



SCIENCE, TECHNOLOGY,
ENGINEERING, AND MATH
COLORADO STATE UNIVERSITY
EXTENSION

ST[EMpower]



CAREERS

Last month, you took a quiz about things you would like to do. In that quiz, you were careful to only select those things that sounded really interesting. This month, we are going to examine your interests. You need last month's answers.

There were 84 questions, and each question can be grouped into 1 of 12 categories. On the last page, you will find the score sheet. To calculate your interests:

1. Find all of the numbers that you selected on the survey and locate the matching number in the boxes below. Put a check by that number.
2. Count the number of checks in each box, and put that number on the line in the box.
3. Cut out the 12 cards.
4. Order the cards from the highest total to the lowest total. If two boxes have the same number, they will be assigned the same rank. For example, if both Math and Travel have 7 checks, they will both be ranked as number 1. Continue until all 12 boxes are ranked.
5. What are your top areas of interest?
6. Discuss these interests with your parents, 4-H

THE STARRY NIGHT! January's amazing sky show

Dr. Barbara J. Shaw



BACKGROUND

The Starry Night by Vincent VanGogh

Information

Have you ever looked at the stars on a clear, cold night and been amazed at the wonder and beauty? Did you know that you can see your shadow by moonlight? Even more surprising, if you are out in a really dark area, and Venus is shining after sunset or before sunrise, you can see your shadow in Venus light!

January sky gazing is glorious! This January marks some amazing astronomical events:

- **1/01/18** Supermoon! The full moon is on January 1st, and the moon will be closest to the earth (called **perigee**). The moon will be the largest it can be in our night sky.
- **1/03/18** Quadrantids Meteor Shower! Starts in the early morning just before sunrise continues through the day (although we can't see them during the daylight).

- **1/03/18** Earth at Perihelion! The Earth will be the closest to the sun than any other time during the entire year!
- **1/16/18** New Moon after sunset! This is the best time to look for planets! Uranus and Neptune are in the early evening sky, but you will need binoculars or a telescope to see them. Uranus sets right before midnight, and Neptune will set just before 11:00 PM. This will be an amazing night to stargaze! Cold air is great for seeing stars!
- **1/17/18** New Moon before sunrise! New Moon means no moonlight. Saturn will hug the horizon, rising just before dawn, at 5:45 AM. Jupiter is a much better show. It rises at 2:17 AM, and just before dawn, will be about 33° above the horizon. Mars rises shortly after Jupiter, at 2:40 AM. Before dawn, it will be 29° above the horizon.
- **1/31/18** Total Lunar Eclipse—Blood Moon! Starting at 5:51 AM, the shadow of the Earth will start to cover the sun. By 6:30 AM, the moon will be completely in the shadow of the Earth. Look fast, because at 7:07 AM, the total eclipse ends.
- **1/31/18** Blue Moon! A blue moon is when a month has 2 full moons. January 2018, we are fortunate to have a blue moon! By the way, this year, February will have no full moons. A month with no full moon is called a Black Moon. Way too cool!

Objectives

You will:

- Make a planisphere and practice using it
- Collect moon data, and observe the lunar eclipse
- Observe the Quadrantids Meteor Shower on Wednesday January 3rd early in the morning
- Identify some **circumpolar** and some winter constellations
- Read and retell the wonderful stories that are in our night sky from three different cultures
- Comfortably stargaze in cold weather
- Explore your interests—calculate your score from last month's quiz.

DO:

Materials:

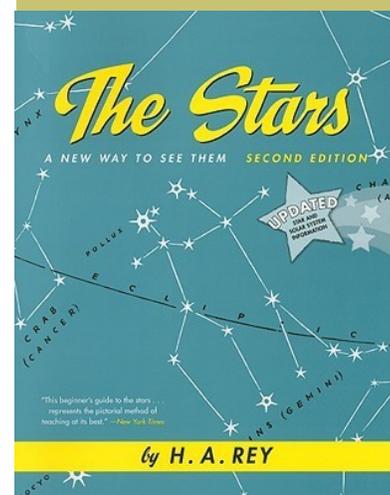
- Computer
- Printer
- Paper (cardstock would be best but not necessary)
- Brass brad paper fastener 
- Scissors
- Optional—glow in the dark paint
- Optional—toothpick
- Camera or cell phone camera
- Optional—sleeping bag pad or air mattress
- Optional—sleeping bag
- Optional—pillow
- Hot chocolate (a must to warm up after star gazing!)
- H. A. Rey, *The Stars: An New Way to See Them* (1952) from your library (or another good constellation book)

leader, and close friends. Brainstorm ideas for a project that incorporate at least the three top areas of interest. For example, if your top interests are art, business, and talking, you could design a line of electric t-shirts with the 4-H clover and market them to your 4-H club.

7. Would you like try out your idea for real?

Keep your cards for next month. The real fun begins then!

If you don't have a camera or cell phone, call your county 4-H extension agent. They will be able to locate a camera you can borrow.



FASCINATING FACTS— THE EARTH'S MOON

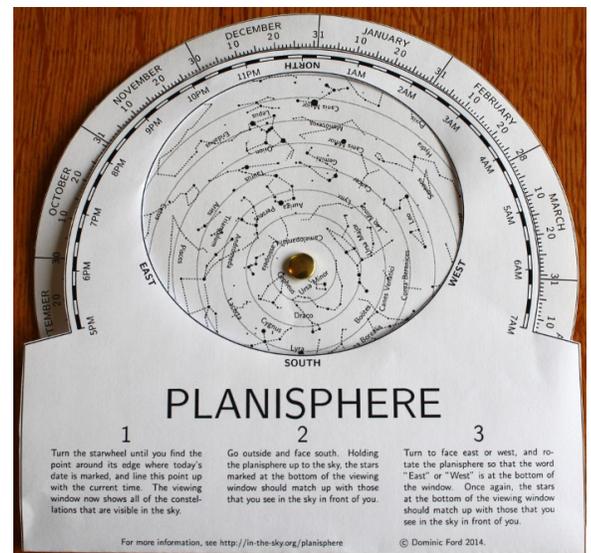
- The moon was created when a rock the size of Mars slammed into Earth, shortly after the solar system began forming about 4.5 billion years ago, according to the leading theory.
- The moon always shows us the same face. Since both the Earth and moon are rotating and orbiting, how can this be? Long ago, the Earth's gravitational effects slowed the moon's rotation about its axis. Once the moon's rotation slowed enough to match the time it takes the moon to go around Earth, the effect stabilized. Many of the moons around other planets behave similarly.
- The moon's heavily cratered surface is the result of intense pummeling by space rocks between 4.1 billion and 3.8 billion years ago called the Heavy Bombardment Period. These craters, have not eroded much for two main reasons: The moon is not geologically active, so earthquakes, volcanoes and mountain-building don't destroy the landscape as they do on Earth; and with virtually no atmosphere there is no wind or rain, so very little surface erosion occurs.
- Apollo astronauts used seismometers during their visits to the moon and discovered that it isn't a totally dead place, geologically speaking.

