

# Science @ Home

## OUR SKY

### Day 1: Sun

30-60 minutes

- » Sun and Shadows (video)
- » Sun Tracker (activity)
- » Sun Art (craft)

### Day 2: Moon

60-90 minutes

- » Moon Explorers (video)
- » Eat the Moon (activity)
- » Phases of the Moon Chart (craft)

### Day 3: Stars

45-60 minutes

- » Shapes in the Sky (video)
- » Create Your Own Star Pattern #1 (coloring sheet)
- » Create Your Own Star Pattern #2 (activity)
- » Paper Cup Planetarium (craft)

### Day 4: Observe the Sky

30-60 minutes

- » Cardboard Tube Binoculars (craft)
- » Skywatching (activity)
- » Telescope, Moon, and Dipper (coloring)
- » Sun and Moon Dance (activity)

### Extension Activities

- » Skywatchers Guide
- » Virtual Planetarium Events
- » About Asterisms
- » Figures in the Sky
- » Stellarium

**Got your head in the clouds? Perfect! These astronomy-themed activities are designed to inspire stargazers-in-training ages 4-8.**

Home to one of the largest all-digital planetarium domes on the planet, the Academy is as fascinated by heavenly happenings as Earthly ones. Get ready to space out with a constellation of videos, crafts, and astronomy resources.

*Please note: While Science @ Home activities are designed to be conducted by kids, some little ones might need adult help with reading instructions and preparing crafts.*





# Sun Tracker

The Sun's position changes over the course of the day as it appears to move across the sky. This means the shadows cast by the Sun's light change throughout the day, too. By tracking *your* shadow, you can make your own sundial.

*Please note:* This activity requires at least 3 hours and can be done over 2 days.

## Materials

Open, sunlit, 10ft x 10ft space (like a sidewalk, patio, or driveway)

3–12 position markers like rocks or coins (heavy enough to not be blown by wind)

Chalk

Timer, alarm, or stopwatch (optional)

## Directions

1. Start this activity in the morning, if possible. 10 am is a good time.
2. Find an open, sunny area outside away from shadows. Draw an **X** with chalk or place a marker to make your special spot to stand on.
3. Stand on your special spot and hold your hand up as high as you can.
  - a. See where the shadow of your hand is on the ground.
  - b. Have a helper place a marker on the ground where your hand's shadow is OR remember where that spot is and (quickly!) put a position marker or draw a chalk line there.
  - c. Double-check that you marked the correct spot by going back and standing on your mark again. Make your shadow's fingers touch the spot where your marker is.
  - d. Optional: Use chalk to write the time next to the marker.



4. Wait one hour. Go inside and have lunch, play a game, watch a livestream of the Academy's penguins, or do something else fun. It can be helpful to set a timer!
5. After one hour, go back to your special spot marker, stand on it, and raise the same hand. Where is your hand's shadow now? Has it moved?
  - a. Place another position marker or draw another chalk line where your hand's shadow is now.
  - b. Use chalk to write the time next to the new marker.
6. Repeat Step 3!
7. Repeat Step 4!
8. Keep repeating Steps 3 and 4 every hour until you are done or the Sun has set.
9. The next morning, after the Sun rises, stand on your special spot again. Where is your shadow? Is it in the same spot as it was yesterday? If it is in a different spot, why might that be?
10. At the same time as you first measured your shadow yesterday (example: 10 am), stand on your special spot again and raise your hand. Is your hand's shadow in roughly the same place as it was at the same time yesterday?
11. Challenge: Mark your shadow every hour from the time you wake up (or the Sun rises) until you go to bed (or the Sun sets) to create a "clock" of a whole day.
12. Alternative: Instead of using your own shadow, put a tall toy, like an action figure, doll, or tower of blocks on the special spot marker. Every hour, mark where the top of its shadow touches the ground. You can also trace the shadows and see how the shapes change!



# Sun Art

The Sun's light is bright and hot, illuminating and warming our planet during the daytime. Enjoy three quick art projects that demonstrate the power of the Sun.

*Please note:* This project involves leaving materials outside for multiple hours. Activities can also be broken up into three mini projects if desired.

## Materials

- 2 pieces of dark-colored paper
- Sunscreen
- Coins
- Tape or heavy object
- Water in a cup (or other container)
- Paintbrush (optional)

## Directions

1. Find a nice sunny spot outside, away from any shadows, on concrete or a patio.
2. Let's start by making **Sun prints!**
  - a. Place a piece of paper in the sunny spot.
  - b. Place coins on top of the paper in any design.
  - c. Tape down the edges or use something heavier so the paper doesn't blow away.
  - d. Leave the paper sitting in the Sun for at least 4 hours, the longer the better!
3. Now an art experiment to see how sunscreen protects our skin.
  - a. Take the second piece of paper, fold it in half, and then open it



again.

