STEM ACTIVITY:
Name that Plane

Grades 5–12

www.nasa.gov

NAME THAT PLANE

The N-Number, logo, and the color of your aircraft are small details about an aircraft that make the craft more personal and can also make a big impact. If you own your own plane, these details are the face of your aviation business and therefore are a crucial part of making your aircraft (and business) memorable.

SUMMARY

This activity guide contains two different activities which can be completed together or independently; one does not need the other. For activity one, students will choose an N-number or tail number for their plane, design a logo, and pick a color scheme for their own sustainable aircraft. For the second activity, students will be Introduced to the phonetic alphabet and use It to help them communicate.

Students will learn the importance of and procedure for giving an aircraft its N-Number, a logo, and some color. They will design their own planes and learn how these small details can make a big difference.

OBJECTIVES

Students will:
- Be Introduced to the Importance of N-numbers (also called tail numbers) on aircraft.
- Design a logo for their plane to represent the values and mission of their business.

SAFETY NOTE

No safety items of note.

Grade Level: 5–12

Materials Needed:
- Alphabet, Number, & Color wheels (printed on cardstock/paper): one per student or team
- Colored Pencils / Markers
- Brad Fasteners
- Scissors
- Craft materials (optional)

Optional
- Airplane b/w printout
- Random pictures for logo or design use
- Magazines for cutouts
- Images of aircraft with different or unique paint schemes, colors, logos, etc.
- Alphabet, Number, & Color wheels (printed on cardstock/paper): one per student or team
- This activity can instead be completed using computer based design software if desired.

Time required: 1 hour 10 minutes

Figure 1. Aircraft flying with displayed N-Number.

BACKGROUND

History of the N-Number

The N-Number, also refered to as a tail number, is the identification number displayed on the tail or fuselage of all aircraft. Depending on what country your plane comes from, the first letter will be different to represent that country.

In 1919, the International Air Navigation Covention issued the letter "N" as the United States' nationality designator for aircraft, with four letters following. Other countries have identification numbers that start with a different letter. Canada's aircraft, for example, start with a "C," and Germany's aircraft start with "D." This also served as the radio call sign for the aircraft. Before Air Commerce Regulations were put into place in 1927, the U.S. used the letter C for commercial, S for state, and P for private licensed aircraft. Unlicensed aircraft were only required to have assigned numbers, no letters.

Until 1948, a second letter was issued to categorize airworthiness of an aircraft. C for standard, R for restricted, X for experimental, and L for limited. Two years later all U.S. aircrafts were regulated to start with the letter "N" followed by 1-5 alphanumeric characters. In January 1960, federal regulations added that identification marks are to be displayed on the vertical surfaces of the tail or the fuselage.

To learn more about aircraft registration and the current standards, check out:
https://www.faa.gov/licenses_certificates/aircraft_certification/aircraft_registry/aircraft_nnumber_history#:~:text=Where%20do%20N%2Dnumbers%20come,example%2C%20G%2DREMS).

NASA's aircraft have particular tales to tell. Some of these aircraft are first built or flown by either the military or an aircraft company and may have an N-number at that time. Once these aircraft are transferred to NASA they then receive a NASA N-number, which can be used to help designate where each aircraft Is flown since NASA Is made of multiple NASA Centers.

Two T-38 trainer aircraft on display at Space Center Houston.
Photo credit: Space Center Houston

The picture above shows two retired NASA planes now at Space Center Houston, which Is Johnson Space Center's Visitor Center. The history of the plane with "00" Is described below:

* Manufacturer: Northrop Corp.
* Model: AT-38B (United States Air Force (USAF) converted the aircraft to an armed Lead-In Fighter Trainer)
* NASA N-number: N900NA
        * N-North America
        * 9-NASA Johnson Space Center (4 designates Wallops Flight Facility, 5 Is for Langley Research Center, 6 Is for Glenn Research Center, 7 Is used for Ames Research Center, and 8 Is for Armstrong Flight Research Center)
        * 00-aircraft number
        * NA-NASA
* Air Force serial number: SN 68-8133
* Construction number: N6138
* Fabricated In 1968
* Acquired by NASA In May of 1997

The aircraft was not originally "00." It was given at the time It was painted for display and Is a made-up number assigned by NASA for this static display.

