

LAB 1-1

Name _____

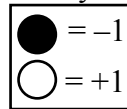
MARBLE MODEL 1

Date _____

Materials: Colored chips

The chips are like the marbles used on-screen. Red chips show negative numbers; yellow chips show positive numbers. Write legibly and explain your answers.

Key



1.
 - a. Use your chips to make +5. Draw the model for +5.
 - b. Draw two more models for +5.
 - c. What is the minimum number of chips you need to represent +5? Why?
 - d. Draw a representation of +5 that uses 7 chips. Now use 9 chips, 12 chips, and 15 chips and draw the representations. What do you notice?

2.
 - a. Use your chips to make -4. Draw the representation for -4.
 - b. Draw two more representations for -4.
 - c. What is the minimum number of chips needed to represent -4? Why?
 - d. Draw a representation of -4 that uses 6 chips. Now use 8 chips, 12 chips, and 17 chips and draw the representations. What do you notice?

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- e. Find a representation for -4 that could model this number sentence: $+6 + (-10) = -4$. Explain your representation.
3. a. Show at least three ways to represent 0.
- b. Is 0 positive or negative? Support your answer.
4. a. How are the representations for $+6$ and -6 alike?
- b. How are they different?

LAB 1–2

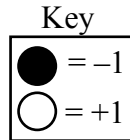
Name _____

MARBLE MODEL 2

Date _____

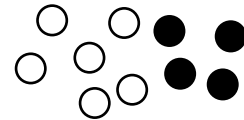
Materials: Colored chips

The colored chips are used like the marbles on-screen. The red chips represent negative numbers; the yellow chips represent positive numbers. Write legibly and explain your answers.



1. Kevin used chips to show $-5 + 8 = 3$. Explain how he may have done this.

2. a. Shalei let ● represent -1 and ○ represent $+1$. What addition problem could she be showing? Explain.



b. Write the addition/subtraction fact team that Shalei’s chips represent.

c. Shalei says that her chips can show that $2 - (-4) = 6$. Explain what she means.

3. Show how to use chips to solve these problems:

a. $-4 - (-3)$

b. $-4 - 3$

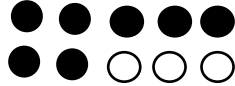
c. $-3 - 4$

LAB 1–2 (pg 2)

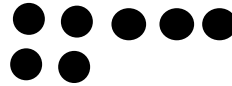
4. Danielle showed $-4 - 3$ in three steps. Write an explanation for each step.



Step 1

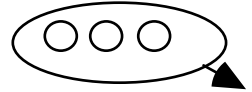


Step 2



Step 3

Step 3



5. What are some important ideas to remember when using chips or marbles to show addition and subtraction of integers? Provide at least two ideas.

LAB 1–3

Name _____

EXPONENT PROBLEM

Date _____

Materials: TI83+ calculator

1. What digit will be in the ones place for
 - a. 3^{65} ?
 - b. 3^{650} ?
2. Describe what you noticed about the powers of 3.
3. What digit will be in the ones place for
 - a. 8^{65} ?
 - b. 8^{650} ?
4. How are the powers of 3 and 8 alike and different?
5. Consider the ones digits of the powers of 4. How are the powers of 4 and the powers of 8 alike? How are they different?

LAB 1-4

Name _____

WHICH ONE DOESN'T BELONG?

Date _____

1. For each part, circle the selection that does not belong with the other three. Tell why it doesn't belong.

a. $5 - 8$ $10 - 13$ $15 - 12$ $1 - 4$

b. $9 + -4$ $1 + 4$ $0 + 5$ $-1 + 4$

c. $4 - 2, 2 - 4$ $5 + 4, 4 + 5$ $3 \cdot 7, 7 \cdot 3$ $1 \cdot 9, 9 \cdot 1$

d. associative commutative repetitive distributive

e. $\frac{1}{2} + \frac{7}{8} = 1\frac{3}{8}$ $1\frac{3}{8} - \frac{1}{2} = \frac{7}{8}$ $1\frac{3}{8} - \frac{7}{8} = \frac{1}{2}$ $\frac{7}{8} - 1\frac{3}{8} = \frac{1}{2}$

f. $2 \div 0 = 0$ $2 \cdot 0 = 0$ $0 \div 2 = 0$ $0 \cdot 2 = 0$

2. Make up a problem like number 1. Describe why one of the parts is different. Describe why the other parts are alike.

LAB 2-1

Name _____

ALGEBRA TILE MODELS

Date _____

Materials: Set of Algebra Tiles

Use your Algebra Tiles. Record your answers on this lab sheet.

