Title: Money Matters: Integers are Integral!

Brief Overview:

In this unit, students will design and develop a working budget for a one-month period after learning to add and subtract integers. Within that budget, students will utilize integers to maintain an accurate account of monies saved and spent over that time. Students will explore addition and subtraction of integers with various strategies and manipulatives along the way.

NCTM Content Standard/National Science Education Standard:

Number and Operations:
- Develop meanings for integers and related vocabulary; and, represent and compare quantities with them;
- Understand the meaning and effects of arithmetic operations with fractions, decimals, and integers;
- Simplify computations with integers, fractions, and decimals;
- Develop and analyze algorithms for computing with fractions, decimals, and integers and develop fluency in their use;

Representation:
- Create and use representations to organize, record, and communicate mathematical ideas;
- Select, apply, and translate among mathematical representations to solve problems.

Grade/Level:

Grades 6 – 8, Pre-Algebra

Duration/Length:

Two 90-minute lessons or four 45-minute lessons

Student Outcomes:

Students will:
- Recognize integers as whole numbers, their opposites and zero (0);
- Learn how to understand and use the Zero Principle;
- Solve problems using addition and subtraction of integers;
- Analyze real-world applications of addition and subtraction of integers.

Materials and Resources:

- Algebra Tiles (1 set for each student or student pair)
- Algebra Tiles for overhead projector (See Algebra Tiles Template)
- Interactive Number Line:
    - Approximately 20 feet of plastic clothesline
    - Clothes pins
    - White, blue and pink 3x5 index cards
- Colored 8 ½" x 11" paper for vocabulary Foldable (See Example of Vocabulary Foldable)
  *Approximately 20 feet of plastic clothesline
  *Clothes pins
  *Colored 3x5 index cards (i.e.: blue for positive integers and pink for negative integers)
  *Neutral 3x5 index card for zero (0)
- Student Worksheets:
    - Integers: Identify and Compare
    - Adding Integers: Across and Downs
    - Subtracting Integers: Across and Downs
    - Money Matters: Budgeting Your Money with Integers
    - Budget Worksheet
    - Money Matters Project: Scoring Tool
    - Extra Practice Problems

Development/Procedures:

Lesson 1: Pre-assessment –Students will have prior knowledge of number lines and whole numbers. Prior to class, write various integers from –20 to 20 on cards. Be sure to have a corresponding negative number for every positive number. At the start of class, choose two students to hold the clothesline at the front of the room. Explain that the clothesline represents a number line and ask for a volunteer to place the "zero" card on the clothesline number line using a clothespin. Ask for a volunteer to clip a positive number card on the number line. Repeat this activity with all the integer cards, handing them out in random order, allowing all students in the class to place an integer on the number line. Allow students to approximate where the integers should be placed on the number line. Poll the class to agree or disagree with each placement of the integer card(s). Utilize the "thumbs up" to agree or "thumbs down" to disagree. If the consensus is "disagree," have the student adjust the placement of the integer card.

Teacher Facilitation – On the overhead, project the algebra tile integer chips. Explain to the students that the small red squares always represent negative integers, and the small green squares represent positive integers. Recall the definition of integers, and have students chorus the definition back to the teacher.

Student Application – Have students create a Foldable by folding an 8.5"x 11"sheet of paper into three columns vertically. Instruct them to write the headings TERM, DEFINITION, and EXAMPLE at the top of each column. Students should complete the project by writing and defining each of the following vocabulary terms onto their foldable: integers, positive integers, negative integers, algebra tiles, zero, zero pair, Zero Principle. In the third column, students should make examples/drawings of each. Allow the students approximately 10 minutes to complete the examples on the foldable. Refer to the worksheet "Example of Vocabulary Foldable" as a reference for this project. Assign worksheet "Integers: Identify and Compare" to assess student understanding.

Embedded Assessment – Monitor each pair's progress while walking around the classroom throughout each part of the lesson

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Re-teaching/Extension –
  ▪ Have students complete a short hands-on activity in which they work in pairs identifying more zero pairs using the algebra tiles.
  ▪ Have students practice plotting integers on number lines.