A Logo that Counts

A logo is a symbol or design used by an organization to make themselves seen by the public. Creating a logo for your plane gives it an identity that can be recognized anywhere. A logo represents your company's purpose, mission, and its values.

The NASA "meatball" logo was designed In 1959 when NASA's predecessor, the National Advisory Committee on Aeronautics (NACA) advanced its mission to advance the future of aeronautics and explore space. James Modarelli, the head of Lewis' (now Glenn) Research Center Reports Division, designed the spere shape to represent a planet, the stars for space, a red chevron to represent a wing for aeronautics, and an orbital space craft flying around the wing.

To learn more about the importance of a logo, check out: https://history.nasa.gov/meatball.htm

Science of Color

Color is a part of everything you see no matter how dark or how light the object appears. In 1666, Sir Isaac Newton proved color is part of the electromagnetic spectrum by passing a narrow beam of sunlight through a prism in a dark room. The prism projected a rainbow of colors showing different colors at different angles. He also found that passing light through two prisms cancelled all colors producing only white light.

There are three primary colors: yellow, red, and blue. Different colors are created by mixing these colors in varying amounts. The primary colors of light (made from primary colors) are cyan, yellow, and magenta. Color is seen because of an objects' ability to reflect, absorb, and transmit one or more colors. The colors perceived by the eye are the colors remaining after absorbing or subtracting certain electromagnetic wavelengths.

To learn more about the relationship between light and color, check out:
https://www.nasa.gov/pdf/58258main_Optics.Guide.pdf

INSTRUCTIONS

ACTIVITY ONE: Students will create a unique and personalized aircraft following the steps below. This activity can be done In teams or students can work Independently.

Create an N-Number for a US aircraft
1. Every aircraft identification should begin with the letter "N" followed by 1-5 alphanumeric characters representing the registration number.
   a. Letters "I" and "O" are not used to reduce confusion with the numbers one and zero.
2. N-Numbers for the U.S. begin with the letter "N" followed by any of the following combinations:
   a. 1-5 numbers
   b. 1-4 numbers and one letter at the end
   c. 1-3 numbers and two letters at the end
   *NOTE: N1 - N99 are reserved for the FAA
3. Students can either create their own identification combination that has special significance to them or can make an alphabet and number spinner wheel to randomly select numbers and letters for the N-Number of their plane.
4. Students will write the created N-Number on the tail of their plane design.

Design the Logo
1. For this aircraft, students should imagine they own a company. The company's aircraft needs a logo. A logo should represent their company. It should:
   a. Explain their company's purpose.
   b. Depict their company's mission.
   c. Represent their company's values.
   d. Be memorable and recognizable.
   e. Be simple and legible, easy to read.

   Keep in mind that these components to a logo may not be obvious but designers should be able to explain them. Refer to the NASA "meatball" logo information in the Background Section if students need a better explanation of what is behind a logo.

   Students will create a logo that represents them or their team. Along with creating a logo on Its own sheet of paper, It should also be added to the aircraft design sheet.

Color the Plane
1. Print out the black/white picture of a plane for students to color and display their N-Number and logo.
2. Students will add color to give the aircraft a unique and memorable color scheme that will be recognizable by the public.
3. Students will choose their own colors or make a color spinner wheel to randomly select colors.
4. Students will use these colors to decorate their plane.

Final Aircraft Design
Students should add the colors they chose, their logo and write their N-Number on the tail or fuselage of their plane.

ACTIVITY TWO: Students will use the Phonetic Alphabet to translate their names and guess other student names.
1. Print or write out the phonetic alphabet table included in this activity.
2. Read and review the pronunciation of each letter with the students.
3. Have each student write their name using the phonetic alphabet. Practice this with students using NASA, which would be November Alpha Sierra Alpha.
4. When students finish translating their names, collect them from the students.
5. Hold up each translation to allow the students to guess the name on the paper or pass names out to other students to translate.

