1.3 Subtracting Integers

Contents:

INTRODUCTION

You have been doing subtraction for a long time. In the world of math we call subtraction *finding the difference*. What you might not know is that subtraction is really another form of addition. This section is going to introduce subtraction in a new way, especially as it relates to positive and negative numbers.

THE FIRST THREE MEANINGS OF THE DASH '–'

You have seen this dash '–' for many years as the **subtraction sign**, or **minus**. More recently you have seen it used as the **negative sign**. There is a third meaning that will prove to be very valuable to your understanding of algebra; the dash also means "**the opposite of**."

Here are the first three meanings of the dash:

1. minus — as in 9 – 4 is "9 **minus** 4."
2. negative — as in -6 is "**negative** 6"
3. the opposite of — as in -4 is "**the opposite of** 4."

The interesting, yet sometimes confusing, thing about these meanings is that they can be interchanged at almost any time. We can think of any one of these three meanings when we see the dash. *Negative* 8 can easily become *the opposite of* 8.

Example 1: Rewrite the outer negative sign as "the opposite of" the number within the parentheses. Also, state its value as we might normally say it. If the value of the number is positive, be sure to place a + in front of it.

a) - (+ 6) means the opposite of + 6 which is - 6

b) - (- 5) means the opposite of - 5 which is + 5

Exercise 1: Rewrite the outer negative sign as "the opposite of" the number within the parentheses. Also, state its value as we might normally say it.

a) - (+ 7) means ______________________ which is _______

b) - (+ 1) means ______________________ which is _______

c) - (- 4) means ______________________ which is _______

d) - (- 1) means ______________________________ which is _________

e) - (- 12) means ______________________________ which is _________

f) - (- 20) means ______________________________ which is _________

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THE DOUBLE NEGATIVE

Refer back to Example 1 and Exercise 1. What was the result of having *the opposite of* a negative number? For example, we can think of - (- 5) as "the opposite of - 5" which has the value of + 5.

We could say that *the opposite of a negative number* is a *positive number*. When written algebraically, *the opposite of* - 5 becomes - (- 5), but this has the value of + 5.

We are looking at what is called the **Rule of the Double Negative**. When two *negative* signs—two minus signs, two dashes—are next to each other (possibly separated by a parenthesis) then the number can be rewritten as a positive number. In other words, the two negative can be *replaced* by a positive.

In these cases, parentheses are usually quite helpful. For example, it's a little awkward to read - -5 as anything meaningful, so we always *separate* the negative signs with parentheses: - (-5).

Example 2: Rewrite each double negative as a positive. Be sure to include the + in front of the positive number.

a) - (- 9) = + 9 b) - (- 4) = + 4

c) - (- 2) = + 2 d) - (- 7) = + 7

Exercise 2: Rewrite each double negative as a positive. Be sure to include the + in front of the positive number you get.

a) - (- 15) = _____ b) - (- 12) = _____

c) - (- 2.3) = _____ d) - (- 0.92) = _____

e) - (- 1) = _____ f) - (- 0) = _____

g) $-\left(-\frac{2}{3}\right)$ = _____ h) $-\left(-4\frac{1}{5}\right)$ = _____

We'll return to the Rule of the Double Negative in a little bit. First, though, a look at why and how subtraction can be thought of as addition.

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SUBTRACTION WRITTEN AS ADDITION

Consider the *difference* (subtraction) of 7 and 4: 7 – 4 (which you know is 3). We now know that the minus sign—the dash—has more meaning than just subtraction. We know that it can also mean *negative* if we want it to, and that's exactly where we are headed.

First, let's return to thinking of addition as two numbers separated by the word *and*. In Section 1.2 we saw that, for example, 7 + (-4) could be thought of as *a positive 7 and a negative 4*, or as just + *7* and - *4* . In any case, + 7 + (- 4) = + 3.

Of course, when we write 7 – 4 = 3, we understand it to mean that 7 – 4 = **+ 3**. This is the same result as adding 7 + (-4). What you need to see is that 7 – 4 = 7 + (- 4); they're both equal to + 3.

This leads to two related ideas:

1. subtraction can be rewritten as addition, as "adding the opposite;" and
2. the sign in front of the term belongs to that term.

Let's first look at writing subtraction as addition. This means to change two things: change the operation to addition and change the second number to its opposite.

