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#CSPDWeek2026

#CompSciNJ

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# New Jersey CSPDWeek

*This material is based upon work supported by the National Science Foundation under Award No. 2607763.*



# Unplugged Activities for Grades 4-8

Monday, 8/3/26 - 1:00pm - 1:55pm

TCNJ Social Sciences Building - Room 324

Jessica LaRosa

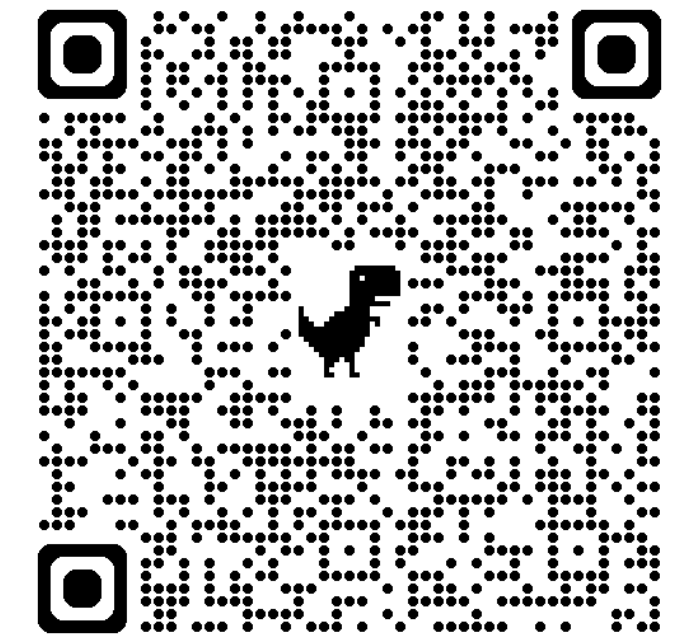
NJ CSPD Week 2026



Slides

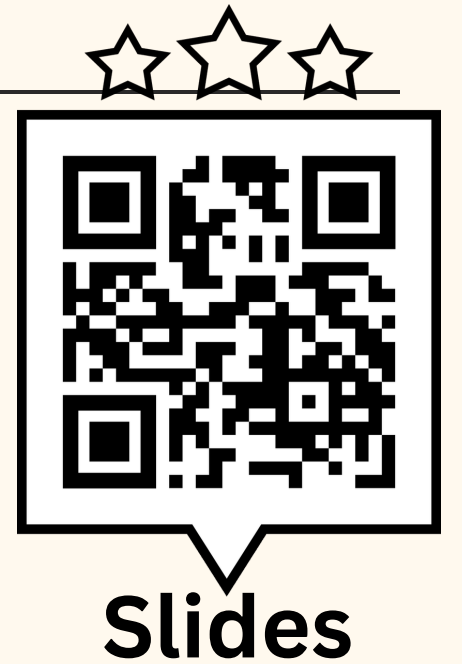


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## Computer Science Education

# Why Teach CS Unplugged?

Internet outages and limited device access are real classroom challenges. Unplugged activities ensure learning never stops, building foundational CS skills anytime, anywhere.

Hands-on engagement deepens understanding of core CS concepts without screens or devices.

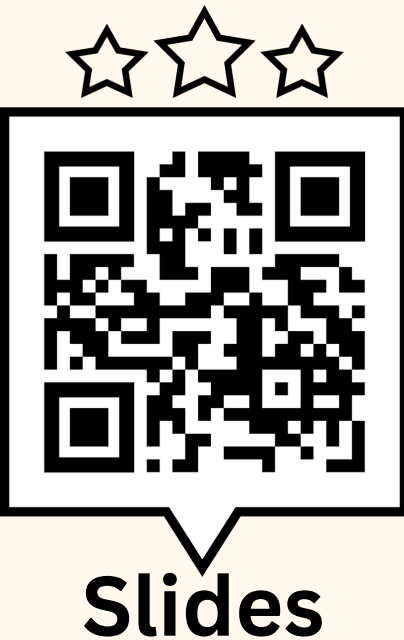
Cross-curricular connections link computer science to math, ELA, science, and social studies.

Builds computational thinking skills students can use anytime, anywhere.



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Computer Science Foundations

# Core CS Concepts Covered



- ⬆ Algorithms & sequencing, debugging and problem-solving across all grade levels.
- ⬆ Data collection & analysis, networks, communication, and cybersecurity basics.
- ⬆ Conditional logic, classification, and computational thinking skills.





**Grades 4–5**

# Activities Overview

**All activities in this section are designed for 45-minute sessions. Students will explore core computer science concepts – including algorithms, debugging, data collection, sorting, and cybersecurity – through hands-on, unplugged activities that require no devices or internet access.**







Grades 4-5 | 45 Minutes

# Debug the Story

Students reorder scrambled story events or fix missing details (e.g., plant growth steps) to practice debugging and sequencing.

Focus on debugging and sequencing: identify errors and put events in logical order.

Includes discussion prompts and reflection questions.



Slides

Cross-curricular: ELA, Science, Social Studies & Technology

Materials: printed story cards with scrambled or incomplete sequences.







**Grades 4-5 | 45 Minutes**

# Human Coordinate Grid

Students navigate a floor or paper grid using coordinates and compass directions, following step-by-step instructions to move through the grid.

**Cross-curricular: Technology, Math, Social Studies**

**Teaches coordinates, directions, and collaborative problem-solving.**

**Materials: grid layout using masking tape or painters tape, compass rose, direction instruction cards.**







**Grades 4-5 | 45 Minutes**

# Data Collection: Favorite School Lunch

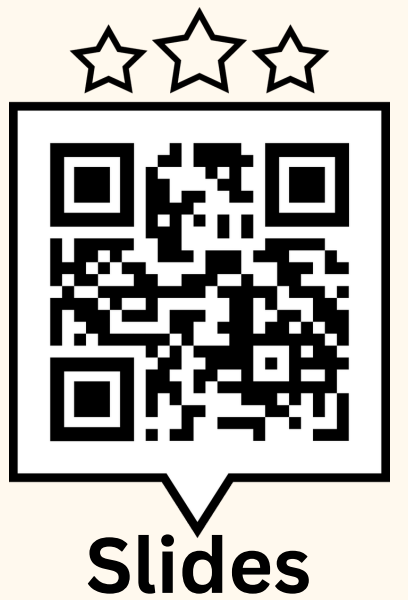
**Cross-curricular: Technology, Math, ELA.**

**Students survey classmates about their favorite school lunches, tally the results, and create bar graphs to visualize and analyze data trends.**

**High-performance computing enables complex simulations and data analysis.**

**Answer analysis questions to identify trends and draw conclusions from the data.**

**Materials: survey sheets, graph paper.**







**Grades 4-5 | 45 Minutes**

## Animal Adaptation Sorting Algorithm

Sort animal cards by traits to develop sorting algorithms and explore classification through hands-on, collaborative thinking.

Sort animal trait cards using student-developed sorting algorithms.

Teaches classification, algorithmic thinking, and pattern recognition.

