

A 7th Grade Unit on...

Adding and Subtracting Positive and Negative Integers

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Buffalo State: I² T²

Unit Overview

Length of Unit: 5 Days

Technology and Manipulatives Used:

- Red/yellow chips
- Overhead Projector
- Computers for each student
- One computer linked to a projector or TV (for demonstrations)
- Internet
- Website: <http://nlvm.usu.edu/en/nav/vlibrary.html>

Objectives: Students will...

- Add and subtract negative and positive integers
- Explain why pairs of positive and negative chips can be added to help solve a problem.
- Develop a strategy for using a number line to add and subtract a series of positive and negative integers.
- Understand there are multiple ways of combining numbers (using addition and subtraction) to end up at a given number.
- Create word problems and scenarios to describe problems with negative and positive integers.
- Discover real-life connections with positive and negative integers.
- Gain an understanding of real-life expenses and responsibilities.
- Relate earning money and paying bills to positive and negative integers.
- Develop a budget based upon a given salary.
- Record transactions by using algorithms for adding and subtracting integers.
- Explain the strategies they use to solve problems.

NCTM Content Standards:

- Number and Operations

NCTM Process Standards:

- Problem Solving
- Communication
- Connections
- Representations

NYS Content Standards:

- 7.N.12 Add, subtract, multiply, and divide integers
- 7.N.13 Add and subtract two integers (with and without the use of a number line)
- 7.N.19 Justify the reasonableness of answers using estimation

NYS Process Standards:

- Problem Solving
- Communication
- Connections
- Representations

Resources Used:

- Student & Teacher's Edition from Connected Mathematics 2: Lappan, Fey, Fitzgerald, Friel, Phillips. Accentuate the Negative. Pearson/Prentice Hall: Boston, 2006.
- National Library of Virtual Manipulatives ~ Utah State University: <http://nlvm.usu.edu/en/nav/vlibrary.html>

Day-by-Day Outline of the Unit

Day 1:

- *Adding positive and negative integers using red/yellow chips*

Day 2:

- *Subtracting positive and negative integers using the "Color Chips Subtraction" activity on the National Library of Virtual Manipulatives website*

Day 3:

- *Using a number line to add and subtract a series of integers using the "Number Line Bounce" activity on the National Library of Virtual Manipulatives website*

Day 4:

- *Relating integers to real-life financial situations by developing a budget*

Day 5:

- *Recording the transactions of paying bills and earning money to practice adding and subtracting integers*

Day 1

Objectives: *Students will...*

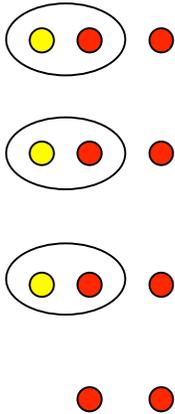
1. Add negative and positive integers
2. Explain the strategies they use to solve the problems

Materials

- Red/yellow chips
- Overhead Projector
- Board & dry-erase markers/chalk
- Poster board & markers
- Group sets of problems on cards

Outline of the Activity:

1. Introduce the topic by asking students to show how to solve "5+7" with yellow chips. Students can demonstrate how to solve by manipulating chips on an overhead projector.
2. Ask the students to solve $-1+1$ and describe how they figured it out. If students need a hint, tell them a story problem to match the expression (ex: *I owe my mom a \$1. After earning \$1 from washing the car, I gave my mom \$1. How much do I owe her now?*).
3. Place the problem "3+-8" on the board. Ask the students to represent this problem with yellow and red chips (do not solve!). If necessary, tell students that the yellow chips are positive and the red chips are negative.
4. Ask the students to explain *how* to solve the problem by manipulating the chips. Refer back to " $-1+1$." A -1 and a $+1$ cancel each other out to equal 0. Therefore, a red chip and a yellow chip can be matched together and taken away, until all the chips of one color are gone:



5. Students will work in groups to solve 4 problems. The students will show how to solve the problems using chips (and then represent their work by drawing on a piece of paper).
6. The students in each group will work together to solve the extension question. They will present their work on a poster.
7. The groups will share their posters with the class, teaching the other students how to solve the extension problem.

