Section 1.4 Multiplying and Dividing Integers

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Introduction

We now turn our attention to multiplication and division of signed numbers. Just as we developed rules for the addition of signed numbers, so shall we develop rules for their multiplication as well.

It is important to mention, though, that the rules for addition and rules for multiplication are different; just like rules for chess and checkers are different; just like rules for soccer and football are different. They may be played on the same checkerboard or on the same playing field, but you can't use the rules of one game to play the other game.

Evaluating with signed numbers is the same: the rules for addition and the rules for multiplication are different; the numbers will look the same, but you can't use the rules of addition to evaluate a problem of multiplication.

Multiplying Signed Numbers

As you know, multiplication is an abbreviation for repeated addition. For example, $3 \cdot 4 = 12$ because $3 \cdot 4$ means the sum of *three* 4's: $4 + 4 + 4 = 12$.

With this idea in mind, let's consider what happens when we try to add *two* - 5's or $(-5) + (-5)$; we know that the answer is -10, but when we abbreviate this addition problem and turn it into multiplication, it looks like $2 \cdot (-5)$. This introduces us to the idea of multiplying signed numbers:

First: $2 \cdot (-5) = (-5) + (-5) = -10$.

Furthermore, $3 \cdot (-5) = (-5) + (-5) + (-5) = -15$.

We could add another (- 5)—making it $4 \cdot (-5)$—and get a larger negative number, - 20.

This illustrates the first rule for multiplying signed numbers:

The **product** of a **positive** number and a **negative** number is a **negative** number.

Example 1: Evaluate each product.

a) $6 \cdot (-3) = -18$ b) $12 \cdot (-2) = -24$

c) $7 \cdot (-8) = -56$ d) $4 \cdot (-1) = -4$

Exercise 1: Evaluate each product.

a) $9 \cdot (-4) =$ ______ b) $2 \cdot (-11) =$ ______

c) $3 \cdot (-10) =$ ______ d) $6 \cdot (-6) =$ ______

e) $5 \cdot (-7) =$ ______ f) $8 \cdot (-1) =$ ______

You are probably familiar with the *commutative property for multiplication* which allows us to write

$$3 \cdot 4 = 4 \cdot 3.$$

The commutative property is also true for signed numbers, so that we may write

$3 \cdot (-5)$ as $(-5) \cdot 3$; the answer, either way we look at it, is -15:

$3 \cdot (-5) = -15$ and $(-5) \cdot 3 = -15$:

This illustrates the second rule for multiplying signed numbers:

The **product** of a **negative** number and a **positive** number is a **negative** number.

Example 2: Evaluate each product.

a) $-6 \cdot 4 = -24$ b) $-2 \cdot 15 = -30$

c) $-5 \cdot 8 = -40$ d) $-1 \cdot 4 = -4$

Exercise 2: Evaluate each product.

a) $-4 \cdot 3 =$ b) $-5 \cdot 6 =$ c) $-8 \cdot 7 =$ d) $-2 \cdot 2 =$

e) $-10 \cdot 5 =$ f) $-7 \cdot 3 =$ g) $-1 \cdot 9 =$ h) $-12 \cdot 1 =$

Next consider the special number , -1. Notice that

<u>-4 is the opposite of 4</u> and that $(-1) \cdot 4 = -4$.

Therefore, we could think of "multiplication by -1" as the same thing as "the opposite of." So that:

$(-1) \cdot 3 = -3$ (the opposite of 3)

$(-1) \cdot 7 = -7$ (the opposite of 7).

By that same reasoning, if we multiply -1 by a negative number, we'll get the opposite of that negative number (a positive number, by the way) as a result:

$(-1) \cdot (-4) = +4$ (the opposite of -4).

This means that we have a fourth meaning for the dash.