LESSON 2   Pre-assessment- Students will use their knowledge of integers with a number line and zero pairs. Have students draw a number line from -10 to 10 on their papers. Instruct them to demonstrate how to use a number line to solve addition problems with the following:
    1) 2+2=
    2) 3+4=
Have students list 4 sets of zero pairs on their paper (i.e.: -2 and 2, -4 and 4, -14 and 14).

Launch – In this activity, students will return to the Interactive Number Line to demonstrate how to add integers. Choose two students to hold the number line and one student to stand at zero. Ask for a volunteer to stand at –3 on the number line and have another student hold up a sentence strip containing the number +2. Randomly poll the rest of the class by asking, "Who can add the two integers – 3 + 2 ?" Demonstrate by physically moving the

student standing at –3, two points to the right, representing +2. The student now stands at –1. Have new volunteers come up and dramatize additional problems using both positive and negative integers. Emphasize how adding negative integers causes the student to move in the opposite direction from when adding positive integers.

Teacher Facilitation – Distribute algebra tiles to the students. Visually introduce the Zero Pair, using the overhead set of integer tiles. Recall how the red is negative and green is positive. Start with +5 and –5, explaining that they are opposites and *subtract each other out*. Therefore they represent a zero pair. Repeat with other integers and their opposites. REPEAT: "WHO CAN TELL ME THE DEFINITION OF INTEGERS?" Have the class repeat the definition together.

Student Application –Have several students come to the chalkboard and write different zero pairs. Ask each of them why their's represents a zero pair. State here how this process is also called the Zero Principle.

Teacher Facilitation – Model several different problems demonstrating how to add two positive integers, $(+3)+(+4)=+7$, two negative integers, $(-2)+(-6)=-8$, a negative integer and a positive integer, $(-8)+(+10)=+2$, and a positive integer plus a negative integer, $(+5)+(-9)=-4$. With each example, show students how zero pairs are formed, and the solution to the problems are the tiles that remain after forming the zero pairs. Repeat this process several times using different problems while randomly polling students for solutions.

Student Application – Have students complete the worksheet "Adding Integers: Across and Downs." Allow students to work in pairs.

Embedded Assessment – Monitor each pair's progress while walking around the classroom throughout each part of the lesson.

Re-teaching/Extension –
- Students will continue write and refer to the vocabulary foldable
- Utilize additional problems from the worksheet "Extra Practice Problems."
- For those who have understood the lesson, introduce how to subtract integers.

LESSON 3

Pre-assessment - Students will use their knowledge of integers and adding integers in order to solve problems involving subtracting integers. Write the following problems on the overhead or board:

1) 5+(-2)=
2) 9+(-7)=
3) -8+5=
4) 7+(-6)=
5) -15+9=

Instruct students to copy and solve the problems. Have five students display their work and solutions on the board and explain how they determined the solutions to the class.

Launch – Students will demonstrate their ability to subtract integers on a human number line. Choose student volunteers to hold the number line, and one student to stand at zero. Model the problem $(-3)-(+6)=-9$ by having a student stand at -3. Challenge the students by asking $(-3)-(+6)=-9$ "Who can move [subtract] *back* six spaces? Why do we move *back* when the six is positive?" Have the student move physically along the number line to solve the problem. Have new volunteers come up and dramatize additional problems using both positive and negative integers.

Teacher Facilitation – Distribute algebra tiles to the students. Present the problem $(-3)-(+6)$ again. Have the students lay out three negative red integer chips. Ask them how it is possible to take away six positive chips. Lead the students into bringing in six zero pairs, which will not change the value of -3. Now there are six positive chips to take away, leaving nine negative red chips, which is the answer. Guide students through more examples in which zeros pairs need to be added, eventually leading into the rules for subtracting integers. Provide enough examples so that students can form their own conjectures about these rules. Demonstrate how to subtract two positive integers $(+4)-(+8)=-4$, two negative integers $(-2)-(-4)=+2$, and a negative integer and a positive integer $(+8)-(-6)=+14$ and $(-9)-(+5)==-14$ .Have students take out their journals and write the formal rule for subtracting integers: RULE: To subtract an integer, add its inverse. Follow through with examples for their journal, such as: $7-(-2)=7+2=9$.