- Optional—flashlight with red filter gel. When you go outside, your eyes have to adjust to the dark. If you use your flashlight, they have to readjust to the low levels of light each time you use it. If you use a red filter on your flashlight, your eyes do not have to readjust.
 - You can make a red filter for your flashlight by purchasing good quality red filter gel and attaching it to your flashlight.
 - Google “red filter gel” and click “shopping” tab at the top of the google page.
 - Sort from least to most expensive.
 - Look for a 10x10” square of primary red filter gel. You should be able to find a sheet for less than \$3.00 (not including S&H).
 - Cut the filter 2-3” larger than the lens of your flashlight . You can make several filters with one sheet.
 - Secure with the rubber band.

Directions:

Planisphere

- Print the Planisphere central wheel star chart (called star wheel in the rest of these directions) and the planisphere body on two separate pages, using cardstock paper if available.
- Carefully cut out the star wheel on page 12.
- Carefully cut out the planisphere body on page 13. In addition to the outer lines, you also need to cut out the shaded oval.
- Fold the line on the planisphere body back.
- Locate the small circle on the planisphere body and the star wheel. With a sharp pencil, poke a hole at that small circle on each paper.
- Insert the brass brad paper fastener; spin the star wheel until it rotates easily.
- Push the brass brad paper fastener through the star wheel (print side up). Then push the fastener through the planisphere body (print side down). Open the legs of the fastener to secure.
- Optional—if you have glow-in-the-dark paint, you can add dots with a toothpick on the stars. Allow to dry before continuing to the next step.
- Fold the planisphere body up over the star wheel, so that the star field show through the oval window.
- Carefully examine the planisphere. Do you notice anything peculiar? Look carefully at the compass points. If our nose is north and our bottom is south, our right hand is east and our left hand is west. On the planisphere, east and west are reversed. How can you hold the planisphere so that east and west have the correct orientation?
- The only way to hold a planisphere is over your head. That corrects the east/west orientation.
- Did you notice that every day of the year is on the star wheel? Did



- you notice that the time of day is located on the planisphere body?
- Spin the wheel and match the correct day to the time you are going to view the stars. The star field you see in your planisphere is what you can see at that time. Align January 1st to 12:00 midnight. Turn the star wheel to 1:00AM, 2AM, 3AM. Notice what happens to the star field. As the night progresses, it appears that the stars rise in the east and set in the west. The planisphere can show you what the sky will look like anytime of day, or any day of the year.
- We will be using your planisphere all month, and each time, it will be easier to use and understand.

Supermoon

- Supermoon refers to a full moon at **perigee**, or the closest approach to the Earth during its orbit. The moon's orbit is not perfectly circular, but slightly **elliptical**. The closest the moon orbital cycle comes to Earth is 221,457 miles at **perigee** and the furthest is 252,712 miles at **apogee**. What does the moon look like when it is 31,255 miles closer or further from the Earth?
- You are going to measure the moon at perigee on January 1, 2018, when the moon is full and at **perigee**. Each month, you will measure the full moon, and compare your measurements. There is a datasheet included for these measurements, so save this issue for the next six months.
- Finally, you can calculate the difference in the brightness of the moon when it is at **perigee** and **apogee**. (I love math! It is so useful!)
- Wait until the sky is complete dark, after 6:30 PM.
- If your school has a science fair, this would be a perfect project. You can explore the moon's elliptical orbit around the Earth and how the moon revolves on its axis, and calculate how bright it is when closest and furthest from Earth.
- Before you go outside, launch your camera's app. Use the camera's exposure control and reduce the exposure so that they moon is not overexposed. You can see the dark and light areas of the moon with the correct exposure. The pictures below show you the exposure you want. Once you know how to change the exposure, go outside and check. Use a tripod if you have one, or support your camera. Take a couple of pictures, and adjust until you can duplicate the image.



- Small moonquakes, originating several miles below the surface, are thought to be caused by the gravitational pull of Earth. Sometimes tiny fractures appear at the surface, and gas escapes.
- Tides on Earth are caused by the moon (the Sun has a small effect). Here's how it works: The moon's gravity pulls on Earth's oceans. High tide aligns with the Moon as Earth spins underneath. Another high tide occurs on the opposite side of the planet because gravity pulls Earth toward the moon more than it pulls the water. At full moon and new moon, the Sun, Earth and moon are lined up, producing the higher than normal tides. When the moon is at first or last quarter, smaller neap tides form. The Moon's 29.5-day orbit around Earth is not quite circular. When the moon is closest to Earth (called its perigee), spring tides are even higher, and they're called **proxigean** spring tides.
- As you read this, the moon is moving away from us. Each year, the moon steals some of Earth's rotational energy, and uses it to propel itself about 3.8 centimeters higher in its orbit. Researchers say that when it formed, the moon was about 14,000 miles (22,530 kilometers) from Earth. It's now an average of 239,000 miles, or 385,000 kilometers away.

Full Moons 2018

January 1 (Wolf Moon, Supermoon)

Time:

Pixels

January 31 (Snow Moon, Blue Moon)

Time:

Pixels

March 1 (Worm Moon)

Time:

Pixels

March 31 (Pink Moon, Blue Moon)

Time:

Pixels

April 29 (Flower Moon)

Time:

Pixels

May 29 (Strawberry Moon)

Time:

Pixels

June , 2018 (Buck Moon)

Time:

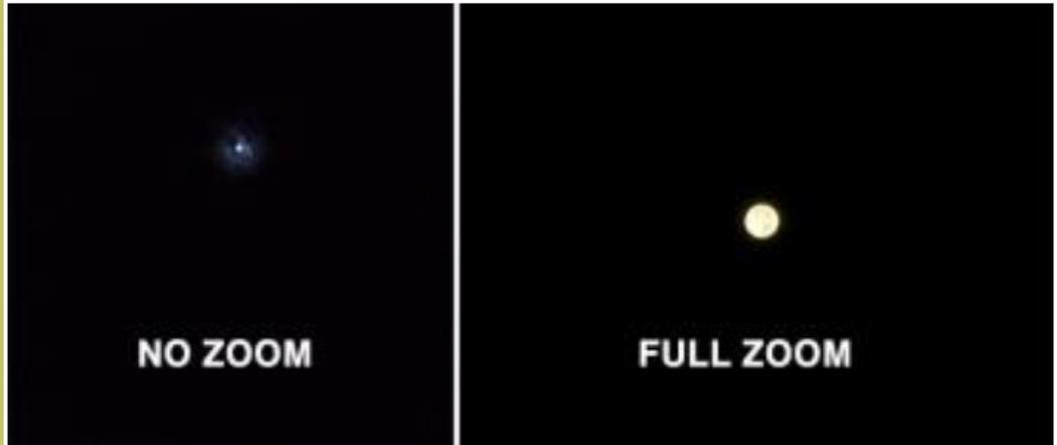
Pixels

July 27, 2018 (Sturgeon Moon, Micromoon)