- Pick out one each of the following tiles from your set of Algebra Tiles and complete the table below:

	Length in units	Width in units	Area in sq. units
a. Small square tile	1		
b. Long tile	x		
c. Big square tile			

- Describe how you would use tiles to represent -6 . Think about the marble model.
 - What is the minimum number of tiles you need to model -6 ? What is the maximum number? What do you notice in your models?
- Use tiles to model $3x$. Describe or draw your representation.
 - Can you model $3x$ using 5 tiles? Show the model.
 - Can you model $3x$ using 7 tiles? 8 tiles? Why or why not? Show your models.

LAB 2-2

Name _____

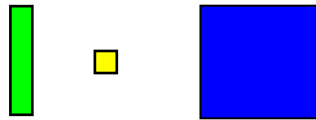
ALGEBRA TILE MODELS FOR EXPRESSIONS

Date _____

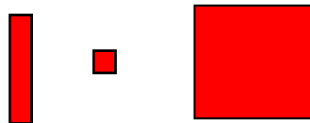
Materials: Set of Algebra Tiles

Use your Algebra Tiles. Record your answers on this lab sheet.

1. The tiles on the right represent 1, x , and x^2 . Label the tiles. Explain why you labeled them that way.



We use red tiles to represent -1 , $-x$ and $-x^2$. Label these tiles and explain why you labeled them that way.



2. a. Use the tiles to show three different representations for $-3x^2 - 2x$. Sketch each representation. Write algebraic expressions for each representation.
- b. Are the expressions equivalent? Why or why not?
3. a. Write an algebraic expression for “twice the sum of x -squared and 3.”
- b. Use the tiles to show a representation of “twice the sum of x -squared and 3.” Explain how you decided on what tiles to use.

LAB 2–3

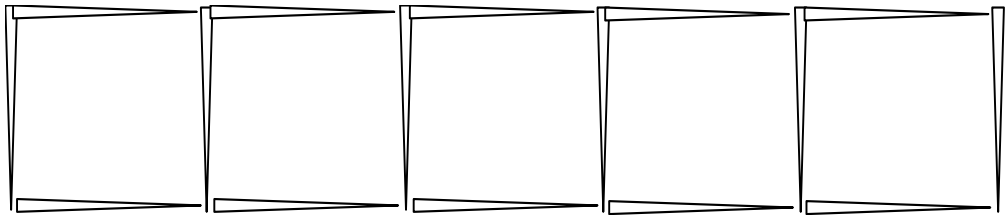
Name _____

TOOTHPICK PROBLEMS

Date _____

Materials: Package of toothpicks

1. *Without counting*, find a way to determine how many toothpicks are needed to make this arrangement of five squares:



2. Draw a sketch that shows how you got your answer.

3. Try to find other ways to determine the number of toothpicks needed. Describe your techniques and illustrate them with diagrams.
 - a. How are the various methods similar?

 - b. How are they different?

LAB 3–1

USING THE TI CALCULATOR

Name _____

Date _____

Materials: TI-83+ calculator

Use your calculator. Record your answers on this lab sheet.

- Erin used a calculator to help her solve the equation $3x - 5x + 4 = 8$. This is what she did:
 - She turned on the calculator, then hit the $\boxed{Y=}$ key.
 - Then she entered $3x - 5x + 4$ where the blinking cursor was.
 - Next she pressed the $\boxed{2nd}$ key and then the \boxed{GRAPH} key. What happened?
 - Erin also experimented with the arrow keys. What do these keys do?
 - Describe how you think Erin was able to solve the equation.
- How could you use Erin's method to solve $5(x + 4) - 1 = 9$? Explain thoroughly.
- Patrick discovered the \boxed{QUIT} and the \boxed{TBLSET} commands on the calculator. How did he access them and what does each do?