DIFFERENTIATION AND GOING FURTHER

ACTIVITY ONE:
Logo Design
- Instructor can provide a set of pictures for students to choose a logo instead of creating one from scratch.
- Students may choose to put multiple pictures together to make a logo.
- Show memorable aircraft logo or Image designs to Inspire them to be creative.
- Or ask students to find other existing aircraft logos and paint schemes
- Have students create a digital logo using design software
- Students can present their design (orally or In writing) and describe what their aircraft Includes.

Plane Design
- Students could make their own plane out of clay, craft or building materials, or design one with 3D printing software.

ACTIVITY TWO:
- Instructor may print out individual worksheets included in this activity or students could design their own aircraft
- This activity could be completed Individually or in small groups.

ASSESSMENT SUGGESTIONS
Students could be evaluated on:
* Accuracy of their N-number following FAA conventions
* Presentation skills If sharing their work
* Teamwork and communications skills

STANDARDS
Disciplinary Core Ideas
- ETS 1.B: Developing Possible Solutions
- PS4.C: Information Technologies and Instrumentation

Crosscutting Concepts
- Systems and system models

Science and Engineering Practices
- Developing and Using Models
- Obtaining, Evaluating, and Communicating Information

RESOURCES

- https://www.nasa.gov/sites/default/files/atoms/files/coloring-page-dc8.pdf

- https://www.nasa.gov/pdf/58258main_Optics.Guide.pdf

- Meet our planes In Talon Park: https://spacecenter.org/meet-our-t-38-jets-in-talon-park/

