

# **Supercharged Science & Math**

# **Adventure Day Workbook**

Explore • Build • Discover



Hands-On Labs • Experiments • Challenges  
For Grades K–8

## Table of Contents

LIVE Class Teaching Schedule.....	3
SCIENCE: Chemistry & Chemical Reactions.....	4
MATH: Secret Codes & Ciphers.....	6
SCIENCE: Supernovae & Black Holes.....	13
Answer Key .....	14
Teaching Science & Math Right .....	15
The 3 Steps to Real Learning.....	15
The Shortcut for Parents.....	15

## LIVE Class Teaching Schedule

Aurora is teaching three live classes in a single day! Each class is 30-60 minutes, and you can choose to participate in one or all three.

- Chemistry: 10am Pacific | 1pm Eastern
- Secret Codes & Ciphers: 11am Pacific | 2pm Eastern
- Supernovae & Black Holes: 5pm Pacific | 8pm Eastern

To connect to each class, please check your welcome email for all the details.  
No previous experience required. Open to all ages. All classes include time for Q&A after.

Materials List: You can still fully participate with *no* materials.  
Gather what you can find easily, and we'll take care of the rest.

Also, please print out this *entire* workbook if you're participating in all three classes!  
Otherwise, just print the section you need (print in "black and white" or in color, either works).

### Chemistry

- Chemistry [Workbook](#) section
- [Borax](#)\* laundry booster detergent
- [Yellow highlighter](#)
- [White glue](#) or [clear glue](#) or [glitter glue](#)
- Sugar *OR* salt *OR* borax *OR* [Epsom salts](#) \*\*
- Popsicle sticks for mixing (about 10)
- Disposable cups (paper or plastic) to mix up experiments in (about 6)
- Clean, empty glass jar for crystal growing

*\*BORAX Substitute Options: liquid starch; contact lens solution mixed with baking soda; saline solution that contains boric acid. (You're looking for a source of borate ions.) As a last resort, a small amount of powdered laundry detergent can work, but results are less consistent and brands vary a lot.*

*\*\*If you want to grow crystals, you can use sugar, salt, Epsom salts, or borax. The crystals from borax and Epsom will grow overnight; salt crystals take 2-4 weeks, sugar crystals require at least a month (due to growth driven by evaporation).*

### Secret Codes & Ciphers

- Secret Codes & Ciphers [Workbook](#) section
- Two different coins (penny & dime)
- Pencil
- Scissors

### Supernovae & Black Holes

- Supernovae & Black Holes [Workbook](#) section
- Two different sizes of balls (example: tennis and bouncy ball)
- Two marbles, one larger than the other if you have it
- Bedsheet or large t-shirt

*OPTIONAL: If you want to make the Linear Accelerator, you'll need at least 4 magnets and 10 ball bearings and the items below:*

- [Ball bearings](#)
- [Strong neodymium magnets](#)
- Plastic ruler OR cardboard tube

## SCIENCE: Chemistry & Chemical Reactions

Student instructions: Use the slides during class to fill in the blanks. If you prefer to focus on listening during class, you may complete this section after class. Answers are provided in the back of the workbook.

1. Chemistry is the study of \_\_\_\_\_
  2. Matter is anything that has \_\_\_\_\_
  3. Chemistry is the study of how \_\_\_\_\_ interacts.
  4. Matter is made of \_\_\_\_\_
  5. \_\_\_\_\_ are built from atoms.
  6. The number of \_\_\_\_\_ determines the type of atom.
  7. A \_\_\_\_\_ is a large molecule made of many small repeating units \_\_\_\_\_ together.
- I am doing (circle):

Polymer Challenge

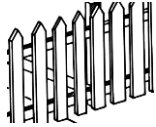


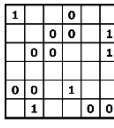
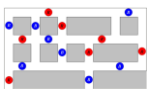
Sulfate Challenge  
(Go to next page)

**SULFATE CHALLENGE** Please complete the following table *after* performing your experiment:

Question	Your Answer
What did you observe?  <i>HINT: What happened in each cup?</i>	I observed...
What do you think caused it?  <i>HINT: What is different between the baked and unbaked Epsom salt that could matter?</i>	I think this happened because...
Why does your idea make sense?  <i>HINT: Think about energy, heat, water, or particles as you work on your explanation.</i>	This makes sense because...
Going further	If I tested this again, I would try...