Example 3: Rewrite each subtraction as addition and evaluate.

a) 6 – 2 b) 1 – 7 c) 5 – 5 d) - 2 – 8 e) 3 – 7 f) - 4 – 1

Answer: For each of these, the operation will become addition and the second number will become its opposite.

a) 6 – 2 = 6 + (- 2) = + 4

b) 1 – 7 = 1 + (- 7) = - 6

c) 5 – 5 = 5 + (- 5) = 0

d) - 2 – 8 = - 2 + (- 8) = - 10

e) 3 – 7 = 3 + (- 7) = - 4

f) - 4 – 1 = - 4 + (- 1) = - 5

Exercise 3: Rewrite each subtraction as addition. Then, evaluate the sum using techniques learned in Section 1.2 (Adding Signed Numbers).

a) 9 – 6 = ____________ = ________

b) 12 – 5 = ____________ = ________

c) 3 – 11 = ____________ = ________

d) 7 – 7 = ____________ = ________

e) 2 – 2 = ____________ = ________

f) - 4 – 4 = ____________ = ________

g) - 3 – 9 = ____________ = ________

h) - 16 – 1 = ____________ = ________

i) - 10 – 28 = ____________ = ________

j) - 26 – 17 = ____________ = ________

k) 13 – 41 = ____________ = ________

l) 46 – 63 = ____________ = ________

Understanding that we can change subtraction into "adding the opposite" is very useful in algebra. When all we need to work with is simple subtraction, we can think about changing subtraction into addition *mentally* without having to write it out.

The key to understanding *subtraction as addition* goes back to the three meanings of the dash. We can, as it suits our need, think of the minus sign as a negative sign. For example, using the word "and" of addition, we can think of 7 – 4 as **+ 7 and - 4**. You know that the sum of + 7 and - 4 is + 3, just as you know that 7 – 4 = + 3.

This leads to the idea that **the sign in front of a number belongs to that number**. When we see, for example 7 – 4, we don't see any sign in front of the 7; this means that it is *positive* 7, + 7. However, we do see a sign in front of the 4, and it is a negative sign (a minus sign); therefore, the second number is really - 4.

Likewise, if we see a plus sign immediately in front of a number, then the number is considered to be positive. For example, in - 3 + 5, the 5 is considered to be a positive number (and - 3 is, of course, negative).

The diagrams show this new understanding.

$7 - 4$

positive 7 — No sign in front of the 7 means that it is positive.

negative 4 — A minus sign in front of the 4 means that it is negative.

$-3 + 5$

negative 3 — A negative sign in front of the 3 means that it is negative.

positive 5 — A plus sign in front of the 5 means that it is positive.

We can even think of $7 - 4$ as *+ 7 and - 4*. Likewise, $-3 + 5$ is *- 3 and + 5*, as we've seen before. This new understanding allows us to *add* numbers that, at first, appear to be subtracted. We'll take this idea in two steps. The first step is demonstrated in Example 4, below.

Example 4: Use the word *and* to rewrite each subtraction; then evaluate.

Remember The sign in front of the number belongs to that number. If there is no sign in front of the first number, then that number is positive.

a) $6 - 2$ = + 6 *and* (- 2) = + 4

b) $1 - 7$ = + 1 *and* (- 7) = - 6

c) $5 - 5$ = + 5 *and* (- 5) = 0

d) $-2 - 8$ = - 2 *and* (- 8) = - 10

Exercise 4: Use the word *and* to rewrite each subtraction; then evaluate.

a) $9 - 4$ = ____________ = ______

b) $6 - 7$ = ____________ = ______

c) $5 - 15$ = ____________ = ______

d) $-6 - 12$ = ____________ = ______

e) $-21 - 32$ = ____________ = ______

This time, think the word *and* in your head and try to evaluate the difference. If you need to, you may show some scratch work off to the side.

Exercise 5: Mentally, think the word *and* to evaluate. Remember, the sign in front of a number belongs to that number.

a) 8 – 10 = _____ b) 12 – 3 = _____

c) 6 – 6 = _____ d) 5 – 9 = _____

e) - 1 – 7 = _____ f) - 24 – 13 = _____

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Subtraction and the Commutative Property

This section has introduced two new ideas about subtraction:

(1)	Subtraction can be rewritten as *adding the opposite*; and
(2)	*the sign in front of the number belongs to the number*

We can use both of those ideas to demonstrate a commutative property for subtraction. I will use both ideas separately to demonstrate the commutativity.