- Figure One: https://www.faa.gov/training_testing/training/fits/training/media/generic/inspector.pdf
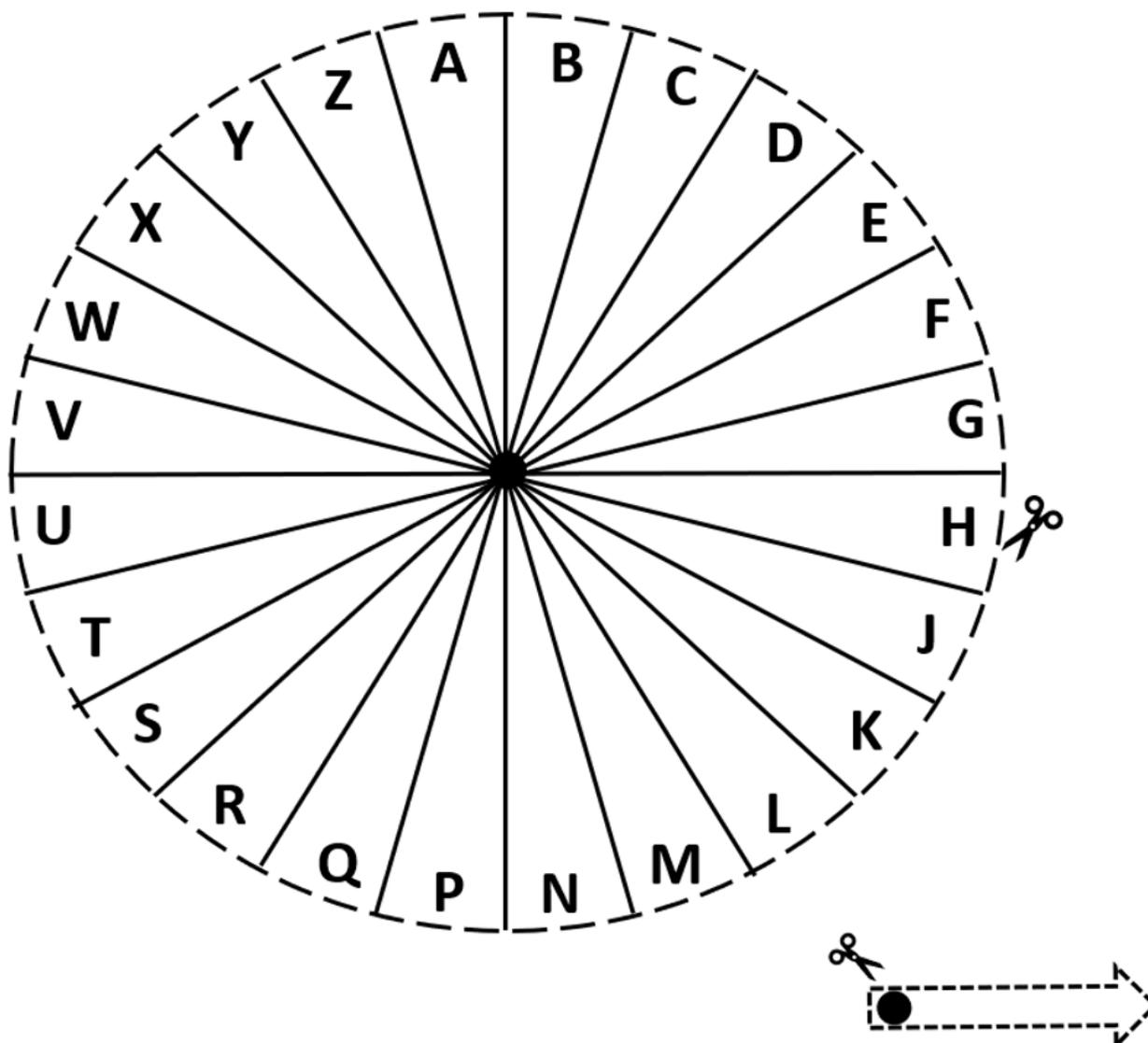
Commercial Aircraft
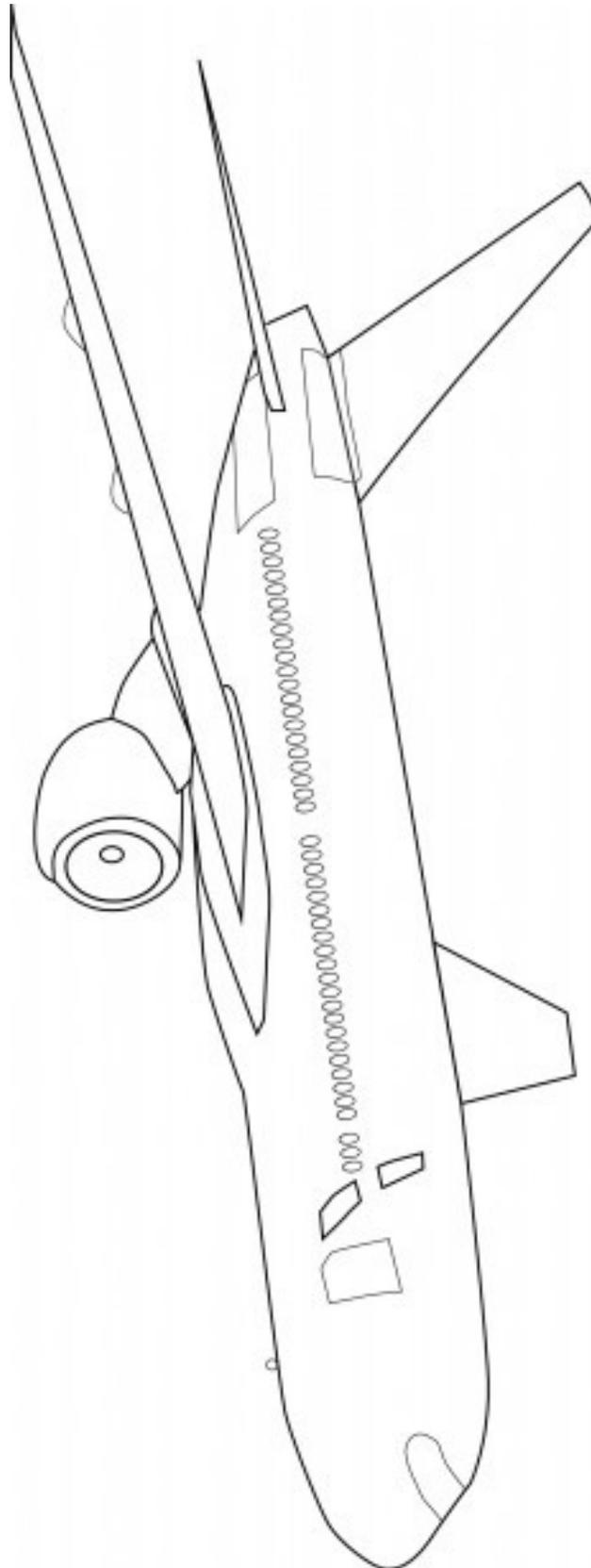
The Alpha Wheel