Materials: animal trait cards, sorting mats, pencils. ▶







**Grades 4-5 | 45 Minutes**

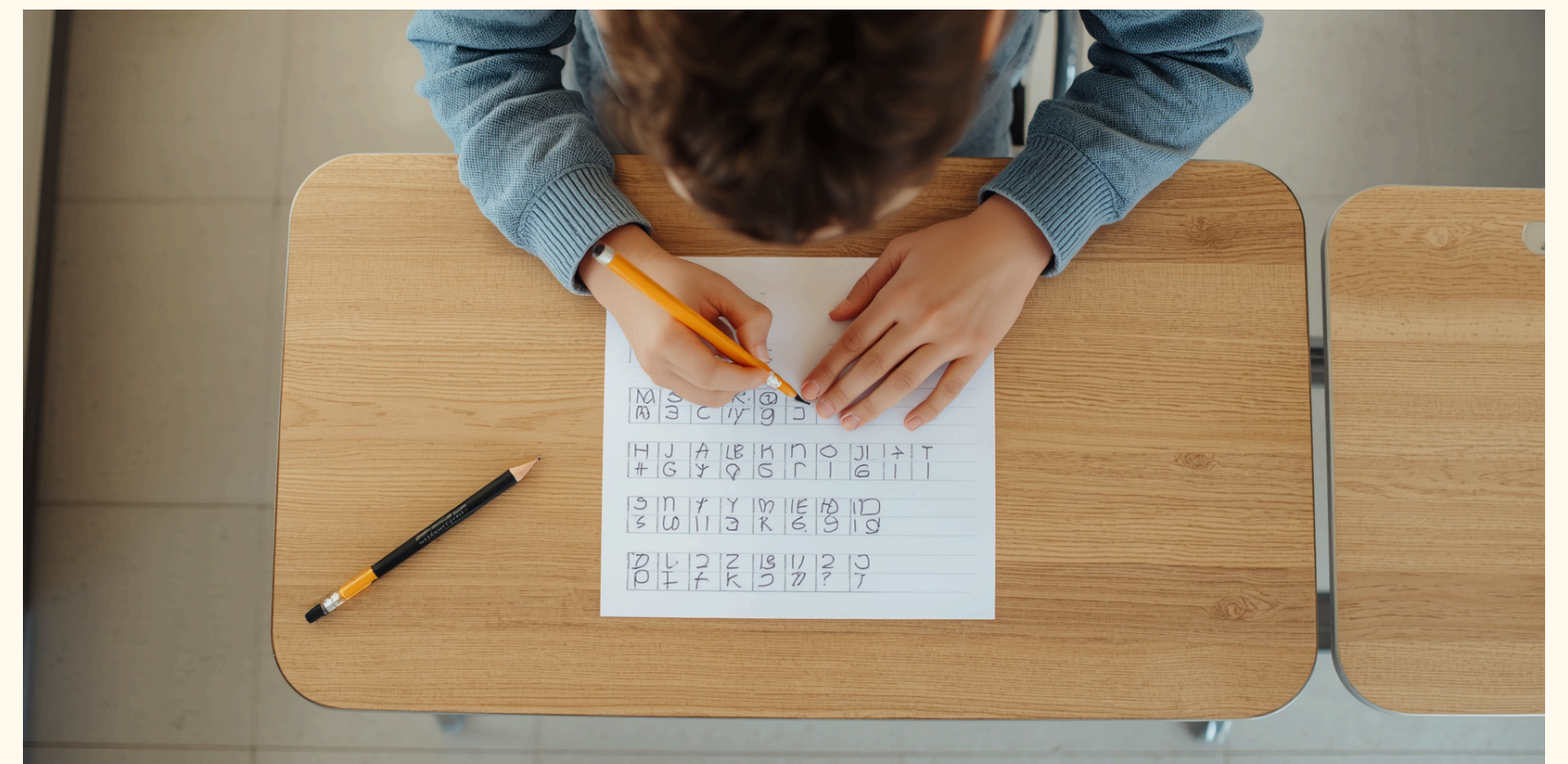
# Build a Strong Password Code

Students learn strong password patterns combining letters, numbers, and symbols, then practice creating secure passwords. Cross-curricular: Technology, ELA, Math. Materials: paper, pencils.

Learn to recognize and apply strong password patterns using letters, numbers, and symbols.

Practice creating secure passwords and understand cybersecurity basics and pattern recognition.

Reflection prompts to discuss password safety and digital responsibility.







**Grades 4-5 | 45 Minutes**

# Algorithm Recipe Challenge

Students write step-by-step instructions for a task. A partner follows the directions exactly, then revises for clarity and precision.



Teaches algorithms, sequencing, and precise communication through hands-on writing tasks.

Cross-curricular: Technology, ELA, Math — includes sentence starters and reflection questions.

Materials: paper and pencils only — no devices or internet required.





# Let's try the Algorithm Recipe Challenge

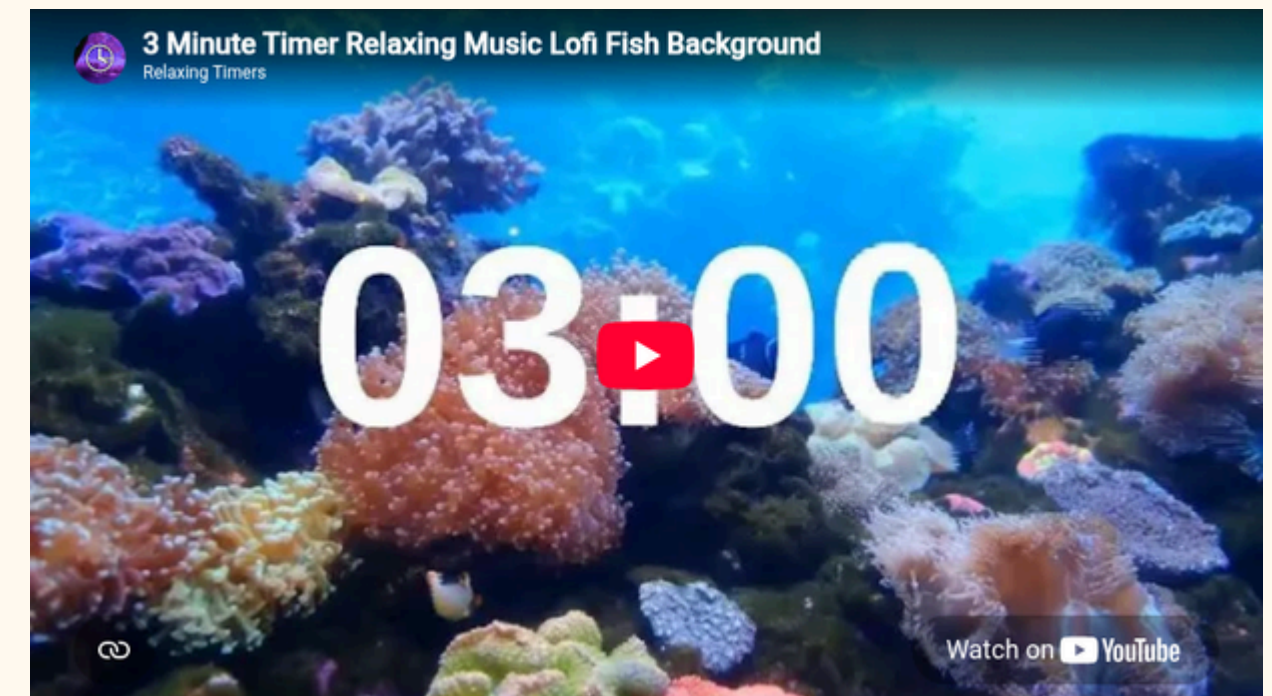
**Materials:** Blank paper, Pencils & One simple drawing prompt per pair  
(A house, robot, flower, or snowman works well).