Time:

Pixels

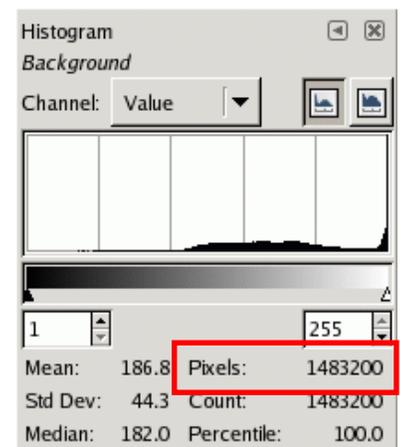
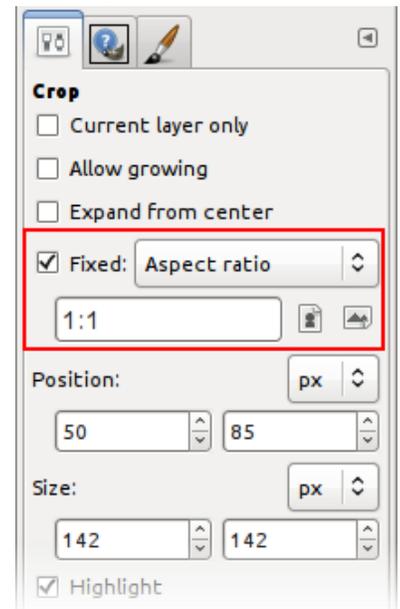
- Zoom your camera to the maximum factor. Be sure to record the zoom factor (e.g. 2.0x, 3.4x) if your camera has that feature. If your camera does not display the zoom factor, you still can do this project. Remember to zoom to the maximum, and each time, you know that the factor is the same.



- Take several pictures of the moon at full zoom, and go inside.
- Use the best image of the moon and download to your computer.
- If you do not have an image editor, you can download GIMP. This program was developed by university professors. It is powerful, and it is free!
- Use Tools → Transform Tools → Crop in the image window. Lock aspect ratio 1:1.
- This changes the cursor and allow you to click and drag a rectangular shape. Crop the picture around the moon; enlarge it.
- To find the number of pixels, you can use the histogram report. From the image menu: Windows → Dockable Dialogs → Histogram. The pixel data is included with the histogram report. Record this number.
- Each month, during the full moon, zoom your camera to full, take a picture, insert the image in the image editor program, count the pixels, and record that number.
- July 27th, the moon will be the furthest from the Earth, called a Micromoon. You will have **data** that supports the apparent size of the moon changes from larger to smaller. If you collect data all year long, you can watch the moon grow big again.

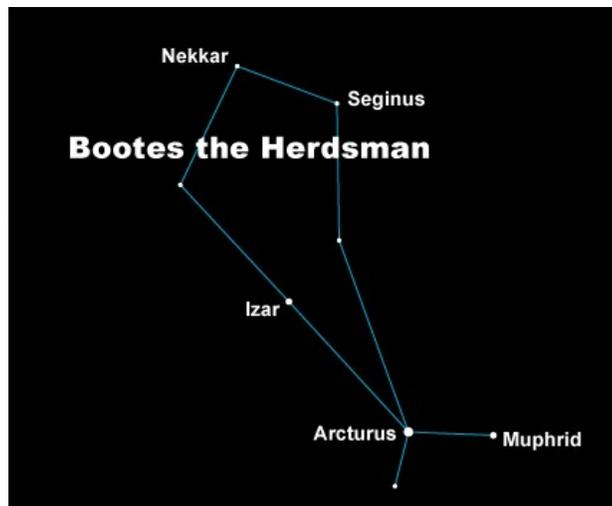
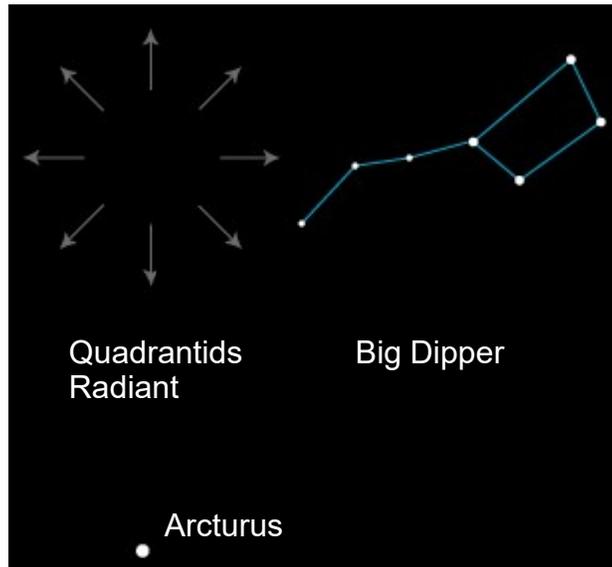
Blood Moon:

- Set your alarm clock on the evening of January 30th for 5:30 AM.
- About every 10 minutes, check the moon for the total lunar eclipse. Totality is 6:30 AM. By 7:07, the lunar eclipse is complete. It is amazing, so don't miss it!



Quadrantids Meteor Shower

- There are three amazing things about this meteor shower.
 1. It is the first meteor shower of the year.
 2. It is named after a defunct constellation. In 1922, the International Astronomical Union (IAU) revised the skies to 88 official constellations. They removed *Quadrans Muralis*, but the meteor showers keep the name. It is sometimes called Bootids after the modern constellation *Boötes*.
 3. This meteor shower is hard to see, because it has a very short peak period (just a couple of hours).
- The Quadrantids Meteor Shower is just above the constellation Boötes. If you look in this general direction, shooting stars appear from this general direction, called the **radiant**.
- To find best location to see shooting stars, we are going to “star hop.” That is a term to find something familiar in the sky, and using that as an anchor, find other stars and constellations. The most recognizable group of stars that is present every single night of the year is the big dipper. That is a perfect **asterism** to use to star hop. An **asterism** is a familiar group of stars that is not a constellation. The Big Dipper is part of the constellation *Ursa Major* (big bear). Some **asterisms** are made from different constellations, like the summer triangle. The three bright stars are found in *Aquila* (the eagle), *Cygnus* (the swan), and *Lyra* (the harp).
- The Big Dipper is found in our night sky every night of the year together with its constellation *Ursa Major*—big bear, and 5 other **circumpolar** constellations (*Ursa Minor*—little bear, *Cassiopeia*—the vain queen, *Cepheus*—king of Aethiopia, *Draco*—the dragon, and *Camelopardalis* -- the giraffe), never set.
- Set your alarm for 5:00AM on the evening of January 2nd. You want to go out to see this meteor shower early in the morning on January 3rd. Remember to dress warm and bring your sleeping bag!
- Look directly overhead (**zenith**). You can find the Big Dipper high in