The four meanings of the dash:

(i) minus
(ii) negative
(iii) the opposite of
(iv) - 1 times

Example 3: Evaluate each product.

a) $-1 \cdot 9 = -9$ b) $-1 \cdot (-3) = +3$

c) $-1 \cdot 5 = -5$ d) $-1 \cdot (-6) = +6$

Exercise 3: Evaluate each product.

a) $-1 \cdot 3 =$ ______ b) $-1 \cdot (-2) =$ ______

c) $-1 \cdot 7 =$ ______ d) $-1 \cdot (-8) =$ ______

e) $-1 \cdot 5 =$ ______ f) $-1 \cdot (-4) =$ ______

g) $-1 \cdot 9 =$ ______ h) $-1 \cdot (-1) =$ ______

Likewise, we could think of any negative number as a product of -1 and a positive number:

Example 4: Write each negative number as the product of -1 and a positive number.

a) $-9 = -1 \cdot 9$ b) $-8 = -1 \cdot 8$

c) $-5 = -1 \cdot 5$ d) $-6 = -1 \cdot 6$

Exercise 4: Write each negative number as the product of -1 and a positive number.

a) $-4 =$ ________ b) $-7 =$ ________

c) $-2 =$ ________ d) $-10 =$ ________

e) $-1 =$ ________ f) $-3 =$ ________

g) $-15 =$ ________ h) $-21 =$ ________

Now, hold on to your hat, we're about to take a look at what goes on behind the scenes of this next rule. First, let's recall the *associative property of multiplication* that says that if we have three numbers to multiply, then we can rearrange the groupings to multiply them in any order:

$$(a \cdot b) \cdot c = a \cdot (b \cdot c)$$

Consider the following problem. It is worked out in more detail than you would ever use, so treat this work as "behind the scenes." This is what is actually going on when you multiply two negative numbers:

Multiply:	$(-5) \cdot (-4)$	multiplying two negatives: two negative *factors*
rewrite this as:	$= [(-1) \cdot 5] \cdot (-4)$	-5 is the same as $-1 \cdot 5$
use associative prop:	$= (-1) \cdot [5 \cdot (-4)]$	re-group
use rule 1, above:	$= (-1) \cdot (-20)$	a positive · a negative = a negative
"rule of opposites"	$= 20$	20 is the opposite of -20
End result:	so, $(-5) \cdot (-4) = 20$	new rule: negative · negative = positive

The product of two negative numbers is a positive number.

Example 5: Evaluate the product.

a) $-10 \cdot (-6) = +60$ or just 60

b) $-3 \cdot (-12) = +36$

c) $-4 \cdot (-7) = +28$

Exercise 5: Evaluate each product.

a) $-2 \cdot (-8) =$

b) $-7 \cdot (-3) =$

c) $-8 \cdot (-1) =$

d) $-6 \cdot (-9) =$

e) $-5 \cdot (-4) =$

f) $-9 \cdot (-7) =$

g) $-1 \cdot (-6) =$

h) $-3 \cdot (-3) =$

The fourth rule is actually the rule you've been using most of your life, you've just probably never had to think of it this way:

The product of two positive numbers is a positive number.

Example 6: Evaluate the product.

a) $6 \cdot 4 = +24$

b) $2 \cdot 15 = +30$

c) $5 \cdot 8 = +40$

The bottom line is that the four rules stated above can be broken down into just two rules:

rules (1) and (2), above, refer to the product of a positive and a negative (in any order); and

rules (3) and (4) refer to the product of two numbers with the same sign, either both positive or both negative.

Summary for the rules of *multiplying* two signed numbers:

a) if the signs of the factors are **different**, the product will be **negative**

b) if the signs of the factors are the **same**, the product will be **positive**

Example 7: Find the product between the two given signed numbers.

	Example	Rule	Result
a)	$-8 \cdot 6$	signs are different; the product is negative	$= -48$
b)	$3 \cdot 9$	signs are the same; the product is positive	$= +27$
c)	$-4 \cdot (-2)$	signs are the same; the product is positive	$= +8$
d)	$5 \cdot (-7)$	signs are different; the product is negative	$= -35$

Exercise 6: Find the product between the two given signed numbers.

