AP Computer Science

Computer Science Education Week Carnival Event

About College Board

College Board is a mission-driven not-for-profit organization that connects students to college success and opportunity. Founded in 1900, College Board was created to expand access to higher education. Today, the membership association is made up of over 6,000 of the world's leading educational institutions and is dedicated to promoting excellence and equity in education. Each year, College Board helps more than seven million students prepare for a successful transition to college through programs and services in college readiness and college success—including the SAT® and the Advanced Placement Program®. The organization also serves the education community through research and advocacy on behalf of students, educators, and schools.

For further information, visit **collegeboard.com**.

Contents

Acknowledgements

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Carnival Activities

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Introduction

Congratulations! We are glad you are interested in having a Computer Science Carnival during National Computer Science Education Week. This event is designed to encourage and create awareness around one of the fastest growing career fields: computing. Computing is at the cornerstone of most STEM (science, technology, engineering, and math) fields, and more career fields require students to develop computational thinking skills and the basics of computer science. It is becoming an essential skill as important as reading and arithmetic. Writing code helps students to problem solve and think critically. This carnival helps to create excitement in elementary and middle-school-aged students for learning computational thinking skills, which can be cultivated in computer science classes at your school.

Make It a Success

National CS Education Week is the first week of December. In order to make your event a success, you will want to:

- select a date;
- recruit volunteers; and
- advertise your event at both elementary and middle schools in your district.

The timing of this event being near Thanksgiving may require advertising both before and after Thanksgiving to ensure parents and students do not forget. If the first week of December is problematic, don't let that stop you. Pick another time in the year that suits your school calendar best.

Make It Accessible

This event should be open and welcoming to all students. To be successful at including all students, you will need to do some advanced planning. We have included some hands-on activities that can be adapted to students with disabilities in these materials. Here are some things to consider that will make your event welcoming to all students and parents:

- Students who have a disability such as being blind or visually impaired should be able to participate along with other students. Students who are blind might need alternative formats for activities. Students or their parents who are deaf may need sign language interpreters.
- Students and parents who do not speak English should also be welcomed by providing interpreters in their own language.
- Students who are in wheelchairs will need more space between activities to maneuver between activities.

Some accommodations, such as interpreters, may require funding, so anticipate that in the budget for the event. Incorporating these requests into a registration process for the event will allow the advanced planning necessary to meet the needs of students and parents. Be sure to mention that any accommodations should be requested well ahead of time to see if they can be provided.

Showcase Your Event

Ask parents and students to share photos of your event on social media. Be sure to include the tags #APCSCarnival, #CSEDWeek, #APCSP, and #APCSA.

Volunteer List

The success of your event will depend heavily on your ability to recruit volunteers.

How Many?

The number of volunteers needed depends on the size of your school district. We recommend having at least two volunteers per carnival table, but you may need four or six volunteers for each.

Who?

In addition to teachers within your department and administrators, encourage high school computer science students or club members to be volunteers. Don't forget to ask parents to volunteer.

Job	*Volunteers*	
Check-in Table		
Prize Table		
Human Diagram Tracing		
Make Faces		
Binary Magic		
Binary Bracelets		
Binary Decoding		
Label Hardware		
Robot Cups		
Matrix Magic		
Color Decryption		
Insertion Sort		
Parallel Sort		
Candy Machine		
Computer Lab Monitors		
Sign Language Translator		
Language Interpreter		

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Example Set Up

Objective

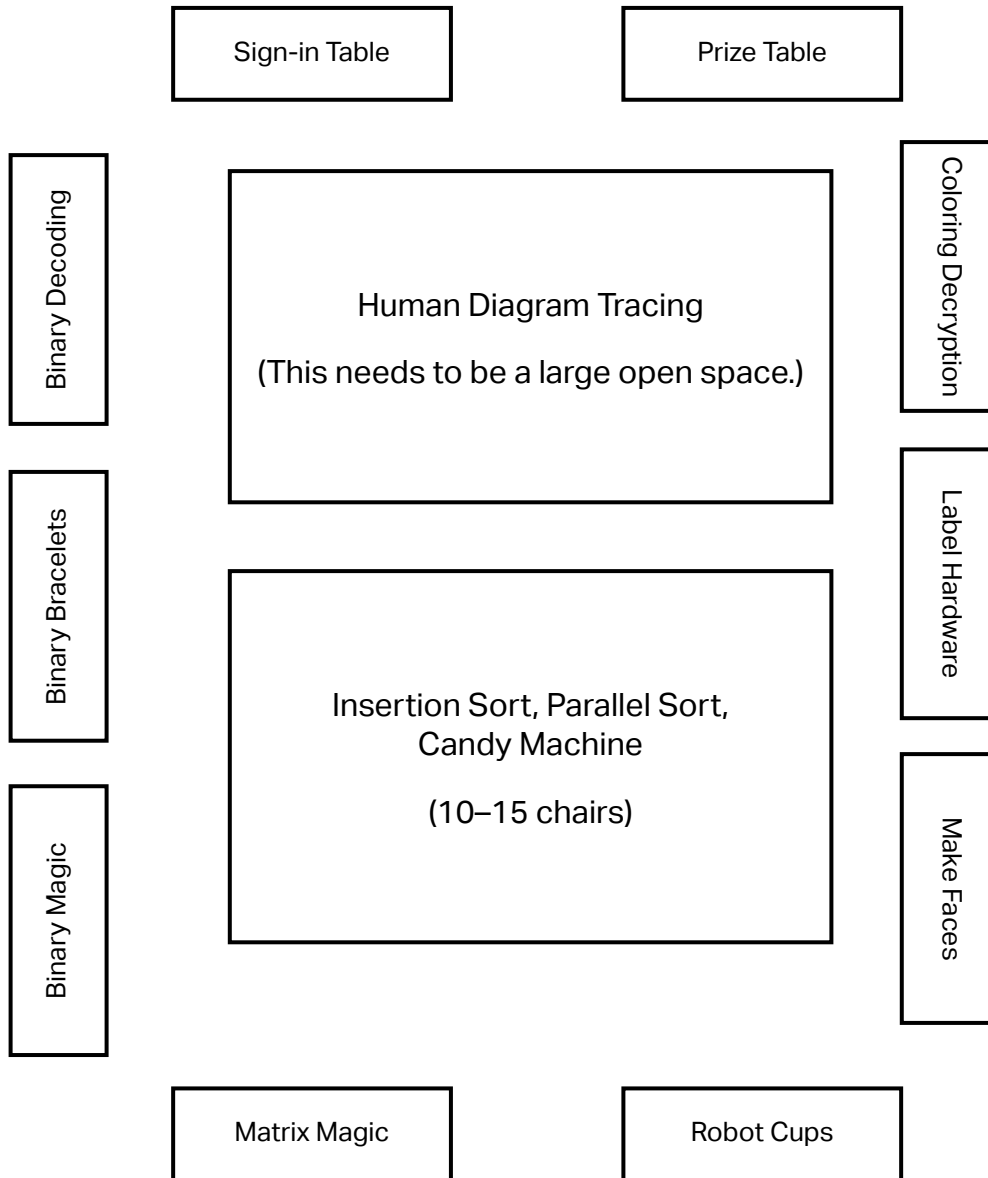Use this example to model the setup of your carnival.

Materials

- A large open area, such as a gym or common area
- Tables and chairs for activities
- Access to a computer lab or a table of laptops
- Signs for each activity, sign-in table, and prize table
- Sign-in sheet (optional)

DIRECTIONS

1. Setup can take 1–2 hours, depending on the number of volunteers. The Human Tracing Diagram activity is the most time consuming to set up. Be sure to leave yourself enough time to be prepared for your visitors.

2. A sign-in sheet will allow you to track attendance at your event, as well as the age level and school of students. Be sure parents know that this is a family event and they should attend the event with their students.

3. Be sure to give each student a Participation Card when they sign in. Explain to students that they should try each activity to fill their card with stickers and stamps. Once they have filled their card, they can show it at the prize table and get a prize.

4. Encourage students to take their prize card home, as the QR code and URL on the front provide additional online activities for them to do at home.

5. Students should visit the URL on the front of the card, or scan through the QR code, to complete online activities while in computer lab or on laptops.

Sample Diagram of Carnival Set Up

Sign-in Table	Prize Table

Binary Decoding	Human Diagram Tracing (This needs to be a large open space.)		Coloring Decryption
Binary Bracelets			Label Hardware
Binary Magic	Insertion Sort, Parallel Sort, Candy Machine (10–15 chairs)		Make Faces

Matrix Magic	Robot Cups

Participation Card

Objective

Use participation cards to encourage students to try all available activities.

Materials

- Card stock to print and create cards
- Stickers or stamps
- Small prizes or candy

DIRECTIONS

1. Print the next two pages back-to-back and then cut to create cards.

2. Each activity should have stickers or stamps to mark participation cards after the students visit them.

3. If students are using a tablet or cell phone, they can scan the QR code to access online activities.

4. Once the students have filled the card, they should show them at the prize table for a prize.

5. Encourage students to take their prize card home, as the QR code and URL on the front provide additional activities for them to do at home.

Welcome to CS ED Week!	Make Faces	Binary Magic	Binary Bracelets	Binary Decoding
Label Hardware	Robot Cups	Matrix Magic	Color Decryption	Human Diagram Tracing
Insertion Sort	Parallel Sort	Candy Machine	Computer Labs	

Welcome to CS ED Week!	Make Faces	Binary Magic	Binary Bracelets	Binary Decoding
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WELCOME TO

CS EDUCATION WEEK CARNIVAL EVENT

… learning to be the innovators of the future!

***On the back of this card is a list of activities.
Present your filled card for a prize.***

Computer tutorials are available online.

Visit **csedweek.org/learn**—*We recommend you start with* **tutorials for beginners.**

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AP COMPUTER SCIENCE

Activities

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ACTIVITY 1
Human Diagram Tracing

Objective

This activity introduces students to the flow of a program and the different structures that are used, such as conditional statements to make decisions and loops to repeat the same activity multiple times.

