

LAUNCH YOUR ROCKET!

Grades 4-8, Day 3

WELCOME

(5 min)

STEM READER'S THEATER

(30-40 min)

Materials:

- Print one copy of "Day 3: Lift-Off!"
- Three pairs of scissors
- One roll of tape



STEM GAME

(20 min)

Materials:

- 1 handout "Star Boxes" Game for every two students)

LAUNCH YOUR OWN ROCKET

Introduction: Welcome your students. Be friendly.

READ VOYAGE THROUGH THE GALAXY

Read Day 3 of Voyage through the Galaxy with your students. Talk about the story and let volunteers listen to act out their part.

Prepare beforehand: Print out one copy of "Day 3: Lift-Off!" from the story. Gather scissors and tape.

What you'll do:

1. Setup storytelling props (10 min):

Call up volunteers to help with the reader's theater. Ask students to cut out the story props found in the story document.



2. Assign a volunteer actor to handle each prop for story time.

3. Read the story to your students. Guide your volunteer prop holders in following the acting instructions written in red and behind the props as you read.

4. Discuss the story with your students following the discussion question prompts printed underneath the story text.

PLAY "STAR BOXES"

What you'll do:

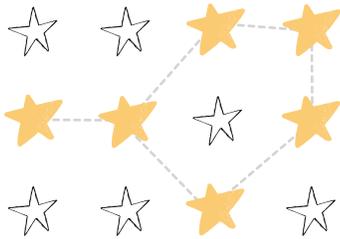
Students play as pairs. They takes turns drawing a line (a "beam of starlight") between two neighboring stars. They can draw the line up, down, or side-to-side but not diagonally.



Say: **The game we are playing today was first called La Pipo-Pipette and was invented in the mid-1800s by a French mathematician named Édouard Lucas. In French, "pipo" means a little trick or joke, "pipette" hints at careful precision, and the ending "ette" makes the name sound playful and fun.**

STEM GAME

(Continued)



Instructions:

1. Two players take turns drawing a line (a beam of starlight!) between two neighboring stars; up, down, or side-to-side, but not diagonally.
2. Every time a player completes a 4-star box to form a constellation, they mark it with their initials.
3. When all constellations are formed, the player with the most wins! Get an extra point for every yellow star you close in a box and five points if close the North Star First!

SPORTS / GAMES

(20 min)

Materials:

- Four square court (or create one with chalk or masking tape)
- Volleyball

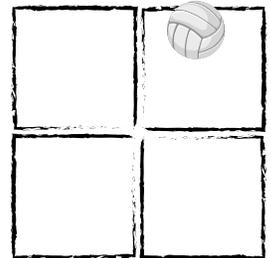


FOUR SQUARE VOLLEYBALL

Say: **The Voyager twins are the farthest and fastest travelers from Earth, carrying messages from humanity into the unknown. First, you connected beams of starlight as you explored the galaxy. Now, we get to play Four Square! Pass the ball, call out names, and keep the “message” moving across your team—just like Voyager carries pieces of Earth on its journey through the galaxy.**

What you'll do:

1. Organize players into groups, with each group assigned to a four square court. If you don't have a four square court draw one with chalk. If needed, create multiple courts.
2. The first four players step into the four squares. The first student in line serves the ball to Player 1.
3. Player 1 calls out another player's name and hits the ball to them. The receiving player must hit the ball to another player, continuing the pattern.
4. If a player misses the ball, they go to the end of the line, and the next player in line takes their place.
5. The game continues until the STEM Coach signals the end.



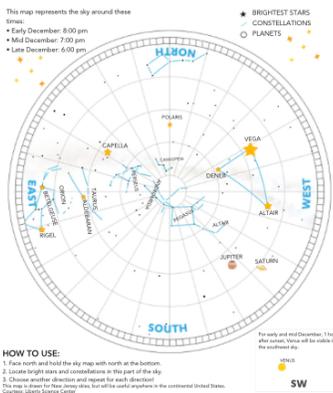
STEM TIME

(60 min)

Materials:

- Slingshot rockets with rubber bands
- December evening sky chart handout

DECEMBER EVENING SKY MAP



LAUNCH A SLINGSHOT ROCKET TO A CONSTELLATION

Objective:

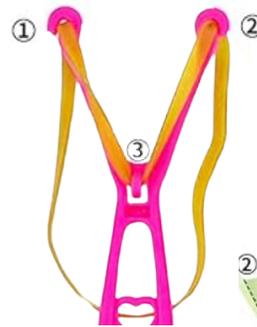
Students practice launching their slingshot helicopters outside.

