TSC | WILLIAM D. LAW, JR. LEARNING COMMONS

Operations on Rational Numbers (decimals)

Operations with signed numbers will require us to use all the rules for working with decimals as well as all of the rules for the signs.

ADDITION

EXAMPLE 1: $-3.21 + (-4.7)$

Both of these decimals are negative numbers. The signs are the SAME. When we are adding and the signs are the same (both + or both −), we add the absolute values (meaning add 3.21 and 4.7) and then attach the common sign.

$-3.21 + (-4.7)$ Ignore the minus signs for now.

Add the absolutes values

$3.21 + 4.7$

$$\begin{array}{r} 3.21 \\ +\,4.70 \\ \hline 7.91 \end{array}$$

Be sure to line up the decimal points

-7.91 Be sure to attach the sign.

EXAMPLE 2: $-8.073 + 4.39$

In this problem the signs are *different*. When we are adding and the signs are different (one + and one −), we must do two things:

1. We must determine the sign of the sum by looking to see which of the numbers we are adding has the larger absolute value.
2. We must find the difference between the absolute values of the numbers by subtracting the smaller absolute value from the larger.

$-8.073 + 4.39$ The number with the larger absolute value is negative so sign will be negative.

$-8.073 + 4.39$ Subtract the absolute values

$$\begin{array}{r} 8.073 \\ -\,4.390 \\ \hline 3.683 \end{array}$$

Be sure to line up decimal points

-3.683 Attach the sign

SUBTRACTION

REMEMBER that when we are subtracting in algebra, we rewrite subtraction as addition of the additive inverse or opposite.

EXAMPLE 3: $3.02 - 9.87$

$3.02 + (-9.87)$ Rewrite as addition. Now add (signs are different). The number with the larger absolute value is negative.

$9.87 - 3.02$ Find the difference between the absolute values

$$\begin{array}{r} 9.87 \\ -3.02 \\ \hline 6.85 \end{array}$$ Be sure to line up the decimal points

-6.85 Be sure to attach the sign

EXAMPLE 4: $-4.58 - (-8.05)$

$-4.58 + 8.05$ Rewrite as addition of the opposite, then find the difference between the absolutes values.

$8.05 - 4.58$ The number with the larger absolute value is positive.

$$\begin{array}{r} 8.05 \\ -4.58 \\ \hline 3.47 \end{array}$$ Be sure to line up the decimal points

3.47 The answer is positive

MULTIPLICATION

The rules for multiplying signed number are as follows:

1. If the signs are the SAME (both + or both −), the product will ALWAYS be POSITIVE.
2. If the signs are DIFFERENT (one + and one −), the product will ALWAYS be NEGATIVE.

EXAMPLE 5: $(-0.005)(-2.5)$

The signs are the same (both −), so the product will be positive.

Multiply the absolute values

2.5	1 decimal place
× 0.005	3 decimal places
125	4 places total. Do not worry about lining up the decimal point!
= 0.0125	We must have 4 decimal places in the answer

REMEMBER that we must have the same number of decimal places in the answer as the total number of decimal places in the numbers we are multiplying.

EXAMPLE 6: $(1.36)(-0.2)$

The signs are different (one + and one −), so the product will be negative.

Multiply the absolute values

1.36	2 decimal places
× 0.2	1 decimal place
.272	3 places total Do not worry about lining up the decimal points.
= .272	We must have 3 decimal places in the answer.

$(1.36)(-0.2) = -0.272$ Be sure to attach the sign

DIVISION

The rules for dividing two signed numbers are the same as the rules for multiplying two signed numbers.

1. If the signs are the SAME (both + or both −), the quotient will ALWAYS be POSITIVE.

2. If the signs are different (one + and one −), the quotient will ALWAYS be NEGATIVE.

EXAMPLE 7: $-5.4 \div 9$

The signs are different (one + and one −), so the quotient will be negative.

$9\overline{)5.4}$ Divide the absolute values

0.6

$$9\overline{)5.4}$$
$$\underline{-5.4}$$
$$0$$

Keep the decimal point lined up

$-5.4 \div 9 = -0.6$ Be sure to attach the sign.

EXAMPLE 8: $-11.52 \div (-2.4)$

REMEMBER to move the decimal point one place to the right in the divisor and the dividend.

$$24\overline{)115.2}$$
$$4.8$$
$$\underline{96}$$
$$192$$
$$\underline{192}$$
$$0$$

Keep the decimal point lined up

$-11.52 \div (-2.4) = 4.8$ The sign is +

EXERCISES

1. $-2.79 + 7.02$
2. $-7.67 + (-0.02)$
3. $2.14 - 8.68$
4. $-0.06 - (-5.8)$
5. $(3.09)(-0.03)$
6. $(-2.6)(-1.002)$

7. $-8.4 \div 0.7$

8. $-17.92 \div (-3.2)$

KEY:

1. 4.23	2. −7.69	3. -6.54	4. 5.74
5. −0.0927	6. 2.6052	7. −12	8. 5.6