POWER WORDS

apogee: the point in the orbit of the moon or a satellite at which it is furthest from the earth

asterism: a prominent pattern or group of stars, typically having a popular name but smaller than a constellation

circumpolar: above the horizon at all times in a given latitude

elliptical: relating to or having the form that is oval or egg-shaped

perigee: the point in the orbit of the moon or a satellite at which it is nearest to the earth

perihelion: the point in the orbit of a planet, asteroid, or comet at which it is closest to the sun

proxigeon-spring-tide: An unusually high tide that occurs when the Moon is at its closest point in its orbit to the Earth and in its new or full moon phase. January 1st will not only be a Supermoon, we will also have a proxigeon spring tide!



radiant: a point or object from which light or heat radiates

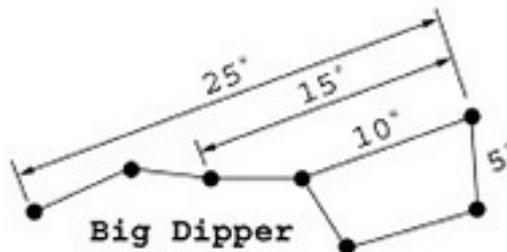
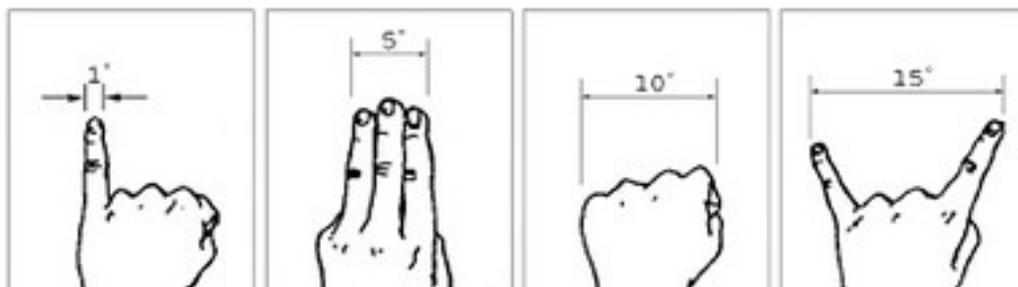
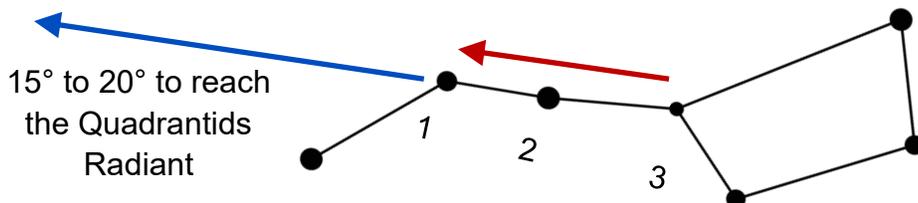
zenith: the point in the sky or celestial sphere directly above an observer; the highest point reached by a celestial or other object

FASCINATING FACTS— CONSTELLATIONS

- In 1922, the International Astronomical Union (IAU) officially recognized 88 constellations, 48 of which were recorded by the Greek astronomer Ptolemy in his book 'Almagest' written around 150 AD.
- the Greeks knowledge of the constellations stretches way back in time at least to the 8th century BC when Homer made the earliest known Greek reference to the constellations Boötes, Orion, and Ursa Major in his epic poem the Illiad and the Odyssey. Nevertheless, much of the Greek's initial knowledge of the constellations came to them from the Ancient Egyptians, who likely inherited their understanding from Ancient Babylon and Sumeria before them. In fact, at least 30 modern constellations can be shown to date back to at around the Late Bronze Age (1650-1050 BC), with references to some of the constellations found in Mesopotamian clay writing tablets and Babylonian star constellation catalogs dating back to the 3rd millennium BCE. There are also references to be found in the Hebrew Bible, and Biblical texts. Orion is perhaps the most distinctive of all the constellations, and an amazing discovery was made in 1972 at the Ach valley in Germany after an

the sky at 5:00AM on the 3rd. The Big Dipper is formed by seven stars: three stars form the handle and 4 stars form the bowl of the dipper.

- We call this asterism the Big Dipper, but other countries have different names. In Great Brittan, it is called the Plough. In Mongolia, it is called the Seven Gods.
- Use the stars 2, 3, and 4 (as indicated on the diagram): stars 1 and 2 are part of the handle and star 3 is part of the bowl. Using your fingers to measure, start at the point of the red arrow (the middle star of the handle). Measure 15-20° to the left of the big dipper. That is the **radiant** of the Quadrantids.



- The best way to view our night sky is staying warm and comfortable. Find a spot that has a clear view of the sky, and set up your pad or air mattress, sleeping bag, and pillow. Climb in and start watching.
- By the way, Boötes is pronounced boo-**OH**-tease.
- The meteor shower will be harder to see because we are just past the Supermoon. However, watching the shooting stars early in the morning means that the moon will be low in the west.
- The Greek myth: Boötes represents Arcas, son of Zeus and Callisto, daughter of the Arcadian king Lycaon. Arcas was brought up by his grandfather, the king, who one day decided to test Zeus by serving him his own son for a meal. Zeus, however, saw through Lycaon's intentions, transformed the cruel king into a wolf, killed all his sons with thunderbolts, and brought Arcas back to life. Zeus' wife Hera, having heard of her husband's infidelity, transformed Callisto into a bear. Callisto roamed the woods until years later she met her son, who was now grown up. Arcas didn't recognize his mother and began to chase her. Callisto hid herself in a temple, where he could not hurt her without risking being convicted to death for defiling a sacred place. To avoid a tragedy, Zeus placed both of them in the sky;

Callisto as Ursa Major and Arcas as Boötes.

- The easiest way to find Boötes is to use the curve of the handle of the Big Dipper. “Arc to Arcturus” (the brightest star in the constellation, and the fourth brightest star in the sky) then “Spike on to Spica” (the brightest star in Virgo, and the 16th brightest star in the sky).
- The Quadrantids Meteor Shower, during the very short peak, produces 50-100 shooting stars per hour. Now that’s a show!