Materials

- Painters tape or masking tape to map out connections
- Printout of diagram pieces (Appendix A)
- Dice
- Coin
- 1–10 playing cards or 10 index cards numbered 1–10
- Bag of candy
- Large floor space

DIRECTIONS

1. Print and laminate diagram pieces located in Appendix A.

2. Use the layout example in Appendix A along with diagram pieces to create the diagram in an open space on the floor of your event.

3. Use tape to connect the diagram pieces together. Add arrows at the end to show the flow of the diagram.

4. Have students follow the tapelines and walk through the diagram following the directions on each card they encounter.

5. When students have finished, put a sticker or stamp on their participation card.

Equity and Access

Students with physical disabilities may need alternate activities. Students who are visually impaired may require someone to help walk them through the diagram and read what is contained in the flowchart symbols.

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ACTIVITY 2
Make Faces

Objective

In this activity, students will be exposed to how we can replace a series of steps in a program—in this case, drawing instructions—with just one command. This idea is called abstraction.

Materials

- Markers or crayons
- Printouts of Face Procedures (Appendix B)
- Printouts of Head Shapes (Appendix B)
- Printout of Face Instructions (Appendix B)

DIRECTIONS

1. Make 5–10 copies of the Face Procedures sheets located in Appendix B. Laminate these copies for future reuse.

2. Make multiple copies of the Head Shape sheets located in Appendix B. You will want enough copies for each student to draw at least one face.

3. Make 2–4 copies of each Face Instructions sheet located in Appendix B. There are two sets of instructions on each sheet, so cut these sheets in half and laminate them for future reuse.

4. Allow students to choose one of the four Face Instructions laminated sheets.

5. The Face Instructions sheet tells students which head shape they will use to draw their face. Have students select the given Head Shape.

6. Using markers or crayons, along with the print out of Face Procedures, students will draw out each face feature based on the visual provided with each procedure to create their face.

7. When students have finished, put a sticker or stamp on their participation card. They should take their face drawing with them.

Source: Adapted from **https://studio.code.org/unplugged/unplug2.pdf**

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ACTIVITY 3
Binary Magic

Objective

Introduce students to how binary numbers are related to the number system they use every day, the decimal number system, with this magic trick.

Materials

- Enlarged Binary Magic Trick Cards (Appendix C)
- Binary Magic Trick Cards (find here: **https://cse4k12.org/binary/magic_trick.html**)
- Scissors

DIRECTIONS

1. Print out the Enlarged Binary Magic Trick Cards located in Appendix C. Laminate these for future reuse.

2. Print out Binary Magic Trick Cards from the previous site. Print enough copies for each student to have their own copy of the cards to take with them.

3. Explain to students that computers use a different way to represent numbers than we do. Computers are electronic, so they operate on two states, on or off. Computers use this as a basis to represent everything.

4. Ask students to pick a number between 1 and 63 keeping the number to themselves.

5. Place the six laminated enlarged Binary Magic Trick Cards in front of the student number side facing up and ask them to turn over all cards that do not have their selected number on them.

6. On the cards that are faced up, add up the first number in the upper left corner of the card.

7. Ask the student if the sum is their secret number.

8. Play a couple more times to see if the student picks up on the trick.

9. Explain the trick to the student. Explain that each card represents a bit in a binary number. If the card is faced up, the bit is on, and if it is face down, the bit is off. So, by flipping over the cards that don't have their number on it, they are turning these bits off, leaving only the bits that are necessary for a binary number equivalent to their number.

10. Have students create their own set of cards by giving them the printout of smaller Binary Magic Trick Cards (find at the previous link) and asking them to cut out their own cards.

11. When students have finished, put a or stamp on their participation card.

Source: Adapted from **https://cse4k12.org/binary/magic_trick.html**

Equity and Access

For students with visual impairments, create a set of Binary Magic Cards using Braille.

ACTIVITY 4
Binary Bracelets

Objective

In this activity, students are introduced to how binary numbers can be used to represent letters in the computer. Students will represent their initials in binary by making a binary bracelet.

Materials

- Different-colored pipe cleaners
- Different-colored plastic beads
- Bowls
- Laminated copies of binary bracelet worksheet (find here: **https://code.org/curriculum/course2/14/Activity14-BinaryBracelets.pdf**)

DIRECTIONS

1. Sort the plastic beads by color into individual bowls.

2. Explain to students that computers use a special type of number to represent letters. Computers are electronic, so they operate on two states, on or off. Computers use this as a basis to represent everything.

3. Have students identify their first initial and the binary sequence that represents their initial on the binary bracelet worksheet.

4. Using a different color to represent black squares and one to represent white squares, have students thread related beads onto a pipe cleaner.

5. Carefully twist the ends of the pipe cleaner together to create the bracelet.

6. When students have finished, put a sticker or stamp on their participation card.

Sources: Adapted from **https://csunplugged.org/en/topics/binary-numbers/unit-plan/codes-for-letters-using-binary-representation/ and https://code.org/curriculum/course2/14/Teacher**

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ACTIVITY 5
Binary Decoding

Objective

In this activity, students are introduced to how binary numbers can be used to represent letters and numbers in the computer. Use this information to decode a secret message.

Materials

- Printout of secret message sheet (enough for all students to have their own). Page 8 here: **https://classic.csunplugged.org/wp-content/uploads/2014/12/unplugged-01-binary_numbers.pdf**

- Printout of Binary Number card (one copy to be cut and laminated). Page 6 here: **https://classic.csunplugged.org/wp-content/uploads/2014/12/unplugged-01-binary_numbers.pdf**

- Alternate worksheet: **https://www.teacherspayteachers.com/Product/Sending-Secret- Binary-Message-Worksheet-2226564**

- Pencils

- Optional: copy of Secret Message 2 (Appendix D)

- Optional: copy of page 13 of **https://code.org/files/CSEDbinary.pdf** for the decoding key for each letter.

DIRECTIONS

1. Explain to students that computers use a special type of number, binary numbers, to represent letters. Computers are electronic, so they operate on two states, on or off. Computers use this as a basis to represent everything. Every character has a unique number assigned to it that is represented using an equivalent binary number.

2. Provide students with a secret message sheet.

3. Provide students with a laminated Binary Number cards.

4. For each row of the encoded message, have students use their Binary Number cards to match the boxes where the lighted images appear and add the dots in these boxes. This will give them the value for this row.

5. Match this number to the corresponding letter, at the bottom of the secret message sheet, to get the letter for this row.

6. Repeat this process for all of the rows. Record the letters from each row on the secret message line to reveal the message.

7. Optional: To decode Secret Message 2, located in Appendix D, students will need to use decoding keys (page 13 of **https://code.org/files/CSEDbinary.pdf**)

8. When students have finished, put a sticker or stamp on their participation card.

Source: Adapted from **https://classic.csunplugged.org/wp-content/ uploads/2014/12/unplugged-01-binary_numbers.pdf**

ACTIVITY 6

Label Hardware

Objective

Students will be introduced to the different hardware inside a computer.

Materials

- Labels (Appendix E)
- Double-sided tape
- Old desktop computer with the case off to see the inside of the computer

DIRECTIONS

1. Print, cut out, and laminate the hardware labels located in Appendix E.

2. Put double-sided tape on the back of each label.

3. Ask students to place the labels on the different parts of the computer.

4. Review the correct components and what they do with the students.

5. When students have finished, put a sticker or stamp on their participation card.

Source: Adapted from **https://code.org/files/CSEDbinary.pdf** (includes diagram of the inside of a computer to use as an answer key)

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ACTIVITY 7
Robot Cups

Objective

Students will be introduced to commands a computer program might use to move a robotic hand. In this activity, students will practice developing the commands needed to mimic the movements of a robot.

Materials

- Plastic cups
- Symbol Key (laminate 3–4 of these). Page 11 here: **https://csedweek.org/files/CSEDrobotics.pdf**
- Cup Stack Pack diagrams (cut and laminate 3–4 of these). Pages 12–14 here: **https://csedweek.org/files/CSEDrobotics.pdf**
- Poster board
- Scrap paper
- Pens, pencils, or markers

DIRECTIONS

1. On poster board, make one row of six squares, all touching, that are the size of a cup. This will help students to determine the distance a cup needs to move and will serve as a board for building their cup stacks. You can cut a poster board into three pieces to make multiple boards.

2. Provide students with a Symbol Key sheet and one of the Cup Stack Pack diagrams (let them choose).

3. Have students write out on a sheet of paper, the directions to build the cup stack from the diagram.

4. Have the student or one of their friends follow the directions to build the stack. Does it look like the picture?

5. Students can repeat with other pictures.

6. When students have finished, put a sticker or stamp on their participation card.

Source: Adapted from **https://csedweek.org/files/CSEDrobotics.pdf**

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ACTIVITY 8
Matrix Magic

Objective

Students will be introduced to the detection of errors and how the properties of numbers can assist in detecting errors through this magic trick.

Materials

- Card stock
- Markers

DIRECTIONS

1. Create matrix magic cards by cutting card stock into squares. Place a large dot in the center of each card on one side. Make at least two sets of 36 cards.

2. Provide students with 25 cards. Ask the students to arrange them in a 5 × 5 square with a mix of some dots up and some dots down.

3. Add one more row and one more column. Tell the students that this will make the trick more difficult for you. When adding the cards, make sure that there are an even number of dots in each row and column. Do this by placing the card with the dot up if the row/column has an odd number of dots and dot side down if it has an even number of dots in the row/column.

4. Turn around and ask the student to turn one card over and let you know when they are done.

5. Find their card by locating where the row and column with an odd number of dots intersects.

6. When students have finished, put a sticker or stamp on their participation card.

Source: Adapted from **https://csunplugged.org/en/topics/error-detection-and-correction/integrations/quick-card-flip-magic/**

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ACTIVITY 9
Color Decryption

Objective

Students will be introduced to the idea of compression algorithms and how images are stored on the computer.

Materials

- Crayons or markers
- Code Sheets (Appendix E)

DIRECTIONS

1. Print Code Sheet Picture 1 and Picture 2, found in Appendix F. Be sure to have enough for each student to complete a sheet and take home with them.