LAB 3–1 (PAGE 2)

4. Chelsea tried solving $6x - 2(x + 2) = 6$ using Erin's method but was unable to find the solution. Kris suggested using TBLSET and then changing what Δ TBL equaled. Explain what she may have done.

LAB 3–2

Name _____

EXPRESSIONS AND EQUATIONS

Date _____

Materials: Algebra Tiles

1. Use tiles to represent the expressions given. Draw a sketch of each representation. Then simplify the expression if you can.

1) $2x + 3$

2) $2(x + 3)$

3) $3x + 2(x + 3)$

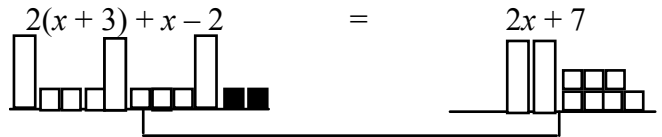
4) $3x - 2(x + 3)$

LAB 3–2 (Page 2)

2.. Doug used tiles to help him solve the equation $2(x + 3) + x - 2 = 2x + 7$.

He said he thought of a balance scale.

Use Algebra Tiles to solve Doug’s problem.



Explain how Doug may have used tiles to solve the equation.

3. How could Doug solve the inequality $2(x + 3) + x - 2 > 2x + 7$ using the balance scale model?

LAB 3–3

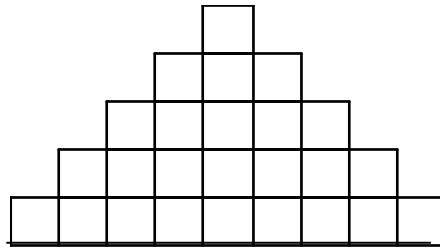
Name _____

STAIRCASE PROBLEM

Date _____

Materials: Color tiles or squares

1. Twenty-five blocks are needed to build a five-step double staircase like the one below. How many blocks will be needed to build a double staircase of similar shape with 50 steps?



2. If you had 250 blocks, what would be the maximum number of steps the staircase would have?
3. What is the relationship between the number of blocks needed to build a double staircase and the number of steps in the staircase? Why is this?
4. Write another problem about the double staircase. Solve it.

LAB 4–1

Name _____

A KNOTTY PROBLEM

Date _____

Materials: Rope (about 1 yard), a meter stick or metric tape, graph paper, notebook paper, ruler

1. You will collect data showing how the length of a rope changes as you tie more knots in it. Before your group begins, discuss what you expect to find out. Write your group's prediction about what you think will happen.
2. Measure the length of the rope before you tie any knots and record the length in the table below. Tie one knot in the rope, measure the new length, and record it in the data table. Continue tying knots in the rope, measuring and recording data until you have nine knots.

Number of Knots	Length of Rope (cm)
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	

3. Plot the data on graph paper. Be sure to label your axes clearly.
4. What do you conclude from your graph? Why do you think you got these results?

LAB 4–1 (Page 2)

5. Write an equation for your graph.

LAB 4-2

Name _____

GRAPHING CALCULATOR

Date _____

SCAVENGER HUNT

Record the keystroke(s) you used to accomplish each task.

Task	Keystrokes
1. Adjust the contrast of the screen.	
2. Evaluate $(-2)^3 - 4$.	
3. Graph $y = 2x - 1$.	
4. Graph $y = -0.5x + 1$.	
5. Show a table of values of x and y for $y = 2x - 1$.	
6. Find the point of intersection of $y = 2x - 1$ and $y = -0.5x + 1$.	
7. Change the graph viewing window.	
8. Turn the calculator off.	