Group Problems:

Group A	Group B	Group C	Group D
$-3 + 10$	$-5 + 2$	$-6 + 8$	$-7 + 3$
$-17 + 9$	$-13 + 8$	$-21 + 7$	$8 + -15$
$-5 + -16$	$-7 + 21$	$9 + -10$	$-7 + -7$
Extension Problem:	Extension Problem:	Extension Problem:	Extension Problem:
$X + 7 = -3$	$12 + X = 4$	$13 + X = -8$	$X + -16 = 4$

Answer Key:

Group A	Group B	Group C	Group D
$-3 + 10 = 7$	$-5 + 2 = -3$	$-6 + 8 = 2$	$-7 + 3 = -4$
$-17 + 9 = -8$	$-13 + 8 = -5$	$-21 + 7 = -14$	$8 + -15 = -7$
$-5 + -16 = -21$	$-7 + 21 = 14$	$9 + -10 = -1$	$-7 + -7 = -14$
Extension Problem:	Extension Problem:	Extension Problem:	Extension Problem:
$X + 7 = -3$ $X = -10$	$12 + X = 4$ $X = -8$	$13 + X = -8$ $X = -21$	$X + -16 = 4$ $X = 20$

Day 2

Objectives: *Students will...*

1. Subtract negative and positive integers
2. Create word problems and scenarios to describe problems with negative and positive integers
3. Explain why pairs of positive and negative chips can be added to help solve a problem

Materials:

- Computer lab with Internet access
- A computer linked to a projector or TV
- Color Chips Subtraction Lab Sheet

Outline of the Activity:

1. The lesson will take place in the computer lab.
2. Ask the students to review what they learned from yesterday's lesson.
3. Instruct the students to go to the National Library of Virtual Manipulatives Website: <http://nlvm.usu.edu/en/nav/vlibrary.html>
4. Click on the Numbers and Operations Box for "6-8." Click on the "Color Chips Subtraction" Activity.
5. Demonstrate how to play this activity by showing the students an example using a projector or TV.
6. Ask students to explain why pairs of positive and negative numbers are added when there are not enough chips to be taken away.
7. Students will have the rest of the lesson to use this activity.
8. During the lesson, students will complete a worksheet, where they are asked to create word problems or scenarios to describe the problems in the activity.

Day 3

Objectives: *Students will...*

1. Develop a strategy for using a number line to add and subtract a series of positive and negative integers
2. Understand there are multiple ways of combining numbers (using addition and subtraction) to end up at a given number

Materials:

- Computer Lab with Internet Access
- A computer linked to a projector or TV
- Board & Dry-erase markers/Chalk
- Exit Slips

Outline of the Activity:

1. Draw a number line on the board.
2. Tell the students they are going to start on "0" and they want to end up at 15. Ask them to develop different ways of "jumping" on the number line to get to 15. Remind them that they do not always have to jump forwards and they can jump backwards too.
3. Allow students to share some of the ways they "traveled" to 15.
4. Choose one of the paths and ask the students to label the jumps and write an equation to describe the path.

Example: 2 jumps forward (+2), 5 jumps backwards (-5), 8 jumps forward (+8), 10 jumps forward (+10)

Equation:

$$2 + -5 + 8 + 10 = 15 \quad \underline{\text{or}} \quad 2 - 5 + 8 + 10 = 15$$

5. Instruct the students to go to the National Library of Virtual Manipulatives Website: <http://nlvm.usu.edu/en/nav/vlibrary.html>
6. Click on the Numbers and Operations Box for "6-8." Click on the "Number Line Bounce" Activity.

7. Demonstrate how to play this activity by showing the students an example using a projector or TV.
8. To play the activity, the given jumps must be used to get to the given number. The jumps can be switched from positive to negative by clicking on the black and red arrows.
9. Students will be given the rest of the lesson to solve problems using the interactive activity. During the last 5 minutes of the lesson they will fill out an Exit Slip to monitor what they learned.

Name:

Section:

Date:

Exit Slip

One thing I learned during this activity is...

The math involved in this activity is...

Some of the strategies to solve the problems in this activity are...

I am still confused about...

Name:

Section:

Date:

Exit Slip

One thing I learned during this activity is...

The math involved in this activity is...

Some of the strategies to solve the problems in this activity are...

I am still confused about...