- b. On one side of the paper, use a very small amount of sunscreen to draw a large picture of anything you'd like. (You can even cover the palm of your hand in sunscreen and then press it on the paper, making a handprint).
- c. Leave the other side of the paper blank.
- d. Tape down the edges or use something heavier so the paper doesn't blow away.
- e. Leave the paper sitting in the Sun for 2–4 hours.

4. While you wait, let's see what else the Sun can do. Let's **water paint!**

- a. Find a safe, dry, sunny section of sidewalk, patio, concrete, fence, or bench, or experiment on different surfaces.
- b. Dip the paintbrush in water and start "painting" the surface. Draw for 1 minute, then leave your art alone for 2 minutes. How long do you think it will take for the water to dry?
- c. What's happening? The heat from the Sun is causing the water to evaporate, or dry. Try water-painting in the shade. Does it last longer? Repeat as many times as you'd like.



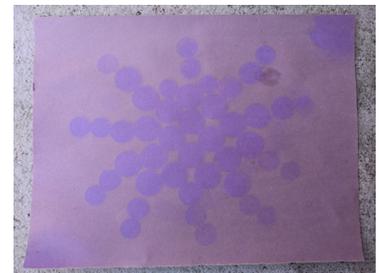
5. Time to check on our **sunscreen art!**

- a. After 2-4 hours, check on your sunscreen art paper. What do you notice? The paper should be faded everywhere except where you drew with sunscreen!
- b. Just like sunlight faded the paper, it can hurt our skin as well. Using sunscreen is one way to help protect our skin.



6. How are our **Sun prints** doing?

- a. After 4-8 hours, check on the Sun prints. Carefully touch the coins—are they warm or cold after sitting in the sunlight?
- b. Remove the coins and look at the paper. What do you notice? Just like sunscreen art, the paper should be faded everywhere except where the Sun's light was blocked by the coins!





# Eat the Moon

The Moon may look smooth from down here on Earth, but up close the Moon's surface is covered in mountains, valleys, plains, and, of course, craters. Let's use food to transform the Moon into a tasty snack!

*Please note:* Substitute ingredients as needed for dietary restrictions or allergies.

## Materials

- Rice cake
- Cream cheese (or peanut butter, applesauce, or jam)
- Bananas (or other fruit) cut into circle pieces
- Cheerios (or other small, circle-shaped food)
- Plastic knife or help from an adult

## Directions

1. Put your rice cake on a plate, paper towel, or clean surface. The rice cake is the surface of the Moon. Notice how bumpy the rice cake is? The surface of the Moon is also uneven, covered in mountains, valleys, and plains.
2. Spread the cream cheese (or other spread) across the top of the rice cake. This is like the layer of really tiny pieces of dust covering the surface of the Moon.



3. Peel your banana and cut 3-6 slices of banana. These will be your *lunar maria*, the large dark patches on the Moon. (Maria were formed by ancient volcanoes, erupting 2.5 billion years ago, creating smoother and darker areas. While there are many maria on the side of the Moon that we can see from Earth, there are almost none on the other side.) Place the banana slices on the rice cake. Look at the picture of the Moon—can you put the banana slices in the same pattern as the maria on the Moon?



4. Next, take your Cheerios and place them all over the rice cake. These are craters that cover the surface of the Moon. Over 4.5 billion years, many, many, many asteroids and meteoroids crashed into the Moon, leaving almost perfect circular craters of all sizes.



5. Now that you have your crater-filled Moon, take a bite out of the side. Can you eat it until its shape looks like a crescent moon?





# Phases of the Moon Chart

Have you ever noticed that the Moon doesn't always look the same? Some nights it is round and bright while other times it is shaped more like a banana (crescent) or even too dark to see at all. The Moon goes through all of its phases over 28 days, or almost one month. Create a chart of the Moon phases and compare it to the Moon the next time it's in view.

*Please note:* Younger children may need assistance with cutting or gluing.

