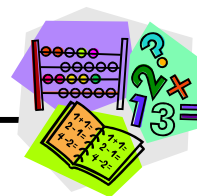# Multiplying Integers

Multiplication of integers can be shown in a variety of ways, such as by using manipulatives, pencil and paper and sign rules, or a calculator.

Multiplying Integers Using Manipulatives

When multiplying integers using manipulatives, the first integer is used to determine if groups of integers are added or removed.

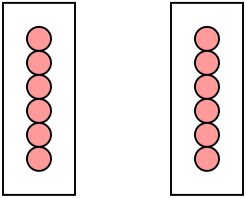A **positive** first integer means **ADD** groups of integers.
A **negative** first integer means **REMOVE** groups of integers.

The second integer is the number of objects in each group.

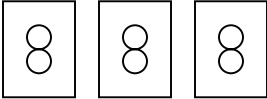The answer to the multiplication question is the number of objects left over.

Examples

two groups of six positive objects

A) $(+2) \times (+6)$

Add two groups of   six positive objects

$= \ \ \textbf{+12}$

$(+2) \times (+6) = \textbf{+12}$

B) $(+3) \times (-2)$

Add three groups of   two negative objects

$= \ \ \textbf{-6}$

$(+3) \times (-2) = \textbf{-6}$

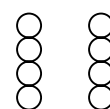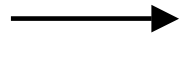**C)** (–2) × (+4) ⟶ There are not any positive objects to remove, so **groups of zeros** must be added until two groups of four positive objects can be removed.

Remove two   four positive objects
groups of

= **–8**
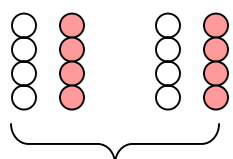
Two groups of
four positive and
negative objects.
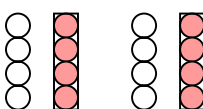
Remove two groups of +4

(–2) × (+4) = **–8**

D) (–3) × (–6) ⟶ There are not six negative objects to remove, so **groups of zeros** must be added until three groups of six negative objects can be removed.
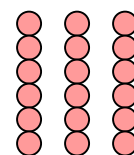
Remove three   six negative objects
groups of

= **+18**
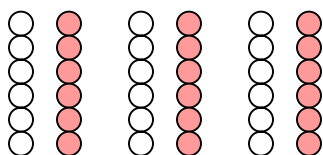
(= zero)
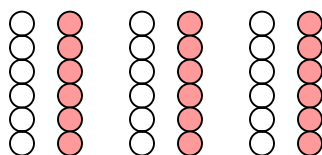
Remove three groups of –6.

(–3) × (–6) = **+18**

Multiplying Integers Using Pencil and Paper, and Sign Rules

The following sign rules can be used to find solutions when multiplying integers.

Step 1: Ignore the signs of the integers and multiply two numbers together to find the product.

Step 2: Apply the sign rules below to determine the sign of the product.

- If the signs are both the same, the product will be positive.

$$(+) \times (+) = +$$
$$(-) \times (-) = +$$

- If the signs are different, the product will be negative.

$$(+) \times (-) = -$$
$$(-) \times (+) = -$$

Examples

A) $(-2) \times (-12)$
$2 \times 12 = 24$

$(-) \times (-) = (+)$

$\longrightarrow$ = **+24**

$(+4) \times (+5) = $ **+20**

B) $(+4) \times (+5)$
$4 \times 5 = 20$

$(+) \times (+) = (+)$

$\longrightarrow$ = **+20**

$(+4) \times (+5) = $ **+20**

C) $(-2) \times (+9)$
$2 \times 9 = 18$

$(-) \times (+) = (-)$

$\longrightarrow$ = **−18**

$(-2) \times (+9) = $ **−18**

D) $(-4) \times (-7)$
$4 \times 7 = 28$

$(-) \times (-) = (+)$

$\longrightarrow$ = **+28**

$(-4) \times (-7) = $ **+28**

Multiplying Integers Using a Calculator

Calculators can be used to multiply integers if the calculator has an integer button. On many models, the integer button looks like this:

$$+ / -$$
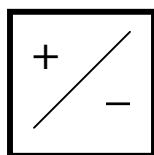
Depending on the model of calculator, the multiplication of integers can be done using one of two methods.

Calculator Method #1

Example   (−15) × (+3)

1. Enter the value of the first integer, followed by the $+ / -$ key only if the integer is negative.

    | 1 | | 5 | | + / − | ⟶ | −15 |
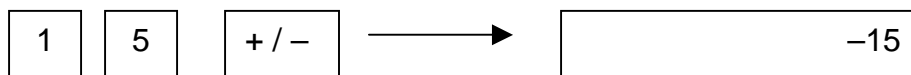
2. Press the $\times$ key.

