

## Operations with Rational Numbers Study Guide

Adding and subtracting **positive** decimals

|  | $12.35 + 105.4$  | $10.9 + 24$ | $10.9 + 24 - 1.35$ |
|--|--|-------------|--------------------|
| <b>Step 1:</b> Stack the numbers, lining up the decimal points. (When subtracting the larger number goes on top).    | $\begin{array}{r} 12.35 \\ + 105.4 \\ \hline 117.75 \end{array}$ |             |                    |
| <b>Step 2:</b> Ignore the decimal point, and add the numbers from right to left, carrying or borrowing if necessary. | $\begin{array}{r} 12.35 \\ + 105.4 \\ \hline 117.75 \end{array}$ |             |                    |
| <b>Step 3:</b> Bring the decimal point directly down.  | $\begin{array}{r} 12.35 \\ + 105.4 \\ \hline 117.75 \end{array}$ |             |                    |

Multiplying decimals

|  | $19.6 \times 0.073$   | $12.5 \times 0.21$  |
|--|---|---|
| <b>Step 1:</b> Stack the numbers. (You do not need to line up the decimal points)  | $\begin{array}{r} 19.6 \\ \times 0.073 \\ \hline \end{array}$                                 |   |
| <b>Step 2:</b> Ignore the decimal point and multiply.<br><div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>Rule 1:</b> Multiple the top number by each digit of the bottom number starting with the rightmost digit.</p> <p><b>Rule 2:</b> Every time you multiply by the next digit, shift the answer one place to the left.</p> <p><b>Rule 3:</b> Add when done.</p> </div> | $\begin{array}{r} 19.6 \\ \times 0.073 \\ \hline 588 \\ + 13720 \\ \hline 14308 \end{array}$  |   |
| <b>Step 3:</b> Count the total numbers of digits to the right of the decimal points in the two numbers multiplied. The product will have this many digits to the right of the decimal point.   | $\begin{array}{r} 19.6 \\ \times 0.073 \\ \hline 588 \\ + 13720 \\ \hline 1.4308 \end{array}$ | <p>The two numbers have a total of 4 digits to the right of the decimal point.</p> <p>The answer also has 4 digits to the right of the decimal point.</p> |

## Dividing decimals

|   | $4.5 \div 0.25$  | Convert $7/25$ to a decimal |
|---|--|-----------------------------|
| <b>Step 1:</b> Set up long division.  | $0.25 \overline{) 4.5}$  |                             |
| <b>Step 2:</b> Move the decimal point in the divisor to the right until it becomes a whole number. Move the decimal point in dividend the same number of places, and then raise it directly up. | $  \begin{array}{r}  0.25 \overline{) 4.5} \\  \underline{\phantom{0.25} 0.5} \phantom{0} \\  \phantom{0.25} 40 \phantom{0} \\  \underline{\phantom{0.25} 40} \phantom{0} \\  \phantom{0.25} 0  \end{array}  $ becomes $25 \overline{) 450}$ |                             |
| <b>Step 3:</b> Divide, ignoring the decimal point.  | $  \begin{array}{r}  18 \\  25 \overline{) 450} \\  \underline{- 25} \phantom{0} \\  200 \\  \underline{- 200} \\  0  \end{array}  $   |                             |

## Addition Rules

- To add numbers with the **same sign**: \_\_\_\_\_ and \_\_\_\_\_ the sign.
- To add numbers with **different signs**: \_\_\_\_\_ and \_\_\_\_\_ the sign of \_\_\_\_\_.

## Adding positive and negative numbers

|   | $-14.25 + 4.75$  | $-9.5 + (-12.5)$ |
|---|--|------------------|
| <b>Step 1:</b> Use the addition rules to set up and solve an addition or subtraction problem. | Different signs -> Subtract<br>$  \begin{array}{r}  14.25 \\  - 4.75 \\  \hline  9.5  \end{array}  $ |                  |
| <b>Step 2:</b> Use the addition rules to determine the sign of the sum.                       | 14.25 has the larger absolute value, so the original sum will be <b>negative</b>                     |                  |
| <b>Step 3:</b> Combine the result of step 1 with the sign from step 2.                        | -9.5   |                  |

## Rewriting a subtraction problem as an equivalent addition problem.

|   | $-2.5 - (-1.24)$   | $-9.5 - 12.5$  |
|---|--|--|
| <b>Step 1:</b> Remember which addition and subtraction problems are equivalent. | 1. When subtracting a positive, the answer is the same as when adding a _____.<br>2. When subtracting a negative, the answer is the same as when adding a _____. | 1. When subtracting a positive, the answer is the same as when adding a _____.<br>2. When subtracting a negative, the answer is the same as when adding a _____. |

|  |               |  |
|--|---------------|--|
| <b>Step 2:</b> Use the answers to step 1 to convert subtraction into addition and to convert the number being subtracted (to the opposite sign). | $-2.5 + 1.24$ |  |
|--|---------------|--|

### Subtracting positive and negative numbers

|   |  |                    |               |
|---|--|--------------------|---------------|
|   | $-2.5 - (-1.24)$   | $-14.25 - (-4.75)$ | $-9.5 - 12.5$ |
| <b>Step 1:</b> Rewrite the subtraction problem as an equivalent addition problem.   | $-2.5 + 1.24$  |                    |               |
| <b>Step 2:</b> Use the addition rules to find the answer to the <b>addition problem</b> from step 1. The answer to the original subtraction problem will be the same. | Different signs: Subtract<br>$\begin{array}{r} 2.5 \\ - 1.24 \\ \hline 1.26 \end{array}$ $-2.5$ has the larger absolute value, so the answer will be $-1.26$ |                    |               |