Use the rule to model several examples on overhead, eventually having students subtract integers without the algebra tiles. On the chalkboard, continue to model examples of subtracting integers

using the real world examples from any textbook, teacher resource book or website, such as United Streaming (unitedstreaming.com). Explain your examples and why you chose these problems. Be sure to illustrate the four different scenarios that students may encounter and model several problems from each.

Student Application – Have students explore subtracting integers by completing the worksheet Subtracting Integers: Across and Downs. Allow students to work in small groups. Review process and worksheet problems by having students work them out on the chalkboard and individually model what they did and why their answers are correct.

Embedded Assessment – Monitor each student's progress while walking around the classroom

Re-teaching/Extension –
  ▪ Students will continue write and refer to the vocabulary foldable
  ▪ Utilize additional problems from the worksheet "Extra Practice Problems."

Lesson 4

Pre-assessment – Students will use their knowledge of integers, adding integers, and subtracting integers in order to solve problems involving integers. Write the following problems on the overhead or board:
  1) -2-1=
  2) 6+(-1)=
  3) 5-(-2)=
  4) -8-(-3)=
  5) -12+(-4)=
Instruct students to copy and solve the problems. Have five students display their work and solutions on the board and explain how they determined the solutions to the class.

Teacher Facilitation- Distribute the instructions for the unit project, "Money Matters: Budgeting Your Money with Integers," along with the "Budget Worksheet," and "Money Matters Project Scoring Tool." Review these materials and requirements for the project with the students. Answer and clarify any questions that may arise.

.   Student Application – Students will complete their real-life Budget Projects in order to give a presentation before the class. Allow class time (minimum of two classes, possibly a third) to complete projects and presentations. Students may need additional time to revise budgets and summaries.

Embedded Assessment – The "Money Matters Project Scoring Tool" identifies the requirements for the assessment within the project, such as accurate computations.

Re-teaching/Extension – Presentation of Money Matters Projects

Summative Assessment:

Students will present their original budgets demonstrating all transactions and calculations over that period as well as a copy of any revised budgets, if needed. In addition, a summary of specific activities must be attached. Teacher will collect the budgets and summaries and assess the calculations, summaries and presentation of budgets using the provided scoring tool.

Authors:

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Integers: Identify and Compare   Name _____

1. Graph the following integers on the number line below: $3, -4, 6, -1$
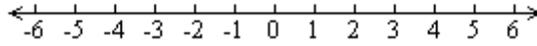
2. Identify the integers graphed on the number line.
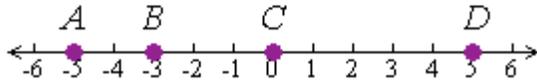
    $A =$ _____

    $B =$ _____

    $C =$ _____

    $D =$ _____

Identify the integers modeled by the Algebra Tiles drawn below.

3. _____

4. _____

Draw a model of each integer using Algebra Tiles.

5. -2 6.   12

7. 4   8. -9

Integers: Identify and Compare   Name _____
ANSWER SHEET

1. Graph the following integers on the number line below: $3, -4, 6, -1$
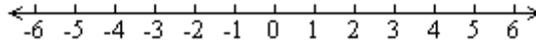
2. Identify the integers graphed on the number line.
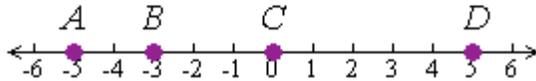
A = ____-5____