**Directions:**

- Pair Up with a partner
- Partner A: Programmer
- Partner B: Computer

**Job Descriptions:**

- The Programmer will write an algorithm telling the computer how to draw the picture.
  - Make sure your directions are very literal.
  - You have 3 minutes to complete the directions for the algorithm.
- The Computer may follow only the written directions. The computer cannot ask what the programmer meant or make assumptions.
  - For Example: If the directions say, "Draw a window," but do not say where, the "computer" should place it wherever they choose.
  - You have 3 minutes to complete the algorithm.





# Debrief the Algorithm Recipe Challenge

**For 1 Minute** – Partners compare the intended and completed drawings.

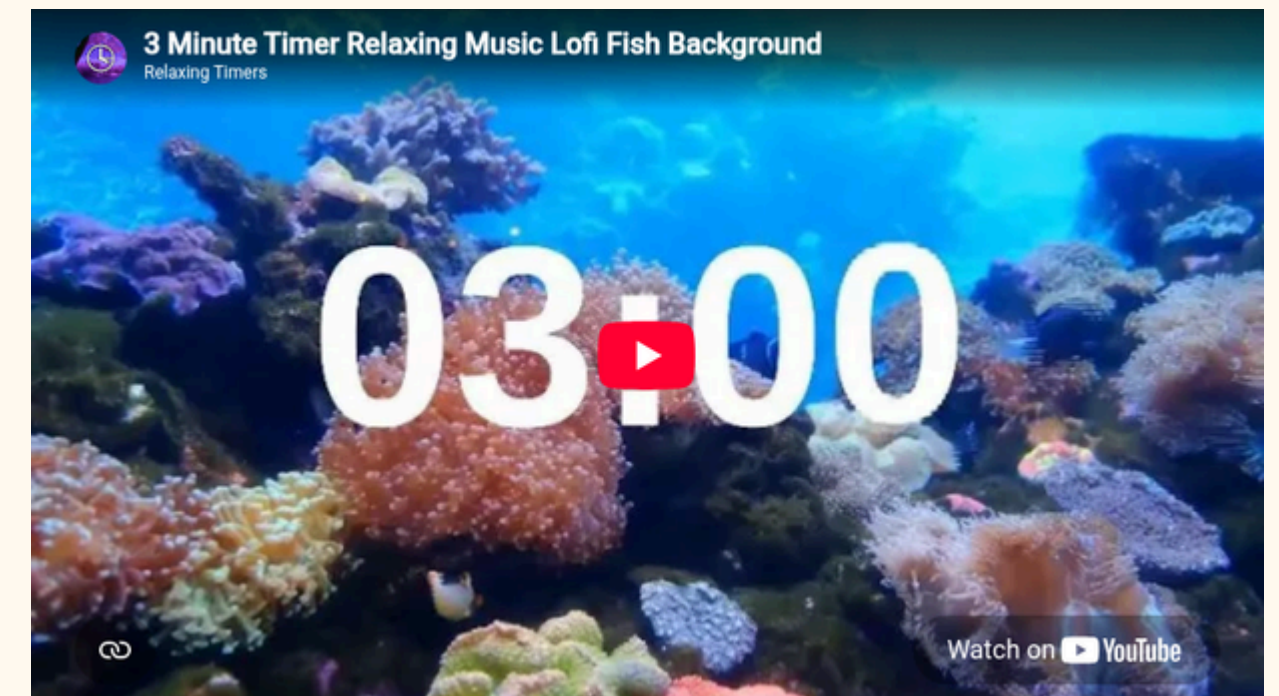
**For 2 Minutes** – Revise one or two unclear instructions.

**Ask:**

- Where did the algorithm break down?
- What assumptions did the programmer make?
- How is revising the directions similar to debugging code?
- How could this activity support writing or sequencing in ELA?

**For ELL students, teachers could provide sentence starters such as:**

- First, draw...
- Next, place...
- Above the...
- To the left of...
- Finally...





# AI Created Algorithm Recipe Challenge Example

**Task:** Write step-by-step instructions for your partner to draw a picture of a snowman.

Programmer  
Job:  
Write clear  
steps!



## 1. Programmer (Writer)

I will write the algorithm.

### My Instructions:

1. Draw a large circle near the bottom center of the page.
2. Draw a medium circle on top of the large circle.
3. Draw a small circle on top of the medium circle.
4. Draw two small dots on the top circle for eyes.
5. Draw a small triangle in the center of the top circle for the nose.
6. Draw a curved smile under the nose.
7. Draw two small circles on the middle circle for buttons.
8. Draw one stick arm on each side of the middle circle.
9. Draw a hat on top of the small circle.
10. Draw a scarf between the top and middle circles.

## 2. Computer (Drawer)

I will follow the instructions  
EXACTLY as written.

### My Drawing:



## 3. Compare & Reflect

We compare our work.  
What is the same? What is different?

### Our Comparison:

- ✓ We both drew a snowman with three circles.
- ✓ We both added a face, scarf, and hat.
- ⚠ My stick arms are different lengths.
- ⚠ I wasn't told how big to make the buttons.
- ⚠ I put the scarf very low because the directions were not specific.
- ★ Next time: Be more specific! Add more details like size, placement, and shape.

## 4. Revise the Algorithm

We rewrite the steps to make them clearer and more specific.

1. Draw a large circle near the bottom center of the page.
2. Draw a medium circle directly on top of the large circle so they touch.
3. Draw a small circle directly on top of the medium circle so they touch.
4. Draw two small black dots near the top of the small circle for eyes.
5. Draw a small orange triangle in the center of the small circle pointing to the right for the nose.
6. Draw a curved smile under the nose.
7. Draw two small black buttons in a vertical line on the middle circle.
8. Draw one thin stick arm coming out of each side of the middle circle.
9. Draw a black top hat on top of the small circle.
10. Draw a scarf wrapped around the neck between the top and middle circles.

### Final Drawing (After Revising)



**What We Learned:** Clear, precise instructions help the “computer” (our partner) create exactly what we imagine. This is how algorithms work in real life!

**CS Concept:** Algorithms, Sequencing, Precision, Debugging

Utilize AI as your co-teacher!

