

Grade 7

NUMBER SENSE AND NUMERATION: INTEGERS - OBJECTS MODEL

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Play **Space Coupe** <http://pbskids.org/cyberchase/games/negativenumbers> and
One False Move www.funbrain.com/ofm/index.html (Easy/Medium Levels).
You may go to www.wiredmath.ca for the link.

- Write an integer to represent each statement.
 - A loss of 2 kg.
 - Travelling up 5 floors in an elevator.
 - An increase of \$6 in a stock price.
 - In golf Mike Weir shot 3 under par.
 - The temperature rose 10 Celsius degrees.
 - The bottom of Lake Ontario is 243 m below sea level.
- Explain what you could do to undo your action in the form of an appropriate integer.
 - The elevator moves down 4 floors.
 - You walk up CN Tower's 1776 steps.
 - You move back 4 spaces on a game board.
- Discuss each of the following statements with a partner.
 - +2 is the same as 2.
 - Subtracting a negative integer is the same as adding the positive integer.
 - The opposite of 4 is -4. All integers except 0 have an opposite.
 - Integers are any one of $\{\dots, -4, -3, -2, -1, 0, 1, 2, 3, 4, \dots\}$.
 - Zero is neither a positive nor a negative integer.
 - Any integer that is to the right of a second integer on a horizontal number line is greater than the first integer.

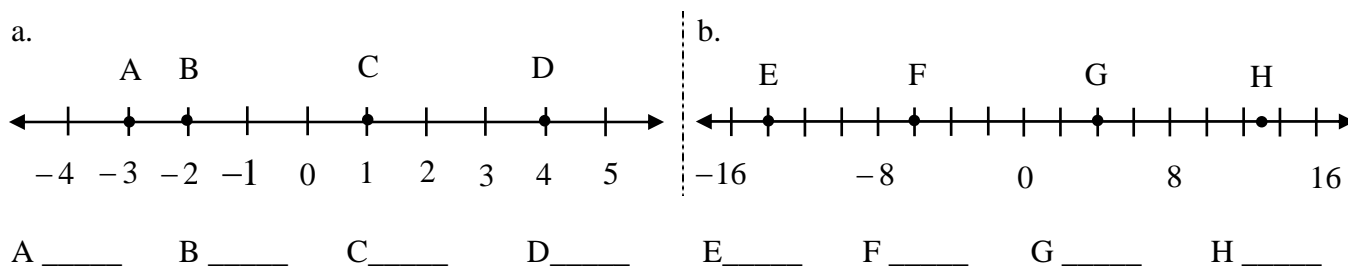
A Slice of History

As recently as the 1500s, there were mathematicians who argued against the "existence" of negative numbers.

They said Zero signifies "nothing," and it's impossible for anything to be less than nothing.



- Write an integer that corresponds to each of the following letters.



- Arrange these integers from least to greatest.
 - 2, 0, -6, 3
 - 4, 6, -7, 8, -9
 - 5, -7, -3, 0, -5

Objects Model – Addition

Let a 'happy face' ☺ be a positive unit (+1) and a 'sad face' ☹ be a negative unit (-1).

E.g. Illustrate the sum $(+2) + (+3)$ using 'faces'. Write an integer for the result of the sum.

Begin with +2. ☺☺	Join +3 more. ☺☺☺	Result. ☺☺☺☺☺
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Therefore, $(+2) + (+3) = +5$.

The Integer 0

An equal number of happy faces and sad faces is equal to zero.

E.g. ☺☺☺ (3 happy faces)

☹☹☹ (3 sad faces)

The combined result is 0. We write $(+3) + (-3) = 0$.

E.g. Illustrate the sum $(+5) + (-3)$ using 'faces'. Write an integer for the result of the sum.

Begin with +5. ☺☺☺☺☺	Join -3 more. ☹☹☹	Combine pairs of happy faces (+1) and sad faces (-1) to get zeros. ☺☺☺ ☹☹☺ ☹☺☹	Result. ☺☺
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Therefore, $(+5) + (-3) = +2$.

6. Illustrate the sum $(-3) + (+6)$ using 'faces'. Write an integer for the result of the sum.

Begin with ____.	Join ____ more.	Combine pairs of happy faces (+1) and sad faces (-1) to get zeros.	Result.
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Therefore, $(-3) + (+6) = \underline{\hspace{2cm}}$.

123454321

11⁶₀ 343

77777777

2002 4554

Did You Know?

A palindrome is a number (or word) that is the same written forwards and backwards. For example, 858 and 1234321 are palindromes.

There are 1998 palindromes less than one million, of which 111 are prime numbers.

121 8888888

563365⁶₇ 9

333₇

76267

Objects Model - Subtraction

E.g. Illustrate the difference $(+3) - (+2)$ using 'faces'. Write an integer for the result of the difference.

Begin with +3. ☺☺☺	Remove +2. ☺☺	Result. ☺
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Therefore, $(+3) - (+2) = +1$. We can write $(+3) - (+2) = 1$.