B = ____-3____
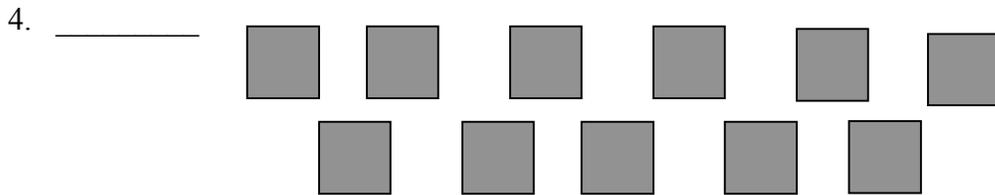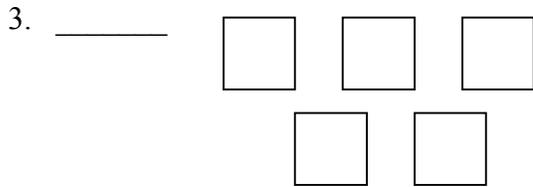
C = ____0____

D = ____5____

Identify the integers modeled by the Algebra Tiles drawn below.

3. __5__
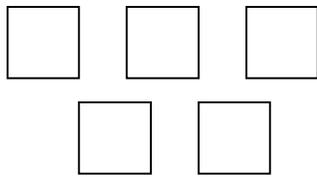
4. ___-11___
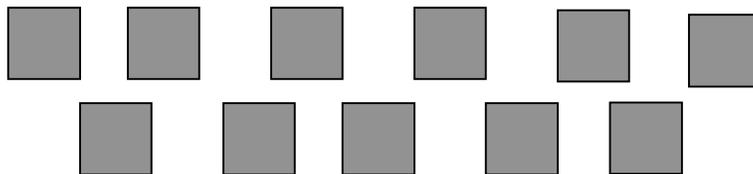
Draw a model of each integer using Algebra Tiles.

5. -2

6. 12
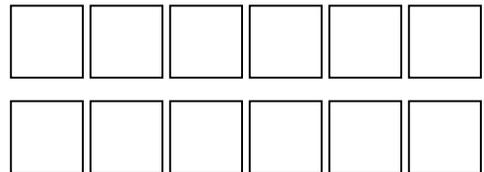
7. 4
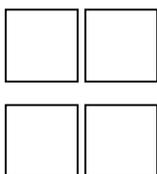
8. -9

Adding Integers: Across and Downs   Name _____

Add across and down in each puzzle to find your sums.

1.

–9	+	2	=	
+		+		+
11	+	–5	=	
=		=		=
	+		=	

2.

–8	+	2	=	
+		+		+
8	+	–9	=	
=		=		=
	+		=	

3.

–5	+	7	=	
+		+		+
–11	+	–4	=	
=		=		=
	+		=	

4.

–3	+	–1	=	
+		+		+
12	+	0	=	
=		=		=
	+		=	

Challenge Problem:
 Add the final sum (bottom right box) of all 4 puzzles. What is the total sum of all the puzzles?

Adding Integers: Across and Downs   Name _____
ANSWER SHEET

Add across and down in each puzzle to find your sums.

1.

–9	+	2	=	-7
+		+		+
11	+	–5	=	6
=		=		=
2	+	-3	=	-1

2.

–8	+	2	=	-6
+		+		+
8	+	–9	=	-1
=		=		=
0	+	-7	=	-7

3.

–5	+	7	=	2
+		+		+
–11	+	–4	=	-15
=		=		=
-16	+	3	=	-13

4.

–3	+	–1	=	-4
+		+		+
12	+	0	=	12
=		=		=
9	+	-1	=	8

Challenge Problem:
 Add the final sum (bottom right box) of all 4 puzzles. What is the total sum of all the puzzles?

          -1 + -7 + -13 + 8 = -13

Subtracting Integers: Across and Downs   Name _____

Subtract across and down in each puzzle to find your differences.

1.

−8	−	-3	=	
−		−		−
12	−	−7	=	
=		=		=
	+		=	

2.

−4	−	2	=	
−		−		−
−3	−	8	=	
=		=		=
	−		=	

3.

9	−	7	=	
−		−		−
−13	−	9	=	
=		=		=
	−		=	

4.

−6	−	0	=	
−		−		−
15	−	−1	=	
=		=		=
	-		=	

Challenge Problem:
Subtract the final differences (bottom right box) of all 4 puzzles. What is the difference of all the puzzles?