LAB 4–3 (Page 2)

4. a. Change XMIN to a negative integer greater than -10 . What is your value for XMIN?
- b. Change XMAX to a positive integer less than 10. What is your value for XMAX?
- c. Change YMIN to a negative integer greater than -10 . What is your value for YMIN?
- d. Change YMAX to a positive integer less than 10. What is your value for YMAX?
- e. Press GRAPH. How many units are marked on the x -axis?
- f. How many units are marked on the y -axis?
- g. What effect do XMIN, XMAX, YMIN, and YMAX have on the graph display?
5. On graph paper, draw the Cartesian coordinate plane and label the region for Quadrant I. Then press **WINDOW** and change the settings to display Quadrant I only on the graphing calculator.
- a. What is your value for XMIN?
- b. What is your value for XMAX?

c. What is your value for XMIN?

LAB 4–3 (Page 3)

d. What is your value for YMAX?

e. Are your answers to 5.a.–5.d. unique? Explain why or why not.

6. On your graph, label the region for Quadrant II. Then press **WINDOW** and change the settings to display Quadrant II only on the graphing calculator.

a. What is your value for XMIN?

b. What is your value for XMAX?

c. What is your value for YMIN?

d. What is your value for YMAX?

e. Are your answers to 6.a.–6.d. unique? Explain why or why not.

7. On your graph, label the region for Quadrant III. Then press **WINDOW** and change the settings to display Quadrant III only on the graphing calculator.

a. What is your value for XMIN?

b. What is your value for XMAX?

c. What is your value for YMIN?

d. What is your value for YMAX?

e. Are your answers to 7.a.–7.d. unique? Explain why or why not.

LAB 4–3 (Page 4)

8. On your graph, label the region for Quadrant IV. Then press **WINDOW** and change the settings to display Quadrant IV only on the graphing calculator.

- a. What is your value for XMIN?
- b. What is your value for XMAX?
- c. What is your value for YMIN?
- d. What is your value for YMAX?
- e. Are your answers to 8.a.–8.d. unique? Explain why or why not.

9. Explain how to display each of the following using the **WINDOW** settings.

- a. Quadrants I and II only
- b. Quadrants I and IV only
- c. Quadrants III and IV only
- d. Quadrants II and III only

- e. Quadrants II and IV only

LAB 4–3 (Page 5)

10. Press **ZOOM** and set the calculator to the Standard setting. Press **WINDOW** and change the values for XSC and YSC. Display the graph. What do you conclude that XSC
11. L and YSC are used for?

LAB 4-4

Name _____

FAMILIES OF LINES

Date _____

Materials: TI83+ calculator, notebook paper

Using your graphing calculators, graph each family below. You may want to graph them simultaneously to notice features. For each family of lines, sketch the graphs of the four lines displayed on your graphing calculator. Then answer the questions given.

1. Parent graph: $y = x$
 $y = 2x$
 $y = 4x$
 $y = 8x$
 - a. What do all lines in this family have in common? In what ways are they different from one another?
 - b. Write the equations of two more lines that will belong to this family. Explain.
 - c. What kind of motion can be used to describe this family of lines?

2. Parent graph: $y = -2x$
 $y = -2x + 1$
 $y = -2x - 2$
 $y = -2x + 4$
 - a. What do all lines in this family have in common? In what ways are they different from one another?
 - b. Write the equation of another line that will belong to this family. Explain.
 - c. What kind of motion can be used to describe this family of lines?

3.
 - a. Set your graphing window to ZDecimal.
 - b. Find equations of two lines that will go through the origin and be perpendicular to each other. Describe how you went about finding your two equations.
 - c. Find an equation of a line that will be perpendicular to $y = \frac{2}{3}x$. Explain how you got your equation.

LAB 4–4 (Page 2)

4.
 - a. Given the equation $y = 4x + 2$, create a table of four pairs of x - and y -values.
 - b. Predict what the graph will look like.
 - c. Graph $y = 4x + 2$. Was your prediction correct? Explain.
 - d. What would be the effect on the table and the graph if you changed the equation to $y = 2x + 2$?
 - e. What if you had changed the equation to $y = 4x - 2$ instead?