	Product		Rule		Result
a)	$-7 \cdot (-6)$	=	______________________	=	________
b)	$-7 \cdot 8$	=	______________________	=	________
c)	$2 \cdot (-6)$	=	______________________	=	________
d)	$5 \cdot 9$	=	______________________	=	________
e)	$-3 \cdot 10$	=	______________________	=	________
f)	$6 \cdot 4$	=	______________________	=	________
g)	$-4 \cdot (-4)$	=	______________________	=	________
h)	$3 \cdot (-3)$	=	______________________	=	________

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THE PRODUCT RULE OF SIGNS

The Product Rule of Signs

a) if the *product* of two factors is **positive**, the *factors* must have the **same sign**

b) if the *product* of two factors is **negative**, the *factors* must have the **different signs**

Example 8: Given the product, what do you know about any of its factor pairs?

a) the product is + 15   b) the product is - 24

Answer:

a) since 15 is a positive number, it could only have a factor pair in which both numbers are positive or both are negative. For example, the factor pair of + 15 could be + 5 and + 3 or might be - 5 and - 3; in either case, the signs are the same.

b) Since - 24 is a negative number, it could only have a factor pair in which one factor is positive and the other is negative. For example, the factor pair of - 24 could be - 12 and + 2 or it might be + 3 and - 8.; in either case, the signs are different from each other.

Example 9: Given the product, determine if the factors will have *the same* sign or *different* signs. (The answers are given directly.)

The signs of the factors of:

a) **+ 30** are the same; they are either both positive or both negative.

b) **- 18** are different; one is positive and the other is negative.

Exercise 7: Given the product, determine if the factors will have the same sign or different signs. Use Example 9 as a guide.

The signs of the factors of:

a) **- 28** are ______________ ______________________________

b) **+ 48** are ______________ ______________________________

c) **+ 24** are ______________ ______________________________

d) **- 35** are ______________ ______________________________

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THE PRODUCT OF MORE THAN TWO SIGNED NUMBERS

What if we were to multiply more than two signed numbers? No problem, the associative property and the commutative property allow us to multiply in any order we choose.

Example 10: Find each product.

a) $2 \cdot 3 \cdot 4$ (no negatives) b) $-2 \cdot 3 \cdot 4$ (one negative)

c) $-2 \cdot (-3) \cdot 4$ (two negatives) c) $-2 \cdot (-3) \cdot (-4)$ (three negatives)

Procedure: Notice the number of negatives in the expression.

Answer:

a) $2 \cdot 3 \cdot 4$ Nothing special about these; use the associative property.

$= (2 \cdot 3) \cdot 4$

$= 6 \cdot 4$

$= +24$

b) $-2 \cdot 3 \cdot 4$ **One** negative; the end product is negative.

$= (-2 \cdot 3) \cdot 4$

$= -6 \cdot 4$

$= -24$

c) $-2 \cdot (-3) \cdot 4$ **Two** negative factors; the end product is positive. This is like having a "double negative."

$= [-2 \cdot (-3)] \cdot 4$

$= +6 \cdot 4$

$= +24$

d) $-2 \cdot (-3) \cdot (-4)$ **Three** negative factors; two of them form a double negative, making a positive product 6; the third negative factor, though, reverts the end product back to negative.

$= [-2 \cdot (-3)] \cdot (-4)$

$= +6 \cdot (-4)$

$= -24$

So, three negative factors gives a negative product. What do you think will happen if there are <u>four negative factors</u>? Let's find out:

$-1 \cdot (-2) \cdot (-3) \cdot (-4)$ We get two pairs of "double negatives," each resulting in a positive product.