Subtracting Integers: Across and Downs   Name _____
ANSWER SHEET

Subtract **across and down in each pu**zzle to find your differences**.**

1.

−8	−	-3	=	-5
−		−		−
12	−	−7	=	19
=		=		=
-20	−	4	=	-24

2.

−4	−	2	=	-6
−		−		−
−3	−	8	=	-11
=		=		=
-1	−	-6	=	5

3.

9	−	7	=	2
−		−		−
−13	−	9	=	-22
=		=		=
22	−	-2	=	24

4.

−6	−	0	=	-6
−		−		−
15	−	−1	=	16
=		=		=
-21	-	1	=	-22

Challenge Problem:
Subtract the final differences (bottom right box) of all 4 puzzles. What is the difference of all the puzzles?

Money Matters: Budgeting Your Money with Integers

Name _____

Date Due: _____

Instructions:

Did you ever wonder where all of your money goes? Well, let's find out!

As a teenager, you have many things you would like to own. You also have numerous activities that you engage in on a monthly basis. All these wants cost money. For this assignment, you will plan a monthly budget for yourself that will include all necessary expenses as well as the luxuries you want. Just remember: you don't want to owe anyone money at the end of the month!

Budget Requirements:
- ✓ You will receive a weekly allowance of $10.

- ✓ You have the option of working a job for minimum wage. (You can ascertain the current minimum wage via research.) You would be paid on a weekly basis.

- ✓ You must choose at least 2 of the following activities per week. Following are examples of weekly activities. You may substitute acceptable alternative activities. (NOTE: These activities do not have to occur every week of the month.):
  - o You purchase a soda or snack at lunch each day for $.50.
  - o You go to the movies on Friday or Saturday night with friends. The ticket price is $7.50.
  - o You attend the school dance or sporting event on Friday night. The ticket price is $5.00.
  - o You go bowling with friends on Saturday afternoon. The cost for two games and shoe rental is $12.00.
  - o You purchase a cell phone plan. Research what plan you can afford and be interested in purchasing to determine the monthly fees. (Don't forget about text messages and pictures.)
  - o You go roller/ice skating with your friend over the weekend. The total cost for entrance and rental skates is $10.50.
  - o You go to the mall and buy new clothes/shoes. You can choose the amount you spend.
  - o You buy a new CD or download songs from the Internet. Research the total cost of your purchases.
  - o You buy food at your favorite fast food restaurant. Did you super size it? How much did it cost?

- ✓ You need to enter each activity on the Budget Worksheet starting with your first week's allowance. For example: Type-deposit; Date-today's date; Description-Week 1 Allowance; Debit- leave blank; Credit- +$10.00; and Balance- $10.00.

- ✓ You can use the following Type codes for that column:
  - o D-deposit
  - o W-withdrawal
  - o P-pay
  - o E-expense
  - o A-activity

- ✓ You need to add or subtract each entry to have a running total of your money.

- ✓ You will continue the budget for a total of four (4) weeks. After four (4) weeks, determine the amount of money you still have in your account or the money you owe. If you owe money, analyze your spending habits to determine the revisions needed in your budget to keep from owing money. Create a revised budget displaying your adjustments. (NOTE: Be sure to double-check your computations.)

- ✓ You will write a summary of your spending activity over the four (4) week period. Analyze your budget and determine if you need to revise your spending habits.

- ✓ You will present your budget and summary to the class. (Extra credit will be given for creativity.)