## Materials

- 1 printed Moons and labels (page 3)
- 1 printed Phases of the Moon title (page 3)
- 1 printed "Tonight the Moon looks like this" arrow (page 3)
- Piece of cardboard (part of a cardboard box works well)
- Scissors
- Glue stick
- Tape (optional)
- String (optional)
- Crayons, markers, or colored pencils (optional)

## Directions

1. Cut out:
  - a. 8 printed moon pictures and labels
  - b. "Phases of the Moon" title
  - c. "Tonight the Moon looks like this" arrow
  - d. Space pictures



2. Glue the "Phases of the Moon" title at the top-center of the cardboard.
3. Put the printed moon pictures in the following order (see the picture below) on the cardboard under the title to make sure they will all fit:
  - a. Waxing Crescent (bright crescent on the right side)
  - b. First Quarter (right half of the moon is bright)
  - c. Waxing Gibbous (dark crescent on the left side)
  - d. Full Moon (whole circle)
  - e. Waning Gibbous (dark crescent on the right side)
  - f. Last Quarter (left half of the moon is bright)
  - g. Waning Crescent (bright crescent on the left side)
  - h. New Moon (all dark)

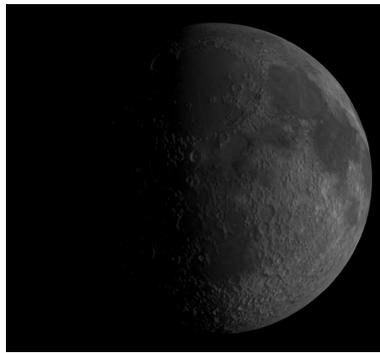


4. Make sure there is enough room underneath your Moon pictures to fit the "Tonight the Moon looks like this" arrow.
5. Once they are in order, glue each of the printed moon pictures and labels to the cardboard.
6. (Optional): Flip cardboard over and tape the string to the top of the cardboard. Now you can hang your Moon Phases chart up!
7. Decorate the Moon Phase chart any way you want. Add color, draw other space pictures, it's totally up to you!
8. Roll a piece of tape sticky-side out and place it on the back of the "Tonight the Moon looks like this" arrow. Put it under the picture of what you think the Moon might look like tonight.
9. The next time you see the Moon in the sky, see if it looked how you guessed it would. Move the arrow.
10. Use your chart to see how the Moon changes over one month.