$= [-1 \cdot (-2)] \cdot [(-3) \cdot (-4)]$

$= (+2) \cdot (+12)$

$= +24.$

Did you expect it to be positive? Notice that every *pair* of negative factors produces a positive number. We can actually make rule out of this:

> If a product has more than two factors, then
>
> 1) if there are an *odd* number of negative factors, the end product will be *negative*; and
>
> 2) if there are an *even* number of negative factors, then the end product will be *positive*.

Is this rule consistent with the rule stated on the previous page, or does it contradict that rule? Think about it. Maybe you can see in this next set of examples.

Example 11: Multiply. First decide whether the product is positive or negative, then multiply the numerical values of the factors. (Be sure your result is consistent.)

a) (6) (- 3) (- 2) b) (- 5) (4) (10)

c) (- 2) (- 8) (- 10) d) (- 4) (- 3) (- 5) (- 1)

Answer:

	Product of factors	# of negatives	result will be	End Product
a)	(6) (- 3) (- 2)	2 (even)	positive	(6) (- 3) (- 2) = $^{+}$36
b)	(- 5) (4) (10)	1 (odd)	negative	(- 5) (4) (10) = - 200
c)	(- 2) (- 8) (- 10)	3 (odd)	negative	(- 2) (- 8) (- 10) = -160
d)	(- 4) (- 3) (- 5) (- 1)	4 (even)	positive	(- 4) (- 3) (- 5) (- 1) = $^{+}$60

Exercise 8: Multiply. First decide whether the product will be positive or negative then multiply their numerical values. (You may get the answer directly, without showing all of the work in Example 11.)

a) (2) (- 4) (- 5) = ______ b) (- 2) (5) (3) (- 6) = ______

c) (- 3) (- 1) (- 6) = ______ d) (10) (- 4) (3) (- 1) = ______

e) (5) (6) (- 8) = ______ f) (- 1) (- 8) (- 2) (- 3) = ______

g) (- 8) (5) (- 7) = ______ h) (- 9) (3) (- 1) (- 2) = ______

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DIVISION OF SIGNED NUMBERS

In Elementary school these days, children are being taught to recognize "families" of numbers. For example, second graders learn that 6, 4 and 10 form a *family* in this way:

$6 + 4 = 10$ and
$4 + 6 = 10$ and
$10 – 6 = 4$ and
$10 – 4 = 6$.

The connection, therefore, between 4, 6 and 10 becomes familiar to the students not only for addition but for how addition and subtraction work together.

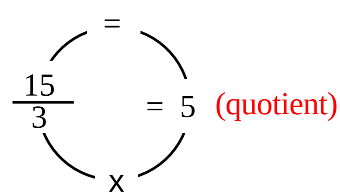
In the third grade, students learn the connection between multiplication and division as well. Consider the family of 3, 5, and 15:

$3 \cdot 5 = 15$ and
$5 \cdot 3 = 15$ and
$15 \div 5 = 3$ and
$15 \div 3 = 5$.

Furthermore, if we look at division in the sense of the division bar, as in fractions, we see the same "family" of numbers:

$$\frac{15}{3} = 5 \qquad \text{and} \qquad \frac{15}{5} = 3$$

We can start to see a circular pattern occurring: The denominator multiplies by the quotient (answer) to get the numerator.



How would this be different if some negative numbers were involved in the family? The process would be just the same; we'd simply need to be more careful. Consider the family of - 2, - 5 and 10:

Product or quotient	how it is interpreted
$-2 \cdot (-5) = 10$	(negative) · (negative) = positive
$10 \div (-5) = -2$	positive ÷ (negative) = negative
also $\frac{10}{-5} = -2$	$\frac{\text{positive}}{\text{negative}}$ = negative

Now consider the family of 4, - 6 and - 24:

Product or quotient	how it is interpreted
$4 \cdot (-6) = -24$	positive · (negative) = negative
$-24 \div (-6) = 4$	negative ÷ (negative) = positive
$-24 \div 4 = -6$	negative ÷ positive = negative
also $\frac{-24}{-6} = 4$	$\frac{\text{negative}}{\text{negative}}$ = positive
and $\frac{-24}{4} = -6$	$\frac{\text{negative}}{\text{positive}}$ = negative

The rules of dividing signed numbers are exactly the same as those for multiplication:

In any division, either by fraction or quotient,

1) if there are an *odd* number of negative factors, the quotient will be *negative*; and

2) if there are an *even* number of negative factors, then the quotient will be *positive*.