Day 4

Objectives: *Students will...*

1. Gain an understanding of real-life expenses and responsibilities
2. Develop a budget based upon a given salary

Materials:

- Salary Cards
- Living Expenses Packet
- Game of Life Worksheet

Outline of the Activity:

1. Tell the students they are going to play a version of the Game of Life.
2. Students will work in pairs to record their living expenses.
3. First, students will pick cards with a given salary. (The card will also state how much money they will receive in their bi-monthly paycheck.)
4. Students will then fill in a worksheet listing the amounts they will spend on housing, transportation, food, entertainment, etc.
5. The students will be given a "Living Expenses" packet with choices for their housing, transportation, etc.
6. Tell the students that the goal of the game is not to go into debt. (They should not spend more than they earn.)
7. Remind the students that sometimes in life, unexpected incidents occur (both good and bad) and they should plan for these events.
Ask: What are some things you can do to financially plan for the future?
8. The students will complete Part II of the Game of Life in the next lesson. (They will record the transactions, along with receiving a list of "unexpected occurrences.")

Name:

Section:

Date:

Game of Life Worksheet (page 1 of 2)

Directions: Fill in the worksheet with your expenses.

Salary

Bi-Monthly Salary (Amount in each paycheck):

Monthly Salary:

Housing

Type of Housing:

Mortgage/Rent (per month):

Utilities:

Transportation

Type of Transportation:

Cost per month:

Gas:

Car Insurance:

Game of Life Worksheet (page 2 of 2)

Food

Groceries:

Additional Expenses:

Phone Bill:

Cable Bill:

Entertainment:

(List as many choices as you want/can afford. Include the cost and the day of the month you plan on choosing this entertainment.)

Type

Day

Cost

SALARY CARDS

Salary:

\$19,200

Amount in Bi-Monthly Paycheck:

\$800

Salary:

\$24,000

Amount in Bi-Monthly Paycheck:

\$1000

Salary:

\$20,400

Amount in Bi-Monthly Paycheck:

\$850

Salary:

\$16,800

Amount in Bi-Monthly Paycheck:

\$700

Salary:

\$21,600

Amount in Bi-Monthly Paycheck:

\$900

Salary:

\$18,000

Amount in Bi-Monthly Paycheck:

\$750

Salary:

\$22,800

Amount in Bi-Monthly Paycheck:

\$950

Salary:

\$36,000

Amount in Bi-Monthly Paycheck:

\$1,500

Game of Life

Living Expenses Packet

(page 1 of 2)

Housing

<i>Type of Housing</i>	<i>Mortgage/Rent</i>	<i>Utilities</i>
3 bedroom house	\$850	\$200
2 bedroom house	\$700	\$150
3 bedroom apartment	\$600	Included in the rent
2 bedroom apartment	\$450	\$75

Transportation

<i>Type of Transportation</i>	<i>Monthly Payment</i>	<i>Gas</i>	<i>Car Insurance</i>
Public Transportation Monthly Pass	\$65 per person	\$0	\$0
Old Car	Already paid for, but you need to pay \$150 for repairs	\$100	\$100
New Car	\$350	\$100	\$100
New Sports Car	\$500	\$150	\$200

Food

<i>Groceries</i>	\$200
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Living Expenses Packet (page 2 of 2)

Additional Expenses:

(You can choose not to have any of the optional expenses)

<i>Type of Expense</i>	<i>Monthly Payment</i>
Phone Bill	\$40
Cell Phone Bill (optional)	\$40
Cable Bill (optional)	\$55
Newspaper Delivery (optional)	\$30

Entertainment:

<i>Type of Entertainment</i>	<i>Cost</i>
Dinner at a Restaurant	\$40
2 Tickets to the Movies	\$20
Snacks at the Movies	\$15
2 Tickets to a Concert	\$75
2 Tickets to a Sporting Event	\$60
Shopping Trip at the Mall	\$100

Day 5

Objectives: *Students will...*

1. Discover real-life connections with positive and negative integers
2. Relate earning money and paying bills to positive and negative integers
3. Record transactions by using algorithms for adding and subtracting integers

Materials:

- Students' Game of Life Worksheets (from Day #4)
- Transactions Worksheet
- Calendar of Due Dates
- Chance Cards
- Pink Hi-liters
- Overhead Projector

Outline of the Activity:

1. Review with the students what they did in the last lesson.
2. On the overhead projector, show students an example of the Transactions Worksheet (used to keep track of the money coming in and going out of their bank accounts).
3. Review the terms: Deposits, Withdraws, Balance
4. Tell the students that on the 1st and 15th of the month they will get a paycheck.
5. Demonstrate how to fill in the Transactions Worksheet by recording the first transaction of getting a paycheck. Tell the students that they are each starting with a balance of \$0.