Work smarter, not harder







## Section Overview

# Grades 6-8

# Activities Overview

**All Grades 6-8 activities are designed for 60-minute sessions. These hands-on, unplugged lessons build foundational computer science skills – from algorithms and debugging to networks, cybersecurity, and data analysis – without requiring any devices or internet access.**







**Grades 6-8 | 60 Minutes**

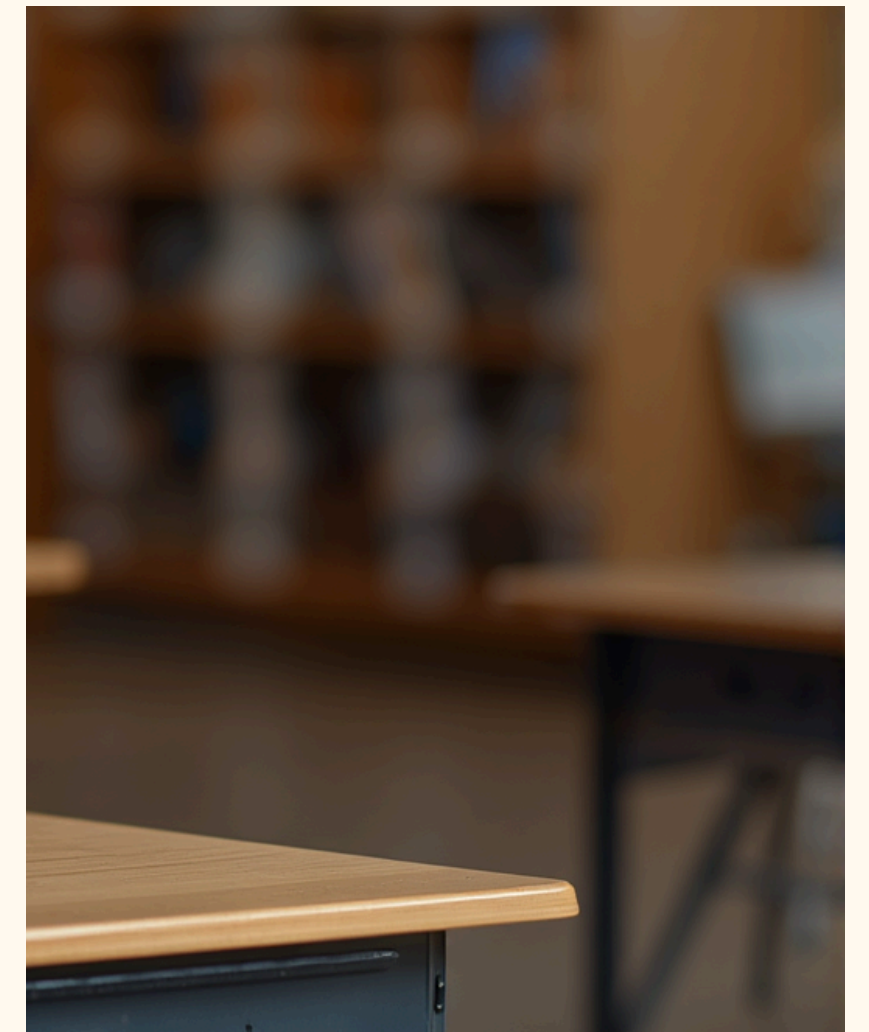
# Create an Algorithm for a Real-Life Task

Students write precise step-by-step instructions for real-life tasks. Partners follow directions exactly, then revise for clarity and accuracy.

Write step-by-step instructions for tasks like opening a locker or tying shoes.

A partner follows the instructions exactly – no assumptions allowed.

Revise instructions for precision, teaching algorithms and sequencing.







**Grades 6–8 | 60 Minutes**

# Debug the Paragraph

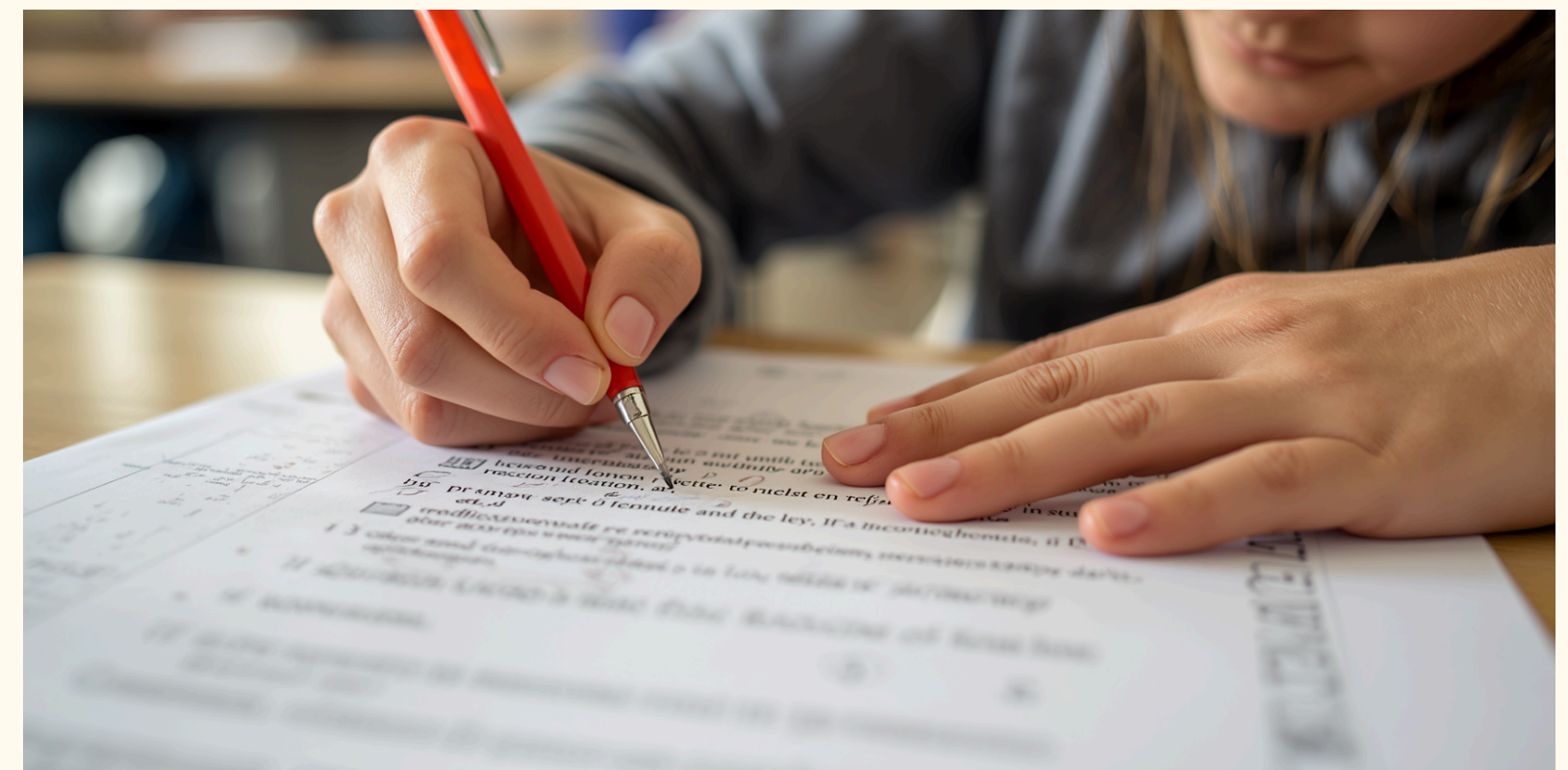
**Cross-curricular: Technology, ELA**

**Students identify and correct spelling, grammar, and logic errors in provided paragraphs to develop debugging and problem-solving skills.**