5. Since the calculator only accepts equations in the form $y = \underline{\hspace{2cm}}$, Ryan wondered how he could graph $3x - 5y = 15$ on the calculator. What would you tell him?

LAB 5–1

Name _____

BASKET OF COCONUTS

Date _____

Materials: Notebook paper, two-color counters (optional), and calculator (optional)

1. You may solve this problem using any strategy.

Five baskets contain coconuts. The first and second baskets together have a total of 52 coconuts. The second and third baskets have 43 coconuts. The third and fourth baskets have 34 coconuts. The fourth and fifth baskets have 30 coconuts. And the first and fifth baskets have 47 coconuts. How many coconuts are in each basket?

2. Solve the problem another way, excluding the guess-and-test method. Describe how this method is similar to or different from the method you used in problem 1.

LAB 5–2

Name _____

HOW MUCH DO I HAVE?

Date _____

1. “Wow,” said R.J. “I have a special amount of money in my savings account.”

“How much do you have?” asked Marty.

“Well,” said R.J., “I can give you these clues. Let’s see if you can figure out this special amount. I will tell you that it is less than \$3,000.

1. Divided by 10, the remainder is 9.
2. Divided by 9, the remainder is 8.
3. Divided by 8, the remainder is 7.
4. The pattern continues down to a remainder of 1 when it is divided by 2.”

Describe your solution process. How much does R.J. have?

What patterns did you use to solve this problem? Or what algebraic ideas helped you? Explain.

LAB 7–1 (Page 2)

4. Is your answer unique? If yes, explain why. If no, find other examples.

5. What patterns do you notice?

LAB 8-1

Name _____

SOLVING QUADRATICS BY
GRAPHING

Date _____

Materials: TI-83+ calculator

Before you begin, clear the calculator memory. Press $\boxed{\text{MEM}}$ ($\boxed{2\text{nd}}$ $\boxed{+}$) and select the Reset, then Defaults.

1. Jeremy used a calculator to help him solve the equation $x^2 - 3x - 4 = 0$. This is what he did.
- He entered the left side of the equation in the Y= window:

$$Y_1 = x^2 - 3x - 4$$

- Then he went to the GRAPH window. Sketch the graph, with the coordinate axes.

- Next Jeremy experimented with TRACE and the blue arrow keys. What did these keys do?

- To solve the equation $x^2 - 3x - 4 = 0$, Jeremy knew that he needed to find the values of x at the points on the graph where $y = 0$. But the TRACE function displayed very long decimal numbers, not integers. Using TRACE, Jeremy guessed integer values for x . What do you think he guessed?

$$x = \underline{\hspace{2cm}} \quad x = \underline{\hspace{2cm}}$$

Then he tested each of the values in the equation.
Test your values. Were you correct?

LAB 8–1 (Page 2)

e. Sam suggested that Jeremy go to ZOOM and choose Zdecimal. When Jeremy traced his graph again, what happened?

2. Rita used a calculator to solve the equation $x^2 + 4x = -3$. She used the CALC function.

a. She entered these equations in the calculator:

$$\begin{aligned} Y_1 &= x^2 + 4x \\ Y_2 &= -3 \end{aligned}$$

Then she went to the GRAPH window.

b. Rita then selected CALC ($\boxed{2\text{nd}} \boxed{\text{TRACE}}$) and chose INTERSECT.

When the calculator asked, First curve? Rita made sure the cursor was on the parabola, then pressed ENTER.

When the calculator asked, Second curve? Rita made sure the cursor was on the line $y = -3$, and pressed ENTER.

Then the calculator asked, Guess? Rita moved the cursor to one of the points where the line intersected the parabola. What values of x and y did the calculator give?

$$x = \underline{\hspace{2cm}} \quad y = \underline{\hspace{2cm}}$$

c. Does this value of x make the equation true? How do you know?

d. Use Rita's method to find the other value of x that will make the equation true. Describe what you did.

LAB 8–1 (Page 3)

3. Ardell used a calculator to solve the equation $2x^2 + 9x - 5 = 0$. He used the CALC function, but in a different way than Rita did.