# PHASES OF THE MOON



WAXING CRESCENT



FIRST QUARTER



WAXING GIBBOUS



FULL MOON



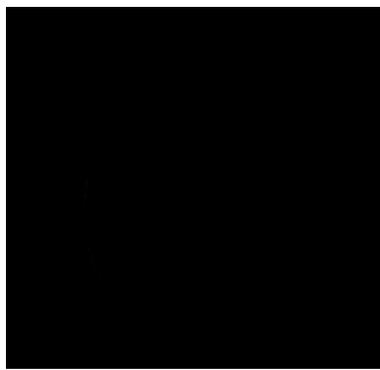
WANING GIBBOUS



THIRD QUARTER



WANING CRESCENT



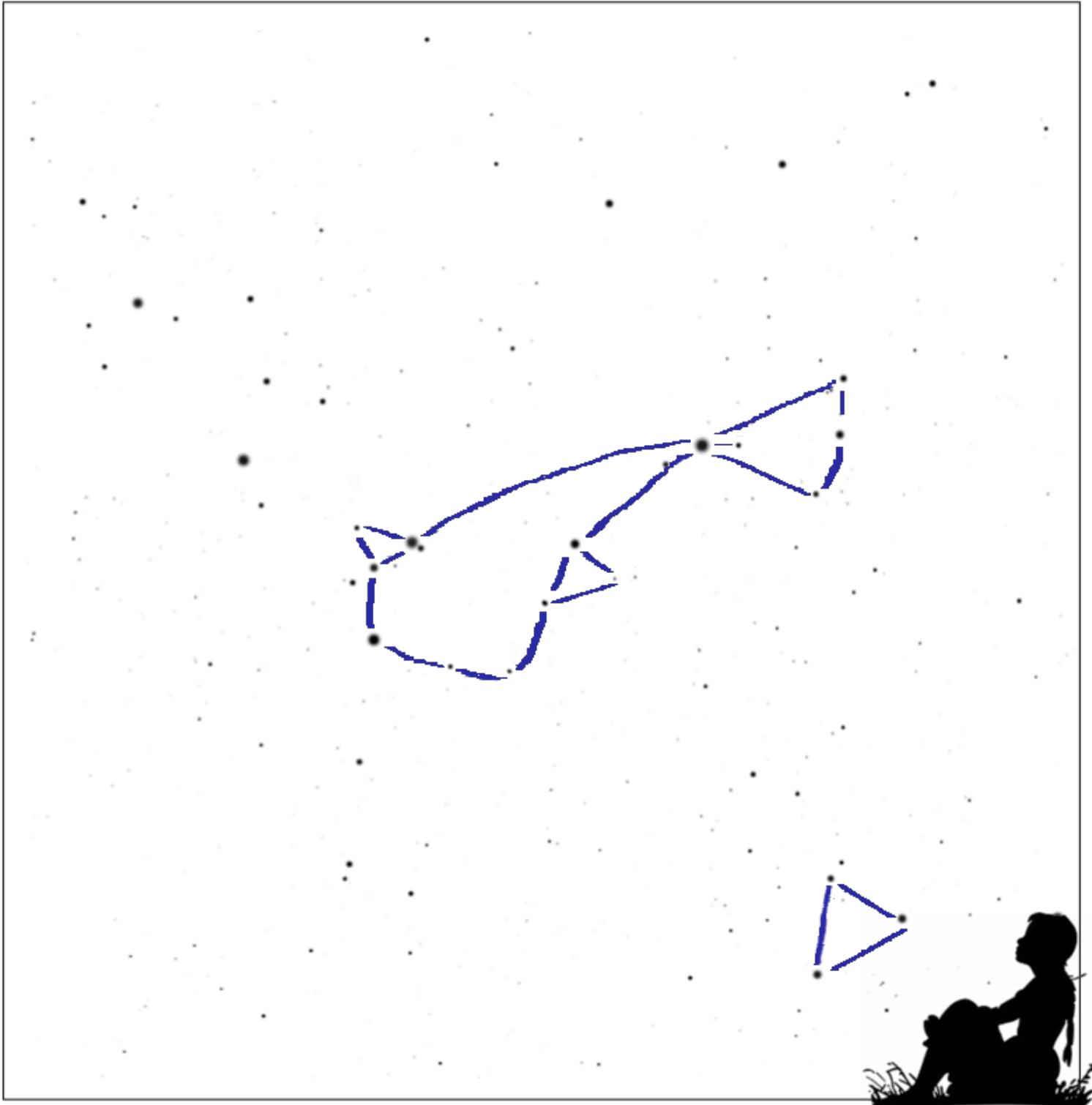
NEW MOON



Tonight the Moon looks  
like this.

## Create Your Own Star Patterns

Throughout time, people have used the night sky to tell stories as they imagined heroes, monsters, objects, animals, and ideas in the patterns of the stars. Below is an image of part of the night sky. Imaginary lines have been drawn connecting some of the stars to make shapes. Color in these shapes or draw in your own shapes and patterns.





# Paper Cup Planetarium

Using paper drinking cups, pre-made patterns, and a push-pin, you can make your very own projections of night-sky constellations!

*Please note:* This activity requires a little assistance from a caregiver.

## Materials

Twenty 5-oz. paper drinking cups

Pre-printed constellation pictures (provided)

Push pins

Glue sticks

A bright, single-LED flashlight (optional) or a cell phone flashlight (optional)

Safety scissors

## Directions for making your Paper Cup Planetarium

1. Select a constellation from the pre-printed sheet found at the end of this activity.
2. Cut out the circular image, which should fit easily on the end of a 5-oz paper cup.
3. With the glue stick, apply glue to the outside bottom of the paper cup, and press the constellation to it so the artwork is showing.
4. Using the push pin, carefully poke holes in each star of the constellation art.
5. The cup is now done!
6. Repeat for each of the constellation templates to make your own collection. Or feel free to make your own constellation to share with others.