**Teaches debugging and problem-solving through hands-on text correction.**

**Supports critical reading and editing skills in an engaging format.**

**Materials: printed paragraphs with errors, pens or pencils.**







**Grades 6-8 | 60 Minutes**

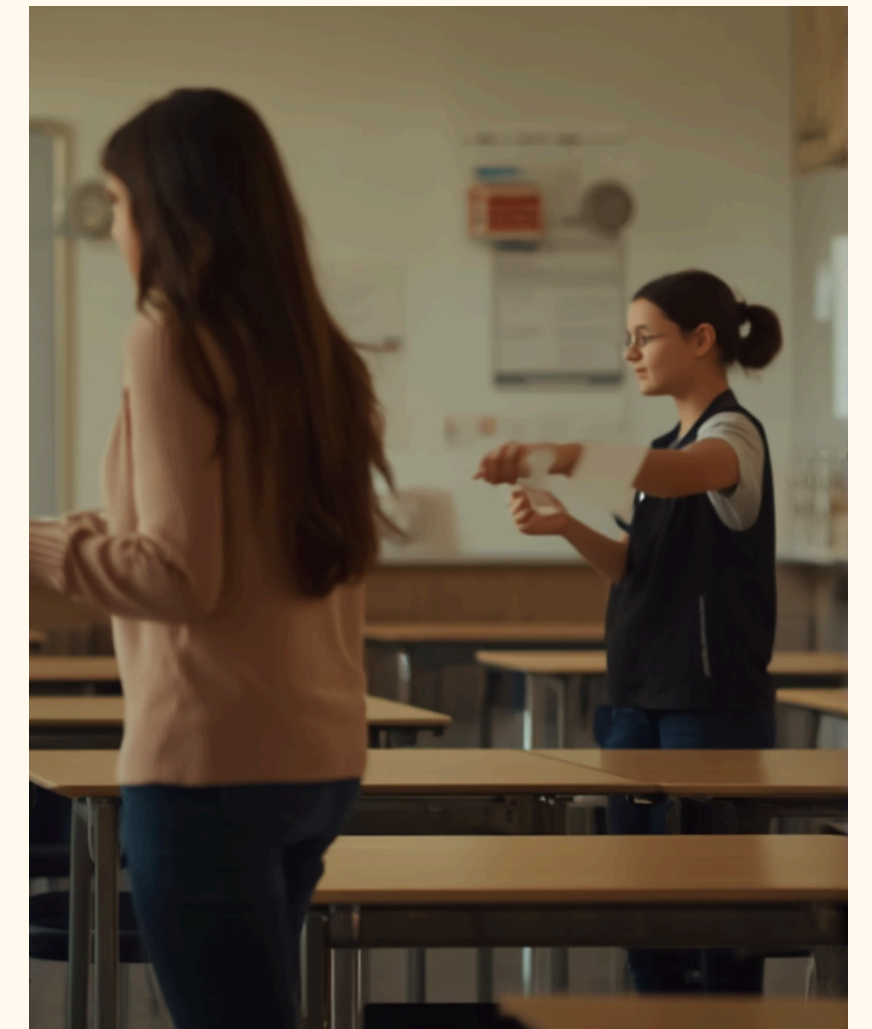
## Human Internet: How Messages Travel

Students act as devices, passing message packets on index cards and reassembling them. Teaches networks, communication, and protocols.

Students role-play as routers and devices, passing message packets written on index cards across the room.

Reassemble packets in correct order to reveal the full message at the destination.

Materials: index cards, labels | Cross-curricular: Technology, Social Studies, ELA







# Grades 6-8 | 60 Minutes

## Cybersecurity

# Phishing Detective

Cross-curricular: Technology, ELA, Social Studies

Students analyze sample emails and texts to identify phishing warning signs such as urgent language, unknown senders, and suspicious links. Teaches cybersecurity awareness and digital citizenship.

Materials: printed sample emails/texts – spot urgent language, fake senders, and suspicious links.

Includes discussion prompts on online safety and digital citizenship.







**Grades 6-8 | 60 Minutes**

# Data Bias in the Real World

Review real data sets to identify bias and fairness issues. Analyze sampling limitations and suggest improvements to promote equity.

Review data sets to identify bias and fairness issues in real-world examples.

Analyze sampling limitations and suggest improvements for accuracy.

Teaches data analysis, bias awareness, and foundational AI concepts.