New Moon

- The best time to stargaze is during the new moon, which is the 16th and 17th of January this year. The advantage of winter stargazing is that the most brilliant and beautiful stars are out in the winter. The disadvantage is that it is COLD! The more comfortable you are, the more you can enjoy the night sky.
- Before television and radio, our ancestors would use the night sky for their entertainment. The myths started as stories about the stars. H.A. Rey (author of Curious George) wrote a book that changed amateur astronomy called The Stars. In it, he connected the dots of the different constellations to make them look more like what they were. When you learn constellations, you view them the way Rey drew them (example of Gemini the twins, below figure 4).

Figure 1: The Twins—A Group of Stars



Figure 2: The Twins—Allegorical

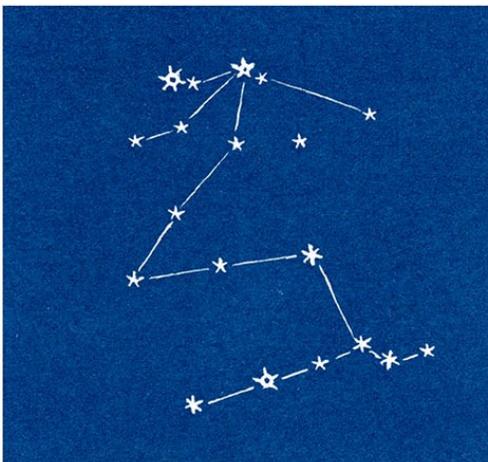
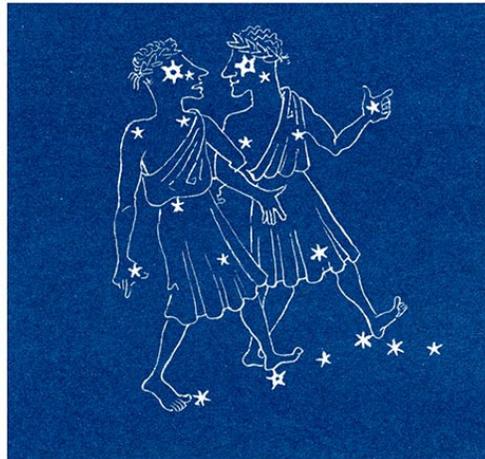


Figure 3: The Twins—Geometrical

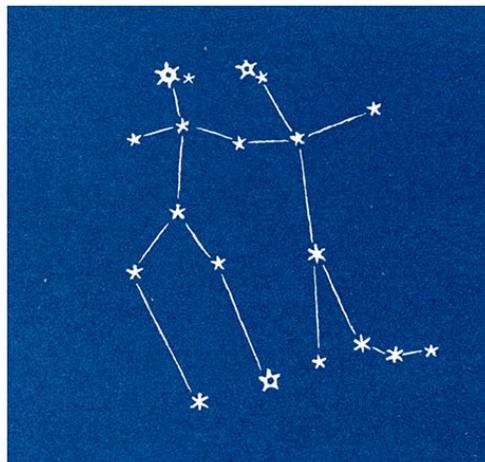


Figure 4: The Twins—Graphic

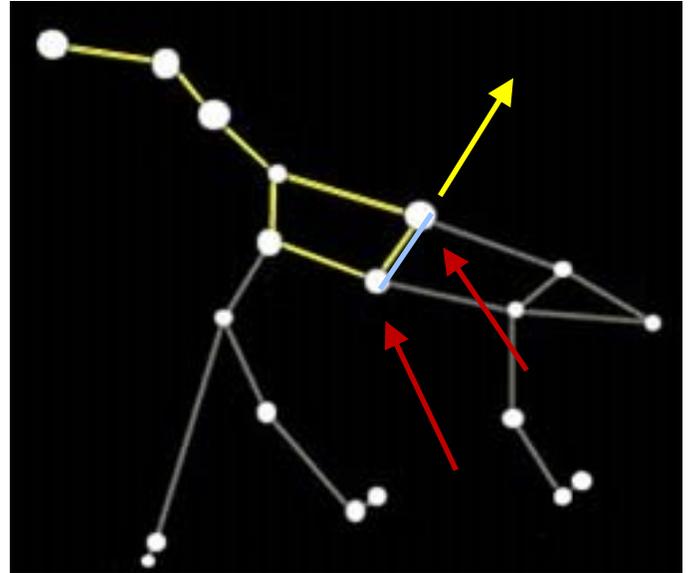
image of Orion was found carved into a piece of mammoth ivory more than 32,000 years old.

- Throughout the year different parts of the sky and therefore different constellations become visible to us as the Earth completes its annual orbit around the Sun. The constellations we see at night are those that are located behind the Earth on our side of the Sun, as we cannot see those constellations in the opposite direction behind the bright Sun during the day. To better understand why this is so, imagine sitting on a merry-go-round (Earth) with a very bright light (Sun) placed at its center. You will not be able to see past the light (Sun) because of its brightness, and so you can only see things by looking towards the outside of the merry-go-round, with the background changing as you spin around in a circle.
- Which constellations can be viewed throughout the year depends upon your latitude and will vary from different locations around the world. In the northern hemisphere, for instance, the constellation of Orion is a winter constellation, while Leo is associated with spring, Scorpius with summer, and Pegasus with autumn.
- Each night more stars and constellations begin to appear in the eastern part of the sky at dusk before

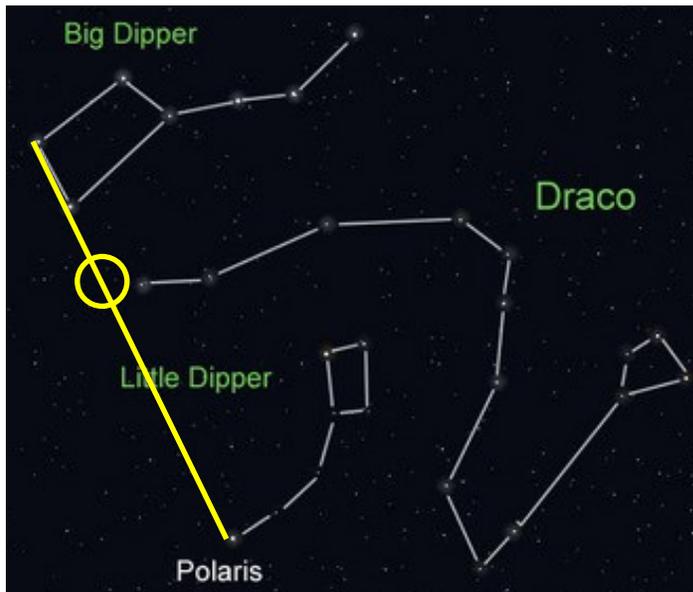
moving across and disappearing over the western horizon by dawn. Likewise, those constellations which we had been able to see low near the western horizon after sunset will vanish from our view only to be replaced by constellations which had been higher in the sky at sunset just a few weeks earlier. The constellations which appear in the east have a daily shift rate close to one degree per day, as completing a 360 degrees circular journey around the Sun in 365 days produces roughly that rate. One full year later, and the stars subsequently return to the same position and rising time as the year before.