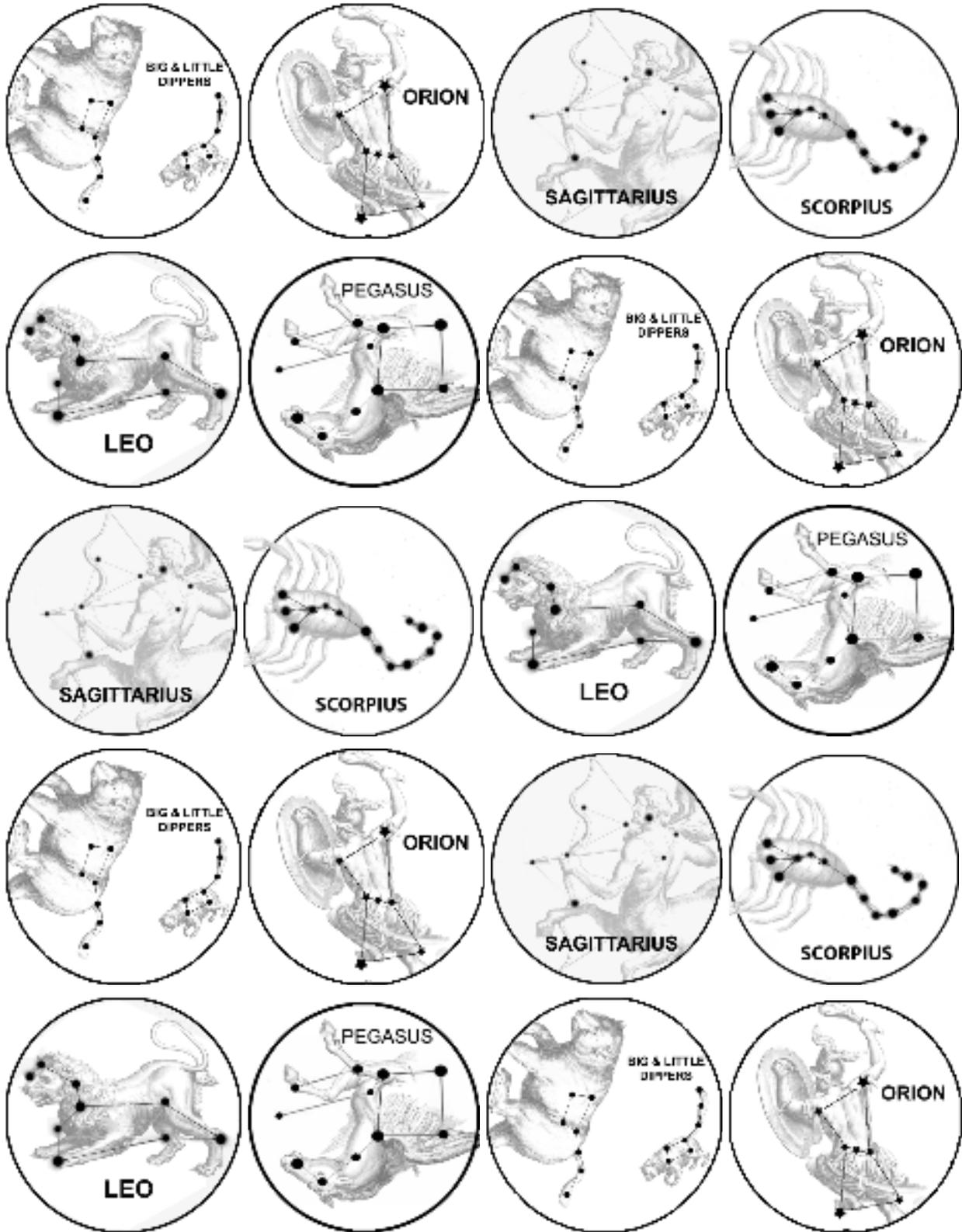


## Directions for using your Paper Cup Planetarium

1. The constellation pictures are actually printed backwards when you look at them. That's so when you look from inside the cup, they will look like they do in the night sky.
2. So, take one of your cups and hold it up to a light. Peer up into the cup, and you should see the constellation that you just created!
3. You can also project your constellation onto a wall in a dark room. Hold your flashlight inside the cup, and aim the cup toward the wall. You just created a pattern of stars, the constellation that you made! For best results, you may want to use a single-LED flashlight to avoid multiple images being created on the wall. Or, you can use a cellphone flashlight.



Enjoy exploring the night skies from right at home!



**PAPER CUP PLANETARIUM CONSTELLATIONS** (designed for 5-oz cups) from Morrison Planetarium, San Francisco, CA [WWW.CALACADEMY.ORG](http://WWW.CALACADEMY.ORG)



# Cardboard Tube Binoculars

Humans use binoculars to make small things look larger or to help us see things that are far away, like the stars and the moon.

Use these binoculars to help focus your observations.

## Materials

2 cardboard tubes

Yarn

Tape

Colored paper

Scissors

Markers, crayons, or colored pencils

Glue

Hole punch (or pencil)

## Directions

1. Decorate both cardboard tubes. You can color them with markers, crayons, or colored pencils. You can also cut shapes out of the colored paper and then glue them onto the cardboard tubes.
2. Place the tubes side-by-side and use tape to stick them together. To do this, stick the tape to the inside of one tube where it meets the other tube
3. Use the hole punch (or pencil) to punch two holes on the outer edge of both tubes on one end. You may want to ask an adult for help.
4. Cut a piece of yarn about the length of your arm to make the neck strap. Ask an adult to help you tie one end of the yarn to one hole, and the other end of the yarn to the other hole.
5. Make some observations with your new binoculars! Observe the sky, the Moon, things around the house, or things outside in nature—but never look directly at the Sun!