### Multiplying and dividing positive and negative numbers

|  |   |                     |                     |                     |              |              |                     |              |              |  |  |
|--|---|---------------------|---------------------|---------------------|--------------|--------------|---------------------|--------------|--------------|--|--|
|  | $-125.46 \div 20.5$   | $-1.2 \div 4.8$     |                     |                     |              |              |                     |              |              |  |  |
| <b>Step 1:</b> Ignore the signs and multiply or divide.  | Problem without “-” signs: $125.46 \div 20.5$<br>$\begin{array}{r} 20.5 \overline{) 125.46} \text{ becomes } 205 \overline{) 1254.6} \\ \underline{6.12} \\ 205 \overline{) 1254.60} \\ \underline{-1230} \\ 246 \\ \underline{-205} \\ 410 \\ \underline{-410} \\ 0 \end{array}$ |                     |                     |                     |              |              |                     |              |              |  |  |
| <b>Step 2:</b> Use the multiplication and division rules to determine the sign.  | negative $\div$ positive = negative<br><br>$-6.12$  |                     |                     |                     |              |              |                     |              |              |  |  |
| <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td></td> <td style="text-align: center;"><b>Positive (+)</b></td> <td style="text-align: center;"><b>Negative (-)</b></td> </tr> <tr> <td style="text-align: center;"><b>Positive (+)</b></td> <td style="text-align: center;">Positive (+)</td> <td style="text-align: center;">Negative (-)</td> </tr> <tr> <td style="text-align: center;"><b>Negative (-)</b></td> <td style="text-align: center;">Negative (-)</td> <td style="text-align: center;">Positive (+)</td> </tr> </table> |   | <b>Positive (+)</b> | <b>Negative (-)</b> | <b>Positive (+)</b> | Positive (+) | Negative (-) | <b>Negative (-)</b> | Negative (-) | Positive (+) |  |  |
|  | <b>Positive (+)</b>   | <b>Negative (-)</b> |                     |                     |              |              |                     |              |              |  |  |
| <b>Positive (+)</b>  | Positive (+)  | Negative (-)        |                     |                     |              |              |                     |              |              |  |  |
| <b>Negative (-)</b>  | Negative (-)  | Positive (+)        |                     |                     |              |              |                     |              |              |  |  |

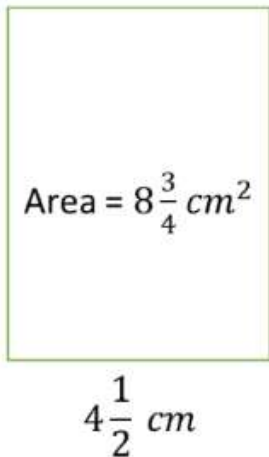
## Operations with Rational Numbers Practice Word Problems

For each problem, annotate the problem using CUBES. In the first box, express the unknown mathematically using rational numbers and addition, subtraction, multiplication, or division (set up your solution). Then solve in the second box.

1. Lacey's bird feeder holds  $\frac{12}{5}$  of a cup of birdseed. Lacey is filling the bird feeder with a scoop that holds  $\frac{3}{5}$  of a cup. How many scoops of birdseed will Lacey put into the feeder?

|                        |                 |
|------------------------|-----------------|
| Express mathematically | Solve and check |
|------------------------|-----------------|

2. What is the height of the rectangle?



|                        |                 |
|------------------------|-----------------|
| Express mathematically | Solve and check |
|------------------------|-----------------|

3. Loren is putting brick along both edges of the 21 meter walkway to his house. Each brick is 0.25 meters long. Loren is placing the bricks end to end. How many bricks does he need?

|                        |                 |
|------------------------|-----------------|
| Express mathematically | Solve and check |
|------------------------|-----------------|

4. A teacher organized a field trip and collected \$2,268 from students. The trip cost \$27 per student. How many students paid for the field trip?

|                        |                 |
|------------------------|-----------------|
| Express mathematically | Solve and check |
|------------------------|-----------------|

5. Jim bought 20 bags of sand. The first 5 bags cost \$1.50 each. The rest of the bags cost \$0.85 each. How much did Jim pay for the 20 bags of sand?

|                        |                 |
|------------------------|-----------------|
| Express mathematically | Solve and check |
|------------------------|-----------------|

6. A farmer owns 9 fields that are  $1\frac{1}{2}$  acres each. He also owns one larger field that is  $7\frac{1}{2}$  acres. He separated all his land into  $1\frac{3}{4}$  acre lots. How many lots does the farmer have?

|                        |                 |
|------------------------|-----------------|
| Express mathematically | Solve and check |
|------------------------|-----------------|

7. The temperature was  $-5^{\circ}\text{C}$  at 6:00 a.m. It increased  $\frac{3}{4}$  of a degree every hour for 6 hours. The temperature then increased  $1\frac{1}{2}$  degrees every hour for 5 hours. What was the temperature at 5:00 p.m.?

|                        |                 |
|------------------------|-----------------|
| Express mathematically | Solve and check |
|------------------------|-----------------|