Let's consider 6 – 4:

Using new idea (1): We now know that this can be rewritten as 6 + (- 4). The Commutative Property of Addition allows us to write this sum in a different order: - 4 + 6. In either case, you know that the sum is + 2, so they are equivalent, and 6 + (- 4) = - 4 + 6.

Using new idea (2): 6 – 4 can also be thought of as *+ 6 and - 4*. just as easily, we can think of this as *- 4 and + 6*, or - 4 + 6.

Also, if we lean on the idea that the sign in front of a number belongs to that number, then when we try to commute the numbers of 6 – 4, we can write the 4 first only if we know that it is really - 4.

In other words, when we move the 4 to the front, we must take the negative sign right with it because the negative sign (the minus sign) belongs to the 4.

Example 5: Use the Commutative Property to rewrite each of these. Remember that the sign in front of the number belongs to that number. Furthermore, if there is no sign in front of the first number, then its sign is positive. Lastly, evaluate the sum.

Remember: If a negative number is written second, then its negative sign shows up as *minus*; If a positive number is written second, then its positive sign shows up as a *plus*.

a)	6 – 2	= -2 + 6	= +4	The 6 is positive and the 2 is negative.
b)	1 – 7	= -7 + 1	= -6	The 1 is positive and the 7 is negative.
c)	6 – 6	= -6 + 6	= 0	One 6 is positive and the other 6 is negative.
d)	-5 + 5	= +5 – 5	= 0	One 5 is positive and the other 5 is negative.
e)	-2 – 8	= -8 – 2	= -10	Both the 2 and the 8 are negative.
f)	-8 + 9	= +9 – 8	= +1	The 9 is positive and the 8 is negative.

Exercise 6: Use the Commutative Property to rewrite each of these. Remember that the sign in front of the number belongs to that number. Furthermore, if there is no sign in front of the first number, then its sign is positive. Lastly, evaluate the sum.

a) 10 – 6 = ____________ = _______

b) 1 – 9 = ____________ = _______

c) -7 + 4 = ____________ = _______

d) -5 – 11 = ____________ = _______

e) -6 – 12 = ____________ = _______

f) -19 + 15 = ____________ = _______

g) -21 + 32 = ____________ = _______

h) 31 – 35 = ____________ = _______

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Subtraction and the Double Negative

At the beginning of this section we discussed the Rule of the Double Negative. This rule says that a double negative, such as - (- 8), can be rewritten as a positive, in this case as + 8.

We also understand that - (- 8) can be interpreted as *the opposite of - (- 8)*, which is + 8. Within a difference problem—one involving subtraction—a double negative should always be rewritten as a positive before evaluating. Let's explore this idea.

Consider the difference 5 – (- 8). This may be difficult to interpret with just one glance. Putting the three meanings of the dash to work, and using our discussion about the word *and*, *we* can write 5 – (- 8) as *+ 5 and the opposite of - 8*. Of course, as mentioned, *the opposite of - (- 8)* is + 8, so we can write this further as *+ 5 and + 8*, or as + 5 + 8.

The effect of this work is this: 5 – (- 8) can be rewritten as a sum: + 5 + 8. The double negative has been rewritten as a positive. Of course, + 5 + 8 = + 13 which means that 5 – (- 8) = + 13 also. Subtracting a negative number always requires rewriting the expression as a sum, as in *adding the opposite*. Let's practice this new idea.

First let's return to understanding the double negative.

Example 6: Rewrite each double negative first as *the opposite of* (the negative number) and then as a positive number. Be sure to include the + in front of the positive number.

a) - (- 6) b) - (- 1) - (- 5.8) d) $-\left(-\frac{3}{4}\right)$

Answer:

a) - (- 6) = *the opposite of - 6* = + 6

b) - (- 1) = *the opposite of - 1* = + 1

c) - (- 5.8) = *the opposite of - 5.8* = + 5.8

d) $-\left(-\frac{3}{4}\right)$ = *the opposite of* $-\frac{3}{4}$ = $+\frac{3}{4}$

Exercise 7: Rewrite each double negative as a positive. Be sure to include the + in front of the positive number you get.

a) - (- 10) = ____________________ = ______

b) - (- 4.8) = ____________________ = ______

c) - (- 9) = ____________________ = ______

d) $-\left(-\frac{5}{2}\right)$ = ____________________ = ______

Let's now put this same idea into practice within expressions involving a double negative.