E.g. Illustrate the difference $(-5) - (-3)$ using 'faces'. Write an integer for the result of the difference.

Begin with -5. ☹☹☹☹☹	Remove -3. ☹☹☹	Result. ☹☹
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Therefore, $(-5) - (-3) = -2$.

E.g. Illustrate the difference $(-5) - (+3)$ using 'faces'. Write an integer for the result of the difference.

Begin with -5. ☹☹☹☹☹	To remove +3, we need to add 3 happy faces and 3 sad faces. We still have the equivalent of -5. ☺☺☺ ☹☹☹☹☹ ☹☹☹	Remove +3. ☺☺☺	Result. ☹☹☹☹☹☹☹☹☹
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Therefore, $(-5) - (+3) = -8$.

7. Illustrate the difference $(-3) - (-5)$ using 'faces'. Write an integer for the result of the difference.

Begin with ____.	To remove ____, we need to add ____ happy faces and ____ sad faces.	Remove ____.	Result.
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Therefore, $(-3) - (-5) = \underline{\hspace{2cm}}$.

8. Use 'faces' to simplify each of the following pairs of questions and compare the results.

- a. $(+3) - (-2)$ and $(+3) + (+2)$ b. $(+5) - (+2)$ and $(+5) + (-2)$ c. $(-3) - (+4)$ and $(-3) + (-4)$

9.  a. Use your results from question 8 to complete the following sentence.

“To subtract an integer, _____”.

b. Write the following subtraction equations as addition equations. [E.g. $(-3) - (+4) = (-3) + (-4)$]

Subtraction Equation	Addition Equation
$(+9) - (+4) = +5$	$(\quad) + (\quad) =$
$(-9) - (-4) = -5$	
$(+9) - (-4) = +13$	
$(-9) - (+4) = -13$	

10. Determine the value of each of the following.

- a. $(+4) + (+3)$ b. $(+6) + (-2)$ c. $(+3) + (-5)$ d. $(-4) + (-1)$
e. $(+5) - (+2)$ f. $(+4) - (+7)$ g. $(+3) - (-2)$ h. $(-5) - (-2)$
i. $(-5) + (+3)$ j. $(-3) + (-2)$ k. $(-4) + (+4)$ l. $(-2) + (-4)$
m. $(-5) - (+2)$ n. $(-3) - (-2)$ o. $(-1) - (-1)$ p. $(-4) - (-7)$
q. $(-5) + (-2) + (+4)$ r. $(+3) + (-2) + (-1)$ s. $(+6) + (-7) + (+3)$

11. Determine the missing integer in each equality.

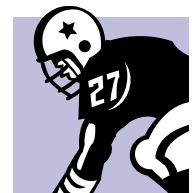
- a. $(+3) + () = +7$ b. $(+4) + () = -1$ c. $() + (+6) = -8$
d. $(+4) - () = +1$ e. $(-7) - () = -2$ f. $() - (+2) = -4$

12. a. Using integers, write a mathematical expression to describe each of the following.
b. Calculate the sum.

- i. A profit of \$250 and then an additional profit of \$50.
ii. A loss of \$45 and then an additional loss of \$55 in a business deal.
iii. An advance of 8 metres and then an advance of 4 metres.
iv. A fall of 15 m and then a fall of 6 m.
v. A walk of 4 km left followed by another of 3 km in the same direction from a starting point of zero.

13. What is the change in temperature from a high of 15°C to a low of 8°C ?

14. In Canadian football, a school team began on the 30-yard line. In a series of plays the team gained 6 yards and followed this by another gain of 5 yards for a first down. On their next two plays they lost 3 yards and then gained 4 yards. What was their total gain or loss? At what yardage marker were they after the four plays?



15. Kristen started a new ladies wear store with a debt of \$4200. During the first four weeks she made a profit of \$2800, lost \$450, lost \$150, and then made a profit of \$1400. How much did Kristen owe after four weeks?



Don't forget now! Go to www.wiredmath.ca for the link.



TRY THESE!

Adding One- and Two-Digit Integers

<http://www.berghuis.co.nz/abiator/maths/sa/saintegeradd2.html>

Subtracting Integers

<http://www.berghuis.co.nz/abiator/maths/sa/saintegeradd1.html>

INTERESTING RESULT

16. Write a 3-digit number so that the first digit minus (subtract) the third digit is greater than 1. For example, 723 is fine because $7 - 3 = 4$. Reverse the digits of the original number. Subtract the reversed number from the original to get another NEW three-digit number. Now, find the sum of this number and the number that you get after reversing its digits. Try this with other 3-digit numbers. What do you notice?

CHALLENGE YOURSELF!

17. What is the value of $1 + 2 - 3 - 4 + 5 + 6 - 7 - 8 + \dots + 45 + 46 - 47 - 48 + 49 + 50$?
18. Of the 33 students in a class, 18 belong to the mathematics club, 17 belong to the science club, and 4 belong to neither club. How many students belong to both clubs?

EXTENSION

19. Three positive integers are added two at a time. The sums obtained are 180, 208 and 222. Find the greatest of these three integers.