The most commonly known of all the 88 constellations are the 12 zodiac constellations, which appear within an 18 degree wide band of sky called the ecliptic plane, which the Sun, Moon and planets seems to traverse throughout the year from the Earth's perspective. Less well known, however, is that there is in actual fact a 13th constellation which also occupies this zodiacal band, namely Ophiuchus the 'serpent-bearer.'

- The winter constellations are brilliant! Use the constellation book and your planisphere to plan out your evening.
- In the early evening (after 6:45 PM, the end of astronomical twilight), find the Big Dipper towards the east, about half-way between the horizon and **zenith** (directly over your head).
- The Big Dipper is part of the constellation *Ursa Major* (big bear). The image to the right is how it will look.
- The red arrows point to the pointer stars which are part of the bowl of the Big Dipper (furthest from the handle). Use those two stars, moving in the direction of the yellow arrow, you will find the north star, Polaris. The distance between these two asterisms is about 5 times the distance between the two pointer stars (line in blue).
- The north star is part of the constellation Little Bear (*Ursa Minor*). It is also the asterism the Little Dipper. The north star is the brightest star in *Ursa Minor*, however it is fainter than all of the stars in the Big Dipper. It is important because it is less than one degree off the north pole, the imaginary axis that Earth spins. Both *Ursa Major* and *Ursa Minor* are circumpolar constellations (always in the sky). This picture was taken over several hours. The circles are stars that appear to move throughout the night. The center point is the North Star. It is almost directly over our true north.



- As you look between the north star and the two pointer stars of the Big Dipper, your eyes will see that there is a star in between (yellow line and circle). That star is Thuban, and part of the constellation *Draco* the dragon. *Draco* curls around *Ursa Minor* (looks more like a Chinese dragon to me).



- Face the opposite direction to the Big Dipper. This is where you find most of the brightest stars visible from the Northern Hemisphere. Orion has more bright stars than any other constellation.

- Orion's* stars that outline his body are (from bottom left, bottom right, top right and top left) are Saiph (means sword of the Giant, a blue supergiant), Rigel (means foot, a blue supergiant), Bellatrix (means war-like or female warrior, a blue-white supergiant) and Betelgeuse (means armpit, a red supergiant). The three stars that form his belt are Alnitak (triple star system), Alnilam (blue supergiant), and Mintaka (multiple star system). The sword hanging from his belt are from 2 stars and the center is the Orion Nebula, or gas cloud.



SEEING MORE STARS

Our eyes need to adjust to the dark, about 40 minutes. There are a couple of tricks you can do to help see more stars.

- Use your peripheral vision (what you see out of the corner of your eye without looking at it directly).
- Put a patch over one eye. You are planning on stargazing at 7:00 PM, put a patch over one eye at 6:15. When you go outside to stargaze, use your eye under the patch. If you want to use a flashlight to check out the constellation book or your planisphere, put on the eyepatch!
- Cover your flashlight with a red filter gel (see page 3 for directions). The red gel does not switch on all our color cones, so we can adjust to night vision more quickly.

There are two kinds of receptors in our eyes: rods (see in black, gray, and white in low levels of light) and cones (see colors in bright light). Our cones are concentrated in the direct line of sight in our eye, and they are packed tightly, with very few rods. The receptors that are further from the direct line of sight are mostly rods, that see in low levels of light. It takes about 40 minutes for our brain to switch using on the rods.

REFLECT:

- Read the following myths about Orion:
 - Greek: There are many different versions of Orion. This is one. He was such a good hunter that he was hired by the king Oenopion to kill the ferocious beasts that were terrifying the habitants of the island Chios. Happy for his success, Orion said he would kill all the wild animals on the earth. But, the earth goddess Gaia, who was the mother of all animals, was not pleased with Orion's intention. Then, Gaia set an enormous scorpion on Orion.

CITATIONS

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<https://www.timeanddate.com/astronomy/sights-to-see.html>
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[planisphere/](http://in-the-sky.org/planisphere/) (https://in-the-sky.org/planisphere/pdfs/planisphere_40N_en.pdf)
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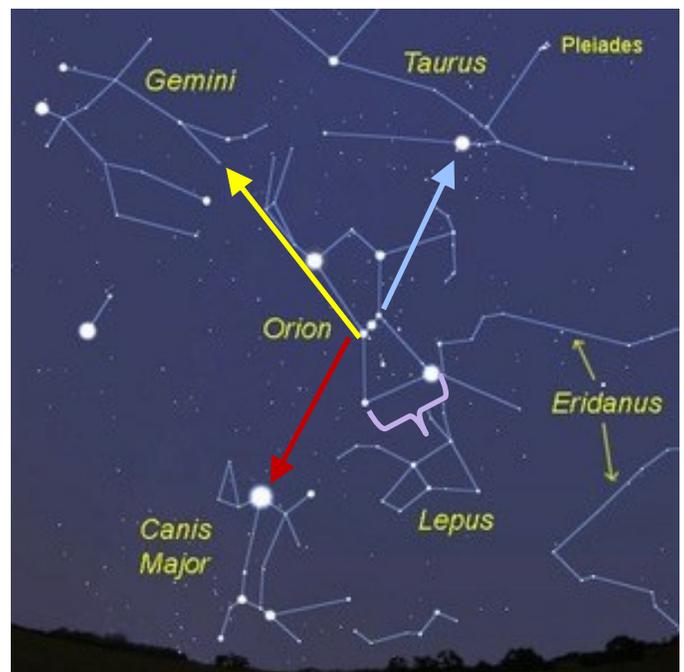
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Orion soon realized that his strength and sword were useless against that mighty beast. He tried to escape, but the scorpion stung him to death. As a reward, Gaia placed the scorpion in the sky as a constellation which appears to be constantly chasing after Orion whose figure was also placed among the stars. Orion had such favor with the other gods and goddesses, they used all the brightest stars to place him in the sky. His beloved dog bayed all night, not able to reach his master. Orion brought his faithful companion into the sky, and gave him Sirius, the brightest star, to be the heart of his dog.