Example 7: Rewrite each expression into words using *and* and *the opposite of* . Then, rewrite the expression as a sum and evaluate.

a) 5 – (- 6) b) - 4 – (- 1) c) -9 – (- 2)

Answer: We'll be turning each subtraction into a sum by "adding the opposite."

a)	5 – (- 6)	= + 5 and *the opposite of - 6*	= + 5 + 6	= + 11
b)	- 4 – (- 1)	= - 4 and *the opposite of - 1*	= - 4 + 1	= - 3
c)	-9 – (- 2)	= - 9 and *the opposite of - 2*	= - 9 + 2	= - 7

Exercise 8: Rewrite each expression into words using *and* and *the opposite of* . Then, rewrite the expression as a **sum** and **evaluate**.

a) 5 – (- 10) = ____________________ = __________ = ________

b) 6 – (- 4) = ____________________ = __________ = ________

c) 2 – (- 9) = ____________________ = __________ = ________

d) - 2 – (- 4) = ____________________ = __________ = ________

e) - 12 – (- 7) = ____________________ = __________ = ________

f) - 6 – (- 6) = ____________________ = __________ = ________

g) - 1 – (- 7) = ____________________ = __________ = ________

h) - 8 – (- 1) = ____________________ = __________ = ________

i) 7 – (- 2) = ____________________ = __________ = ________

j) 0 – (- 3) = ____________________ = __________ = ________

In the next example we'll change the double negative to a positive without writing any words. Still, whenever we encounter "subtracting a negative," we must first rewrite the expression as a sum before evaluating.

Example 8: Evaluate each expression by first rewriting it as a sum. We'll start by turning each subtraction into a sum as in "adding the opposite."

a) $5 - (-6) = \underline{+5 + 6} = \underline{+11}$

b) $-4 - (-1) = \underline{-4 + 1} = \underline{-3}$

c) $-9 - (-2) = \underline{-9 + 2} = \underline{-7}$

Exercise 9: Evaluate each expression by first rewriting it as a sum.

a) $3 - (-1)$ = ______________ = __________

b) $1 - (-8)$ = ______________ = __________

c) $-2 - (-2)$ = ______________ = __________

d) $-3 - (-9)$ = ______________ = __________

e) $-6 - (-5)$ = ______________ = __________

f) $-12 - (-2)$ = ______________ = __________

g) $4 - (-11)$ = ______________ = __________

h) $-10 - (-10)$ = ______________ = __________

i) $-8 - (-8)$ = ______________ = __________

j) $-16 - (-1)$ = ______________ = __________

k) $14 - (-15)$ = ______________ = __________

l) $12 - (-2)$ = ______________ = __________

m) $-34 - (-5)$ = ______________ = __________

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MIXED REVIEW

You have now seen the variety of ways that two numbers can be added to, and subtracted from, one another. When working with algebra, they will not necessarily come grouped together as one type or another. Expressions of addition and subtraction do not need to be restricted to just integers; we can add or subtract positive and negative decimals and fractions as well.

Here is a mixed review of addition and subtraction expressions. Use all of the techniques learned in Sections 1.2 and 1.3 to evaluate these. You may want to draw your own number line to assist you as necessary.

Exercise 10: Evaluate each expression.

a) $3 + (-1) =$

b) $3 - 1 =$

c) $1 - 9 =$

d) $6 + (-8) =$

e) $-2 + (-6) =$

f) $-5 - 2 =$

g) $-5 - 9 =$

h) $-12 + (-9) =$

i) $8 + (-5) =$

j) $6 - 10 =$

k) $-12 - 7 =$

l) $-1 + (-5) =$

m) $4 + (-15) =$

n) $-6 + 8 =$

o) $2.4 - 3.6 =$

p) $-3.17 + 4.28 =$

q) $-3.05 - 4.91 =$

r) $-0.56 + 2.10 =$

s) $\frac{3}{8} - \frac{4}{8} =$

t) $-\frac{5}{9} - \frac{3}{9} =$

u) $-\frac{5}{11} + \frac{8}{11} =$

v) $-\frac{9}{15} + \frac{7}{15} =$

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APPLICATIONS WITH INTEGERS

Here are some situations for which knowing how to add and subtract integers is of great benefit. In a checking account, the **balance** is the result of *adding in deposits* or subtracting checks that are written.

