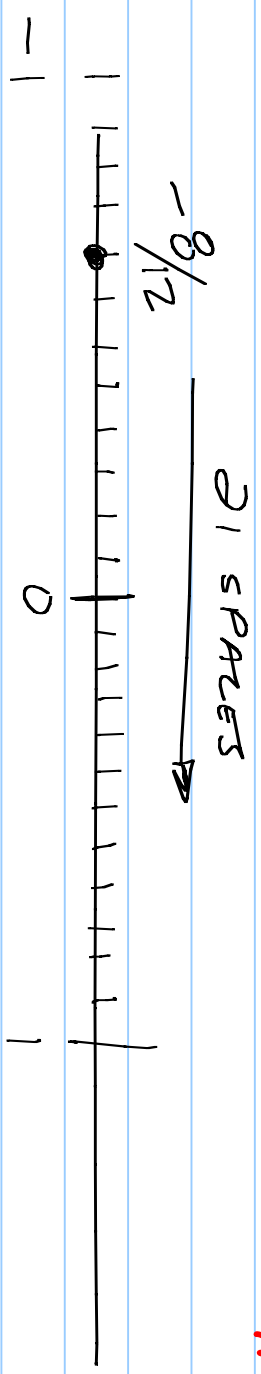
STARTING POSITION

$$= \frac{-8 + 21}{12}$$

• ADD ACROSS TOP & KEEP DENOM.

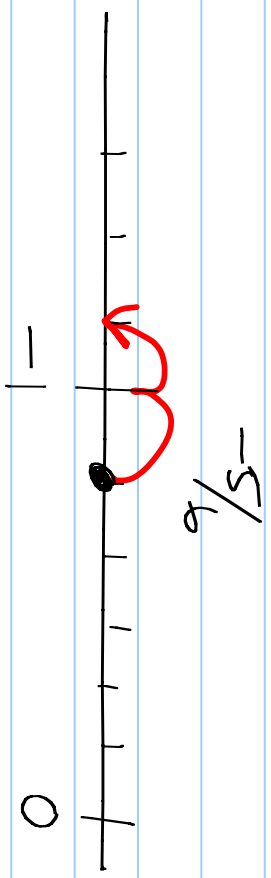
$$= \frac{13}{12} = 1\frac{1}{12}$$

• REDUCE IF NECESSARY



$$3) \quad \frac{-5}{6} + \left( -\frac{1}{3} \times 2 \right)$$

$$\frac{-5}{6} + \frac{-2}{6}$$



$$\frac{(-5) + (-2)}{6}$$

left

$$\frac{-7}{6} = -1\frac{1}{6}$$

IMPROPER

$$4) -2\frac{2}{3} + 1\frac{5}{9}$$

$$\Rightarrow -\frac{8 \times 3}{3 \times 3} + \frac{14}{9}$$

$$-\frac{24}{9} + \frac{14}{9}$$

$$\frac{-24+14}{9}$$

$$-\frac{10}{9}$$

$$-1\frac{1}{9}$$

# SUBTRACTING RATIONAL NUMBERS (FRACTIONS)

METHOD ① USE A # LINE

$$\begin{array}{r} 3x^3 \\ 4x^3 \end{array} - \left( \begin{array}{r} -1x^2 \\ 6x^2 \end{array} \right) = \frac{9}{12} - \left( -\frac{2}{12} \right)$$

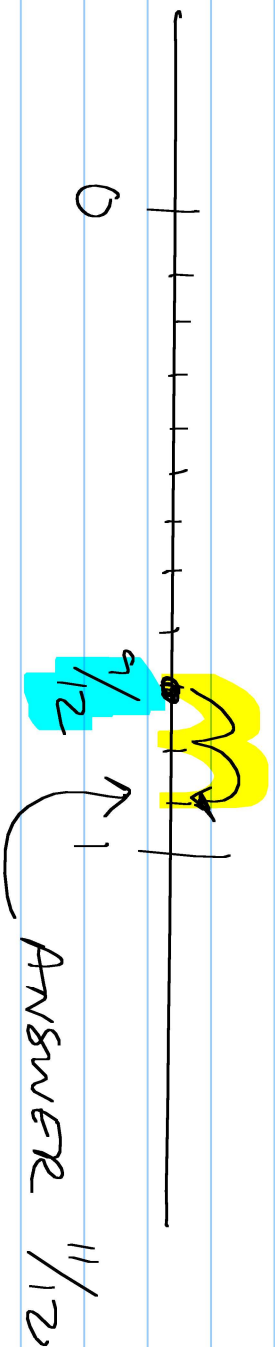
CHANGE TO ONE # LINE

$$\frac{9}{12} + \frac{2}{12}$$

STARTING POSITION

← RIGHT

$$\begin{array}{r} + (+) = + \\ - (-) = + \\ + (-) = - \\ - (+) = - \end{array}$$



METHOD (2)

"SHORTCUT"

- KEEP DENOM.

- SUBTRACT (OR

"ADD THE OPPOSITE")

ACROSS THE TOP

$$\frac{9}{12} + \frac{2}{12}$$

$$\frac{9+2}{12}$$

$$\frac{11}{12}$$



## EXAMPLES

$$1) \quad -\frac{3}{2} - 1\frac{3}{4} = \frac{-3}{2} - \frac{7}{4}$$

• CHANGE TO IMPROPER FRACTIONS

$$= \frac{-6}{4} - \frac{7}{4}$$

• Common Denom.

$$= \frac{-6-7}{4} \quad \text{OR} \quad \frac{-6+(-7)}{4}$$

"ADDING THE OPPOSITE"

$$= \frac{-13}{4}$$

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

$$2) \quad 3\frac{1}{2} - (-1\frac{7}{8})$$

• CHANGE TO IMPROPER FRACTION

$$\frac{7}{2} \times 4 - (-\frac{15}{8})$$

• COMMON DENOM.

$$\frac{28}{8} - (-\frac{15}{8})$$

• KEEP DENOM & SUBTRACT NUMERATORS

$$\frac{28 - (-15)}{8}$$

• SIMPLIFIED SIGNS (OR "ADD THE OPPOSITE")

$$\frac{28 + 15}{8}$$

• "CLEAN UP"

- REDUCE IF NEZ.  
- CONVERT BACK TO MIXED #

$$\frac{43}{8} = 5\frac{3}{8}$$

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$$\frac{6}{5+11} = \frac{6}{5} + \frac{6}{11}$$