

Adding and Subtracting Rational Numbers

A rational number is a number that can be written as the ratio of two integers. A rational number can also be written as a decimal.

In your class, you studied addition and subtraction of fractions. You also learned to determine the order relation between two fractions. It was necessary to have common denominators to do all three of these things.

REVIEW: (a) $\frac{5}{8} + \frac{7}{12}$ (b) $\frac{3}{5} - \frac{1}{4}$ (c) Use $<$ or $>$ between the fractions
 $\frac{7}{12}$ $\frac{5}{8}$

The answers are:

(a) $\frac{29}{24}$ or $1\frac{5}{24}$ (b) $\frac{7}{20}$ (c) $\frac{7}{12} < \frac{5}{8}$ because $\frac{14}{24} < \frac{15}{24}$

If you missed problem (a), study the rules for the Addition of Fractions in your text.

If you missed (b), study the text rules for the Subtraction of Fractions.

If you missed (c), study the text rules for the Order Relation of Fractions.

You have also studied addition and subtraction of decimals and the order relation of two decimals. Although you can use a calculator, be sure you remember the rules.

REVIEW: (a) $5.9 + 27 + 1.46$ (b) $19.3 - 7.53$ (c) Use $<$ or $>$ between
 0.19 0.3

Answers:

(a) 34.36 If you missed either (a) or (b), study the rules for Addition

(b) 11.77 and Subtraction of decimals.

(c) $0.19 < 0.30$ If you missed (c), study the rules for the Order of Decimals.

Now review the rules for addition and subtraction of integers. In this exercise, you will add and subtract rational numbers. Rational numbers can be written as a ratio of two integers or decimal form, and may be positive, negative or zero.

EXAMPLES: $-\frac{5}{6}$, -12 or $-\frac{12}{1}$, $\frac{2}{7}$, -4.7 , 3 or $\frac{3}{1}$ or 3.0

REMINDERS:

- To add rational numbers with different signs, you will have to know which addend has the greater absolute value so you can subtract the smaller absolute value from the larger absolute value.

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- When a negative rational number is written in fraction form, work with the negative sign in the numerator.
- To add or subtract rational numbers in fraction form, you must have common denominators.
- To add or subtract rational numbers in decimal form, you must line up the decimal points.
- Be very careful with the signs. Use the rules you learned earlier for the addition and subtraction of integers.

EXAMPLES:

$$\begin{aligned} \text{A. } & -\frac{5}{8} + \frac{-3}{4} \\ &= \frac{-5}{8} + \frac{-6}{8} \\ &= -\frac{11}{8} \text{ or } -1\frac{3}{8} \end{aligned}$$

$$\begin{aligned} \text{B. } & \frac{-5}{8} + \frac{2}{3} \\ &= \frac{-15}{24} + \frac{16}{24} \\ &= \frac{1}{24} \end{aligned}$$

In examples C and D the signs are different, so you must subtract. Write the greater absolute value on top. In E the signs are the same, so add.

$$\begin{array}{r} \text{C. } -5.4 + 12.3 \\ 12.3 \\ -5.4 \\ \hline 6.9 \end{array}$$

$$\begin{array}{r} \text{D. } -9.7 + 4.83 \\ -9.70 \\ 4.83 \\ \hline -4.87 \end{array}$$

$$\begin{array}{r} \text{E. } -4.3 + (-0.9) \\ -4.3 \\ -0.9 \\ \hline -5.2 \end{array} \left. \vphantom{\begin{array}{r} -4.3 \\ -0.9 \\ \hline -5.2 \end{array}} \right\} \text{For like signs, add and keep the negative sign.}$$

$$\begin{aligned} \text{F. } & \frac{5}{8} - \frac{7}{10} \\ &= \frac{25}{40} - \frac{28}{40} \\ &= -\frac{3}{40} \end{aligned}$$

$$\begin{aligned} \text{G. } & \frac{-2}{3} - \frac{5}{6} \\ &= \frac{-4}{6} + \frac{-5}{6} \\ &= -\frac{9}{6} \\ &= -\frac{3}{2} \text{ or } -1\frac{1}{2} \end{aligned}$$

$$\begin{aligned} \text{H. } & 5.3 - 9.1 \\ &= 5.3 + (-9.1) \\ & -9.1 \\ & 5.3 \\ & \hline & -3.8 \end{aligned}$$

PROBLEMS:

1. $-\frac{3}{8} + \left(-\frac{5}{6}\right)$

2. $4.7 + (-8.36)$

3. $\frac{1}{3} + \left(-\frac{3}{4}\right)$

4. $-9.6 + (-18)$

5. $-\frac{3}{5} - \frac{2}{3}$

6. $-\frac{3}{4} - \left(-\frac{1}{2}\right)$

7. $5.8 - 16.7$

8. $-4.3 - (-20)$

9. $-0.83 - 1.4$

10. $-\frac{3}{4} - \frac{1}{2}$

(Compare #10 with #6).

ANSWERS:

1. $\frac{29}{24}$ or $-1\frac{5}{24}$ 2. -3.66 3. $-\frac{5}{12}$ 4. -27.6 5. $-\frac{19}{15}$ or $-1\frac{15}{24}$

6. $-\frac{1}{4}$ 7. -10.9 8. 15.7 9. -2.23 10. $-\frac{5}{4}$ or $-1\frac{1}{4}$