**Grades 6-8 | 60 Minutes**

# Design a Decision Tree

**Cross-curricular: Technology, Science, ELA, Math**

**Materials: paper, markers**

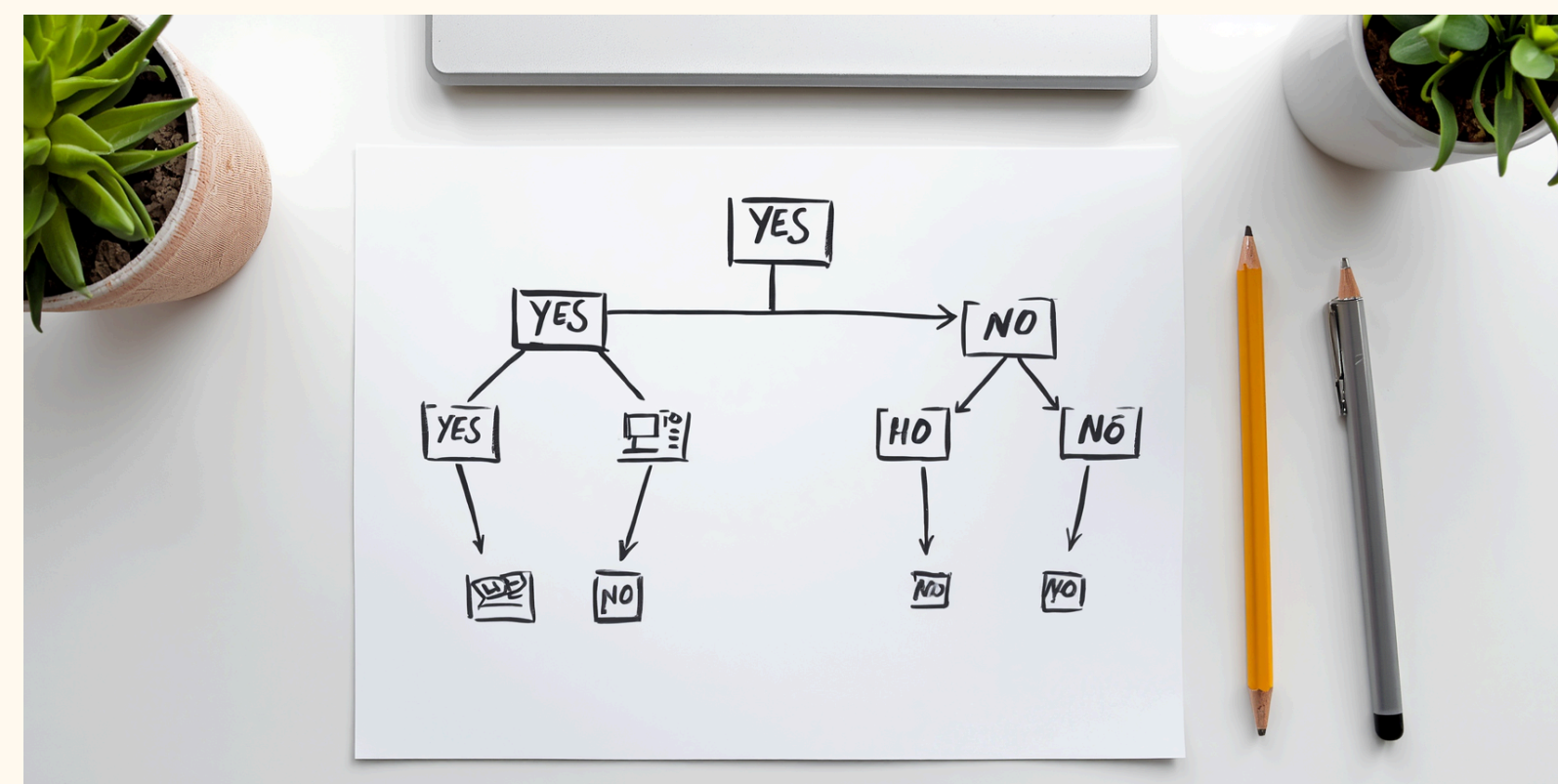


Students create yes/no decision trees to classify items such as animals, planets, or digital safety scenarios.

Teaches conditional logic and classification through hands-on branching diagrams.

Supports logical reasoning and creativity as students design their own classification rules.

Includes reflection questions to deepen understanding of decision-making.



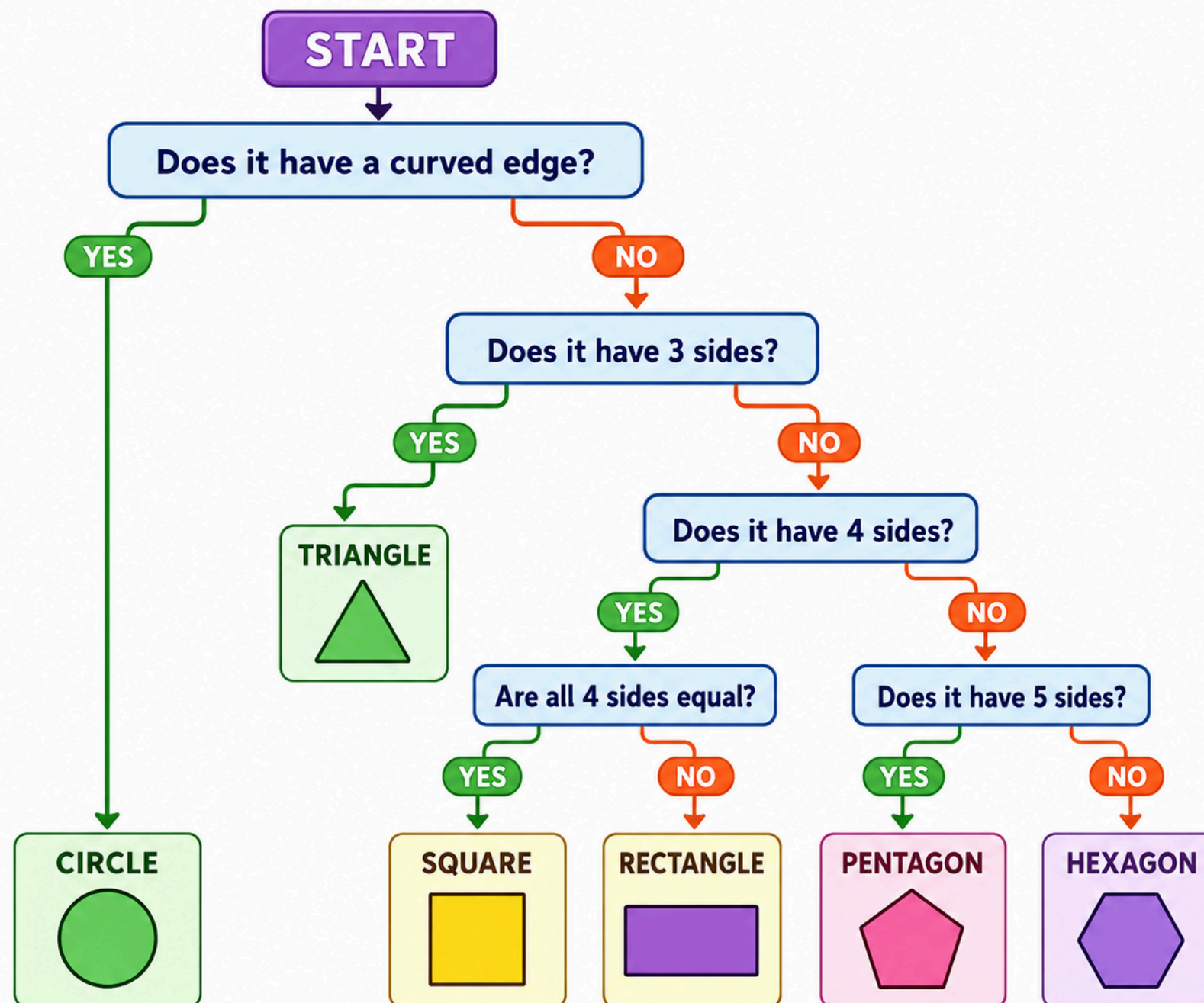




## Sample Decision Tree: Which Shape Is It?

Shapes:

- Circle
  - Rectangle
- Triangle      Square
- Pentagon      Hexagon



### How each shape travels through the tree

#### Circle

1. Does it have a curved edge? Yes
2. Answer: Circle

#### Triangle

1. Does it have a curved edge? No
2. Does it have three sides? Yes
3. Answer: Triangle

#### Square

1. Does it have a curved edge? No
2. Does it have three sides? No
3. Does it have four sides? Yes
4. Are all four sides equal? Yes
5. Answer: Square

#### Rectangle

1. Does it have a curved edge? No
2. Does it have three sides? No
3. Does it have four sides? Yes
4. Are all four sides equal? No
5. Answer: Rectangle

#### Pentagon

1. Does it have a curved edge? No
2. Does it have three sides? No
3. Does it have four sides? No
4. Does it have five sides? Yes
5. Answer: Pentagon