Say: **The special moment we have been waiting for has finally arrived! It's time to send our mini rockets flying! These tiny rockets can soar over 100 feet—that's like stacking 20 of me! The Voyagers had to follow the stars to stay on course. Let's see if we can use our star chart to navigate and reach a specific destination.**

What you'll do:

Students get their December star sky chart. Use any chairs, hoops or chalk you have available to mark one constellation, for example, Orion. Students have fun flying their rockets but you can also set a challenge to try to land on or near Orion. Students can take their charts home and look for constellations.

1. Students attach the rubber band to the three positions shown in the slingshot, in a Y formation.



2. Students fold the two wings of the helicopter so they twist as they fly. They can turn on the LED light near the bottom battery.



3. Students hook the helicopter on the rubber band and pull it back. When they let go of the rubber band, they launch the helicopter into the air. Do a countdown together a few times, then encourage free play!



Have students run and measure how far it went, and notice how high it goes. Have students compare how different launch angles, rubber band positions, and spiral tightness affect the path of their rocket's flight.

MINI FLIER

(40-60 min)

Materials:

- Mini-fliers
- Any available materials like hula hoops, chairs, a sheet on the fence attached with clips, a bench, etc.



HOVERBALL HUSTLE: DEPLOY AND EXPLORE

Say: **The Voyagers are designed to navigate through space, withstand tough cosmic conditions and fly by planets close enough so they can take high quality photographs to send back to Earth. They must do this while drifting through a vast universe, and NASA scientists need to be able to predict their path of motion. Today, you will design your own obstacle course and fly your mini flier through it!**

What you'll do:

1. Students work in groups. Each team uses easily available materials to design something to fly through, something to fly under, and something to fly over. For example, other team members can hold a hula hoop perpendicular, they can fly under the slide and over a chair. Let teams be creative and circulate to check if the challenges are generally fair.
2. Say: **Here's the catch! Each team will navigate through an obstacle course that the another team designed!**
3. Have students go through each station. For example, if there are 4 groups, Group A will go through Group B, C and D. switching who gets to navigate the mini-flier each time. One student from each station gets to stay back and explain the obstacle course to the pilot from the other group.
4. Optional: Students can fly through their own course as well.
5. The first team to successfully navigate through all four courses wins!
6. Explain: **Today, you got to work just like NASA engineers, carefully assembling, launching, and guiding your Voyager mini-fliers through a space fly-by.** Ask: **Was it easiest to fly under, over or through? Why do you think that is?** (Example: **Flying through or under may have been the most challenging.**)

READ A STORY

(10 min)

Materials:

- Handout: A Jar Full of Stars



STEM CRAFT

(40-60 min)

Materials:

- Origami strips
- Rulers (optional)



READ “A JAR FULL OF STARS”

Read “A Jar Full of Stars” with your students. Talk about the story with your students to prepare for the origami activity where they will make tiny origami stars.

ENGINEER ORIGAMI STARS

Say: **NASA scientists teamed up with Japanese origami artists to design special foldable solar panels for space. Since there isn't much room on rockets, the panels had to fold up small for launch —then unfold wide once they reached space! As the Voyagers venture into the stars, we'll make our own glowing origami stars to light up our classroom and celebrate the season. These little reminders of the Christmas lights twinkling on Earth, are like the Voyagers shining their messages of hope and joy in the universe.**

What you'll do:

1. Students watch this media about the role of origami in spacecraft design.
How NASA Engineers Use Origami To Design Future Spacecraft
<https://www.youtube.com/watch?v=Ly3hMBD4h5E>
2. Read the short story ‘A Jar Full of Sky’ to students at the end of this lesson plan. You can also call on students to read one paragraph at a time at the front of the class.
3. Each student gets 5-7 strips. Say: Write a wish on your strips!
4. Students watch only the first 2 min of this video.