Let's do some examples:

Example 13: Divide.

a) $\frac{-21}{3}$ b) $\frac{36}{-9}$ c) $-28 \div (-7)$ d) $32 \div 4$

Procedure: First decide whether the quotient is positive or negative (by the number of negatives), then divide the numerical values. (Be sure your result is consistent.)

Answer:

	Quotient	# of negatives	result will be	Quotient
a)	$\frac{-21}{3}$	1 (odd)	negative	= - 7
b)	$\frac{36}{-9}$	1 (odd)	negative	= - 4
c)	$-28 \div (-7)$	2 (even)	positive	= 4
d)	$32 \div 4$	0 (even)	positive	= 8

Exercise 9: First decide whether the quotient will be positive or negative then divide their numerical values. (You may get the answer directly, without showing all of the work in Example 13.)

a) $45 \div (-5) =$ _____ b) $-42 \div 6 =$ _____ c) $-28 \div (-7) =$ _____

d) $\frac{-36}{-3} =$ _____ e) $\frac{32}{-8} =$ _____ f) $\frac{-54}{9} =$ _____

Another way for us to consider a fractional division of two negative numbers is through this example.

Simplify this fraction: $\frac{-7}{-12} = \frac{-1 \cdot 7}{-1 \cdot 12} = \frac{7}{12}$. In other words, the factor of -1 is able to cancel. This is actually another form of the double negative.

The rule for division of signed numbers leads to an idea that turns out to be quite helpful in some situations involving fractions. Consider the following:

$$\frac{-8}{2} = -4 \qquad \frac{8}{-2} = -4 \qquad -\frac{8}{2} = -4$$

Since the result is -4 for each of these, it is safe for us to say that each fraction, as written , is equivalent to the other fractions; in other words:

$$\frac{-8}{2} = \frac{8}{-2} = -\frac{8}{2}$$

The importance of this is that a negative sign in a fraction may be placed anywhere within the fraction without changing the value of the fraction. *That sounds somewhat like a rule:*

Rule of negatives in a fraction

A *single* negative sign in a fraction may be placed anywhere within the fraction without changing the value of the fraction.

Examples: Follow the negative sign in each pair of fractions.

$$\frac{7}{-9} = \frac{-7}{9} \qquad \frac{8}{-5} = -\frac{8}{5} \qquad -\frac{2}{3} = \frac{2}{-3} \qquad \text{and} \qquad \frac{-6}{11} = -\frac{6}{11}$$

Notice that in each fraction there is only one negative sign; it is either on top (in the numerator), on the bottom (the denominator) or out in front of the fraction. One negative sign may be placed anywhere in the fraction, but it may not show up in two different places within the fraction.

If a fraction starts out having *two* or more negatives, then it should first be simplified. If a negative sign remains, then it should be placed either in front of the fraction or in the numerator.

For example, the quotient for $\frac{-6}{-8}$ will be positive; the fraction should first be written as $\frac{6}{8}$ and then reduced to just $\frac{3}{4}$, which has no negative signs present. (It is a positive fraction.)

However, $-\frac{-9}{-12}$ has three negatives; like multiplication, the quotient will be negative, and we may place the negative sign in the numerator or in front of the fraction: $-\frac{-9}{-12} = -\frac{9}{12} = -\frac{3}{4}$ *or* $\frac{-3}{4}$.

We usually write negative fractions with the negative sign in either the numerator or in front of the fraction, and not in the denominator. This is only because it looks nicer that way.