#### Hexagon

1. Does it have a curved edge? No
2. Does it have three sides? No
3. Does it have four sides? No
4. Does it have five sides? No
5. Answer: Hexagon



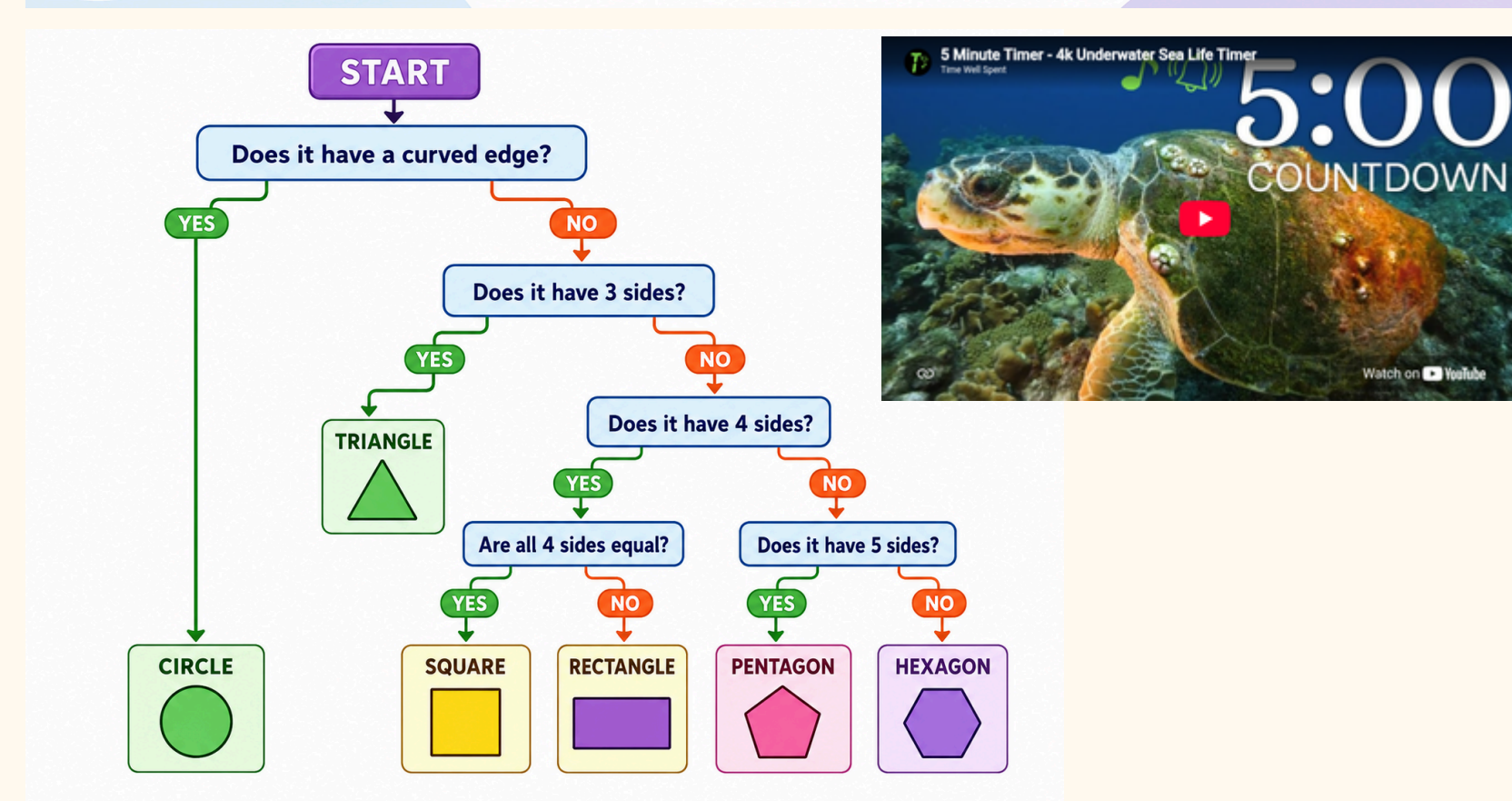
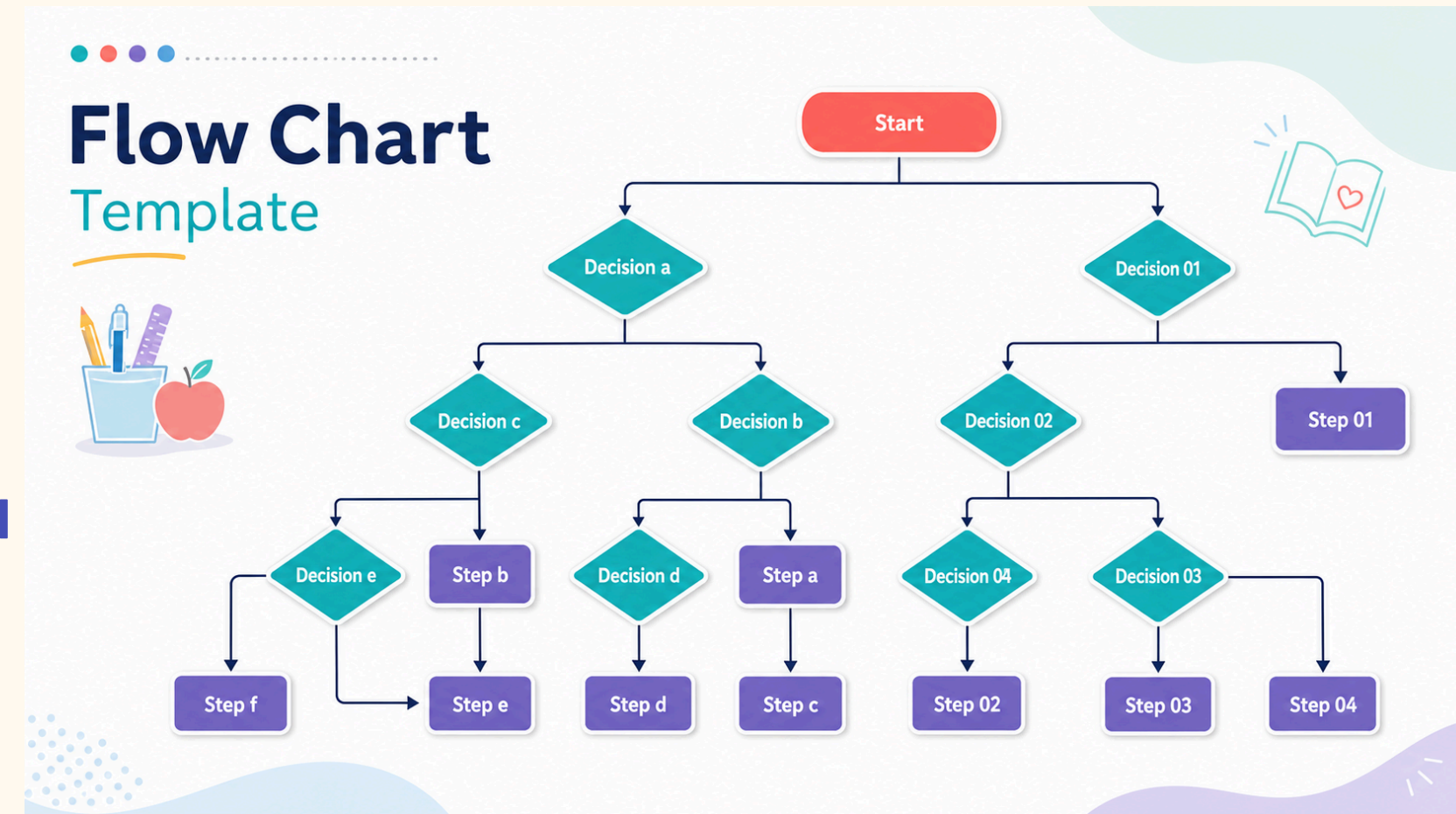
# Let's try Designing a Decision Tree