Instructions to make a Paper Star. Origami Star tutorial

<https://www.youtube.com/watch?v=A5ThJ128GZo>

Students make all their flat stars first.

5. Then, play the rest of the video to puff the stars. Measure one flat strip and one folded star. *Extension: You can make a class garland to decorate your camp classroom or keep these stars in a jar.*

STORY + SLINGSHOT ROCKET



MINI-FLIER PLAY

ORIGAMI STARS

METRIC

MS-PS2-2.

Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object. *Students investigate how changing the launch angle, rubber band tension, and spiral tightness affects the rocket's motion, providing evidence that the motion of an object depends on the forces applied.*

5-PS2-1.

Support an argument that the gravitational force exerted by Earth on objects is directed down. *As students read about the Voyager rocket lifting off, burning fuel, shedding stages, and gliding through space, they understand how the spacecraft's motion depended on the forces acting on it.*

3-5-ETS1-2.

Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5-ETS1-2. (see above)

Crosscutting Concept: Structure and Function

The way in which an object or living thing is shaped and its substructure determine many of its properties and functions.



A Jar Full of Stars

This story is based on a popular Japanese legend, Hoshi and the Legend of Origami Lucky Stars.

In a quiet Japanese village, Hoshi was the kind of girl who didn't just look at the stars—she listened to them. Long after the lanterns had been snuffed out and the rice fields shimmered in the moonlight, Hoshi would tiptoe outside, lie flat on the grass, and stare up at the sky.

The stars, scattered like wildflower seeds tossed by wind, made her feel less alone. Hoshi thought of them as friends—steady, quiet ones who kept their glow even when the world below was too tired to notice.

One night, as Hoshi lay in her cocoon of starlight, something changed. The stars began to fall—not one or two—but dozens, then hundreds, tumbling from above her like tears. Hoshi sat up, heart racing, the air thick with the soundless pitter-patter of the fallen, lost stars. Her chest tightened with a feeling she didn't have a name for yet. She ran home—not for comfort, but for paper and a jar.

Back on the hillside, her small fingers folded carefully, crafting the shapes of the stars she loved. One by one, she creased the paper into tiny points, and each time she tucked the final fold, she whispered a kind of prayer: *Come back. Stay with us. Please!*





By sunrise, her jar held one hundred paper stars, but it wasn't enough. The next night, the sky was nearly empty. A thin hush hung over the fields, and the few stars that remained seemed too weak to shine.

Hoshi knew she couldn't do this alone, so she ran through her village, knocking on doors, waking every sleepy child. She told them what had happened and asked for their help. And they came.

That night, the children sat beneath the thinning sky, the glow of lanterns at their backs and cool wind in their hair. They folded in silence, each crease a kind of hope, each paper star they made was a message to the sky: *We see you. We remember. Shine!*



By midnight, the children had two thousand paper stars tucked into jars. And then, as if the universe had been listening all along, new stars began to return to the sky—one by one, then many, blooming like fireflies in the ink of night. The sky filled and the children smiled.

“These are lucky stars,” Hoshi said softly, her voice barely louder than the wind in the grass. “Every time a lucky paper star is made, a new star is born in the night sky.”

From that day on, folding a paper star isn't just an art—it's a promise. A promise to keep the sky full. A promise to remember what matters.



Play "Star Boxes!"

Draw straight lines between stars and write your initials every time you close a box. Write your initials and see which explorer wins!