Materials:
- Cardstock (recommended) or Paper
- Scissors
- Hole Puncher
- Brad Fastener
- Colors or Markers

Instructions:
1. Print this page on cardstock or paper.
2. Cut out the wheel and the arrow.
3. Fold the wheel in half and use the hole puncher to punch a hole in the center of the wheel and a hole for the arrow on the black dot.
4. Insert a brad fastener into the punched hole of the arrow and then into the punched hole of the wheel.
5. Bend the ends of the brad fastener to secure the wheel and arrow together.
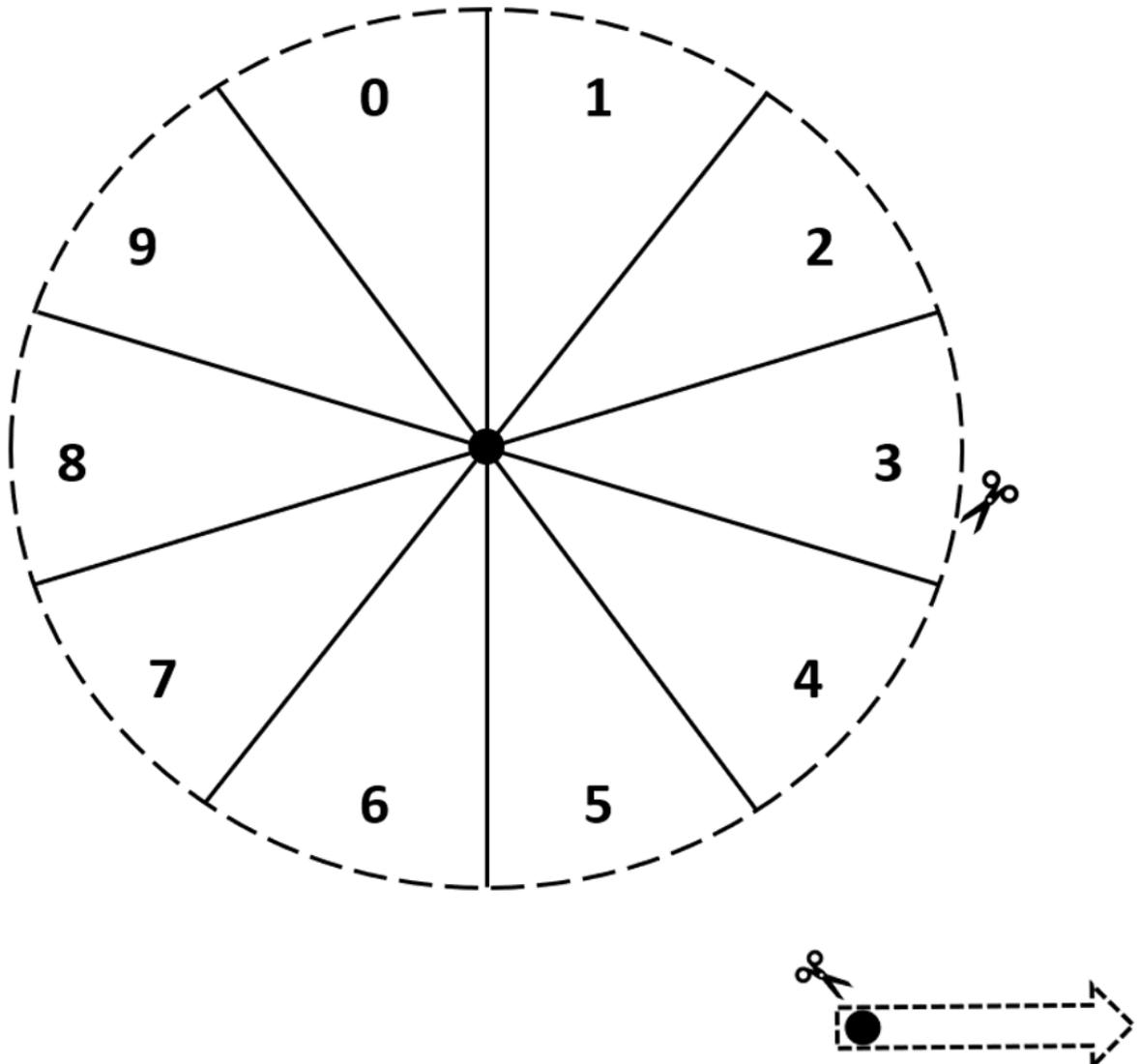6. Be sure not to secure the brad fastener to tightly so the arrow will spin easily around the wheel.