For both *multiplication* and *division* of signed numbers, it turns out that whenever there are an odd number of negatives the result will be negative; likewise, whenever there are an even number of negatives the result will be positive. Based on the number of negative factors, you can decide right away whether the result is positive or negative. Once that's been decided, you may evaluate (reduce or cross cancel) as if the factors were all positive. Watch.

Example 14: Evaluate and simplify by first deciding whether the end result will be positive or negative.

a) $\frac{-1}{3} \cdot \frac{5}{-4}$ b) $\frac{-2}{-7} \cdot \frac{-3}{5}$ c) $\frac{-4}{9} \div \frac{7}{6}$ d) $\frac{-8}{-7} \div \frac{-4}{-5}$

Answer:

a) $\frac{-1}{3} \cdot \frac{5}{-4}$ Two negatives: end product is <u>positive</u>

$= + \frac{1}{3} \cdot \frac{5}{4}$ (Here's the positive sign, but we don't need to show it at each

$= \frac{5}{12}$ step; we already know the quotient is positive.)

b) $\frac{-2}{-7} \cdot \frac{-3}{5}$ Three negatives: end product is <u>negative</u>

$= - \frac{2}{7} \cdot \frac{3}{5}$ (Here, the negative sign *must* be shown at each step, otherwise

$= - \frac{6}{35}$ we might forget that the result is negative.)

c) $\frac{-4}{9} \div \frac{7}{6}$ Invert and multiply.

$= \frac{-4}{9} \cdot \frac{6}{7}$ One negative: end product is <u>negative</u>

$= - \frac{4}{9} \cdot \frac{6}{7}$

$= - \frac{4}{3 \cdot 3} \cdot \frac{3 \cdot 2}{7}$

$= - \frac{4}{3} \cdot \frac{2}{7} = - \frac{8}{21}$

d) $\frac{-8}{-7} \div \frac{-4}{-5}$ Invert and multiply.

$= \frac{-8}{-7} \cdot \frac{-5}{-4}$ Four negatives: end product is <u>positive</u>

$= + \frac{8}{7} \cdot \frac{5}{4}$

$= \frac{2 \cdot 4}{7} \cdot \frac{5}{1 \cdot 4}$

$= \frac{2}{7} \cdot \frac{5}{1} = \frac{10}{7}$

Exercise 10: Evaluate and simplify by first deciding whether the end result will be positive or negative.

a) $\frac{-2}{-3} \cdot \frac{4}{5} =$

b) $\frac{5}{-6} \cdot \frac{-3}{4} =$

c) $\frac{8}{7} \cdot \frac{-21}{-4} =$

d) $\frac{-12}{6} \cdot \frac{-7}{-4} =$

e) $\frac{-10}{-3} \div \frac{-5}{9} =$

f) $\frac{-2}{9} \div \frac{8}{-3} =$

g) $\frac{2}{-9} \div \frac{4}{-3} =$

h) $\frac{-15}{-8} \div \frac{-3}{-4} =$

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Answers to each Exercise

Section 1.4

Exercise 1:

a)	- 36	b)	- 22	c)	- 30	d)	- 36
e)	- 35	f)	- 8				

Exercise 2:

a)	- 12	b)	- 30	c)	- 56	d)	- 4
e)	- 50	f)	- 21	g)	- 9	h)	- 12

Exercise 3:

a)	- 3	b)	+ 2	c)	- 7	d)	+ 8
e)	- 5	f)	+ 4	g)	- 9	h)	+ 1

Exercise 4:

a)	$-4 = -1 \cdot 4$	b)	$-7 = -1 \cdot 7$	c)	$-2 = -1 \cdot 2$
d)	$-10 = -1 \cdot 10$	e)	$-1 = -1 \cdot 1$	f)	$-3 = -1 \cdot 3$
g)	$-15 = -1 \cdot 15$	h)	$-21 = -1 \cdot 21$		