Score: _____
Explorer 1: _____
Explorer 2: _____

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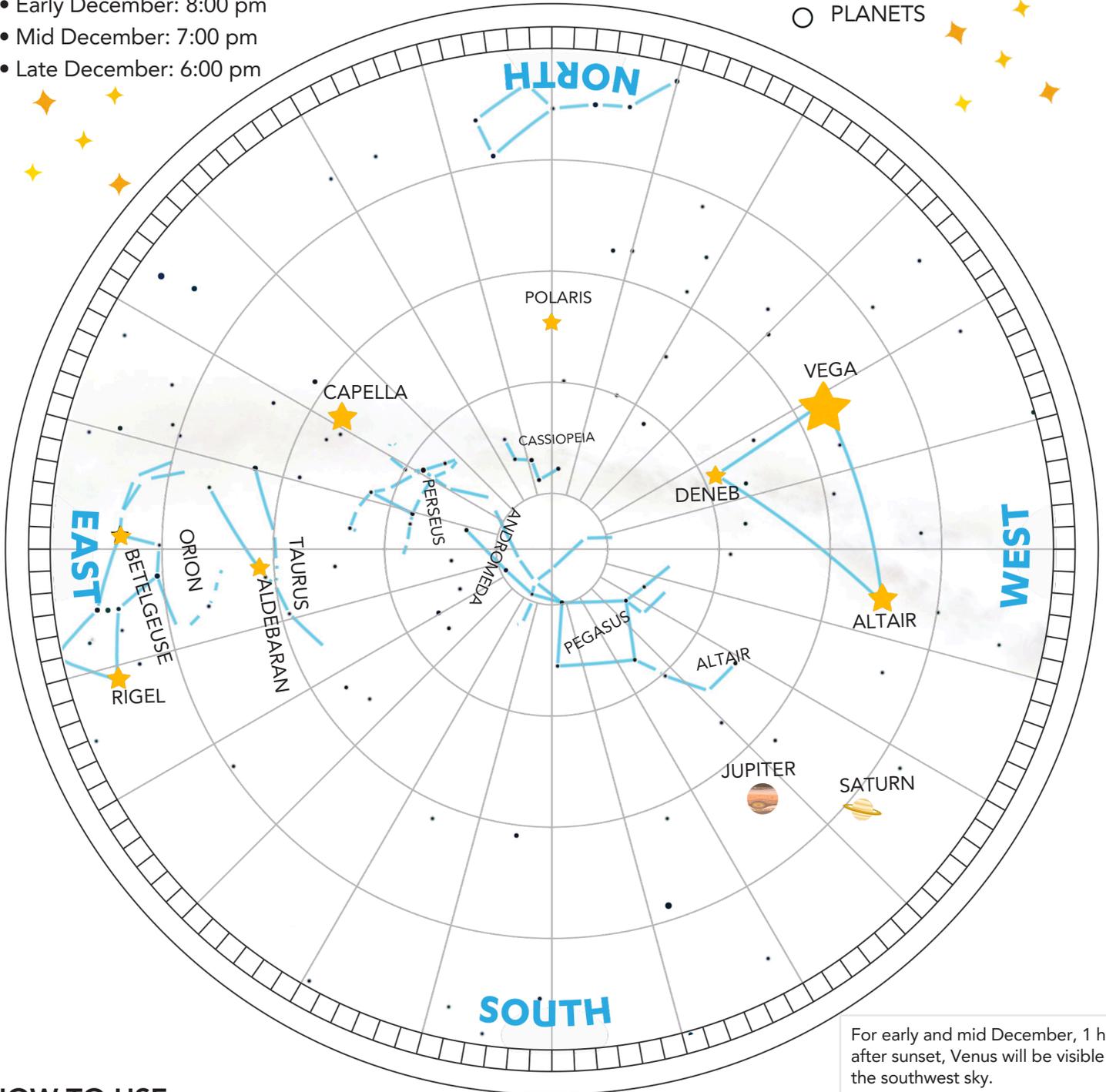


DECEMBER EVENING SKY MAP

This map represents the sky around these times:

- Early December: 8:00 pm
- Mid December: 7:00 pm
- Late December: 6:00 pm

- ★ BRIGHTEST STARS
- CONSTELLATIONS
- PLANETS



HOW TO USE:

1. Face north and hold the sky map with north at the bottom.
2. Locate bright stars and constellations in this part of the sky.
3. Choose another direction and repeat for each direction!

This map is drawn for New Jersey skies, but will be useful anywhere in the continental United States.
Courtesy: Liberty Science Center

For early and mid December, 1 hour after sunset, Venus will be visible in the southwest sky.



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