Budget Worksheet   Name _____

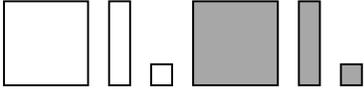| Type	Date	Description	Debit (-)		Credit (+)		Balance		☑

Money Matters Project: Scoring Tool   Name _____

Points Earned	Total Points Possible	Requirements
	4	Allowance included in budget
	4	2 required activities for week #1
	4	2 required activities for week #2
	4	2 required activities for week #3
	4	2 required activities for week #4
	20	Each activity correctly recorded on budget worksheet (5 columns for each entry)
	35	Accurate computations of integers
	15	Spending summary and analysis of spending habits
	10	Presentation of personal budget
	Extra Credit	
	4	Minimum wage job included in budget
	1 pt, per week	Additional activities for week #1
	1 pt, per week	Additional activities for week #2
	1 pt, per week	Additional activities for week #3
	1 pt, per week	Additional activities for week #4
	5	Creativity of presentation
	100	TOTAL POINTS

Algebra Tiles Template
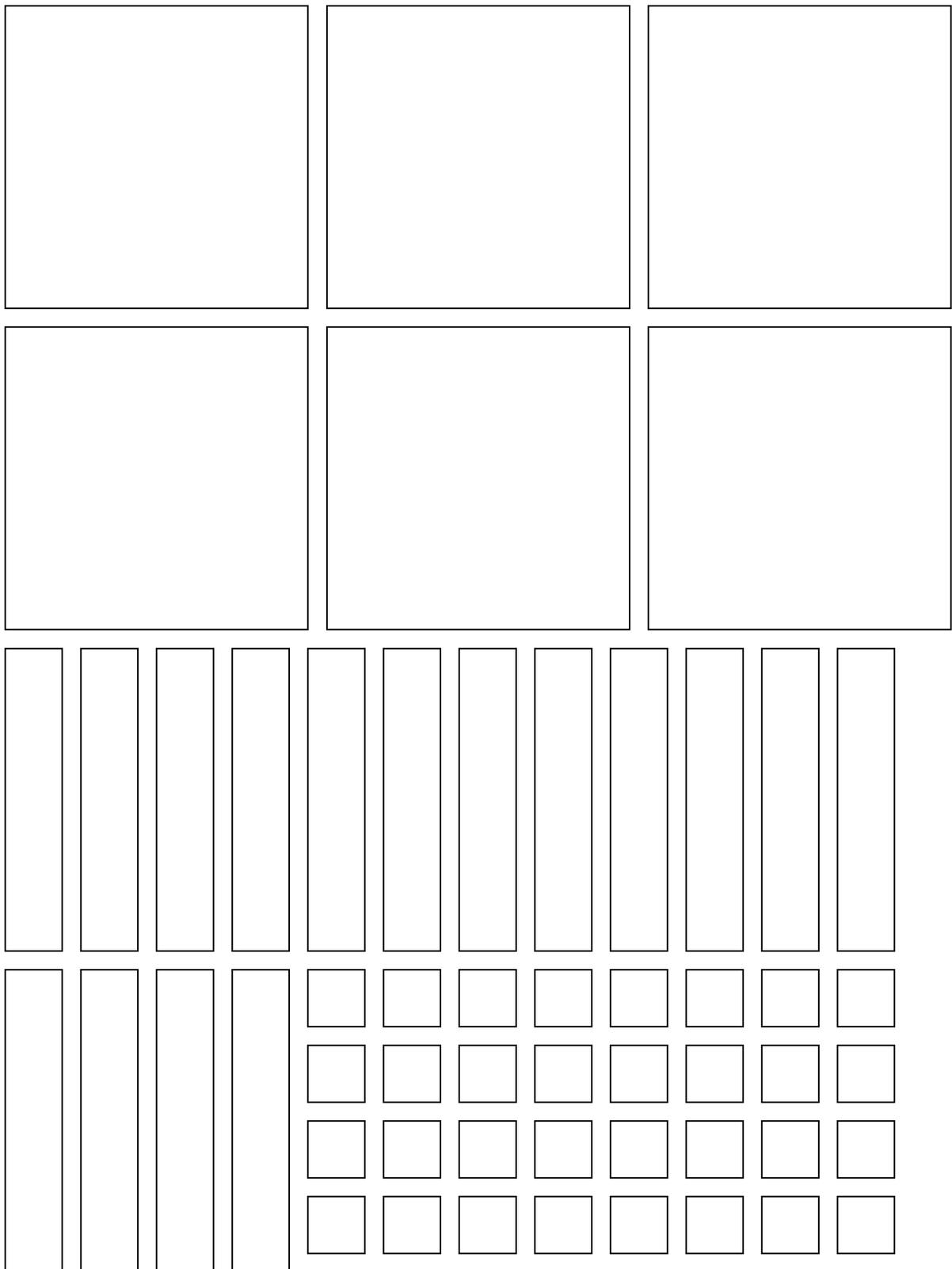
Example of Vocabulary Foldable