2. Print two copies of the Answer Key, found in Appendix F. Keep it hidden while students are completing this activity.

3. Explain to students that pictures stored on the computer are made up of many small squares of color called pixels. In order for a computer to store a picture, it has to know the color of every pixel. That is a lot of information. However, the computer can use a process or algorithm to represent the picture using less data. This is referred to as compression.

4. The numbers at the top of each Code Sheet represent a picture that is 30 columns wide and 22 rows high. Each row of numbers represents the colors in that row of the picture. For each row, starting with the one in the upper left, the numbers represent how many grid blocks in the row are each color, alternating between white and colored blocks. For example, if the first row is 3, 5, 3, then the first row in the picture would be three white blocks, followed by five colored blocks, followed by three white blocks.

5. Provide each student with a Code Sheet and crayon or marker to complete their picture.

6. When students have finished, have them compare their picture with the answer key.

7. When students have finished, put a sticker or stamp on their participation card. They can keep their pictures.

Source: Adapted from **https://classic.csunplugged.org/image-representation/#Colour_by_Numbers**

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ACTIVITY 10
Insertion Sort

Objective

This group activity introduces students to the concept of sorting with one method to sort using a famous algorithm called Insertion Sort. Students will execute the algorithm by physically moving around in a systematic way. In the process they will learn that the sorted items have a location in a line of chair which is commonly called an array.

Materials

- 10 to 15 chairs

DIRECTIONS

1. Place 10 to 15 chairs in a semicircle. Chairs should be spaced so that participants will be able to see and/or hear each other clearly. Reuse this same space to rotate through the insertion sort, parallel sort, and candy machine activities.

2. Have the students sit in the chairs randomly. Be sure there are no empty chairs between students. Remove any empty chairs.

3. Choose a feature of the students to sort on. It could be by birthday, name, height, or a number on a 3 × 5 card.

4. The students will stand up in order starting at one end, say the students' right end. The idea of the algorithm is that when a student stands up, all the students to their right are already sorted among themselves. The new student then finds where he belongs among those that are already sorted. At the start when the new student stands, their chair is now open. The new student then starts to go down the line of sorted students to find out where they belong, starting with the student on the right. If the new student's feature is smaller than this student, then this student moves to the left to the free chair. The new student then moves to the next student to the right and does exactly the same thing. What is happening is that the new student is seeking an empty seat where the student on the left has a larger feature and the student on the right has the same of smaller feature (or there is no one on the right being that the new student has the smallest feature value).

5. A good way to teach the algorithm is by example, by helping the first three or four students execute the algorithm. At that point most of the students will pick up the idea.

6. After the last student has inserted themselves, then the sorting can be checked by one scan through all the students, say right to left.

7. When students have finished, put a stamp or sticker on their participation card.

Equity and Access

If a student is in a wheelchair, then that student moves with his wheelchair rather than moving to a chair in the algorithm. Be sure to leave enough space for the student to easily insert their wheelchair between the arranged chairs.

ACTIVITY 11
Parallel Sort

Objective

This group activity introduces students to the concept of parallel sorting. Students will execute the algorithm by physically exchanging positions with a neighbor. In the process they will learn how some parallel algorithms work and why some high-level coordination is needed to make them work well.

Materials

- 10 to 15 chairs
- index cards numbered 1 to 15
- tape

DIRECTIONS

1. Place 10 to 15 chairs in semicircle. Chairs should be spaced so that participants will be able to see and/or hear each other clearly. Tape numbered index cards to each chair in order. Reuse this same space to rotate through the insertion sort, parallel sort, and candy machine activities.

2. Have the students sit in the chairs randomly. Be sure there are no empty chairs between students. Remove any empty chairs.

3. Choose a feature of the students to sort on. It could be by birthday, name, height, or a number on a 3 × 5 card.

4. This algorithm alternates between two phases, odd and even, starting with an odd phase. The phases are announced by the coordinator.

   a. On an odd phase the students pair off in adjacent chairs: 1 with 2, 3 with 4, 5 with 6, and so on. If there are odd number of students, then the last student doesn't have a partner.

   b. On an even phase the students pair off in different adjacent chairs: 2 with 3, 4 with 5, 6 with 7, and so on. If there are odd number of students, only chair 1 doesn't have a partner. If there are even number of students, both chair 1 and the last student do not have partners.

   c. In either phase each pair of students compare their features. If the pair is out of order, meaning the larger feature value is in the smaller numbered chair, then the pair of students switch places.

   d. If in two phases no one switches place then the algorithm ends.

5. The sorting can be checked by one pass through all the students.

6. When students have finished, put a stamp or sticker on their participation card.

Equity and Access

If a student is in a wheelchair, then that student moves with his wheelchair rather than moving to a chair in the algorithm. Be sure to leave enough space for the student to easily insert their wheelchair between the arranged chairs.

ACTIVITY 12
Candy Machine

Objective

This group activity introduces the concept of a finite state machine, like a candy machine. A state of the candy machine indicates how much money has been put in the machine so far. Suppose the candy costs 50 cents and customers can insert nickels, dimes, and quarters only. Initially the candy machine is in the "ready" state. If a customer puts in a nickel, then the machine goes to the 5 cent state. If they enter a dime then the machine goes to the 15 cent state. At any point they push the "cancel" button, then the current state indicates how much change should be returned. If at any point a coin is entered that makes the total greater or equal to 50, then candy plus the correct change is returned, and the machine goes back to the ready state.

Materials

- 10 to 15 chairs
- 10 nickels, 5 dimes, and 2 quarters
- Candy or healthy snack

DIRECTIONS

1. Place 10 to 15 chairs in a semicircle. Chairs should be spaced so that participants will be able to see and/or hear each other clearly. Reuse this same space to rotate through the insertion sort, parallel sort, and candy machine activities.

2. Gather the students together to talk about the candy machine. This activity works best with at least 11 students. Ask the students how many states are needed and why. The answer is 10 states, the ready (or 0) state, and 9 states for all possible sums possible less than 50 with the three types of coins. Those states are 5, 10, 15, 20, 25, 30, 35, 40, and 45 representing those sums. For example, 30 can be reached with a nickel and a quarter, or three dimes.

3. Continue to discuss the ideas: input (coin), state transition (coin + current state), and output (coin[s] and candy). Each transition is triggered by a new coin or cancel button. An output is triggered by coin + current state or cancel button.

4. The students become the machine. Each of 10 students plays the role of a state. One student plays the role of the input/output for the machine. Students who are not in one of these roles can be a user of the machine. There are several ways that transitions can be implemented: by voice or by passing a small toy. The student who represents the current state can declare it by voice or can hold the toy. The user gives coins or indicates cancel to the input/output. The input/output announces the input to all the states. The current state passes the toy to the new state or announces out loud the new state. If an output is required, the input/output hands the output to the user.

5. Naturally some supervision is needed to correct errors the machine might make. However, once the machine has run for several users, it would tend to be correct. After a time, users can become states and vice versa.

   As mentioned there are a number of ways to run this machine. It could be entirely by voice, once students know their individual roles or by passing a toy from one state to another.