Example 9: Solve this application. Write a numerical expression, and write your answer in the form of a sentence.

Penny is writing checks to pay her monthly business expenses. After a few checks, her account is reduced to just $25. Knowing that she will get paid for an order that she is delivering tomorrow, she decides to write one more check, even though she doesn't have enough in her account. The check is for $37. How much is her new balance?

Answer: Writing a check means **subtracting** the amount of the check from the starting balance (the amount before the check is written).

Numerical expression: $25 - 37 = -12$

Sentence: Her new balance is - $12.

Exercise 11 Solve these applications. Write a numerical expression, and write your answer in the form of a sentence.

a) Adele has only $10 in her checking account, and she writes a check for $17. How much is her new balance?

Numerical expression:

Sentence: ______________________________

b) Adele is being foolish, now, by writing too many checks when she doesn't have enough money. Her check register had a balance of - $26 when she wrote another check for $15. What is her balance now?

Numerical expression:

Sentence: ______________________________

c) Poor Adele. Look what happened. She bounced a check, and though her bank covered the amount—this time—her bank charged her $17 for their services and a penalty. Adele's balance *before* the bank fees was - $48. What is her new balance?

Numerical expression:

Sentence: ______________________________

d) So, yesterday Adele's checkbook had a balance of - \$87. Fortunately, today she received a check for the \$100 that her brother owed her. Of course, she deposited it in the bank to cover her account. What is the new balance?

Numerical expression:

Sentence: ______________________________

e) What if, instead, when her account was at - \$87, the check she received from her brother was for only \$70? What would be the balance of her account then?

Numerical expression:

Sentence: ______________________________

Negative numbers show up in temperature readings as well. Not in the summer, of course, but in some northern states during the winter it can get very cold, below 0° (Fahrenheit), in fact.

Example 10: Solve this application. Write a numerical expression, and write your answer in the form of a sentence.

a) If the temperature was 8° at 4:00 p.m. and then dropped 15° by midnight, what was the temperature at noon?

Answer: Temperature *dropping* means **subtracting** the number of degrees it dropped, or fell, from the starting temperature.

Numerical expression: $8 - 15 = -7$

Sentence: The temperature at midnight was - 7°.

b) If the temperature was - 18° at 3:00 a.m. and then warmed 12° by noon, what was the temperature at midnight?

Answer: Temperature *warming* means **adding** the number of degrees it warmed, or rose, from the starting temperature.

Numerical expression: $-18 + 12 = -6$

Sentence: The temperature at noon was - 6°.

Exercise 12 Solve these applications. Write a numerical expression, and write your answer in the form of a sentence.

a) At 2:00 a.m. the outside temperature was $-13°$. By noon the temperature had warmed by 27°. What was the temperature at noon?

Numerical expression:

Sentence: ______________________________

b) At 3:00 a.m. the outside temperature was $-20°$. By 10:00 a.m. the temperature had warmed by 16°. What was the temperature at 10:00 a.m.?

Numerical expression:

Sentence: ______________________________

c) At 3:00 p.m. the outside temperature was 8°. By midnight the temperature had dropped 23°. What was the temperature at midnight?

Numerical expression:

Sentence: ______________________________

d) At noon the outside temperature was 18°. By midnight the temperature had dropped 11°. What was the temperature at midnight?

Numerical expression:

Sentence: ______________________________

e) At 8:00 p.m. the outside temperature was $-3°$. By 4:00 a.m. the temperature had dropped 17°. What was the temperature at 4:00 a.m.?