# Skywatcher's Guide

Observing the stars (and other objects in the night sky) is easier than you might think. There are just a few things to plan out before you start!

## Where should I go?

Think about a place you can safely be with an adult that has the darkest sky possible. Lights from buildings, street lamps, and more make it difficult to see stars.

Places to try:

- Out the window from your home.
- In a yard or on a balcony
- At a local park most importantly as few lights as possible
- At a campsite

## What should I bring?

All you really need is you! However, some of the tools listed here can make it more comfortable and fun.

- [Sky Log](#) to draw what you see (print or make your own copy)
- Warm, comfy clothes (especially if you are going outside!)
- Something to sit on (blanket, folding chair, etc)
- A flashlight (remember, extra light can make it hard to see stars so only use it when you need it! A red flashlight is best.)
- Snacks and water (or warm drink)
- Compass
- A tool to help you see like binoculars or a telescope



## How do I get ready?

Once the Sun has set and the sky is getting dark:

- Go to your spot, have your things with you, and give yourself a few minutes to set up and get comfortable.
- Figure out which direction you are looking
  - What part of the sky did the Sun set in (the sky might still be a lighter in that area)? That's West.
- Reach both of your arms all the way out in a straight line. If you keep them straight and point one arm West, the other arm will be pointing East.
- Take your time! The stars get easier to see as the sky gets darker. It takes time for your eyes to get used to the dark.
- Try closing your eyes for a few minutes. This will make your dark vision better and help you see more stars! With your eyes closed, use your other senses to experience how different the night and day are.
  - How does it feel outside? Is it warmer or colder?
  - Take a deep breath through your nose. Does the air smell or feel different?
  - Listen. Can you hear different sounds? Like animals, people, or traffic?

## What can I see?

Each time you go stargazing, it will be at least a little bit different! Some things that make it different are:

- The phase of the Moon
- The time of year (Fall, Winter, Spring, or Summer)
- The time you observe (right after sunset, the middle of the night, or before sunrise)
- The direction you are looking (North, East, South, or West)
- Where you live (different stars can be seen in the US than Australia)

Look up at the sky. Can you see any of these?:

- Can you see the Moon? How would you describe its shape? Can you see dark areas on it?
- Which stars look brightest? Can you see any that look very dim?
- Can you see any patterns of bright stars (like Orion or the Big Dipper)?
- Do any of the things you see have a color? How many colors can you find?



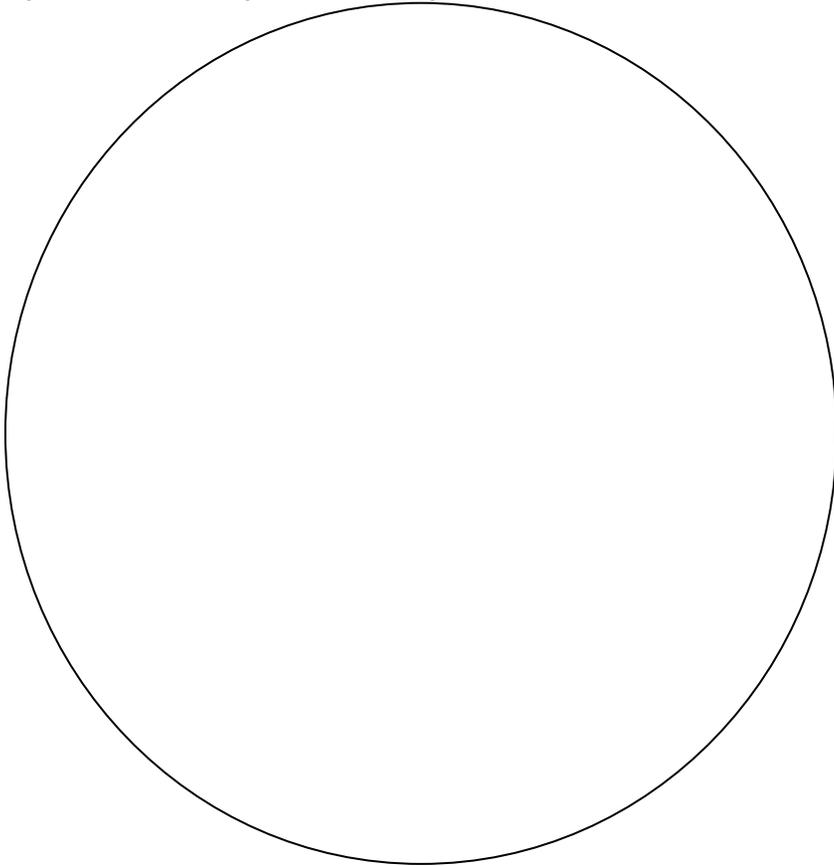
Here are some resources to see what might be visible when you are out:

- [2020 Pocket Almanac](#) (2021 Pocket Almanac coming soon on the [Morrison Planetarium Website](#))
- For more details on what you can see for the next 3 months, check out:
  - [Skywatcher's Guide](#)
  - [Planet Watch](#)
  - [Highlights of the Season](#)



# Sky Log

Use the circle below to draw what you see in the sky. Make sure to note the day and time, so you can compare what you see next time!



Day: \_\_\_\_\_ Time: \_\_\_\_\_

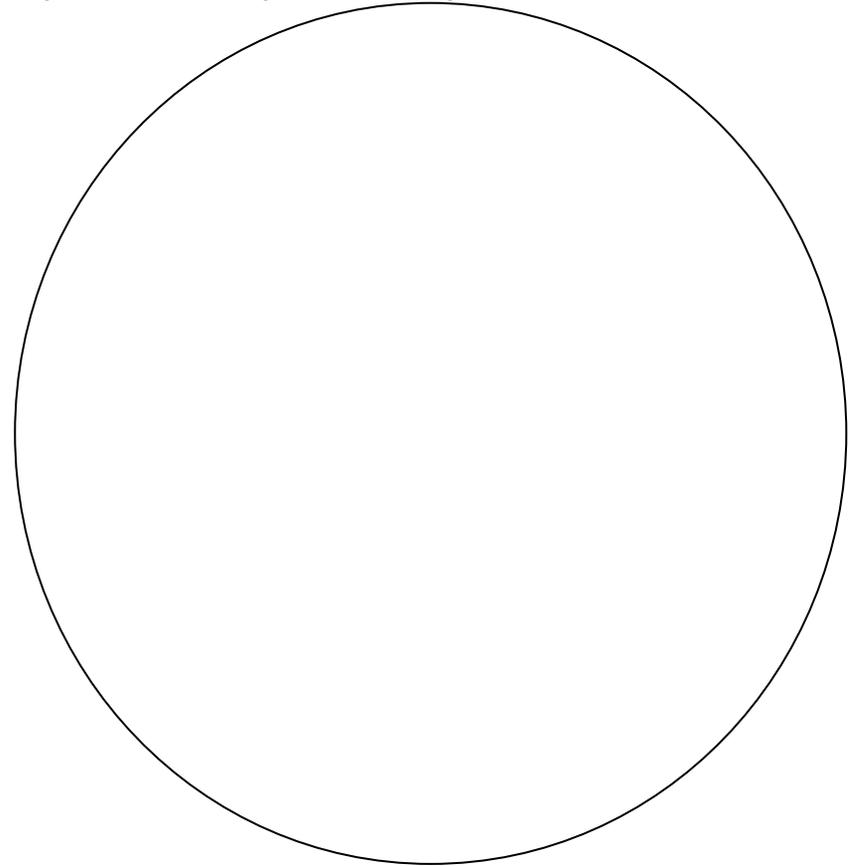
Where did you look?

What did you see?