Date	Transaction	Operation	Balance
			\$0
12/1	Deposits Paycheck \$1000	+ \$1000	\$1000
12/2	Go to the Movies \$20	- \$20	\$980

6. Hand out a calendar of due dates to the students (the due dates will list when the bills are due). Also, hand out the Transactions Worksheet.
7. Remind students that the goal of the game is not to go into debt. Anytime they have a negative balance on their transaction worksheet, they will hi-lite it with a pink hi-liter. Tell the students, "You don't want to go into the red!"
8. Also remind students that in life, unexpected things occur. To practice dealing with these situations, each pair of students is going to pick 3 Chance Cards. The Chance Cards will list what happened and the date it happened on (so they can record it on their Transaction Worksheets). The Chance Cards will include earning money and losing money.
9. Pass out the Chance Cards and allow the students to begin working.
10. Students will answer the questions in a written manner: "If you 'went into the red,' how could you have planned your budget differently or made different choices to avoid going into debt?" or "If you 'did not go into the red,' what strategies did you use to avoid going into debt?"
11. As a closure, hold a discussion over what happened in the students' Games of Life, some of the decisions they made (bad/good), what they would do differently, and what strategies they used.

Name:

Section:

Date:

Date	Transaction	Operation	Balance
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Day 1: You are going on an interview for a new job and you need to buy a new suit.

Pay \$200

Day 2: You are going to a birthday party and you need to buy a gift.

Pay \$50

Day 3: This card applies to you ONLY if you drive a car.

Your car broke down and it needs to be repaired.

Pay \$300

Day 4: You are sick with the flu and had to visit the doctor and get medicine.

Pay \$55

Day 5: This card applies to you if you use public transportation.

You missed the bus and need to get a taxi.

Pay \$300

Day 6: Your stove broke and you need to buy meals from the store for a week.

Pay \$145

Day 7: You need a new winter coat.

Pay \$95

Day 8: You need to make home repairs.

Pay \$175

Day 9: You work overtime.

Earn \$150

Day 10: It's your birthday! You get a gift.

Earn \$50

Day 11: You need to make home repairs.

Pay \$70

Day 12: You broke your arm and have to go to the emergency room.

Pay \$135

Day 13: You need to go to the dentist for a check-up.

Pay \$35

Day 14: You work overtime.

Earn \$85

Day 15: You need to pay for a babysitter.

Pay \$35

Day 16: You watched your neighbor's dog for the weekend.

Earn \$60

Day 17: You work overtime.

Earn \$150

Day 18: You mow your neighbor's lawn.

Earn \$25

Day 19: You need to make home repairs.

Pay \$70

Day 20: You need to go to the doctor's for a check-up.

Pay \$25

Day 21: You work overtime.

Earn \$75

Day 22: You work overtime.

Earn \$85

Day 23: You need to pay for a babysitter.

Pay \$35

Day 24: You helped your neighbor run errands and she gave you a thank you gift.

Earn \$30

Day 25: You work overtime.

Earn \$150

Day 26: Your furnace broke and needs to be repaired.

Pay \$135

Day 27: You need to make home repairs.

Pay \$70

Day 28: You work overtime.

Earn \$75

Day 29: You work overtime.

Earn \$75

Day 30: You work overtime.

Earn \$85

Day 31: You need to pay for a babysitter.

Pay \$35

Day 31: You helped your neighbor run errands and she gave you a thank you gift.

Earn \$30

Game of Life

Calendar of Due Dates

Day	Payment Due
Day 2	Groceries
Day 5	Car Payment
Day 10	Cable Bill
Day 12	Newspaper Bill
Day 16	Utilities
Day 20	Mortgage/Rent
Day 21	Gas
Day 25	Car Insurance
Day 26	Phone Bill
Day 27	Cell Phone Bill

**Remember to record any entertainment expenses and the transactions stated on the "Chance Cards."*

**You will receive a paycheck on Day 1 and Day 15.*