Numerical expression:

Sentence: ______________________________

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Answers to each Exercise

Section 1.3

Exercise 1:

a) the opposite of + 7; - 7
b) the opposite of + 1; - 1
c) the opposite of - 4; + 4
d) the opposite of - 1; + 1
e) the opposite of - 12; + 12
f) the opposite of - 20; + 20

Exercise 2:

a) - (- 15) = + 15
b) - (- 12) = + 12
c) - (- 2.3) = + 2.3
d) - (- 0.92) = + 0.92
e) - (- 1) = + 1
f) - (- 0) = 0
g) $-\left(-\frac{2}{3}\right) = +\frac{2}{3}$
h) $-\left(-4\frac{1}{5}\right) = +4\frac{1}{5}$

Exercise 3:

a) 9 + (- 6) = + 3
b) 12 + (- 5) = + 7
c) 3 + (- 11) = - 8
d) 7 + (- 7) = 0
e) 2 + (- 2) = 0
f) - 4 + (- 4) = - 8
g) - 3 + (- 9) = - 12
h) - 16 + (- 1) = - 17
i) - 10 + (- 28) = - 38
j) - 26 + (- 17) = - 43
k) 13 + (- 41) = - 28
l) 46 + (- 63) = - 17

Exercise 4:

a) 9 *and* (- 4) = + 5
b) 6 *and* (- 7) = - 1
c) 5 *and* (- 15) = - 10
d) - 6 *and* (- 12) = - 18
c) - 21 *and* (- 32) = - 53

Exercise 5:

a) - 2
b) + 9
c) 0
d) - 4
e) - 8
f) - 37

Exercise 6:

a) $10 - 6 = \underline{-6 + 10} = +4$
b) $1 - 9 = \underline{-9 + 1} = -8$
c) $-7 + 4 = \underline{+4 - 7} = -3$
d) $-5 - 11 = \underline{-11 - 5} = -16$
e) $-6 - 12 = \underline{-12 - 6} = -18$
f) $-19 + 15 = \underline{+15 - 19} = -4$
g) $-21 + 32 = \underline{+32 - 21} = +11$
h) $31 - 35 = \underline{-35 + 31} = -4$

Exercise 7:

a) - (- 10) = *the opposite of* - 10 = + 10
b) - (- 4.8) = *the opposite of* - 4.8 = + 4.8
c) - (- 9) = *the opposite of* - 9 = + 9
d) $-\left(-\frac{5}{2}\right)$ = *the opposite of* $-\frac{5}{2} = +\frac{5}{2}$

Exercise 8:

a) 5 – (- 10) = + 5 and *the opposite of* *- 10* = + 5 + 10 = + 15
b) 6 – (- 4) = + 6 and *the opposite of* *- 4* = + 6 + 4 = + 10
c) 2 – (- 9) = + 2 and *the opposite of* *- 9* = + 2 + 9 = + 11
d) - 2 – (- 4) = - 2 and *the opposite of* *- 4* = - 2 + 4 = + 2
e) - 12 – (- 7) = - 12 and *the opposite of* *- 7* = - 12 + 7 = - 5
f) - 6 – (- 6) = - 6 and *the opposite of* *- 6* = - 6 + 6 = 0
g) - 1 – (- 7) = - 1 and *the opposite of* *- 7* = - 1 + 7 = + 6
h) - 8 – (- 1) = - 8 and *the opposite of* *- 1* = - 8 + 1 = - 7
i) 7 – (- 2) = + 7 and *the opposite of* *- 2* = + 7 + 2 = + 9
j) 0 – (- 3) = 0 and *the opposite of* *- 3* = 0 + 3 = + 3

Exercise 9:

a) 3 – (- 1) = 3 + 1 = + 4
b) 1 – (- 8) = 1 + 8 = + 9
c) - 2 – (- 2) = - 2 + 2 = 0
d) - 3 – (- 9) = - 3 + 9 = + 6
e) - 6 – (- 5) = - 6 + 5 = - 1
f) - 12 – (- 2) = - 12 + 2 = - 10
g) 4 – (- 11) = 4 + 11 = + 15
h) - 10 – (- 10) = - 10 + 10 = 0
i) - 8 – (- 8) = - 8 + 8 = 0
j) - 16 – (- 1) = - 16 + 1 = - 15
k) 14 – (- 15) = 14 + 15 = 29
l) 12 – (- 2) = 12 + 2 = + 14
m) - 34 – (- 5) = - 34 + 5 = - 29

Exercise 10:

a)	+ 2	b)	+ 2	c)	- 8	d)	- 2
e)	- 8	f)	- 7	g)	- 14	h)	- 21
i)	+ 3	j)	- 4	k)	- 19	l)	- 6
m)	- 11	n)	+ 2	o)	- 1.2	p)	+ 1.11
q)	- 7.96	r)	+ 1.54	s)	$-\frac{1}{8}$	t)	$-\frac{8}{9}$
u)	$+\frac{3}{11}$	v)	$-\frac{2}{15}$				

Exercise 11:

a) + 10 – 17 = - 7 Her new balance is - $7.
b) - 26 – 15 = - 41 Her new balance is - $41.
c) - 48 – 17 = - 65 Her new balance is - $65.
d) - 87 + 100 = + 13 Her new balance is + $13.
e) - 87 + 70 = - 17 Her new balance is - $17.