**IMPORTANT:** You are not graded on being correct.  
 You are graded on **how well you explain your thinking**

## MATH: Secret Codes & Ciphers

Cipher Clue Card		123	456	789	246
		0	1	2	3
		401	104	140	041
		1110	1001	0110	0100
		10	6	12	15
Password:					

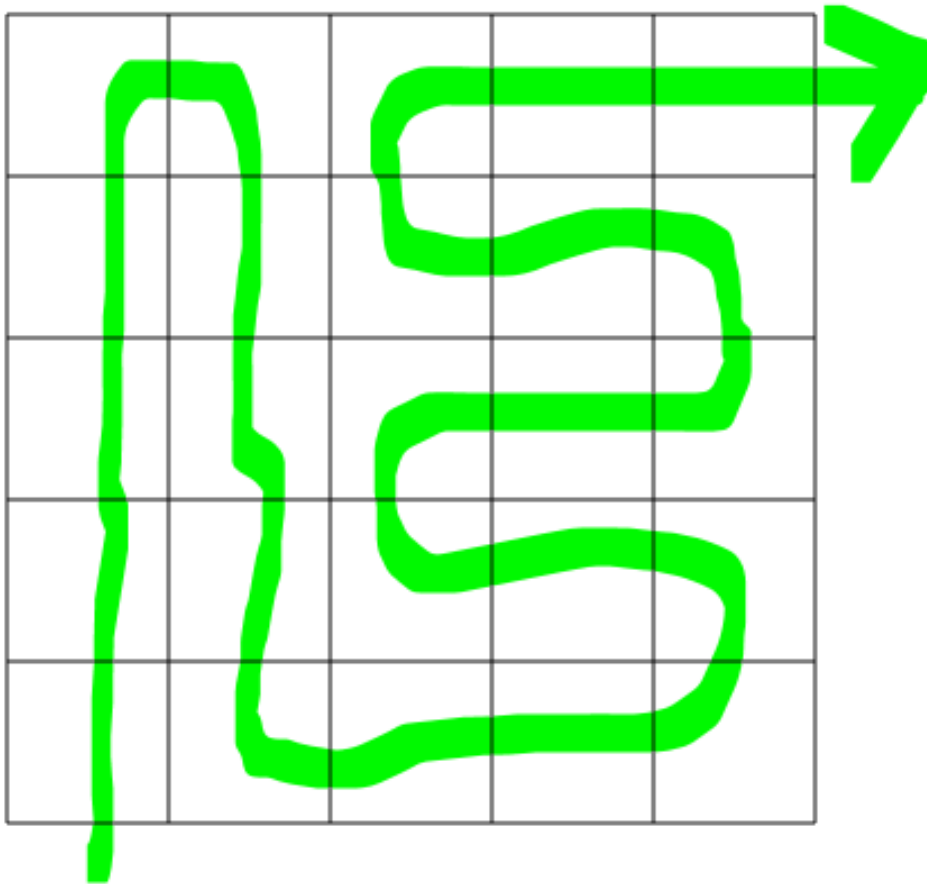
## Math Codes: Rail Fence Cipher

WYAS XFAD FEEQ HWSI ARIO SVNJ

## Math Codes: Twisted Path Cipher

We're going to decode my cipher by putting these letters in the box along a specific path:

AMWO HNYS IDEI QECR AALC NSEIR

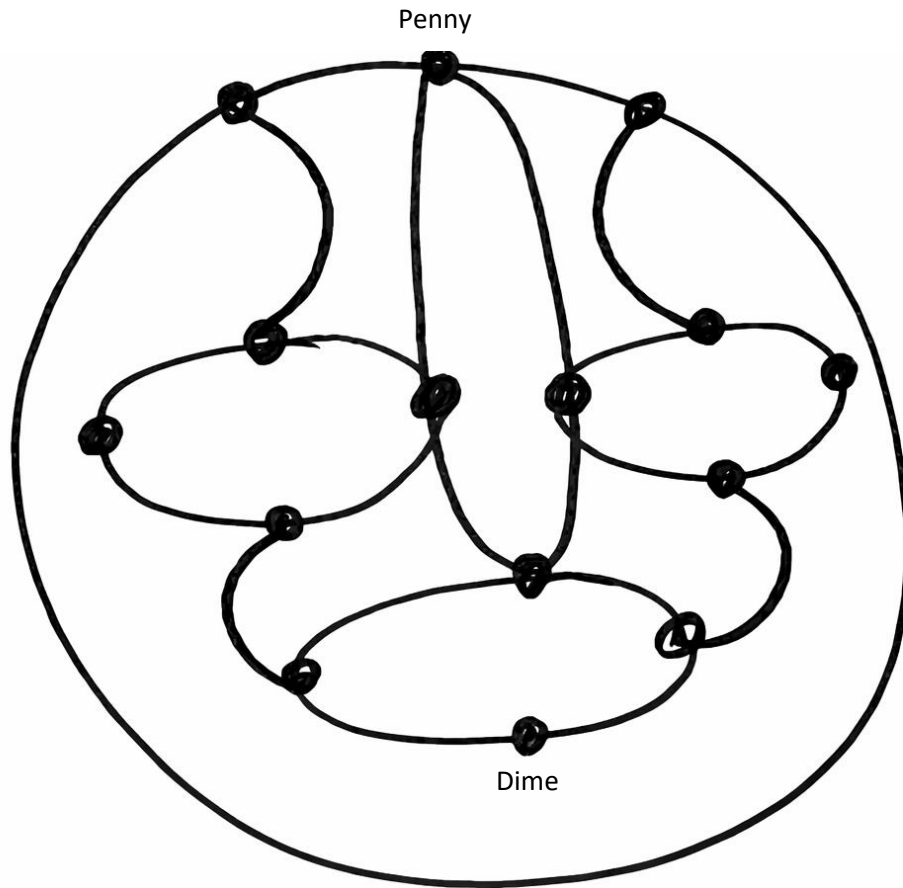


## What does the code say? (and what is the answer?)

MATH HINT: Sides are *straight edges*.



