

## Operations on Real Numbers

### Operations on Real Numbers

Be able to add, subtract, multiply and divide real numbers.

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#### Adding Real Numbers:

- To add two numbers with the same sign, add their absolute values and attach their common sign.
- To add two numbers with different signs, subtract the smaller absolute value from the larger absolute value and attach the sign of the number with the larger absolute value.

Adding two numbers with the same sign:

$$-3 + -7 = -10$$

$$5 + 8 = 13$$

Adding Two numbers with different signs

$$\begin{array}{l} \downarrow \\ 2 + (-6) \\ -4 \end{array}$$

$$\begin{array}{l} \downarrow \\ (-3) + 10 \\ 7 \end{array}$$

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## Operations on Real Numbers

Add the following values:

a.  $-7 + (-10)$

$$-17$$

b.  $8 + (-12)$

$$-4$$

c.  $-4.6 + (-1.9)$   $-6.5$

$$\begin{array}{r} 4.6 \\ 1.9 \\ \hline 6.5 \end{array}$$

$$(2.3)(1.04)$$

$$2.3 + 1.04$$

$$\begin{array}{r} 2.30 \\ 1.04 \\ \hline \end{array}$$

$$\begin{array}{r} 1.04 \\ 2.3 \\ \hline 312 \\ 208 \\ \hline 2.392 \end{array}$$

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### Subtracting Real Numbers:

Subtracting real numbers can be thought as adding the opposite.

$$\text{If } a \text{ and } b \text{ are real numbers, } a - b = a + (-b)$$

Subtracting Real Numbers:

Keep  
Change  
Change

$$\begin{array}{l} (-7) - 9 \\ \downarrow \\ (-7) + -9 \\ -16 \end{array}$$

$$\begin{array}{l} -6 - (-3) \\ -6 + 3 \\ -3 \end{array}$$

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## Operations on Real Numbers

Subtract the following values:

Rewrite First

a.  $7 - 14$

$$\begin{array}{r} +7 + -14 \\ -21 \\ \hline = -7 \end{array}$$

b.  $-10 - (-2)$

$$\begin{array}{r} -10 + 2 \\ -8 \end{array}$$

c.  $-5 - 8$

$$\begin{array}{r} -5 + -8 = \\ -13 \end{array}$$

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Adding or Subtracting Fractions:

Remember: Before you can add or subtract, you must have a **Common Denominator**.

$$\frac{5}{4} + \frac{3}{4}$$

$$\frac{5+3}{4} = \frac{8}{4} = 2$$

$$\frac{5}{6} - \frac{1}{4}$$

$$\begin{array}{r} 2 \cdot \frac{5}{6} + -\frac{1}{4} \cdot 3 \\ 2 \cdot 6 \quad \quad \quad 3 \\ \frac{10}{12} + -\frac{3}{12} \\ \frac{7}{12} \end{array}$$

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## Operations on Real Numbers

Add/Subtract:

a.  $-\frac{2}{3} + \frac{1}{6}$

b.  $-\frac{1}{3} - \frac{1}{2}$

c.  $\frac{5}{7} + \frac{1}{3}$

Rewrite

Common Denom.  $4 \cdot \frac{-2}{3} + \frac{1 \cdot 2}{2} = \frac{-8}{12} + \frac{2}{12} = \frac{-6}{12} = \frac{-1}{2}$

$-\frac{1}{3} + -\frac{1}{2} = \frac{-2}{6} + \frac{-3}{6} = \frac{-5}{6}$

$\frac{5}{7} + \frac{1}{3} = \frac{5 \cdot 3}{7 \cdot 3} + \frac{1 \cdot 7}{3 \cdot 7} = \frac{15}{21} + \frac{7}{21} = \frac{22}{21}$

Solution

$\frac{15}{21} + \frac{7}{21} = \frac{22}{21}$

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To add subtract three or more real numbers, add or subtract from left to right:

Simplify:

$$18 + 3 - 4$$

$$18 + 3 - 4$$

$$21 - 4$$

$$17$$

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## Operations on Real Numbers

Simplify:

a.  $-3 - 11 + 7$

$$\begin{array}{r} \downarrow \\ -3 + -11 + 7 \\ \hline -14 + 7 \\ -7 \end{array}$$

b.  $-13 + 5 - 6$

$$\begin{array}{r} -13 + 5 + -6 \\ -8 + -6 \\ -14 \end{array}$$

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Multiplying/Dividing Two Real Numbers:

The product/quotient of two numbers with the same sign is positive.

The product/quotient of two numbers with different signs is negative.

Product Property of 0

The product of any real number and zero is zero.  
 $0(a) = 0$ , also  $a(0) = 0$

"anything times 0 is 0".

$\frac{N}{0}$   $\frac{0}{K}$   
undefined

Division by 0 is undefined

$$\begin{array}{l} \frac{4}{0} \quad 0 \overline{)4} \quad 0 \cdot 0 = 4 \\ \text{undefined} \\ \frac{12}{4} \quad 4 \overline{)12} \quad 4 \cdot 3 = 12 \checkmark \\ \frac{0}{4} \quad 4 \overline{)0} \quad 4 \cdot 0 = 0 \checkmark \end{array}$$

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## Operations on Real Numbers

5) Multiply/Divide:

a.  $-4(-2)$

8

b.  $0(-10)$

0

c.  $-3.2(0.1)$

$$\begin{array}{r} -3.2 \\ \cdot 0.1 \\ \hline \end{array}$$

$$\begin{array}{r} -3.2 \\ \times 0.1 \\ \hline 32 \end{array}$$

d.  $\frac{-16}{-4}$

$$\frac{-16}{-4} = 4$$

e.  $\frac{-3}{0}$

$$\frac{00}{-0.32}$$

undefined

f.  $0 \div -8$

0

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Multiplying two fractions:

Multiply the numerators together, and multiply the denominators together.

$$\frac{3}{7} \left( \frac{4}{9} \right) = \frac{4}{21}$$

6) Multiply:

a.  $-\frac{2}{5} \left( -\frac{1}{3} \right)$

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

b.  $-\frac{5}{1} \left( -\frac{1}{10} \right)$

$$-\frac{1}{2}$$

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## Operations on Real Numbers

Dividing two fractions:

Dividing is the same as multiplying by the reciprocal.

$$\begin{aligned} &-\frac{1}{11} \div \frac{2}{7} \\ &-\frac{1}{11} \cdot \frac{7}{2} = -\frac{7}{22} \end{aligned}$$

8) Divide:

$$\begin{aligned} \text{a. } &-\frac{1}{12} \div -\frac{3}{4} \\ &-\frac{1}{12} \cdot \frac{4}{3} = \frac{1}{9} \end{aligned}$$

$$\begin{aligned} \text{b. } &\frac{3}{7} \div -\frac{5}{14} \\ &\frac{3}{7} \cdot \frac{14}{5} = \frac{6}{5} \end{aligned}$$

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