Term	Definition	Definition
Integer	All whole numbers and their opposites and zero	$...-3,-2,-1,0,1,2,3...$
Algebra Tiles	Concrete models which help to explore concepts in mathematics	
Zero	An integer that is neither positive nor negative	0
Zero Principle (Zero Pair)	Any two like quantities with opposite signs which sum to zero	$-2+2=0$
Positive Integers	All integers to the right of zero (0) on the number line	$1,2,3,4,5,6,...$
Negative Integers	All integers to the left of the zero (0) on the number line	$...-5,-4,-3,-2,-1$
Absolute Value	The distance a number is from zero (0) on a number line. Distance is always positive	$\lvert 2 \rvert = 2$ $\lvert -2 \rvert = 2$

Foldable Directions:
1. Fold 8 ½ x 11 piece of paper into thirds, long ways (hotdog folds).
2. Label the top of each folded column with titles as shown above.
3. Fold width wise (hamburger fold) after each definition is completed.
4. Write your name, class, and mod/period number on the back of the paper.
NOTE: Folds are shown in the diagram above with dashed lines (------).

Extra Practice Problems

Addition of Integers:

1. $12 + 20 = $ _____

2. $-33 + 22 = $ _____

3. $-29 + (-1) = $ _____

4. $15 + (-20) = $ _____

5. $14 + (-5) = $ _____

6. $-10 + (-8) = $ _____

7. $-3 + (-3) = $ _____

8. $-20 + 15 = $ _____

9. $6 + 9 = $ _____

10. $-25 + (-15) = $ _____

11. $17 + (-4) = $ _____

12. $-10 + 10 = $ _____

13. $4 + (-14) = $ _____

14. $-35 + (-2) = $ _____

15. $-14 + 4 = $ _____

Extra Practice Problems

<u>Addition of Integers:</u>

1. $12 + 20 = 32$

2. $-33 + 22 = -11$

3. $-29 + (-1) = -30$

4. $15 + (-20) = -5$

5. $14 + (-5) = 9$

6. $-10 + (-8) = -18$

7. $-3 + (-3) = -6$

8. $-20 + 15 = 5$

9. $6 + 9 = 15$

10. $-25 + (-15) = -40$

11. $17 + (-4) = 13$

12. $-10 + 10 = 0$

13. $4 + (-14) = -10$

14. $-35 + (-2) = -37$

15. $-14 + 4 = -10$

Extra Practice Problems

Subtraction of Integers:

1. $18 - 23 = $ _____

2. $17 - 11 = $ _____

3. $24 - (-7) = $ _____

4. $3 - (-5) = $ _____

5. $-3 - (-3) = $ _____

6. $3 - (-3) = $ _____

7. $-29 - 1 = $ _____

8. $7 - 13 = $ _____

9. $12 - 14 = $ _____

10. $44 - 55 = $ _____

11. $-36 - (-60) = $ _____

12. $9 - 18 = $ _____

13. $1 - (-9) = $ _____

14. $-10 - 10 = $ _____

15. $18 - 21 = $ _____

Extra Practice Problems

Subtraction of Integers:

1. $18 - 23 = -6$

2. $17 - 11 = 6$

3. $24 - (-7) = 31$

4. $3 - (-5) = 8$

5. $-3 - (-3) = 0$

6. $3 - (-3) = 6$

7. $-29 - 1 = -30$

8. $7 - 13 = -6$

9. $12 - 14 = -2$

10. $44 - 55 = -11$

11. $-36 - (-60) = 24$

12. $9 - 18 = -9$

13. $1 - (-9) = 10$

14. $-10 - 10 = -20$

15. $18 - 21 = -3$