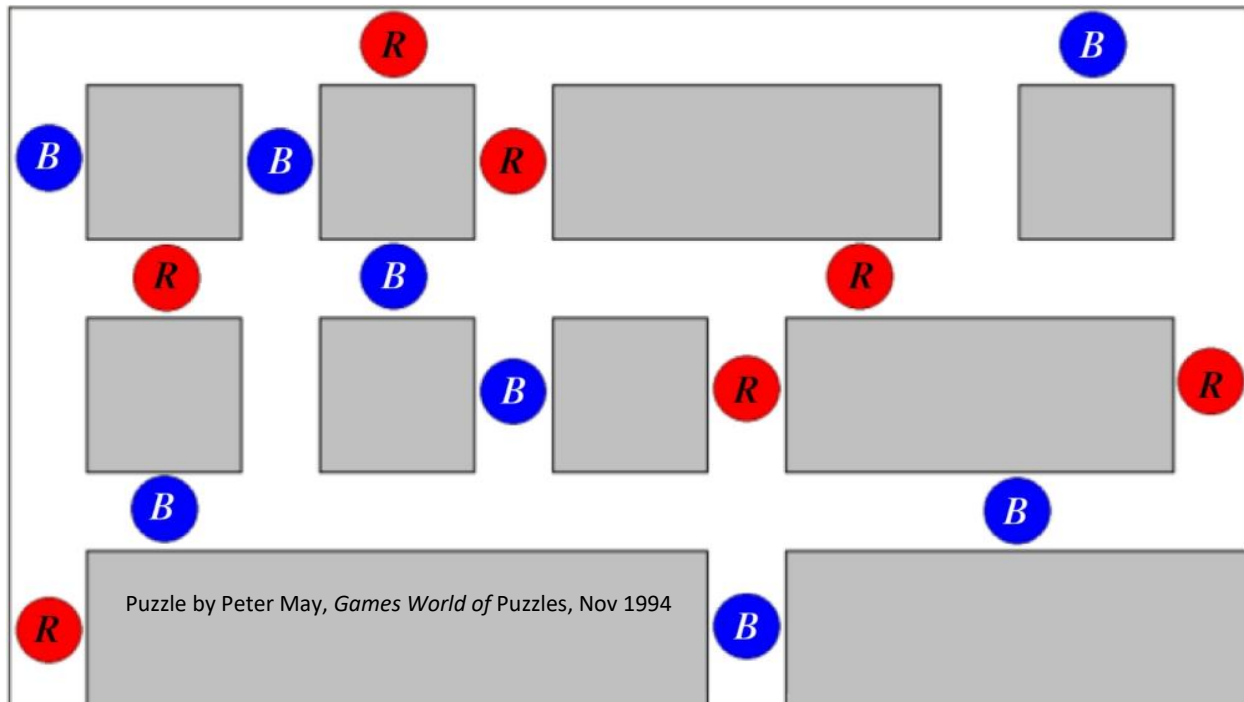
## Math Logic: The Coin Game



## Math Codes: Polybius Checkerboard

		1	2	3	4	5
1	A	B	C	D	E	
2	F	G	H	I/J	K	
3	L	M	N	O	P	
4	Q	R	S	T	U	
5	V	W	X	Y	Z	

## Math Puzzle: Ball Maze



## Math Puzzle: Binary Logic

1			0		
		0	0		1
	0	0			1
0	0		1		
	1			0	0

		0			1
1		0	0		
	1				
				1	
		1			0
0	0		1		

				0	0
	1				
0	1		1		
0				0	
		1			

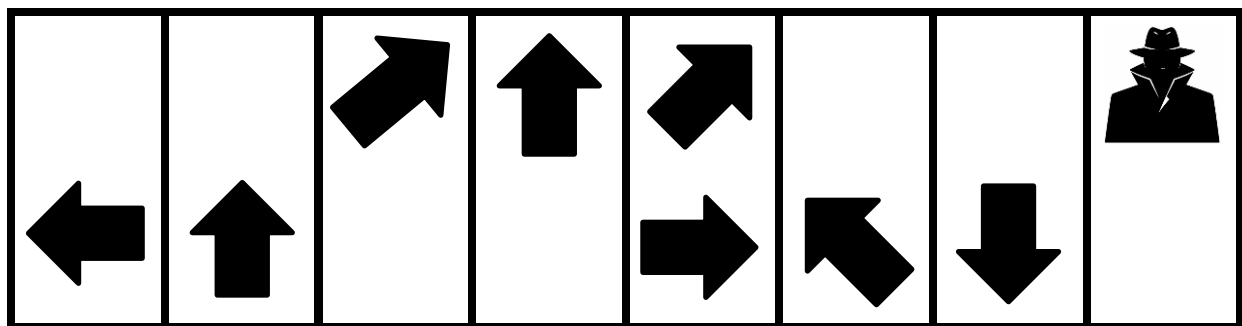
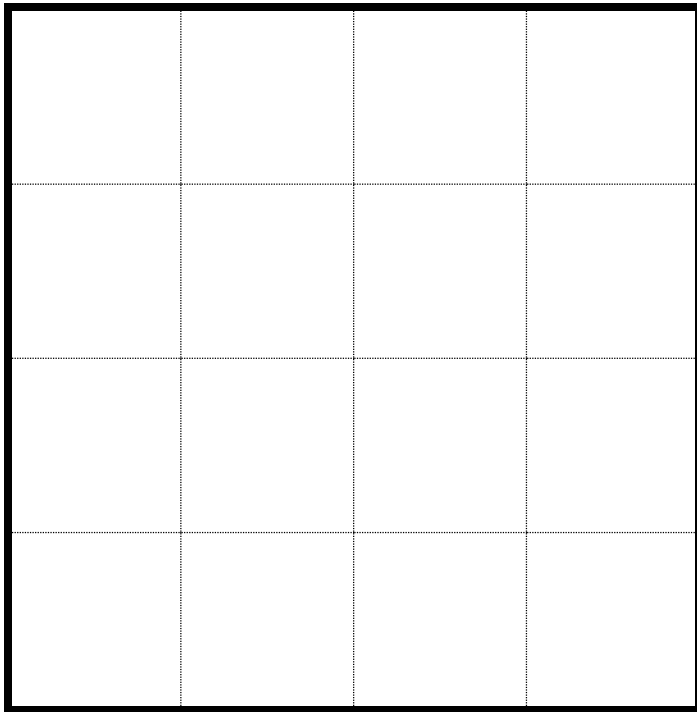
			1		
		0			1
0				0	
	1	1			
1				0	

Puzzles by BinaryPuzzle.com

## Math Challenge: The Elusive Spy

Cut out the eight pieces below the square (cut only on the solid lines). You should have 8 pieces (not 16).

