

Operations with negative fractions

Sunday, 12 April 2020 10:48 am

★ By the end of the lesson I would hope that you have an understanding and be able to apply to questions the following concepts:

- How to add, subtract, multiply and divide fractions using negative numbers
- Know the four rules for multiplying negative and positive numbers

RECAP

This lesson will build on the previous lesson where we recapped the work on applying the four operations to fractions. Having understood the basics and practiced them, we can move onto those questions where we have the four operations applied to negative and positive fractions.

RECAP: The four rules

We have met before the rules for multiplying, dividing, adding and subtracting negative numbers.

They are:

$$\begin{array}{l} + \times + = + \\ - \times - = + \\ + \times - = - \\ - \times + = - \end{array}$$

$$\begin{array}{l} + \times + = + \\ - \times - = + \end{array} \quad \left. \vphantom{\begin{array}{l} + \times + = + \\ - \times - = + \end{array}} \right\} \begin{array}{l} ++ \\ -- \end{array} \left. \vphantom{\begin{array}{l} ++ \\ -- \end{array}} \right\} +$$

Short cut: When they are the same, it's positive, when they are different it's negative.

$$\begin{array}{l} + \times - = - \\ - \times + = - \end{array}$$

Important note: The use of brackets

The questions will use brackets to try and help our brain.

We are programmed to "miss" horizontal lines for some reason.

The use of a set of brackets makes sure the brain "sees" the negative sign.

$$\begin{array}{l} +- \\ -+ \end{array} \left. \vphantom{\begin{array}{l} +- \\ -+ \end{array}} \right\} -$$

The brackets have NOTHING to do with BIDMAS in this instance.

They are there to help improve readability.

Examples without fractions:

$$3 \times 4$$

$$\textcircled{3} \times \textcircled{4} = 12$$

$$(-6) \times 5$$

$$= \textcircled{-6} \times \textcircled{5} = \underline{\underline{-30}}$$

$$(-3) \times (-2)$$

$$\ominus 3 \times \ominus 2 = 6$$

$$10 \div (-4)$$

$$\oplus 10 \div \ominus 4 = \frac{10}{4} = \frac{5}{2} = -2\frac{1}{2}$$

$$-\frac{5}{2} = \frac{-5}{2} = \frac{5}{-2}$$

We can now apply the learning to fractions.

Remember: Always do the operation first and then consider the signs. It might make life a lot easier.

Examples

The following examples have been extracted, with permission, from the Cambridge Essentials Series of textbooks (Year 8 in this case).

Simplify the following:

$$+- = -$$

$$\frac{2}{7} + \left(-\frac{5}{7}\right)$$

$$= \frac{2}{7} + -\frac{5}{7}$$

$$= \frac{2}{7} - \frac{5}{7}$$

$$= \frac{2-5}{7}$$

$$= -\frac{3}{7}$$

$$\frac{2}{3} - \left(-\frac{4}{3}\right)$$

$$= \frac{2}{3} - -\frac{4}{3}$$

$$-- = +$$

$$\frac{2}{3} - \left(-\frac{4}{3}\right)$$

$$= \frac{2}{3} - - \frac{4}{3}$$

$$- - = +$$

$$= \frac{2}{3} + \frac{4}{3}$$

$$= \frac{\cancel{6}^2}{\cancel{3}_1} = \underline{\underline{2}}$$

$$= \frac{2+4}{3}$$

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

$$\frac{1}{5} + \left(-\frac{1}{4}\right)$$

$$= \frac{1}{5} + - \frac{1}{4}$$

$$= \frac{4-5}{20}$$

$$= \frac{\frac{1}{\cancel{5}^4} - \frac{1}{\cancel{4}^5}}{\times 4 \quad \times 5}$$

$$= \frac{-1}{20}$$

$$= \frac{4}{20} - \frac{5}{20}$$

$$-\frac{7}{3} - \left(-3\frac{2}{3}\right)$$

$$= -\frac{7}{3} - - 3\frac{2}{3}$$

$$- - = +$$

$$= -\frac{7}{3} + 3\frac{2}{3}$$

$$3 \times 3 + 2 = 11$$

$$= -\frac{7}{3} + \frac{11}{3}$$

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

$$= \frac{-7+11}{3}$$

$$\frac{2}{3} \times \left(-\frac{4}{5}\right)$$

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

$$= \frac{\frac{2}{3} \times 4}{\cancel{3} \times \cancel{5}} *$$

$$= \frac{2}{3} \times \frac{4}{5} *$$

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

$$-\frac{6}{5} \times \left(-\frac{3}{4}\right)$$

$$= \frac{-6}{5} \times \frac{-3}{4}$$

$$= \frac{18}{20} = \frac{9}{10}$$

$$-\frac{2}{5} \div \left(-\frac{3}{4}\right)$$

$$= -\frac{2}{5} \div -\frac{3}{4}$$

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$$= \frac{-2}{5} \times \frac{4}{3}$$

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

$$-1\frac{1}{3} \div 3$$

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

$$\frac{3}{1}$$

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

$$1 \times 3 + 1$$

$$= \frac{-4}{2} \times \frac{1}{3}$$

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

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