- a. Ardell entered the equation in the calculator:

$$Y_1 = 2x^2 + 9x - 5$$

Then he went to the GRAPH window.

- b. Ardell then selected CALC and chose ZERO to find where the equation equals 0.

The graph of the equation was displayed, and the calculator asked: Left bound?

Ardell moved the cursor to the left of one point where the parabola crossed the y -axis, and pressed ENTER. A small triangle was displayed.

Then the calculator asked: Right bound?

Ardell moved the cursor to the right of the point and pressed ENTER. Another small triangle was displayed.

Then the calculator asked: Guess?

What do you think Ardell did?

The calculator displayed these values:

$$x = .5 \qquad y = 0$$

Is the equation true when $x = .5$?

- c. Use Ardell's method to find the other value of x that will make the equation true. Describe what you did.

4. You have seen three ways to use the graphing calculator to solve a quadratic equation.

Use one of these methods to solve the equation below.

Explain how the graph helped you find the solution.

LAB 9-1

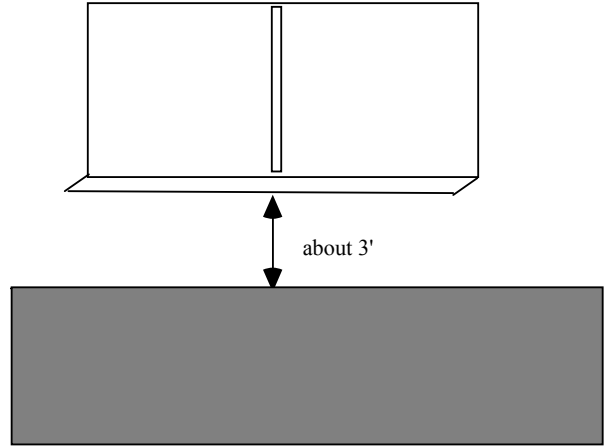
Name _____

TUBE SCENES

Date _____

Materials: Tape measure, yard or meter stick, masking tape, toilet tissue cardboard tube

1. Use masking tape to secure a measuring stick vertically on a wall. Be sure it is about three feet off the floor.
2. Have a family member or friend raise the tubing to his/her eye, keeping it parallel to the floor. Stand about three feet from the wall. Adjust your distance to the wall until you can see a portion of the measuring stick.
3. Report the range you can see. Do not move from your position. Have someone else use a tape measure to measure the distance from the meter stick to your eye.
4. Record both measurements in the table below.
5. Have a family member or friend move closer to the wall until he/she can see only half the range. Measure the distance from the meter stick to your eye. Record the measurements in the table below.



Range of View	Distance from Meter Stick to Eye

LAB 10–1

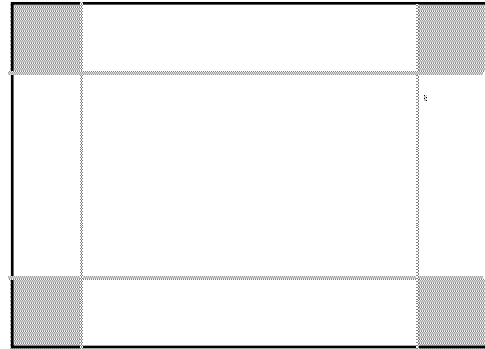
Name _____

DESIGN-A-BOX CONTEST

Date _____

Materials: $8\frac{1}{2}$ " by 11" paper, scissors, ruler with inch markings, tape, graph paper, TI83+ calculator

The Algebra Box Company (ABC) is sponsoring a design-a-box contest. The winner is the contestant who makes a box from an $8\frac{1}{2}$ " by 11-inch sheet of paper with the greatest volume. The box must be an open box made by cutting an identical square from each corner and folding the edges to form the box.

**Part I**

1. Make a box to enter the contest.
2. Measure your box's height, length, and width in inches. Determine the volume of your box in cubic inches. Record your box's height and volume.

Part II

1. Describe how you decided on what your box would look like.

2. Renee said that graphing and using a graphing calculator can be used to help find the box with the greatest possible volume. What do you think she meant by this?