- Chinook (Washington and Oregon): A big canoe (Orion's belt) and a small canoe (Orion's dagger) are in a race to see who can be the first to catch a salmon in the Big River (Milky Way). The little canoe is winning the race. Can you tell which star is the fish? It is the very bright star in the middle of the river (Sirius).
- Chinese: Shen was a great hunter and warrior. The Emperor had two sons, Shichen and Ebo, who were always fighting. So bad was the antagonism that the Emperor had to banish them both. Shichen was sent away to become responsible for sacrifices to Shen, while Ebo became responsible for sacrifices to the lunar mansion Xin, in present-day Scorpius on the opposite side of the sky from Shen. This story parallels the Greek legend of Orion and his antagonist the scorpion being placed on opposite sides of the sky to keep them permanently apart

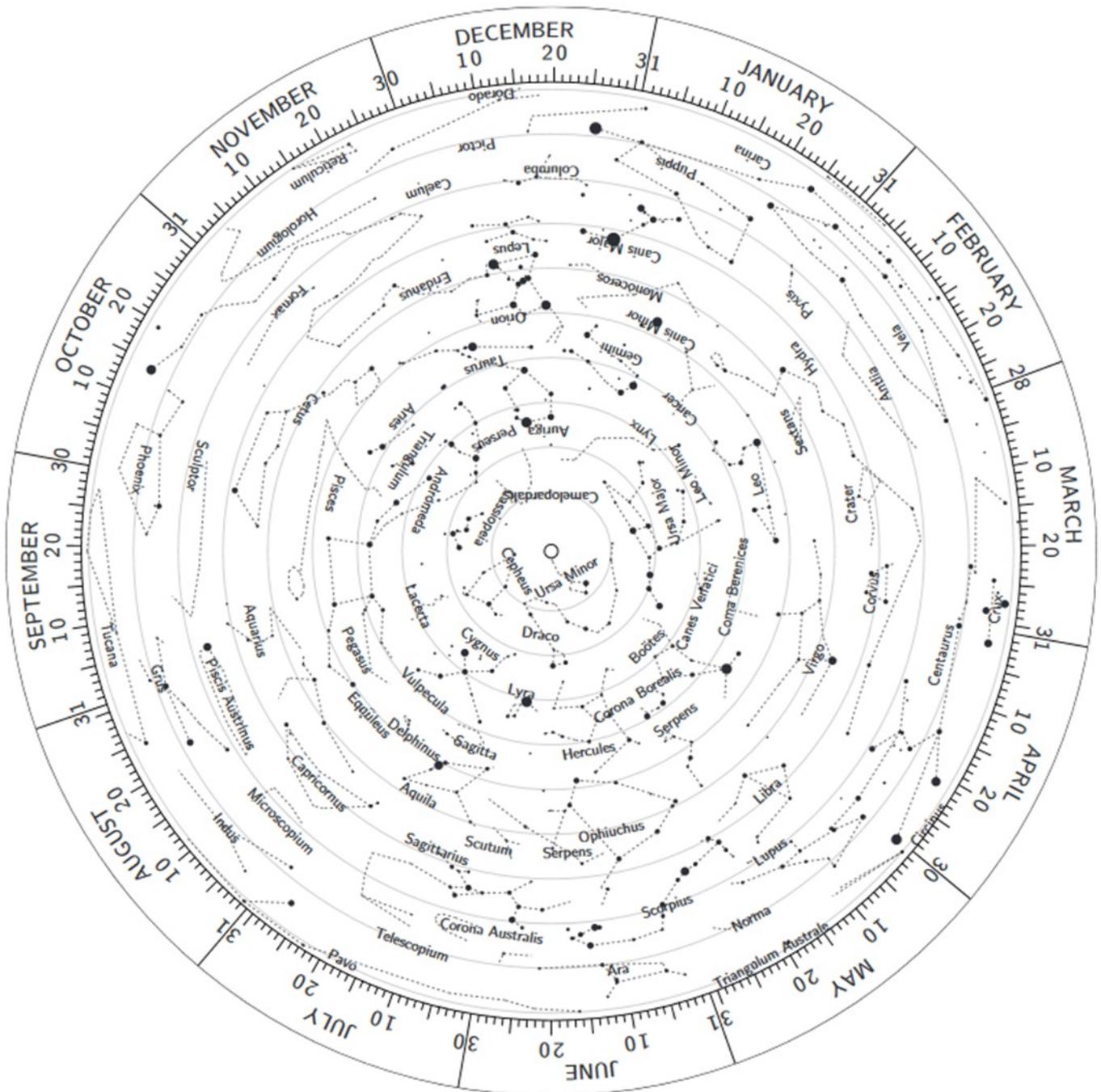
APPLY:

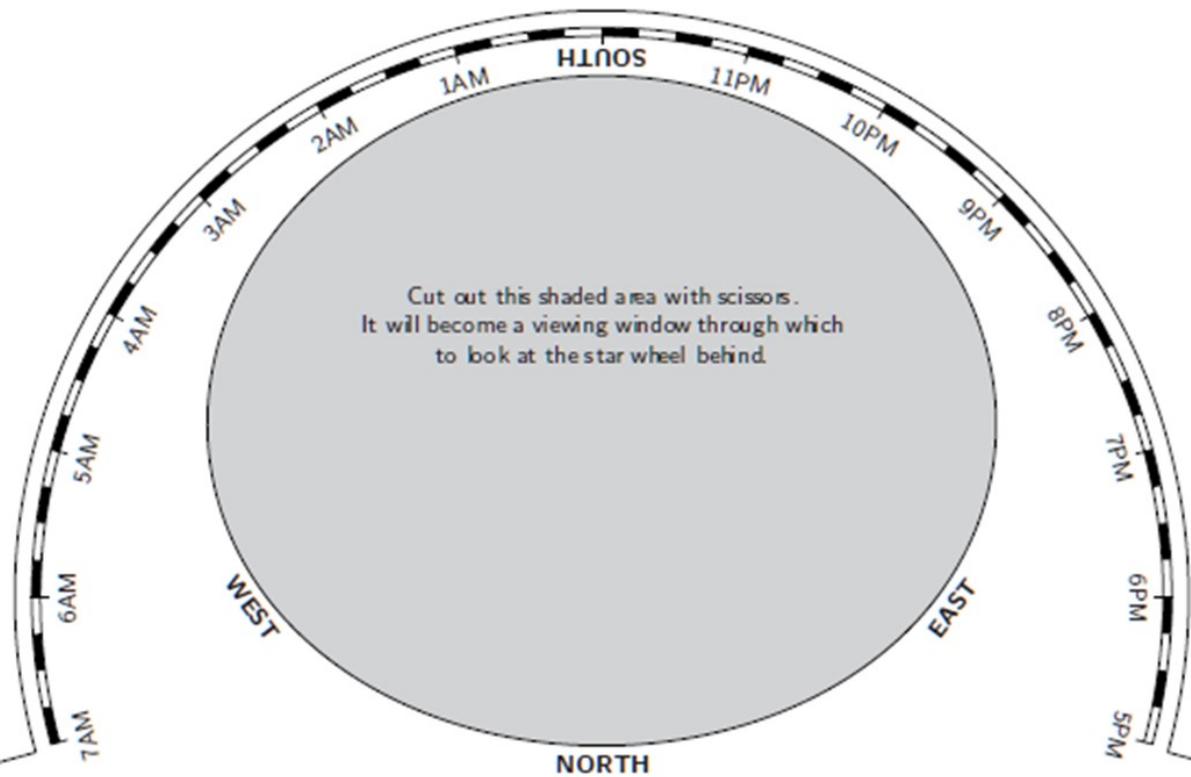
- Since *Orion* is so easy to spot, we can use it like the Big Dipper to find other constellations. The three stars of *Orion's* belt points down and left (red arrow) directly at the brightest star in the sky, Sirius, found in the constellation *Canis Major* (the big dog). Directly under Rigel and Saiph (purple bracket) is the constellation *Lepus* (the rabbit). Easy to remember: Orion wears bunny slippers! Using Orion's Belt, but up and right (blue arrow), leads to the heart of *Taurus* (the bull). The Pleiades, an open star cluster, are found in *Taurus*. Finally, using Betelgeuse and the first star in the belt of Orion (yellow arrow), they will direct you to Gemini the twins, with the bright stars Pollux and Castor, named after these two brothers.
- Why do you think that the International Astronomical Union recognizes constellations? What is their purpose? (Hint: think of state lines.)