6. When students have finished, put a stamp or sticker on their participation card.

AP COMPUTER SCIENCE

Appendix

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Appendix A

Human Diagram Tracing
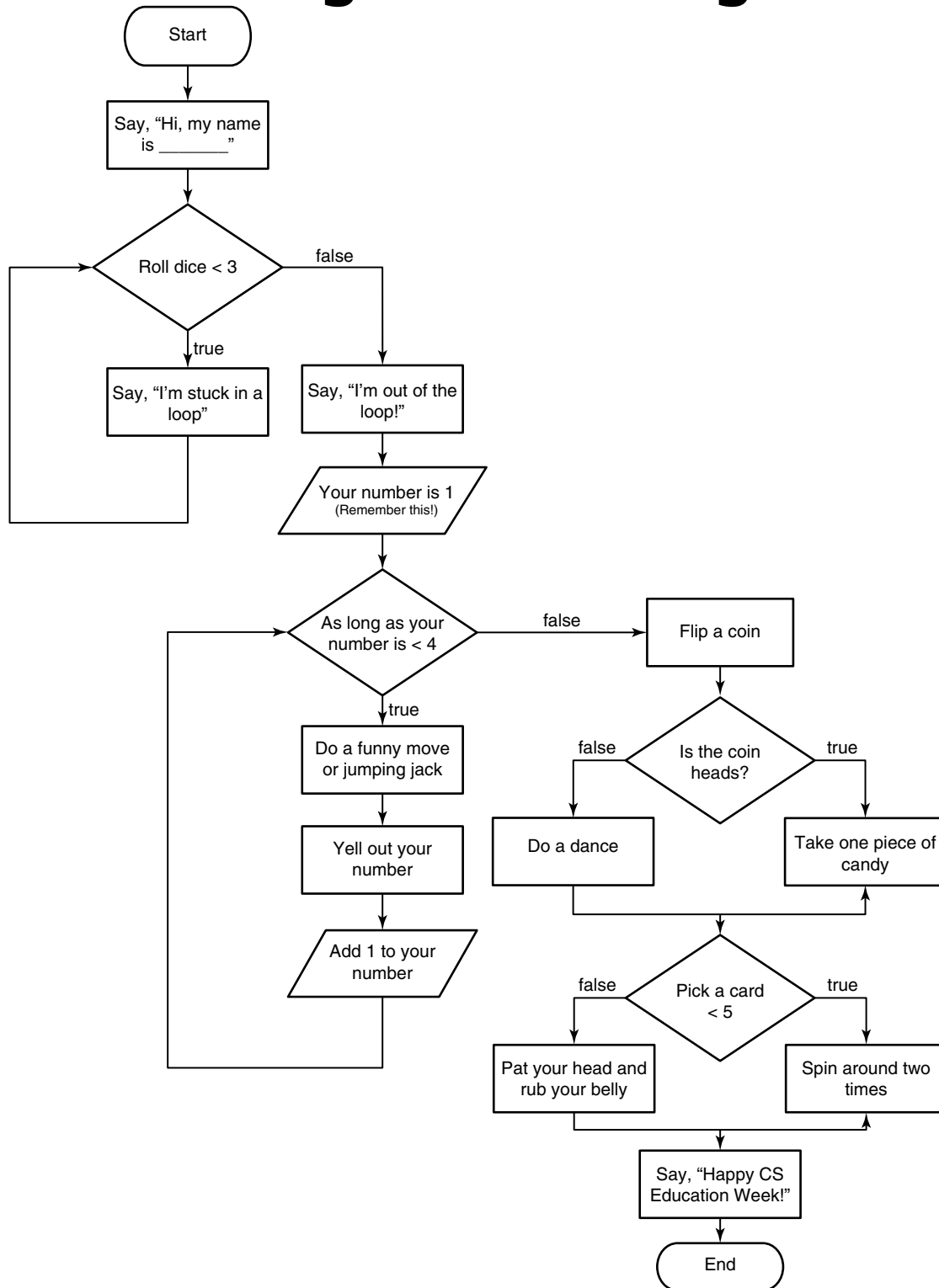
Start

Say, "Hi, my name is _____"
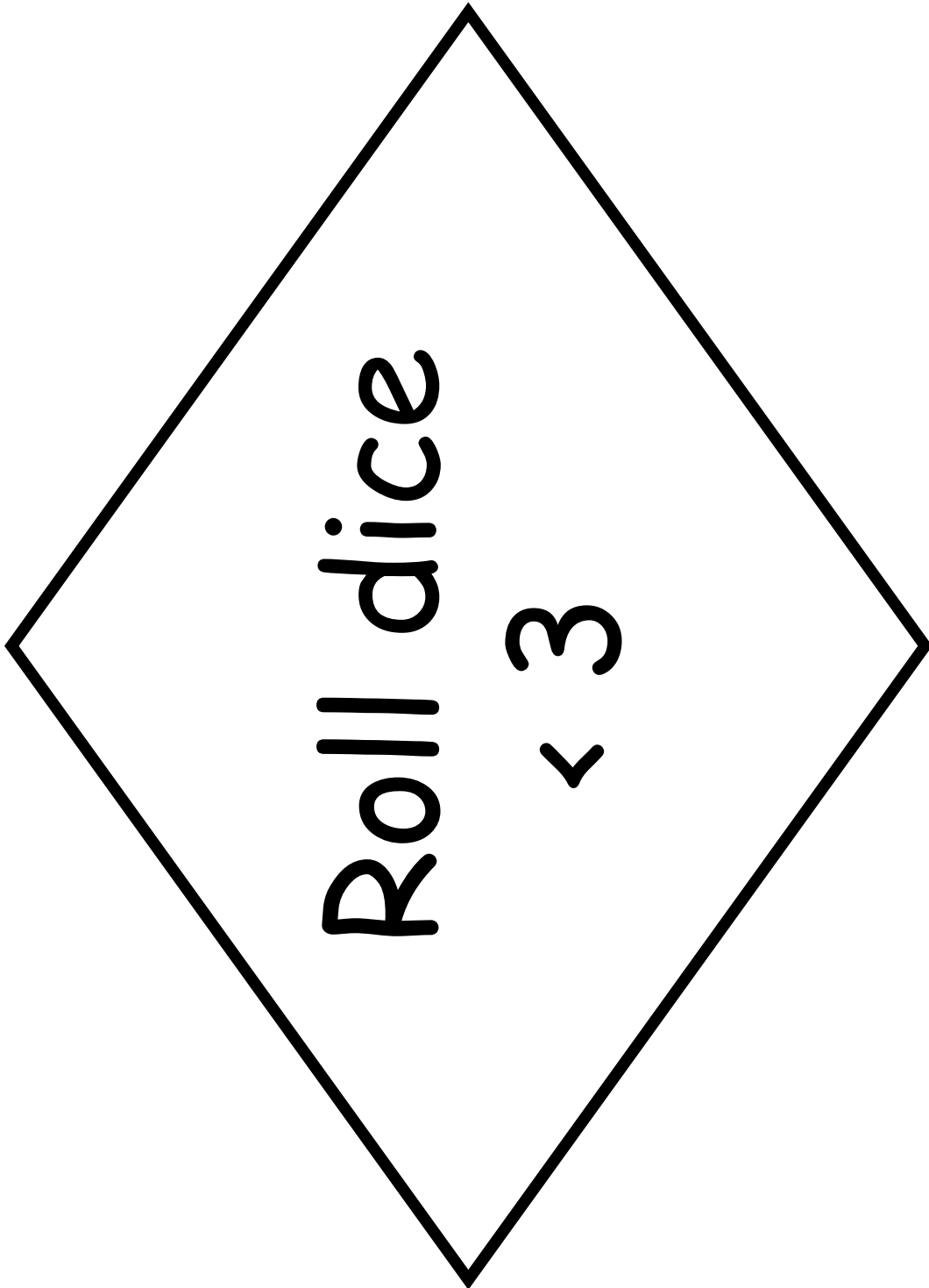
Roll dice < 3
- false
- true

Say, "I'm stuck in a loop"

Say, "I'm out of the loop!"

Your number is 1
(Remember this!)

As long as your number is < 4
- false
- true

Flip a coin

Do a funny move or jumping jack

Is the coin heads?
- false
- true

Yell out your number

Do a dance

Take one piece of candy

Add 1 to your number

Pick a card < 5
- false
- true

Pat your head and rub your belly

Spin around two times

Say, "Happy CS Education Week!"

End

Start

Say, "Hi, my name is _____"

Roll dice < 3

Say, "I'm stuck in a loop"
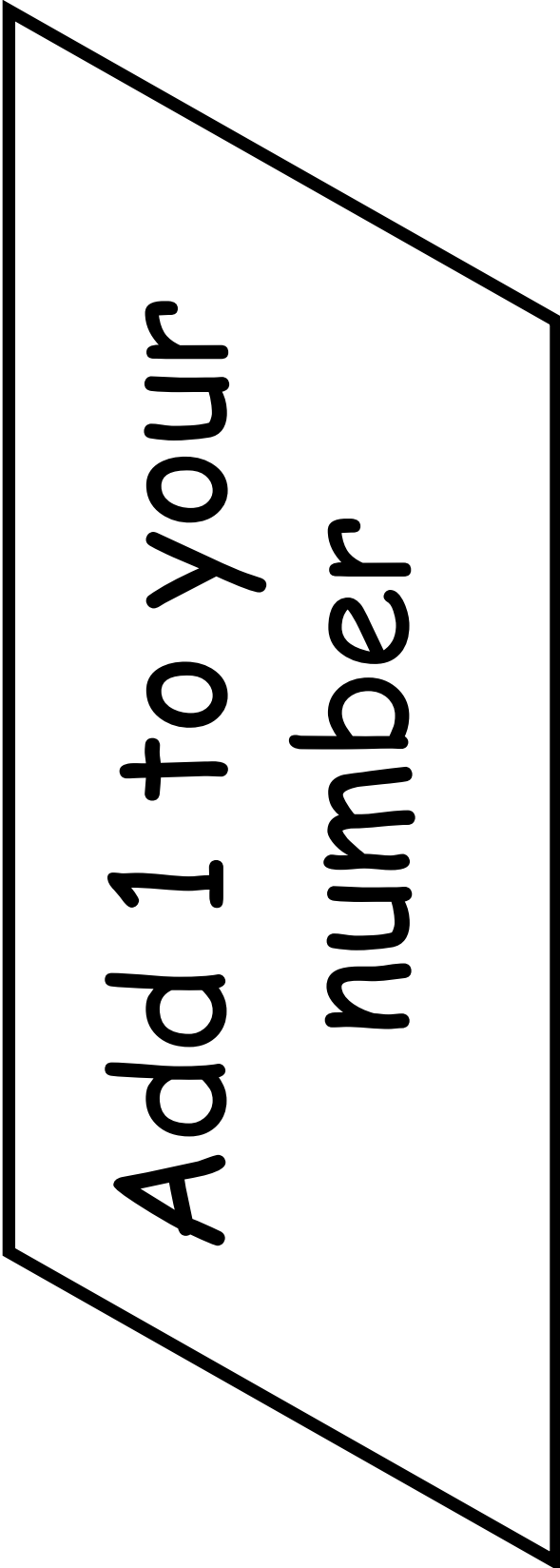
Say, "I'm out of the loop!"

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As long as your number is < 4