3. Enter the value of the second integer, followed by the $+ / -$ key only if the integer is negative. In this example, the second integer is positive so the $+ / -$ key is not pushed.

    | 3 | ⟶ | 3 |

4. Press the $=$ key to display the answer.

    | −45 | (−15) × (+3) = **−45**

Calculator Method #2
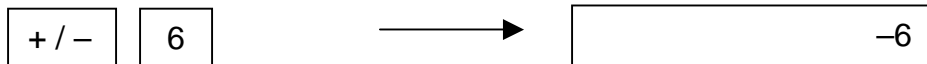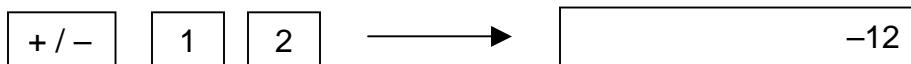
Example $(-6) \times (-12)$

1. If the first integer is negative, press the $\boxed{+/-}$ key on the calculator, then enter the value of the first integer.

   $\boxed{+/-}$ $\boxed{6}$ $\longrightarrow$ $\boxed{\qquad\qquad -6}$

2. Press the $\boxed{\times}$ key.

3. If the second integer is negative, press the $\boxed{+/-}$ key on the calculator, then enter the value of the second integer.

   $\boxed{+/-}$ $\boxed{1}$ $\boxed{2}$ $\longrightarrow$ $\boxed{\qquad\qquad -12}$

4. Press the $\boxed{=}$ key to display the answer.
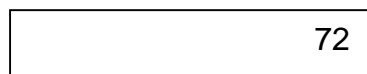
   $\boxed{\qquad\qquad 72}$ $\qquad$ $(-6) \times (-12) = \mathbf{+72}$

Example $(+20) \times (-4)$

Method #1 $\boxed{2}$ $\boxed{0}$ $\boxed{\times}$ $\boxed{4}$ $\boxed{+/-}$ $\boxed{=}$ $\boxed{\qquad\qquad -80}$
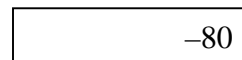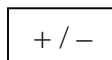
Method #2 $\boxed{2}$ $\boxed{0}$ $\boxed{\times}$ $\boxed{+/-}$ $\boxed{4}$ $\boxed{=}$ $\boxed{\qquad\qquad -80}$
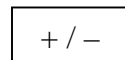
$(+20) \times (-4) = \mathbf{-80}$

Solving Word Problems

Check out these examples of writing mathematical statements from word problems.

Examples   **A)** A store loses fifty dollars a day over six days. How much money was lost in total over these six days?

$$(-50) \times (+6) = ?$$

(Using a calculator)

+/−	5	0	×	6	=	−300

A total of $300.00 was lost by the end of six days.

A negative value of money represents a LOSS of money.

B) The temperature rises +3°C each hour for four hours. By how many degrees Celsius did the temperature rise in four hours?

$$(+3) \times (+4) = ?$$

(Using sign rules)

$$3 \times 4 = 12$$
$$(+) \times (+) = (+)$$

$$(+3) \times (+4) = \mathbf{+12}$$

The temperature increased by a total of +12°C.

Practice: Multiplying Integers

1. Solve the following by selecting an appropriate strategy, such as manipulatives, calculator or pencil and paper.

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

    b) $(+4) \times (-3) =$

    c) $(+5) \times (+12) =$

    d) $(-5) \times (-10) =$

    e) $(-9) \times (-7) =$

    f) $(+11) \times (+20) =$

    g) $(+10) \times (-5) =$

    h) $(+6) \times (-7) =$

    i) $(-15) \times (+2) =$

    j) $(+12) \times (-12) =$

2. Solve the following by selecting an appropriate strategy, such as manipulatives, calculator or pencil and paper.

    a) $(+40) \times (+60) =$

    b) $(-20) \times (-40) =$

    c) $(-35) \times (-5) =$

    d) $(+20) \times (-15) =$

    e) $(+35) \times (-12) =$

    f) $(-42) \times (+17) =$

    g) $(-33) \times (-100) =$

    h) $(+25) \times (+115) =$

    i) $(+54) \times (-152) =$

    j) $(-123) \times (+54) =$

Practice: Solving Word Problems

Write each problem as a mathematical statement using integers. Solve using a variety of strategies, such as manipulatives, pencil and paper or calculator. The first one is done for you.

1. The temperature falls 3°C each hour for eight hours. What is the total change in temperature over this eight-hour period?

    (–3°C) × 8 = –24°C
    The total change in temperature over the eight-hour period is –24°C.

2. A submarine dives 20 m each minute for 15 minutes. What is the total change in depth after 15 minutes?

3. A stock loses $1.50 each day over a five-day period. What is the total change in the value of the stock at the end of five days?

4. The temperature rises 2°C each hour from 6:00 a.m. to 3:00 p.m. What is the total change in temperature during this period of time?

5. Abdul earns $13.00 in interest each month for six months. How much interest will Abdul have earned at the end of six months?