# Sky Log

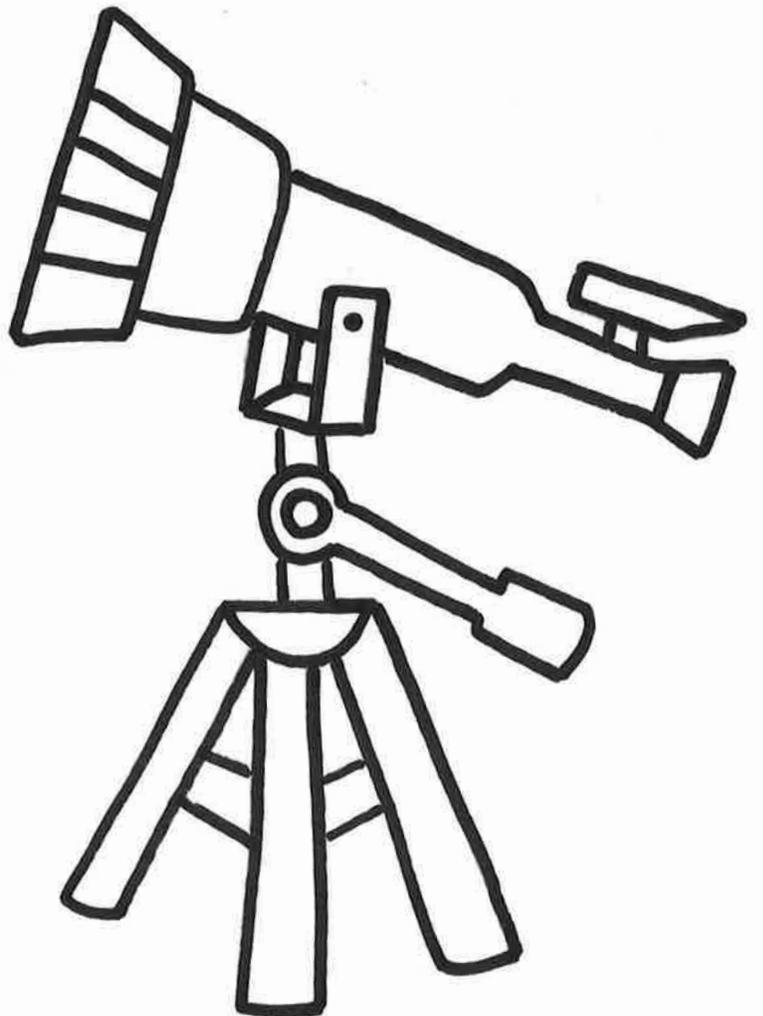
Use the circle below to draw what you see in the sky. Make sure to note the day and time, so you can compare what you see next time!



Day: \_\_\_\_\_ Time: \_\_\_\_\_

Where did you look?

What did you see?



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# Sun and Moon Dance

Explore the movements of the Moon around the Earth and the Earth around the Sun through a fun dance.

## Materials

String (3-4 ft)

Chalk

Bigger "Sun" object (a ball, box, toy, rock, etc.)

Smaller "Moon" object (a ball, a box, toy, rock, etc.)

10 square feet of open flat concrete (like a sidewalk or driveway)

## Instructions

1. Draw a chalk circle. This will be your "orbit" around the Sun.
  - a. Have an assistant (or tape, or rock) hold one end of the string on the ground.
  - b. Hold the other end of the string so that it is pulled all the way out and hold a piece of chalk at the end.
  - c. Keeping the string fully extended and your assistant at the center, place the chalk on the ground and walk in a circle around your assistant to make a circle.
2. The big object will be the Sun, the smaller object will be the Moon, and YOU will be the Earth!
3. The Earth goes around the Sun.
  - a. Put the "Sun" in the center of the chalk circle.





- b. As the Earth, walk along the chalk circle around the Sun. How long did it take you? (It takes the Earth one year to travel around the Sun once—you were probably faster than that!)
    - c. Challenge: Walk counterclockwise around the Sun.
4. The Moon goes around the Earth.
  - a. Hold the “Moon” in your hands.
  - b. The Moon travels around the Earth (that’s you!).
  - c. Stretch your arms to hold the Moon out in front of you and slowly spin in a circle. How long does it take the moon to make one full circle? (It takes the Moon one month to go all the way around the Earth once—you were probably faster than that!)
  - d. Challenge: Spin counterclockwise.
5. Put it all together.
  - a. Walk around the Sun on your chalk circle while spinning the Moon around you. Can you stay on the chalk circle? How many times can you spin the moon around you in the time it takes you to walk around the circle once? The Moon spins around the Earth about 12 times for every one time the Earth goes around the Sun.
6. Extra: Dance with music!
  - a. Add music to your dance—play a song, sing, hum, or maybe just think of it in your head (since there is no sound in space). Fun ones to try: “What is the Sun Really Made of?” by They Might Be Giants, or “Planets Suite” by Gustav Holst.
7. Challenge: Add more planets and moons!
  - a. Once you have perfected your dance, share it with friends or family and see if they want to dance with you! After all, 8 planets go around our Sun, not just Earth, so there’s room for more. They all move at different speeds—planets closer to the Sun go faster and planets farther away go slower, so pretend to be different planets by dancing in a faster circle closer to your “Sun” or in a slower circle farther away from it. Additionally, some planets have no moons, some have lots, so pretend you have one, two, or even no moons to see how that changes your dance.