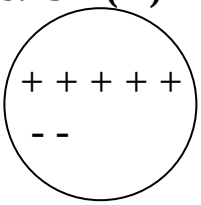
Section 8.1 (Like chapter 3 except includes negative whole numbers)
Addition and Subtraction of Integers

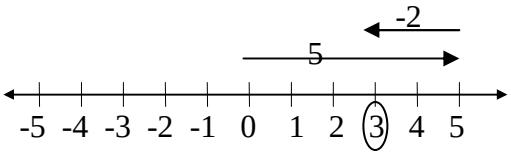
The set of integers is the set of whole numbers and their negatives:

$$I = \{\ldots, -3, -2, -1, 0, 1, 2, 3, \ldots\}$$

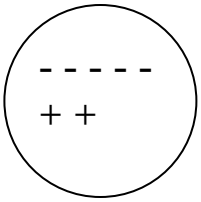
Illustrations can be done using:
1. Set Model
2. Measurement model (number line)
3. Patterns
4. Word Problems

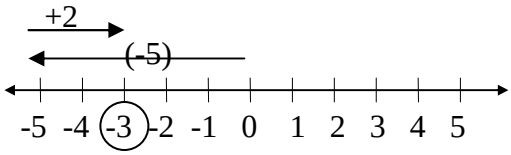
Examples: 5 + (-2) = 3



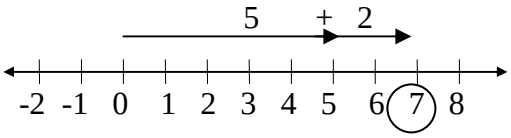


(-5) + 2 = (-3)

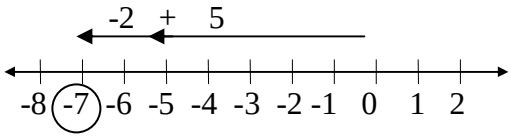




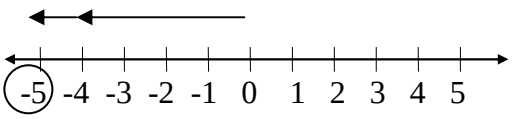
Examples: 5 + 2 = 7



–5 + -2 = -7



(-4) + (-1) = (-5)



The Properties of Integer addition:
1. Closure – When two integers are added, the answer is always an integer.
2. Commutative – Integers can be added in any order: $a + b = b + a$
3. Associative – Addition of Integers can be regrouped: $(a + b) + c = a + (b + c)$
4. Identity is zero – An integer's identity is preserved when zero is added: $a + 0 = a$
5. Additive Inverse (new property)
   For each integer, b, there is a unique integer, written (- b), such that $b + (- b) = 0$

Subtraction of Integers

Illustrations can be done using:

1. Set Model
2. Measurement model (number line)
3. Patterns
4. Word Problems

Example using Patterns -- beginning with a familiar concept in whole numbers lead into a new concept with integers.

4 – 2 = 2	Notice that the first column remained 4
4 – 1 = 3	while the second column decreases by 1
4 – 0 = 4	Thus the number subtracted is smaller by 1 so the answer is
4 – (-1) = 5	larger by 1.
4 – (-2) = 6	

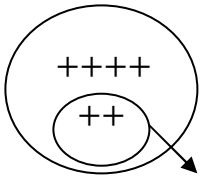
There are three equivalent ways to view subtraction of integers:

1. Take away method
2. Adding the opposite: a – b = a + (-b)
3. Missing addend: a – b = c if and only if c + b = a.

Examples using Set Models:

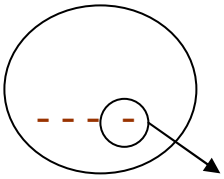
Take away method:

6 – 2 = 4



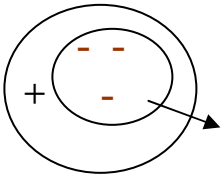
Begin with 6, take away 2, (+ 4) remains

(-4) – (-1) = -3



Begin with (-4), take away (-1), (- 3) remains

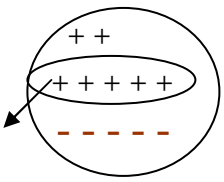
(-2) – (-3) = +1



Begin with (-2)
Insert + and - take away (-3)
this leaves (+1)

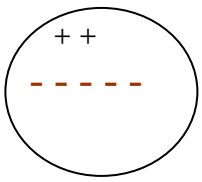
Take away vs. Adding the opposite:

2 – 5 = (-3) is equivalent to 2 + (-5) = (-3)



Start with +2

vs.



Start with +2 and insert -5

Then insert five + and -

Take away +5, leaving an answer equivalent to –3

Missing Addend:

2 – 5 = $\boxed{-3}$ if and only if $\boxed{-3}$ + 5 = 2

Carefully read the 6th grade "Student Page Snapshot", in section 8.1 of your textbook, for illustrations of the different ways to Subtract Integers.