Supplemental Information

Planisphere Central Wheel Star Chart





PLANISPHERE 40°N

1

Turn the starwheel until you find the point around its edge where today's date is marked, and line this point up with the current time. The viewing window now shows all of the constellations that are visible in the sky.

2

Go outside and face north. Holding the planisphere up to the sky, the stars marked at the bottom of the viewing window should match up with those that you see in the sky in front of you.

3

Turn to face east or west, and rotate the planisphere so that the word "East" or "West" is at the bottom of the window. Once again, the stars at the bottom of the viewing window should match up with those that you see in the sky in front of you.

For more information, see <http://in-the-sky.org/planisphere>

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CALCULATE INTERESTS

1. Find all of the numbers that you selected on the survey and locate the matching number in the boxes below. Put a check by that number.
2. Count the number of checks in each box, and put that number on the line in the box.
3. Cut out the 12 cards.
4. Order the cards from the highest total to the lowest total. If two boxes have the same number, they will be assigned the same rank. For example, if both Math and Travel have 7 checks, they will both be ranked as number 1. Continue until all 12 boxes are ranked.
5. What are your top areas of interest?
6. Keep these cards for next month.



<p>Adventure</p> <p><input type="checkbox"/> 1</p> <p><input type="checkbox"/> 13</p> <p><input type="checkbox"/> 25</p> <p><input type="checkbox"/> 37</p> <p><input type="checkbox"/> 49</p> <p><input type="checkbox"/> 61</p> <p><input type="checkbox"/> 73</p>	<p>Animals and Nature</p> <p><input type="checkbox"/> 2</p> <p><input type="checkbox"/> 14</p> <p><input type="checkbox"/> 26</p> <p><input type="checkbox"/> 38</p> <p><input type="checkbox"/> 50</p> <p><input type="checkbox"/> 62</p> <p><input type="checkbox"/> 74</p>	<p>Art</p> <p><input type="checkbox"/> 3</p> <p><input type="checkbox"/> 15</p> <p><input type="checkbox"/> 27</p> <p><input type="checkbox"/> 39</p> <p><input type="checkbox"/> 51</p> <p><input type="checkbox"/> 63</p> <p><input type="checkbox"/> 75</p>	<p>Business</p> <p><input type="checkbox"/> 4</p> <p><input type="checkbox"/> 16</p> <p><input type="checkbox"/> 28</p> <p><input type="checkbox"/> 40</p> <p><input type="checkbox"/> 52</p> <p><input type="checkbox"/> 64</p> <p><input type="checkbox"/> 76</p>
<p>Computers</p> <p><input type="checkbox"/> 5</p> <p><input type="checkbox"/> 17</p> <p><input type="checkbox"/> 29</p> <p><input type="checkbox"/> 41</p> <p><input type="checkbox"/> 53</p> <p><input type="checkbox"/> 65</p> <p><input type="checkbox"/> 77</p>	<p>Math</p> <p><input type="checkbox"/> 6</p> <p><input type="checkbox"/> 18</p> <p><input type="checkbox"/> 30</p> <p><input type="checkbox"/> 42</p> <p><input type="checkbox"/> 54</p> <p><input type="checkbox"/> 66</p> <p><input type="checkbox"/> 78</p>	<p>Music and Dance</p> <p><input type="checkbox"/> 7</p> <p><input type="checkbox"/> 19</p> <p><input type="checkbox"/> 31</p> <p><input type="checkbox"/> 43</p> <p><input type="checkbox"/> 55</p> <p><input type="checkbox"/> 67</p> <p><input type="checkbox"/> 79</p>	<p>Science</p> <p><input type="checkbox"/> 8</p> <p><input type="checkbox"/> 20</p> <p><input type="checkbox"/> 32</p> <p><input type="checkbox"/> 44</p> <p><input type="checkbox"/> 56</p> <p><input type="checkbox"/> 68</p> <p><input type="checkbox"/> 80</p>
<p>Sports</p> <p><input type="checkbox"/> 9</p> <p><input type="checkbox"/> 21</p> <p><input type="checkbox"/> 33</p> <p><input type="checkbox"/> 45</p> <p><input type="checkbox"/> 57</p> <p><input type="checkbox"/> 69</p> <p><input type="checkbox"/> 81</p>	<p>Talking</p> <p><input type="checkbox"/> 10</p> <p><input type="checkbox"/> 22</p> <p><input type="checkbox"/> 34</p> <p><input type="checkbox"/> 46</p> <p><input type="checkbox"/> 58</p> <p><input type="checkbox"/> 70</p> <p><input type="checkbox"/> 82</p>	<p>Travel</p> <p><input type="checkbox"/> 11</p> <p><input type="checkbox"/> 23</p> <p><input type="checkbox"/> 35</p> <p><input type="checkbox"/> 47</p> <p><input type="checkbox"/> 59</p> <p><input type="checkbox"/> 71</p> <p><input type="checkbox"/> 83</p>	<p>Writing</p> <p><input type="checkbox"/> 12</p> <p><input type="checkbox"/> 24</p> <p><input type="checkbox"/> 36</p> <p><input type="checkbox"/> 48</p> <p><input type="checkbox"/> 60</p> <p><input type="checkbox"/> 72</p> <p><input type="checkbox"/> 84</p>