## A short list of six items

- Animals: fish, eagle, dog, frog, snake, butterfly
- School objects: pencil, laptop, book, scissors, calculator, backpack

## Directions:

- Please get into groups of 3 or 4 participants
- Each group must create a series of yes-or-no questions that will correctly identify all six items.
  - Each answer should lead to another question or to the final item
  - **Example:**
    - Does it have a curved edge?
      - Yes → circle
      - No → continue to another question
- Requirements:
  - Begin with one yes-or-no question.
  - Label both branches Yes and No.
  - Continue asking questions until each branch ends with one animal.
  - Test your decision tree using every animal.
  - Correct or debug any branches that do not work.





# ● ● ● Let's try Design a Decision Tree

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## Reflection

1. Which question divided the animals/school objects most effectively?
2. Did any animal/school object reach the wrong answer?
3. What did your group change after testing the tree?
4. How is a decision tree similar to an if/else statement?
5. How could this activity connect to Science, Social Studies or ELA?

**The completed tree is not the most important part. Different groups may create different trees that are all correct.**

**For example, another group might begin with: "Does it have wings?"**

**That is acceptable as long as:**

- Every question can be answered with yes or no.
- Every branch leads to the correct animal.
- Each animal has only one final destination.
- The group tests and debugs its tree.

**There can be multiple correct algorithms for solving the same problem.**

**The important question is whether the decision tree is clear, efficient, and accurate.**





## Teaching Tips

# Benefits of Unplugged Activities

Unplugged activities build foundational CS skills while encouraging critical thinking, collaboration, and engagement – no devices or internet required. ▶

Encourages critical thinking, collaboration, and cross-curricular engagement.

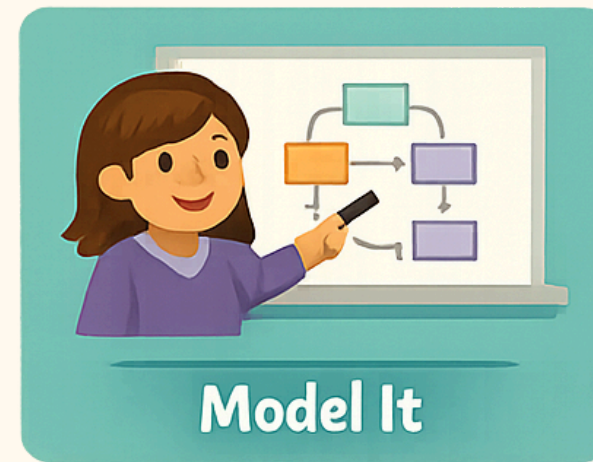
Supports diverse learning styles; use sentence starters and reflection questions to scaffold learning.

Incorporate discussion and extension activities for deeper understanding.





# Unplugged CS Tips



**Start small, have fun, and let students learn by doing!**

**Remember:**

**Unplugged does not mean “without computer science.”**

**It means learning computer science through movement, discussion, collaboration, creativity, and problem-solving.**

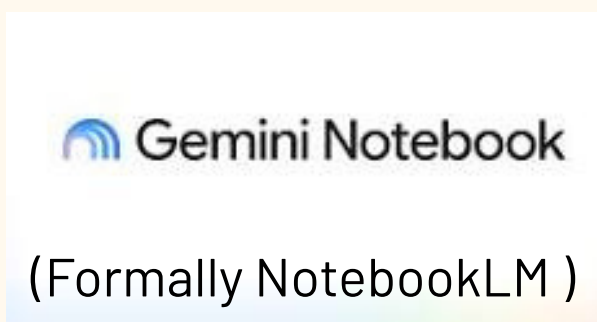
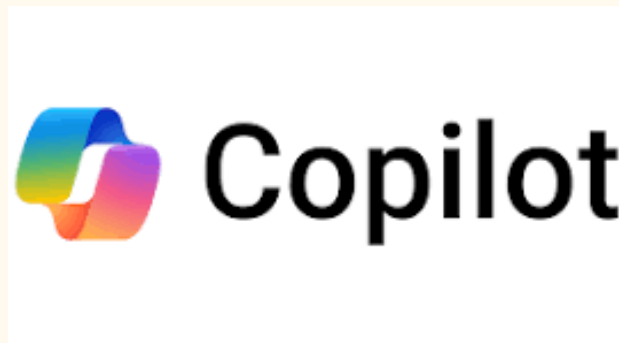




CYBER.ORG  
THE ACADEMIC INITIATIVE OF THE CYBER INNOVATION CENTER

Computational Thinking K-12

Cybersecurity Basics K-8



# Next Steps & Resources

Put these unplugged CS activities into practice and keep the learning going – with or without devices or internet access.

Try these activities during internet outages or device-free days to keep CS learning on track.

Access detailed lesson plans and handouts from shared resource sites for easy implementation.

Share experiences and adaptations with colleagues to continuously refine and improve practice.

Grades 4–8 Cross-Curricular Unplugged Activities



Google Drive Resources



Slides



**Thank You**

**Thank you for your attention!**

Questions or Comments?

**Unplugged Activities Grades 4-8**

**Jessica LaRosa, M. Ed**

**Teacher of Innovation & Technology**

**Grace A. Dunn Middle School**

**Trenton Public Schools**

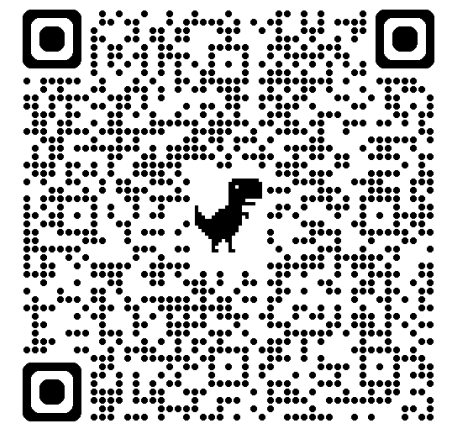


[jlamosa@trenton.k12.nj.us](mailto:jlamosa@trenton.k12.nj.us)



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