1. Every arrow must point to at least \_\_\_\_\_ square.
2. An arrow \_\_\_\_\_ point at another arrow.
3. The spy must be placed where \_\_\_\_\_ arrow points to the spy (even through empty spaces).



Created by Alex Beresford | Creative Craffhouse

## SCIENCE: Supernovae & Black Holes

Student instructions: Use the slides during class to fill in the blanks. If you prefer to focus on listening during class, you may complete this section after class. Answers are provided in the back of the workbook.

1. When a star like our sun runs out of fuel, it can no longer keep the fusion reaction going and  
  
it collapses down into a \_\_\_\_\_
2. It's a balance of \_\_\_\_\_ pushing in on the star and heat and pressure pushing outward from the star's core.
3. A \_\_\_\_\_ star is the collapsed core of a giant star.
4. If the star is more than 3-10X mass of our sun, a \_\_\_\_\_ can form.
5. A black hole is an object that has an \_\_\_\_\_ greater than the speed of light.
6. The largest black holes are inside \_\_\_\_\_ clusters and  
  
in the centers of most \_\_\_\_\_
7. Gravitational \_\_\_\_\_ are ripples in space-time that move outward like a wave.

## Answer Key

### *Chemistry*

1. Chemistry is the study of matter.
2. Matter is anything that has mass.
3. Chemistry is the study of how matter interacts.
4. Matter is made of atoms.
5. Molecules are built from atoms.
6. The number of protons determines the type of atom.
7. A polymer is a large molecule made of many small repeating units linked together.

### *Secret Code & Ciphers*

1. Every arrow must point to at least one empty square.
2. An arrow cannot point at another arrow.
3. The spy must be placed where no arrow points to the spy (even through empty spaces).

### *Supernovae & Black Holes*

1. When a star like our sun runs out of fuel, it can no longer keep the fusion reaction going and it collapses down into a white dwarf star.
2. It's a balance of gravity pushing in on the star and heat and pressure pushing outward from the star's core.
3. A neutron star is the collapsed core of a giant star.
4. If the star is more than 3-10X mass of our sun, a black hole can form.
5. A black hole is an object that has an escape velocity greater than the speed of light.
6. The largest black holes are inside globular clusters and in the centers of most galaxies.
7. Gravitational waves are ripples in space-time that move outward like a wave.

*Parent Tip:* Don't just look for correct answers. Listen for what your child understands as they explain the concepts we covered in class back to you, including answering *your* questions!

## Teaching Science & Math Right

Homeschool science and math aren't just about covering topics — they're about helping kids actually understand and remember what they learn.

If your child can't recall last year's science or math concepts, that is not a failure on your part. It's usually a sign that learning focused too much on memorization and not enough on curiosity and meaning.

**Real science and math learning happens** when kids:

- Wonder how the world works
- Have tools to explore their questions
- Learn the ideas *after* they care about the answers

That's why effective science and math education follows a simple three-step process:

### The 3 Steps to Real Learning

- 1. Spark genuine interest** Start with something that excites your child — a question, experience, or real-world problem they want to understand.
- 2. Explore hands-on** Use experiments, challenges, and projects to turn that interest into experience. This is where learning becomes meaningful.
- 3. Teach the academics** Now introduce the science and math behind what they explored — formulas, concepts, and theory — when your child is ready to understand *why* it works.

Most programs start with step three. That's why kids forget.

When learning begins with curiosity and hands-on discovery, science and math stop feeling abstract — and start making sense.

### The Shortcut for Parents

You don't have to design this process yourself. The easiest path is to use a program that already follows these steps, guiding kids through hands-on exploration and then teaching the supporting science and math clearly and simply.

That's exactly how Supercharged Science is designed — to help kids learn deeply, independently, and with confidence.

My best wishes to you and your family.

~Aurora