—NASA's Aeronautics Research Mission Directorate

The Number Wheel

Materials:
- Cardstock (recommended) or Paper
- Scissors
- Hole Puncher
- Brad Fastener
- Colors or Markers

Instructions:
1. Print this page on cardstock or paper.
2. Cut out the wheel and the arrow.
3. Fold the wheel in half and use the hole puncher to punch a hole in the center of the wheel and a hole for the arrow on the black dot.
4. Insert a brad fastener into the punched hole of the arrow and then into the punched hole of the wheel.
5. Bend the ends of the brad fastener to secure the wheel and arrow together.
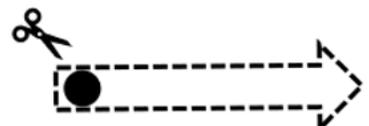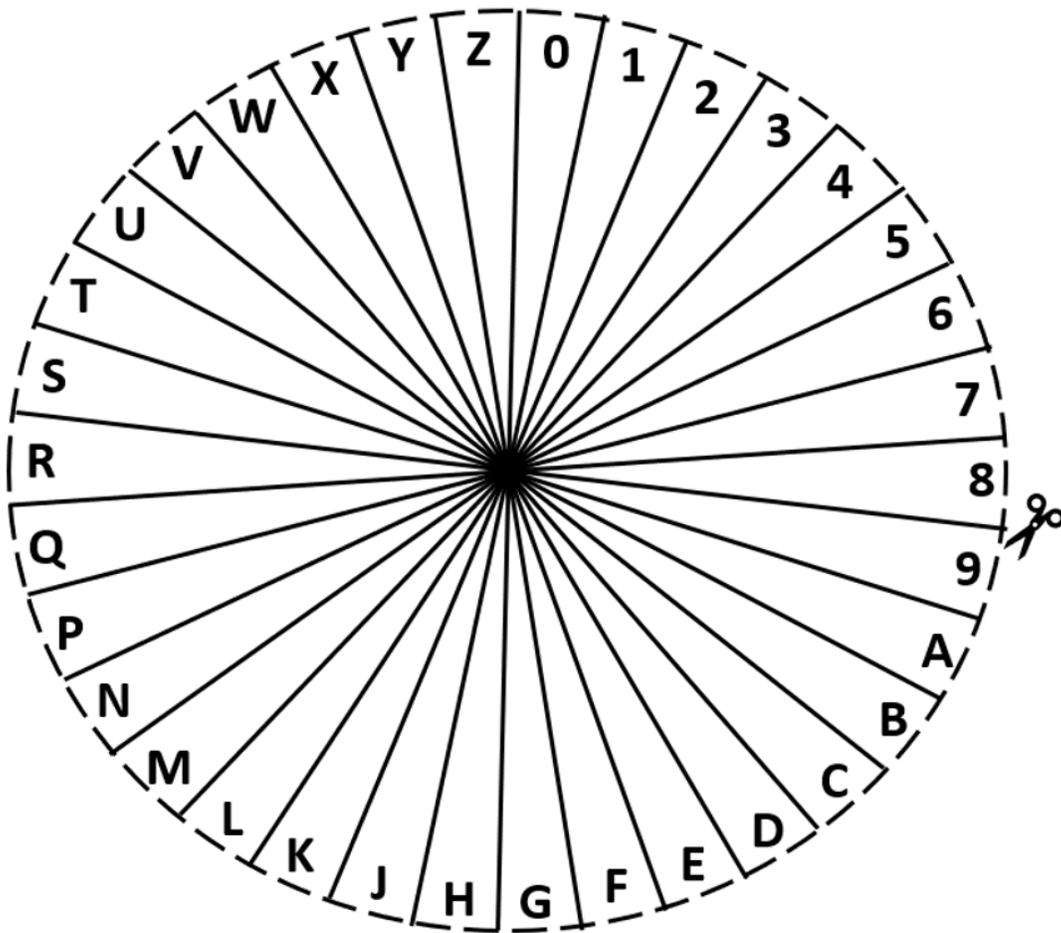6. Be sure not to secure the brad fastener to tightly so the arrow will spin easily around the wheel.