Do a funny move or jumping jack

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Is the coin heads?
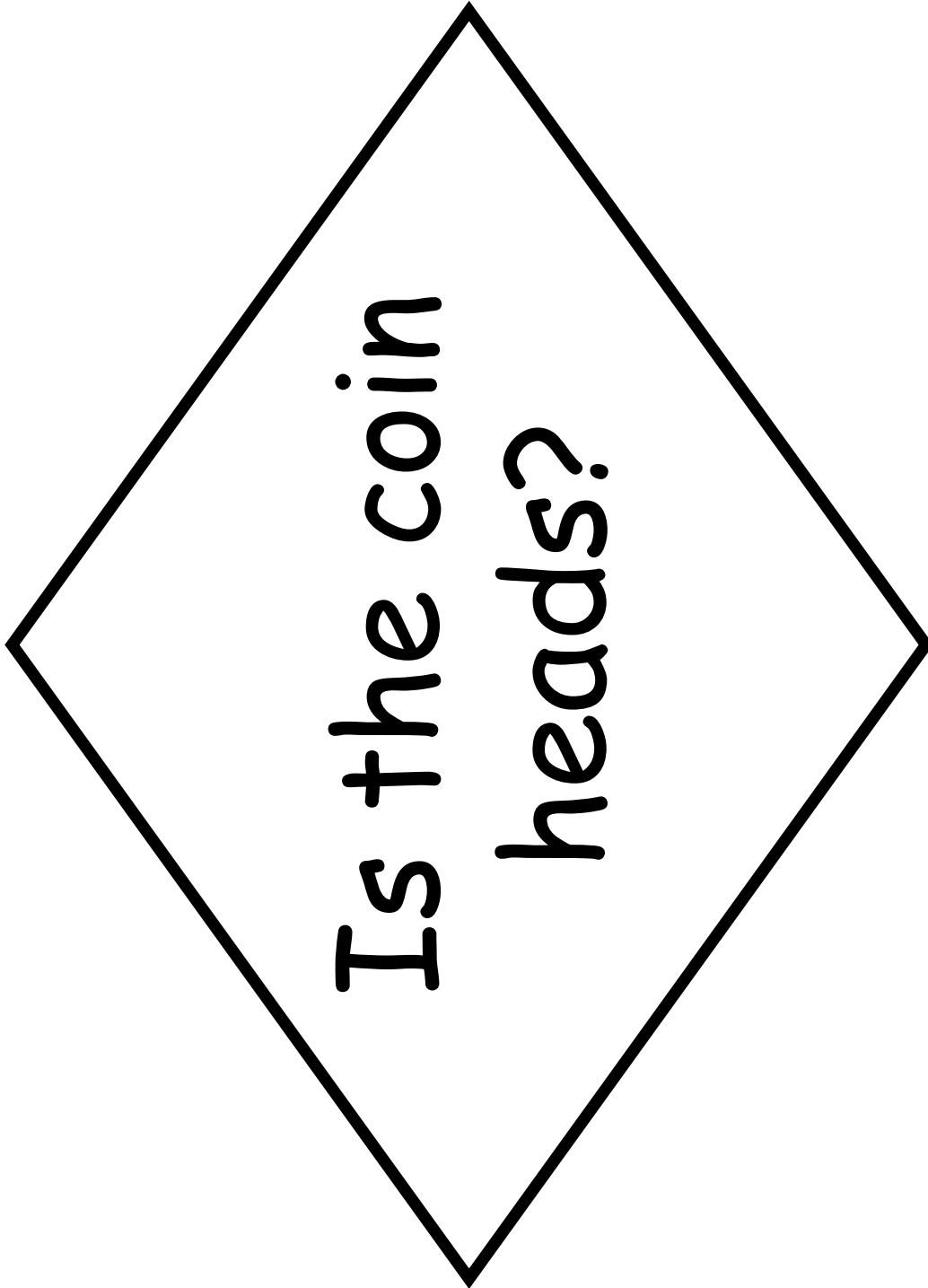
Do a dance

Take one piece of candy

Say, "Happy CS Education Week!"

Pick a card
< 5
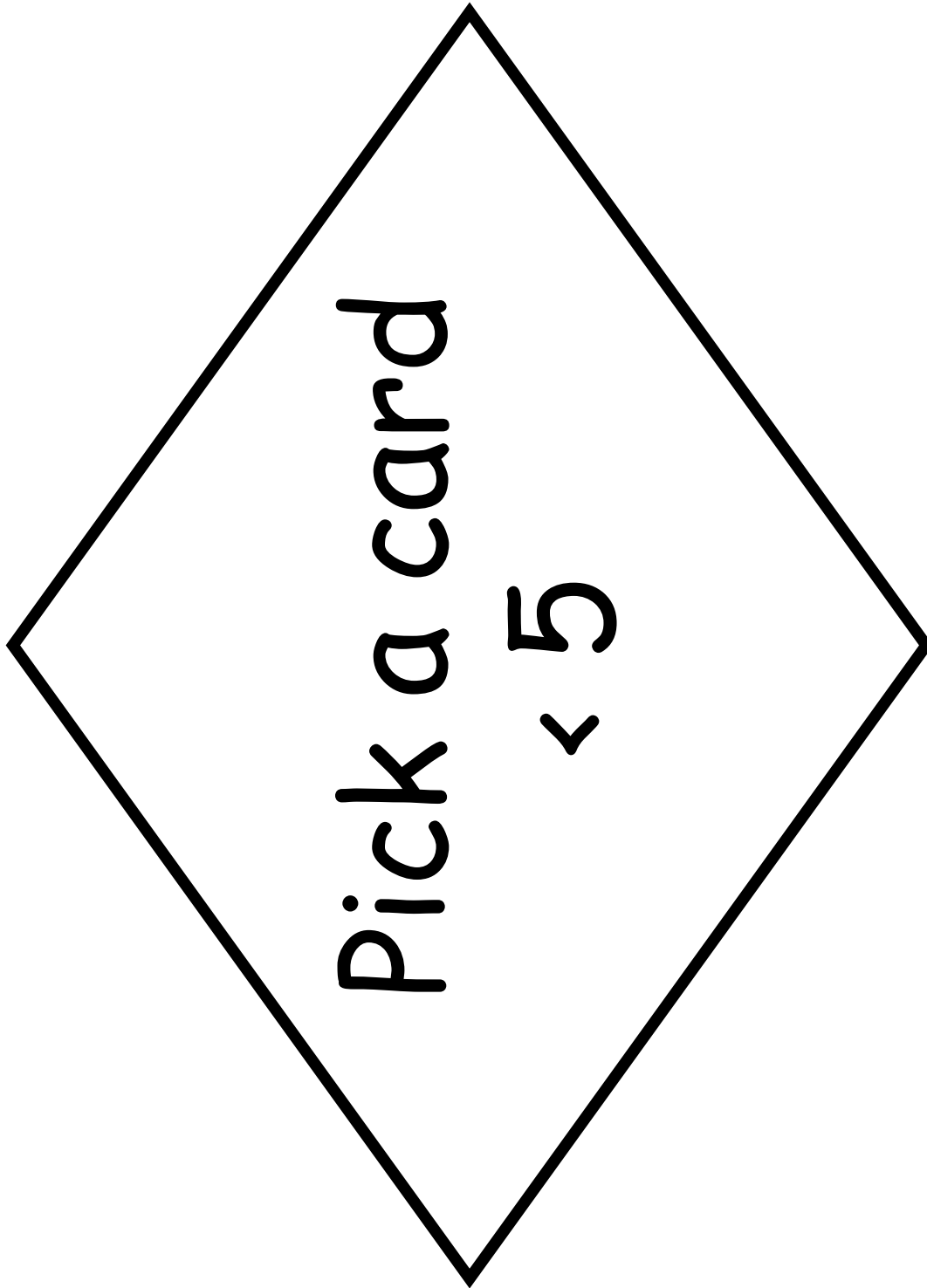
Pat your head and rub your belly

Spin around two times
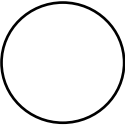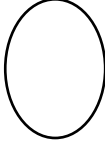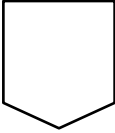
End

Appendix B
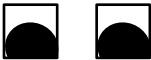
Make Faces

Head Shapes

Face Procedures:

RoundFace	OvalFace	PointedChinFace	HeartFace
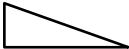
Eye Shape:

SquareEye	OvalEye	TriangleEye

Mouth Shape:

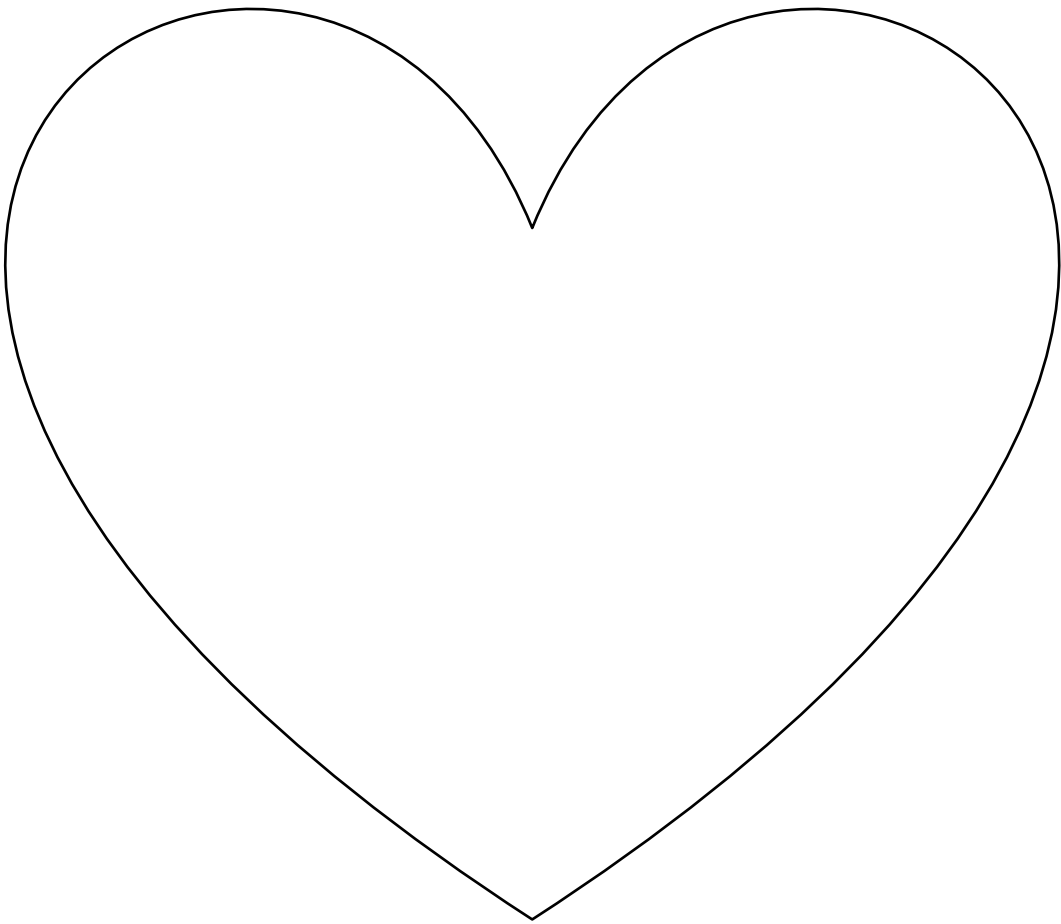| SadMouth	HappyMouth

Nose Shape:

PointRightNose	PointDownNose	NostralNose
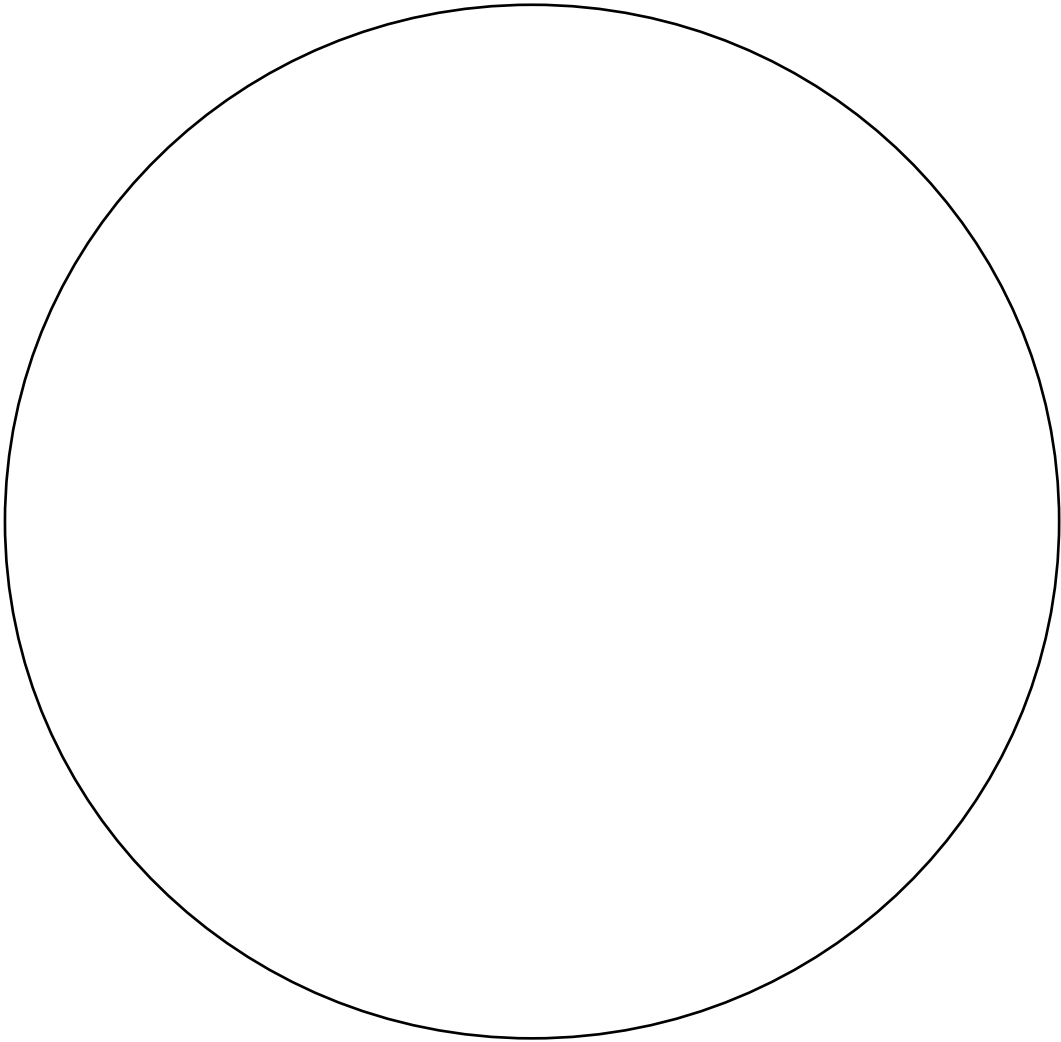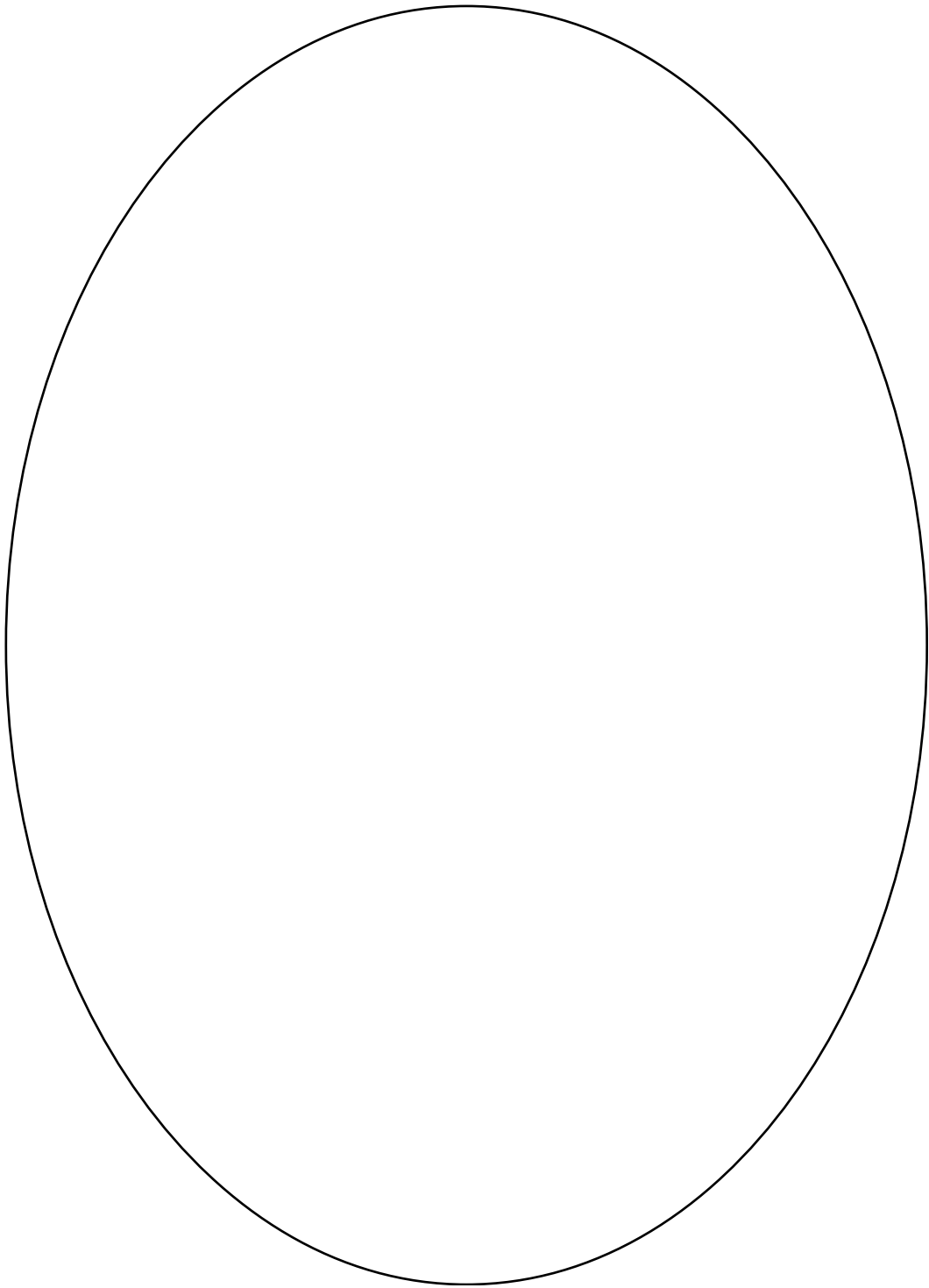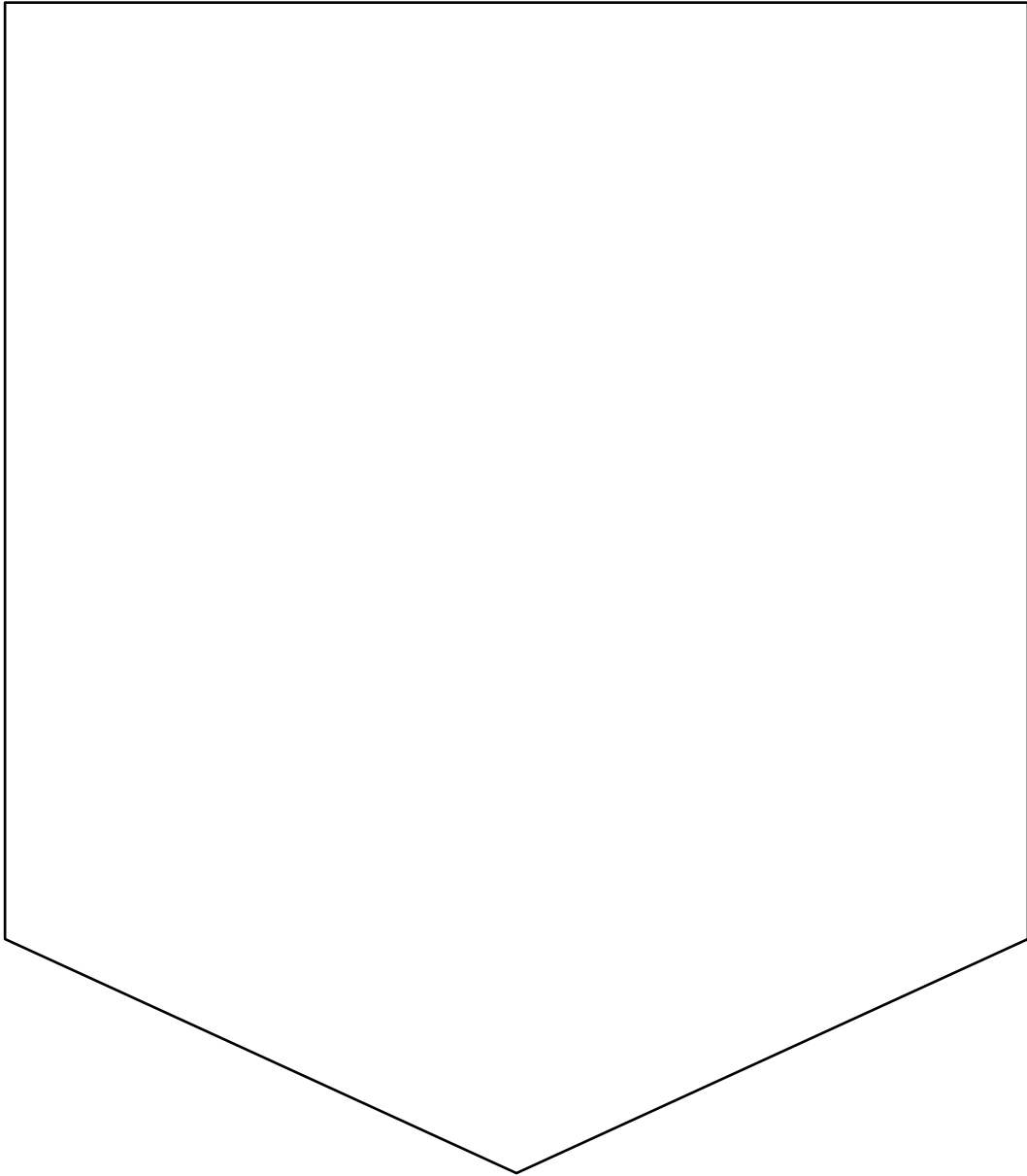
Use the command sheet to draw the described face:

- This face has a RoundFace.
- This face has TriangleEye eyes.
- This face has a SadMouth mouth shape.
- This face has a NostralNose nose shape.