Exercise 12:

a) - 13 + 27 = + 14: The noon temperature was 14°.
b) - 20 + 16 = - 4: The 10:00 a.m. temperature was - 4°.
c) + 8 – 23 = - 15: The midnight temperature was - 15°.
d) + 18 – 11 = + 7: The midnight temperature was 7°.
e) - 3 – 17 = - 20: The 4:00 a.m. temperature was - 20°.

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Section 1.3 Focus Exercises

1. Rewrite each subtraction as addition. Then, evaluate the sum.

a) $10 - 3$ = __________ = ______ b) $15 - 5$ = __________ = ______

c) $8 - 12$ = __________ = ______ d) $9 - 9$ = __________ = ______

e) $-2 - 4$ = __________ = ______ f) $-6 - 9$ = __________ = ______

g) $3 - 8$ = __________ = ______ h) $-16 - 1$ = __________ = ______

2. Use the Commutative Property to rewrite each of these. Then, evaluate the expression.

a) $7 - 4$ = __________ = ______ b) $2 - 12$ = __________ = ______

c) $-3 + 6$ = __________ = ______ d) $-9 - 1$ = __________ = ______

e) $-10 - 8$ = __________ = ______ f) $8 - 20$ = __________ = ______

g) $-15 + 51$ = __________ = ______ h) $22 - 29$ = __________ = ______

3. Rewrite each expression into words using *and* and *the opposite of* . Then, rewrite the expression as a **sum** and **evaluate**.

a) $8 - (-10)$ = ______________________________ = __________ = ________

b) $-3 - (-4)$ = ______________________________ = __________ = ________

c) $7 - (-9)$ = ______________________________ = __________ = ________

d) $-9 - (-4)$ = ______________________________ = __________ = ________

e) $-12 - (-7)$ = ______________________________ = __________ = ________

f) $-6 - (-6)$ = ______________________________ = __________ = ________

4. Rewrite each subtraction as addition. Then, evaluate the sum.

a) $2 - (-7)$ = __________ = ______ b) $12 - (-2)$= __________ = ______

c) $-3 - (-5)$ = __________ = ______ d) $-6 - (-7)$= __________ = ______

e) $-4 - (-4)$ = __________ = ______ f) $0 - (-10)$= __________ = ______

5. Evaluate each expression.

a) $1.4 + (-0.6) =$

b) $2.5 - 8.0 =$

c) $1.6 - 2.3 =$

d) $1.9 + (-3.0) =$

e) $-2.2 + (-7.1) =$

f) $-5.1 - 2.3 =$

g) $-0.35 - 0.9 =$

h) $-2.6 - (-0.08) =$

i) $\frac{7}{9} - \frac{2}{9} =$

j) $-\frac{8}{11} - \frac{2}{11} =$

k) $-\frac{3}{25} + \frac{14}{25} =$

l) $\frac{6}{7} - \frac{12}{7} =$

m) $\frac{6}{13} - \left(-\frac{3}{13}\right) =$

n) $-\frac{8}{14} - \left(-\frac{3}{14}\right) =$

o) $-\frac{1}{11} - \left(-\frac{14}{11}\right) =$

p) $\frac{4}{21} - \left(-\frac{13}{21}\right) =$

6. Marla has only $23 in her checking account, and she writes a check for $35. How much is her new balance?

Numerical expression:

Sentence: ____________________

7. Tom is being foolish by writing too many checks when he doesn't have enough money. His check register had a balance of - $64 when he wrote a check for $36. What is his balance now?

Numerical expression:

Sentence: ____________________

8. At midnight the outside temperature was - 6°. By noon the temperature had risen 13°. What was the temperature at noon?

Numerical expression:

Sentence: ____________________

9. At 3:00 p.m. the outside temperature was - 2°. By 10:00 p.m. the temperature had dropped 15°. What was the temperature at 10:00 p.m.?

Numerical expression:

Sentence: ____________________

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