Addition Review Sheet

Introduction

This lesson is a review sheet for addition. The pace is rapid, so some of the details may be omitted or skimmed so that students don't get bogged down. Students should be familiar with absolute values, the rules for adding positive and negative rationals, and have had experience using algebra pieces. A worksheet is given at the end of the lesson.

Standards Assessed

California Content Standards for Algebra I – Grades 8-12

1.0 Students identify and use the arithmetic properties of subsets of integers and rational, irrational, and real numbers, including closure properties for the four basic arithmetic operations where applicable.

Materials Needed

The only thing needed other than pencil and paper is a large number of two types of small objects to represent the algebra pieces. I used transparent disks of two different colors (red for positive, white for negative), but even small pieces of paper with "+" and "−" written on them can be used. Also, an optional handout with several number lines might be useful (an example is given on the last page of this document).

Addition with the Number Line

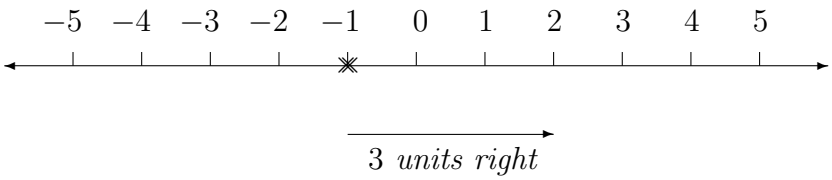
Here are some quick rules for addition with a number line.

1. Mark the left operand on the number line.
2. If the right operand is positive, move to the right.
3. If the right operand is negative, move to the left.

For example, to do the problem

$$-1 + 3$$

we mark the number line at -1 and move 3 units to the *right* (because 3 is positive).



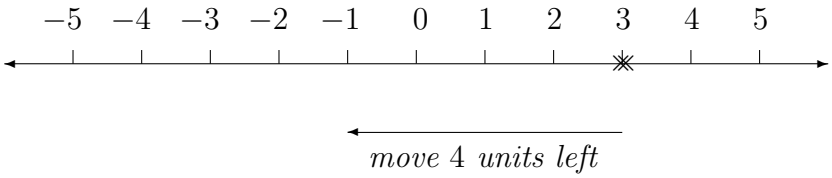
The result is

$$-1 + 3 = 2.$$

On the other hand, to solve

$$3 + (-4)$$

we mark 3 on the number line and move 4 units to the *left* (because -4 is negative).



The result is

$$3 + (-4) = -1.$$

Addition by the Rules

Alternatively, we can use the following rules for adding rationals.

1. If both numbers are positive, then add as usual. $(4 + 8 = 12)$
2. If both numbers are negative, add their absolute values, and make the result negative. $(-4 + (-8) = -12)$
3. If the signs of the numbers differ, then take the difference between their absolute values, and keep the sign of the one with the larger absolute value. $(4 + (-8) = -4)$

Here are two examples that illustrate the last rule. Consider

$$-15 + 12.$$

The absolute values of the two numbers here are 15 and 12. The difference between them is 3, and we keep the sign of the larger (15) so our answer is negative:

$$-15 + 12 = -3.$$

Here is the same problem with opposite signs.

$$15 + (-12) = ???$$

The difference between the absolute values is still 3, but now the number with the larger absolute value is 15, so our answer is positive:

$$15 + (-12) = 3.$$

Addition with Algebra Pieces

This method is commonly used in algebra I classes in middle schools and high schools. It only applies to integers, however, but is a great learning tool for beginning addition and subtraction.

Background Review

We use $\oplus$ for positive pieces and $\ominus$ for negative pieces. We represent positive integers with positive pieces (for example, $\oplus\oplus\oplus$ represents $+3$) and negative integers with negative pieces ($\ominus\ominus\ominus\ominus\ominus$ represents -5).

Zero Pairs. A *zero pair* is a pair consisting of a positive and negative piece ($\oplus\ominus$). A zero pair represents 0 because $1 + (-1) = 0$.

Useful fact about zero pairs. Zero pairs can be inserted or removed from a set of pieces at will, without changing its value. For example,

$\oplus\oplus\oplus$ $\qquad$ $\oplus\oplus\oplus$
$\qquad\qquad\quad\ \oplus\ominus$ $\qquad$ $\oplus\oplus\oplus$
$\qquad\qquad\qquad\quad\ \oplus\ominus\oplus\ominus$

are three different ways of representing $+3$.

The Method

Here is the method we use to add two integers.

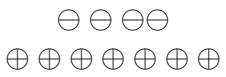
- Represent the integers using the algebra pieces.
- Combine the pieces.
- Remove as many zero pairs as possible.
- The resulting pieces represent the answer.

For example, if we want to solve the problem

$$-4 + 7$$

then we need four negative pieces to represent -4, and seven positive pieces to represent 7 as shown.

We combine these pieces



and then remove as many zero pairs as possible

and we are left with

so we have three positive pieces left, and our result is $+3$; that is,

$$-4 + 7 = 3.$$

Addition Worksheet

1. $3 + 5 = 8$
2. $3 + (-5) = -2$
3. $-1 + (-1) =$
4. $-12 + (-13) =$
5. $-15 + (-16) =$
6. $1 + (-10) =$
7. $15 + (-15) =$
8. $-15 + 15 =$
9. $-15 + (-15) =$
10. $37 + (-46) =$

NUMBER LINES SHEET

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-5 -4 -3 -2 -1 0 1 2 3 4 5

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