2.3b Number Properties

🔑 Key Ideas

Commutative Properties

Words Changing the order of addends or factors does not change the sum or product.

Numbers $-5 + 8 = 8 + (-5)$
$-5 \cdot 8 = 8 \cdot (-5)$

Associative Properties

Words Changing the grouping of addends or factors does not change the sum or product.

Numbers $(7 + 4) + 2 = 7 + (4 + 2)$
$(7 \cdot 4) \cdot 2 = 7 \cdot (4 \cdot 2)$

EXAMPLE **1** **Using Commutative and Associative Properties**

Study Tip

Use number properties to group numbers that are easy to add or multiply.

a. **Evaluate 4.7 + 6 + 3.3.**

$$4.7 + 6 + 3.3 = 6 + 4.7 + 3.3 \qquad \text{Commutative Property of Addition}$$
$$= 6 + (4.7 + 3.3) \qquad \text{Associative Property of Addition}$$
$$= 6 + 8 \qquad \text{Add 4.7 and 3.3.}$$
$$= 14 \qquad \text{Add 6 and 8.}$$

b. **Evaluate $(7 \cdot 4)\dfrac{1}{4}$.**

$$(7 \cdot 4)\frac{1}{4} = 7\left(4 \cdot \frac{1}{4}\right) \qquad \text{Associative Property of Multiplication}$$
$$= 7(1) \qquad \text{Multiply 4 and } \frac{1}{4}.$$
$$= 7 \qquad \text{Multiplication Property of One}$$

● Practice

Evaluate the expression. Explain each step.
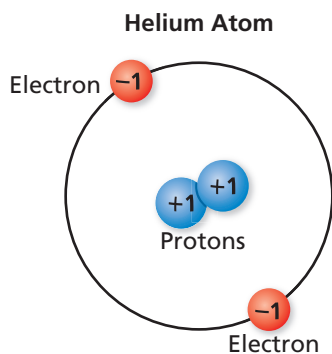
1. $2 + 3 + (-2)$

2. $12 + 6.1 + 5.9$

3. $4 \cdot 19 \cdot \dfrac{1}{2}$

4. $\dfrac{1}{3} \cdot 2 \cdot \dfrac{1}{2}$

5. $5\left(\dfrac{7}{8} \cdot \dfrac{2}{5}\right)$

6. $-1.45 + (-8.55 + 2.7)$

EXAMPLE **2** **Real-Life Application**

Helium Atom
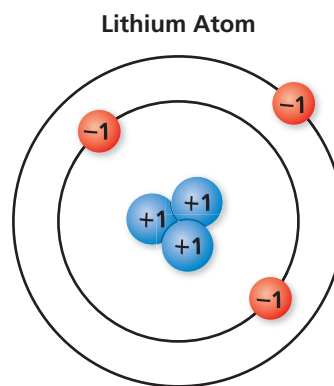

Electron −1

+1 +1
Protons

−1
Electron

A helium atom has positively-charged protons and negatively-charged electrons, as shown in the diagram. The sum of the charges gives the charge of the helium atom. Find the charge of the atom.

Charge of atom = Charge of protons + Charge of electrons

$$= (+1) + (+1) + (-1) + (-1) \quad \text{Substitute.}$$

$$= (+2) + (-2) \quad \text{Simplify.}$$

$$= 0 \quad \text{Additive Inverse Property}$$

The protons and the electrons are oppositely charged. So, the helium atom has a charge of 0.

Practice

7. SCIENCE A lithium atom has positively-charged protons and negatively-charged electrons. The sum of the charges gives the charge of the lithium atom. Find the charge of the atom.

Lithium Atom

8. BANK ACCOUNT The table shows four bank account transactions. Find the change in the account balance.

Transactions	
Deposit	$75
Groceries	−$33.50
Withdrawal	−$75
Deposit	$63.50

9. VIDEO GAME The table shows ways to gain and lose points in a video game. List a series of at least three events that results in 0 points.

Event	Points	Event	Points
Find treasure	+100	Find a map	+50
Find a gold coin	+10	Lose a coin	−10
Lose a map	−50	Find a silver coin	+5
Lose a compass	−25	Lose treasure	−100