Exercise 5:

a)	+ 16	b)	+ 21	c)	+ 8	d)	+ 54
e)	+ 20	f)	+ 63	g)	+ 6	h)	+ 9

Exercise 6:

a)	$-7 \cdot (-6) =$	(the signs are the same; the product is positive)	=	+ 42
b)	$-7 \cdot 8 =$	(the signs are *different*; the product is *negative*)	=	- 56
c)	$2 \cdot (-6) =$	(the signs are *different*; the product is *negative*)	=	- 12
d)	$5 \cdot 9 =$	(the signs are the same; the product is positive)	=	+ 45
e)	$-3 \cdot 10 =$	(the signs are *different*; the product is *negative*)	=	- 30
f)	$6 \cdot 4 =$	(the signs are the same; the product is positive)	=	+ 24
g)	$-4 \cdot (-4) =$	(the signs are the same; the product is positive)	=	+ 16
h)	$3 \cdot (-3) =$	(the signs are *different*; the product is *negative*)	=	- 9

Exercise 7:

a) the signs of the factors of **- 28** are different;
one is positive and the other is negative.

b) the signs of the factors of **+ 48** are the same;
they are either both positive or both negative.

c) the signs of the factors of **+ 24** are the same;
they are either both positive or both negative.

d) the signs of the factors of **- 35** are different;
one is positive and the other is negative.

Exercise 8:

a)	+ 40	b)	+ 180	c)	- 18	d)	+ 120
e)	- 240	f)	+ 48	g)	+ 280	h)	- 54

Exercise 9:

a)	- 9	b)	- 7	c)	+ 4	d)	+ 12
e)	- 4	f)	- 6				

Exercise 10:

a)	$+\frac{8}{15}$	b)	$+\frac{15}{24} = +\frac{5}{8}$	c)	+ 6	d)	$-\frac{7}{2}$
e)	- 6	f)	$+\frac{1}{12}$	g)	$+\frac{1}{6}$	h)	$+\frac{5}{2}$

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Section 1.4 Focus Exercises

1. Evaluate each product.

a) $6 \cdot (-5) =$ b) $3 \cdot (-12) =$ c) $7 \cdot (-8) =$ d) $4 \cdot (-1) =$

e) $-1 \cdot 5 =$ f) $-6 \cdot 3 =$ g) $-4 \cdot 3 =$ h) $-13 \cdot 2 =$

i) $-8 \cdot (-2) =$ j) $-10 \cdot (-4) =$ k) $-5 \cdot (-3) =$ l) $-9 \cdot (-1) =$

2. Multiply. First decide whether the product will be positive or negative then <u>multiply their numerical values</u>.

a) $(4)(3)(-2) =$ b) $(-3)(-2)(-1)(8) =$

c) $(-6)(-1)(8) =$ d) $(-3)(-3)(-2)(-5) =$

e) $(-5)(-2)(-9) =$ f) $(-6)(5)(-1)(7) =$

g) $(-2)(10)(-4) =$ h) $(8)(-5)(-2)(-5) =$

3. First decide whether the quotient will be positive or negative then <u>divide their numerical values</u>.

a) $-30 \div 5 =$ b) $45 \div (-9) =$ c) $-36 \div (-6) =$

d) $\frac{50}{-5} =$ e) $\frac{-60}{12} =$ f) $\frac{-40}{-10} =$

4. Evaluate and simplify by *first* deciding whether the end result will be positive or negative.

a) $\frac{-8}{5} \cdot \frac{2}{-3} =$

b) $\frac{-4}{-3} \cdot \frac{9}{8} =$

c) $\frac{-2}{5} \cdot \frac{-15}{-4} =$

d) $\frac{-9}{-3} \cdot \frac{-2}{-5} =$

e) $\frac{12}{7} \div \frac{-6}{35} =$

f) $\frac{-8}{10} \div \frac{4}{-3} =$

g) $\frac{-6}{-9} \div \frac{2}{-3} =$

h) $\frac{-16}{-15} \div \frac{-4}{-3} =$

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