Use the command sheet to draw the described face:

- This face has a OvalFace.
- This face has OvalEye eyes.
- This face has a HappyMouth mouth shape.
- This face has a PointRightNose nose shape.

Use the command sheet to draw the described face:

- This face has a PointedChinFace.
- This face has TriangleEye eyes.
- This face has a HappyMouth mouth shape.
- This face has a PointDownNose nose shape.

Use the command sheet to draw the described face:

- This face has a HeartFace.
- This face has SquareEye eyes.
- This face has a HappyMouth mouth shape.
- This face has a NostralNose nose shape.

Appendix C

Binary Magic

2 3 6 7 10 11 14

15 18 19 22 23

26 27 30 31 34

35 38 39 42 43

46 47 50 51 54

55 58 59 62 63

16 17 18 19 20

21 22 23 24 25

26 27 28 29 30

31 48 49 50 51

52 53 54 55 56

57 58 59 60 61

62 63

8 9 10 11 12 13

14 15 24 25 26

27 28 29 30 31

40 41 42 43 44

45 46 47 56 57

58 59 60 61 62

63

1 3 5 7 9 11 13

15 17 19 21 23

25 27 29 31 33

35 37 39 41 43

45 47 49 51 53

55 57 59 61 63

4 5 6 7 12 13 14

15 20 21 22 23

28 29 30 31 36

37 38 39 44 45

46 47 52 53 54

55 60 61 62 63

32 33 34 35 36

37 38 39 40 41

42 43 44 45 46

47 48 49 50 51

52 53 54 55 56

57 58 59 60 61

62 63

Appendix D

Binary Decoding

Secret Message

We are so glad that you are participating in the CS Education Week Carnival. We have a secret message for you! The stars represent binary values that are being used and the empty spaces represent values that are not being used. Enjoy your night.

A	B	C	D	E	F	G	H	I	J
65	66	67	68	69	70	71	72	73	74

K	L	M	N	O	P	Q	R	S	T
75	76	77	78	79	80	81	82	83	84

U	V	W	X	Y	Z
85	86	87	88	89	90

Secret Message

Appendix E

Label Hardware

Hard Drive	Processor / CPU with Fan
Power Supply	RAM Slots

Appendix F

Color Decryption

Picture 1

Decode the following picture:

|	
30	30
30	30
3, 4, 4, 2, 5, 4, 1, 3, 4	3, 1, 5, 1, 1, 4, 1, 4, 1, 1, 2, 1, 1, 1,3
2, 1, 4, 1, 2, 1, 2, 1, 4, 1, 4, 1, 2, 1,3	3, 1, 5, 1, 1, 1, 4, 1, 4, 1, 2, 1, 1, 1,3
2, 1, 7, 1, 7, 1, 4, 1, 2, 1,3	3, 1, 5, 1, 1, 1, 4, 1, 4, 1, 1, 1, 2, 1,3
2, 1, 8, 2, 5, 3, 2, 1, 2, 1,3	3, 1, 2, 1, 2, 1, 1, 3, 2, 3, 2, 2, 3, 1,3
2, 1, 10, 1, 4, 1, 4, 1, 2, 1,3	4, 1, 1, 1, 1, 1, 2, 1, 4, 1, 4, 1, 1, 1, 2, 1,3
2, 1, 4, 1, 2, 1, 2, 1, 4, 1, 4, 1, 2, 1,3	4, 1, 1, 1, 1, 1, 2, 1, 4, 1, 4, 1, 2, 1,5
3, 4, 4, 2, 5, 4, 1, 3, 4	5, 1, 1, 1, 3, 4, 1, 4, 1, 1, 2, 1, 1, 1,3
30	30
30	30
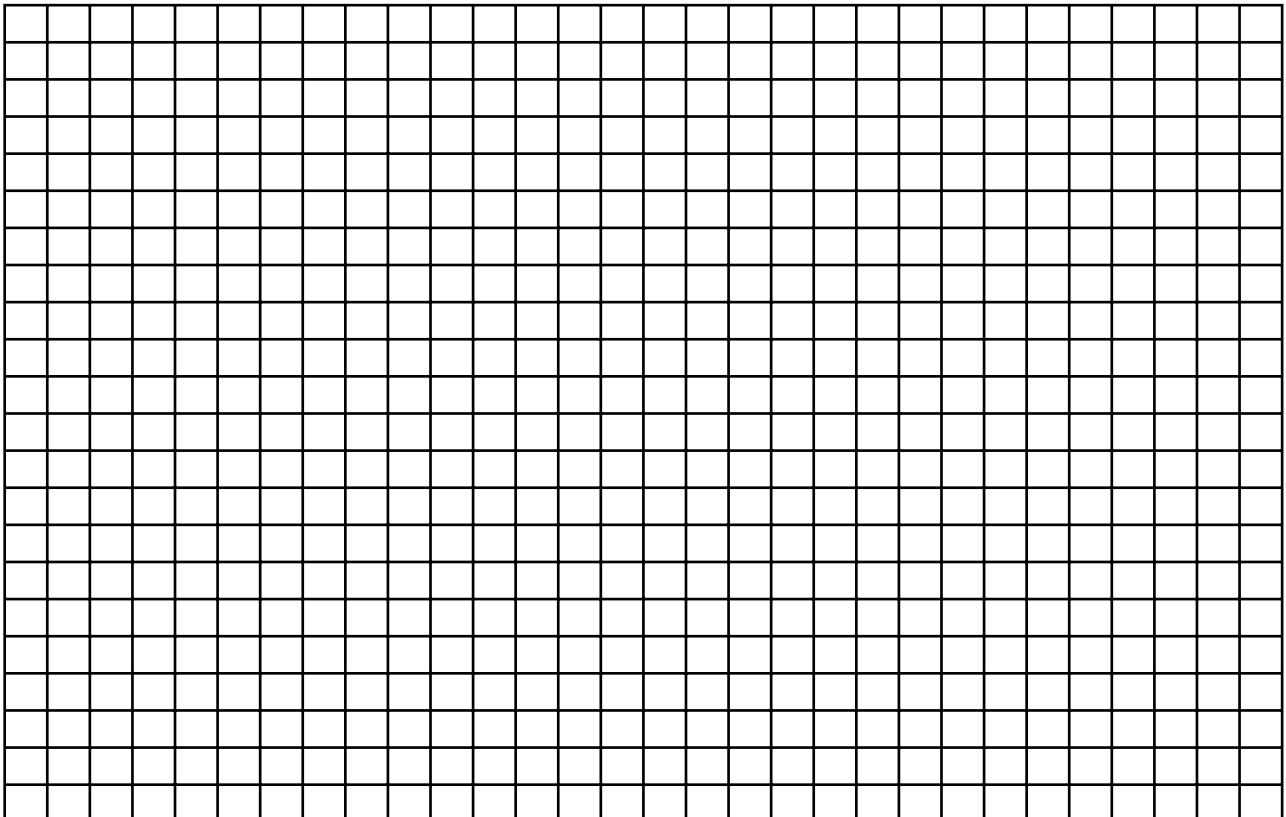
Picture 2

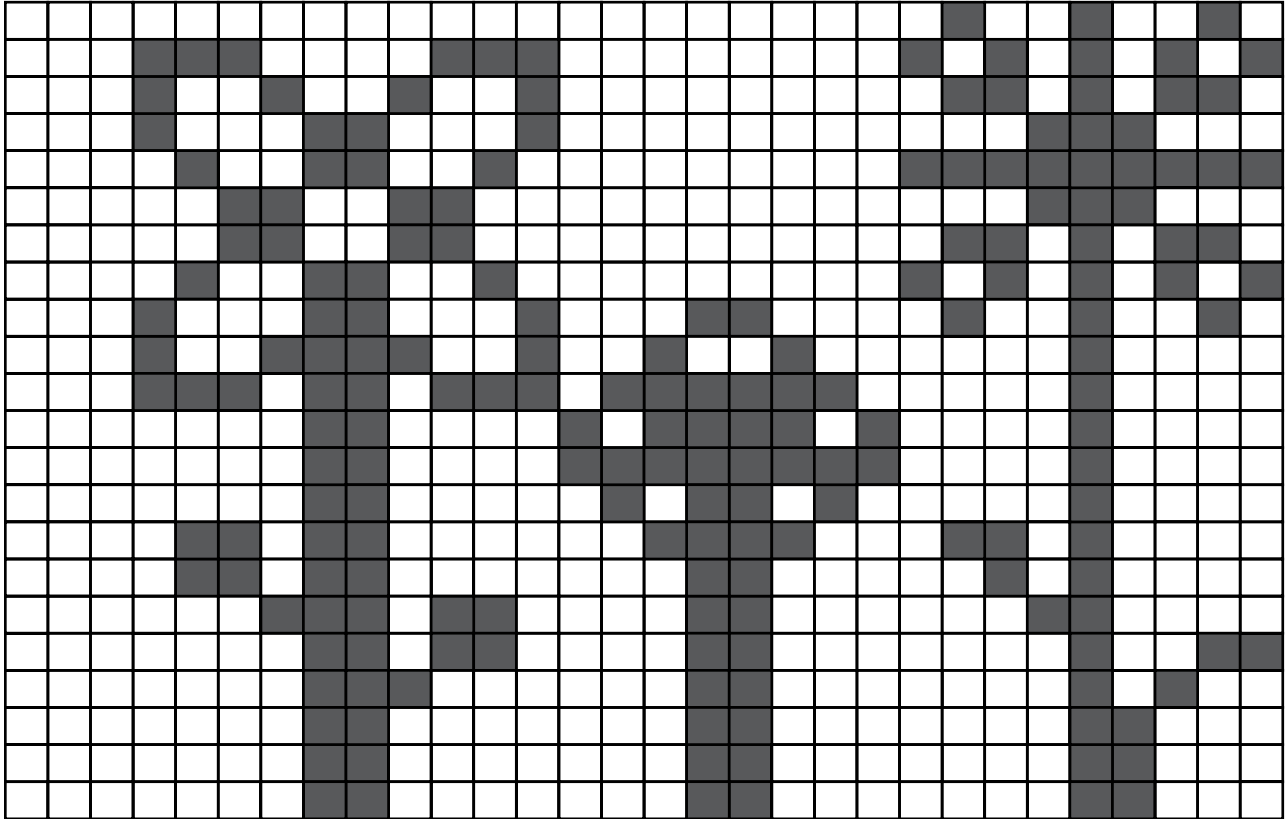Decode the following picture:

22, 1, 2, 1, 2, 1, 1	7, 2, 4, 1, 1, 4, 1,1, 4, 1, 4
3, 3, 4, 3, 8, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1	7, 2, 4, 8, 4, 1,4
3, 1, 2, 1, 2, 1, 2, 1, 9, 2, 1, 1, 1, 2, 1	7, 2, 5, 1, 1, 2, 1, 1, 5, 1, 4
3, 1, 3, 2, 3, 1, 11, 3, 3	4, 2, 1, 2, 6, 4, 3, 2, 1, 1, 4
4, 1, 2, 2, 2, 1, 9, 9	4, 2, 1, 2, 7, 2, 5, 1, 1, 1, 4
5, 2, 2, 2, 13, 3, 3	6, 3, 1, 2, 4, 2, 6, 2, 4
5, 2, 2, 2, 11, 2, 1, 1, 1, 2, 1	7, 2, 1, 2, 4, 2, 7, 1, 2, 2
4, 1, 2, 2, 2, 1, 9, 1, 1, 1, 1, 1, 1, 1, 1, 1	7, 3, 6, 2, 7, 1, 1, 1, 2
3, 1, 3, 2, 3, 1, 3, 2, 4, 1, 2, 1, 2, 1, 1	7, 2, 7, 2, 7, 2, 3
3, 1, 2, 4, 2, 1, 2, 1, 2, 1, 6, 1, 4	7, 2, 7, 2, 7, 2, 3
3, 3, 1, 2, 1, 3, 1, 6, 5, 1, 4	7, 2, 7, 2, 7, 2, 3
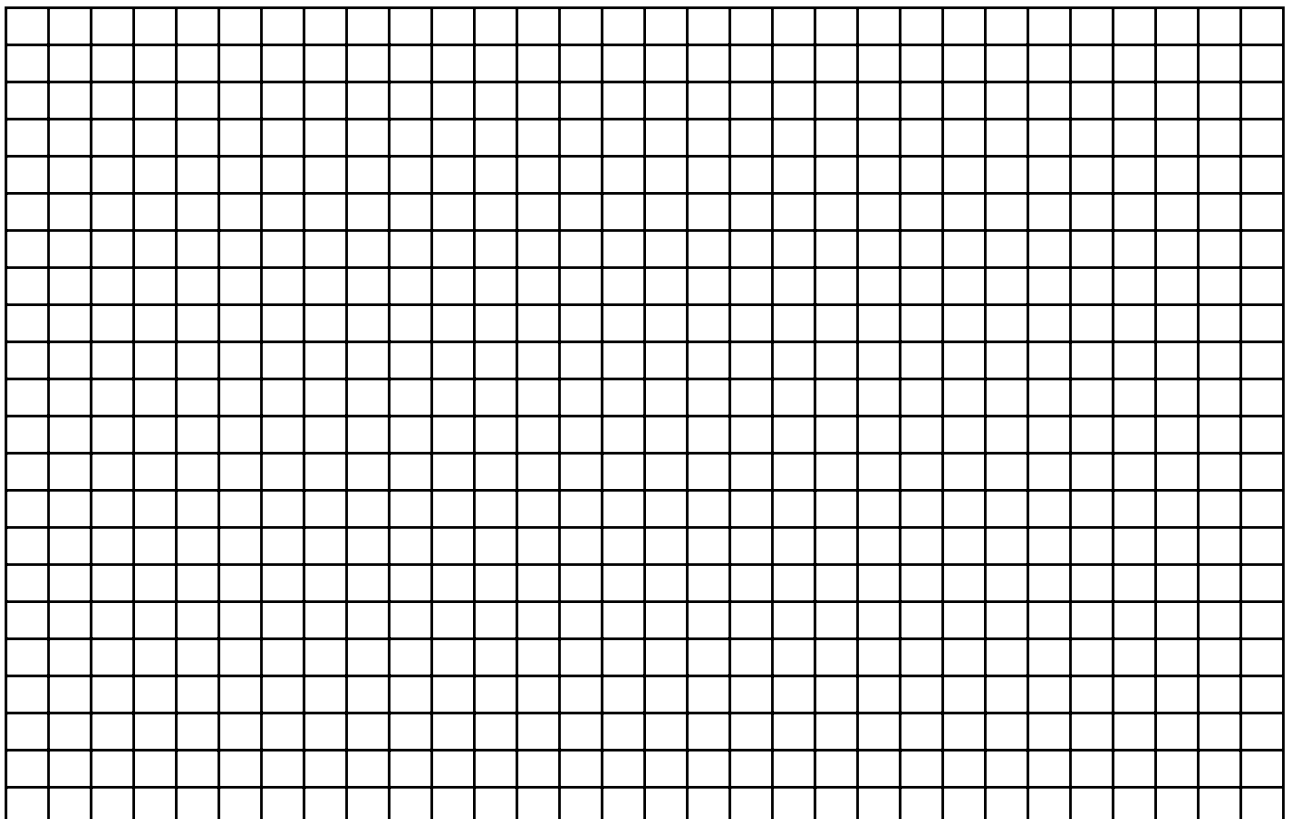
Answer Key: Picture 1
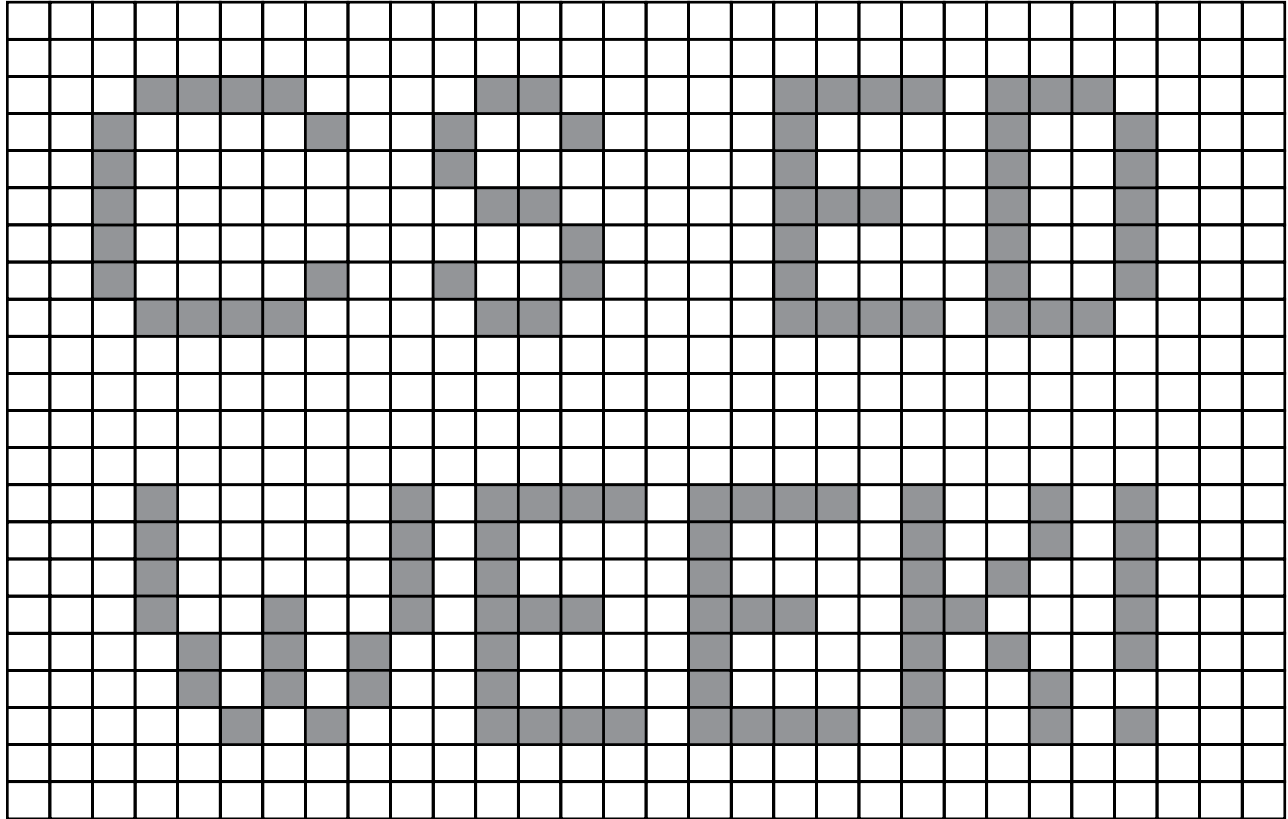
Answer Key: Picture 2

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