The Alphanumeric Wheel

Materials:
- Cardstock (recommended) or Paper
- Scissors
- Hole Puncher
- Brad Fastener
- Colors or Markers

Instructions:
1. Print this page on cardstock or paper.
2. Cut out the wheel and the arrow.
3. Fold the wheel in half and use the hole puncher to punch a hole in the center of the wheel and a hole for the arrow on the black dot.
4. Insert a brad fastener into the punched hole of the arrow and then into the punched hole of the wheel.
5. Bend the ends of the brad fastener to secure the wheel and arrow together.
6. Be sure not to secure the brad fastener to tightly so the arrow will spin easily around the wheel.

The Color Wheel

Materials:
- Cardstock (recommended) or Paper
- Scissors
- Hole Puncher
- Brad Fastener
- Colors or Markers

Instructions:
1. Print this page on cardstock or paper.
2. Cut out the wheel and the arrow.
3. Fold the wheel in half and use the hole puncher to punch a hole in the center of the wheel and a hole for the arrow on the black dot.
4. Insert a brad fastener into the punched hole of the arrow and then into the punched hole of the wheel.
5. Bend the ends of the brad fastener to secure the wheel and arrow together.
6. Be sure not to secure the brad fastener to tightly so the arrow will spin easily around the wheel.
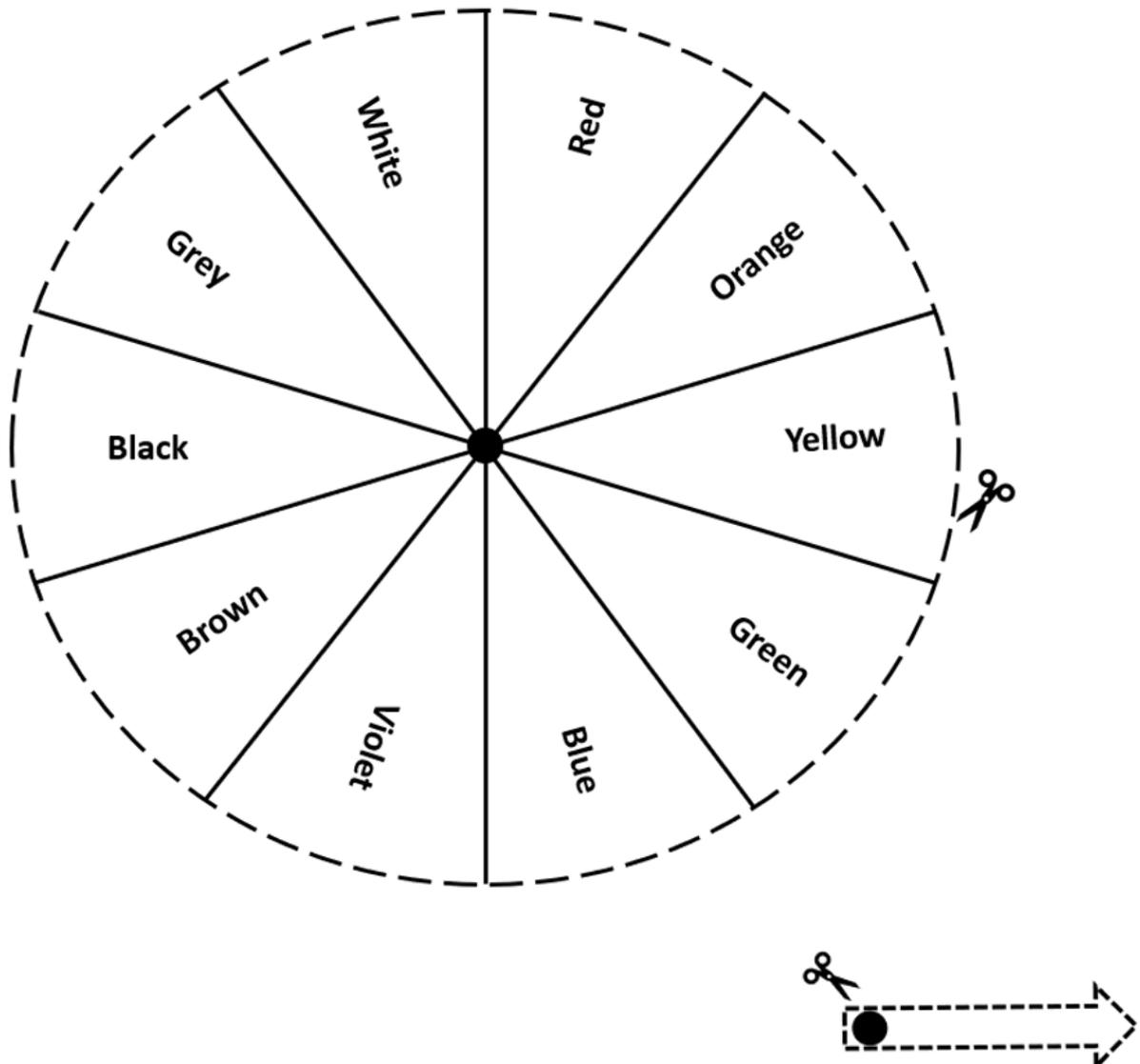
Phonetic Alphabet	
Alpha	November
Bravo	Oscar
Charlie	Papa
Delta	Quebec
Echo	Romeo
Foxtrot	Sierra
Golf	Tango
Hotel	Uniform
India	Victor
Juliet	Whiskey
Kilo	X-ray
Lima	Yankee
Mike	Zulu

Phonetic Alphabet

Alpha	**H**otel	**O**scar	**V**ictor
Bravo	**I**ndia	**P**apa	**W**hiskey
Charlie	**J**uliet	**Q**uebec	**X**-ray
Delta	**K**ilo	**R**omeo	**Y**ankee
Echo	**L**ima	**S**ierra	**Z**ulu
Foxtrot	**M**ike	**T**ango	
Golf	**N**ovember	**U**niform	

Instructions: Use the phonetic alphabet to translate your name.
Example: NASA = November Alpha Sierra Alpha

PHONETIC NAME:

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