EDUCATION @ MESA ARTS CENTER

BILL BLAGG'S MAGIC IN MOTION

Ikeda Theater | November 14 | 10 AM & 11:50 AM | Grades: 1-6
Piper Theater | November 15 | 10 AM & 11:50 AM | Grades: 1-6

2019/2020 EDUCATOR RESOURCE GUIDE

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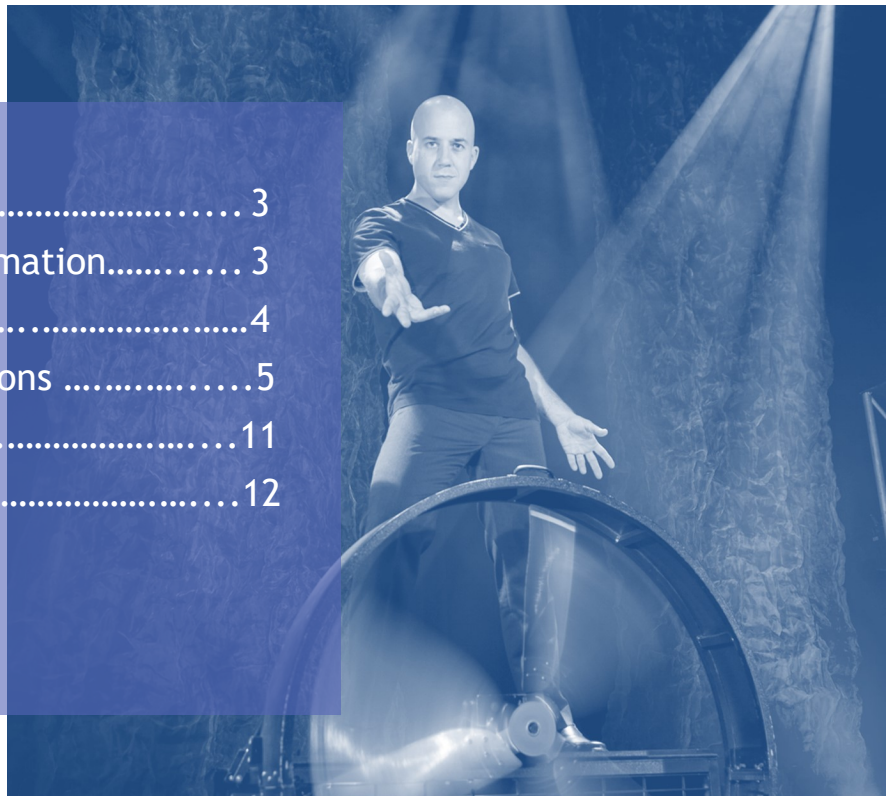

TABLE OF CONTENTS

ABOUT MAGIC IN MOTION...

For centuries magicians have used scientific principles to make people levitate in mid-air and vanish in the blink of an eye. Illusionist Bill Blagg's one-of-a-kind educational experience, *Magic in Motion,* takes students on a rare, never-before-seen journey "behind the scenes" of the magic world. Students will discover firsthand how magicians use science to create the impossible! Students will use science to become stronger than their teachers, stop moving objects with their mind, and even make a cell phone travel through time! *Magic in Motion* is designed to excite, educate, intrigue, and promote students to think "outside the box" and spawn their curiosity about how science and the Scientific Method are used by magicians to create the impossible!

ABOUT BILL BLAGG...

Bill Blagg is now one of the nation's top touring illusionists but he became interested in magic from a very young age. His first professional magic book was from his great-grandfather which led to Bill learning how to build magic props with his dad. Even though he began performing magic professionally at the young age of sixteen, Bill still went on to graduate from college with honors before touring the nation with his magic and illusion shows. Bill's energetic, engaging personality brings added sparkle to his already incredible and mind bending illusions. Get ready to gasp in amazement as Bill shows you some magical science!

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WELCOME!

Dear Educator,

Thank you for selecting a **Performing Live for Students!** field trip with the Mesa Arts Center. We have a dynamic season planned and we look forward to connecting you to our many artists and performances. With Performing Live, students are able to experience live theatre and make educational connections well beyond the classroom.

We also recognize and appreciate the energy and time spent on your part in coordinating field trips. In this guide we have provided information to help make this the best experience possible.

In addition, the Mesa Arts Center has many open and inviting spaces that make good places to hold a brown bag lunch. No prior arrangements need to be made.

Please contact our offices at engagement@mesaartscenter.com or 480-644-6564 should you have any additional questions.

Enjoy the show!

TEACHER AND CHAPERONE INFORMATION

Chaperones

- Assign each chaperone a designated group of students and provide him/her with a written list of the students in that group.
- Ask chaperones to stay with their assigned group throughout the field trip. Adult chaperones are responsible for the students' conduct and behavior throughout their visit to the Center.
- Please review theater etiquette rules and responsibilities with all chaperones.
- Have the phone numbers of every chaperone in your group to quickly access each other in case of emergency.

Theater Etiquette

- No Food or Drink inside the theatre (besides bottled water).
- Students must be accompanied by chaperones at all times.
- Cameras and recording devices may not be used during the performance.
- Please silence cell phones and resist the urge to text message.
- Listening and following the House Managers and Ushers will help the seating and dismissal process.
- Feel free to laugh, clap and enjoy the show but also to be respectful of those around you.

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CURRICULUM CONNECTIONS

Bill Blagg — The Science of Magic

Arizona's College and Career Ready Standards

These standards can be achieved through discussion questions and by participating in the study guide.

Speaking and Listening

Grades 1-6.SL.1 — Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

Grades 1-6.SL.2 — Ask and answer questions about key details in a text read aloud or information presented orally or through other media.

Math

2.NBT.B.7 — Demonstrate understanding of addition and subtraction within 1000, connecting objects or drawings to strategies based on place value (including multiples of 10), properties of operations, and/or the relationship between addition and subtraction.

3.NBT.A.2 — Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

4.NBT.B.4 — Fluently add and subtract multi-digit whole numbers using a standard algorithm.

Mathematical Practice 7 (MP7) — Look for and make use of structure

Science

Strand 1 of the Science standards lays out the Inquiry process for students in grades 1-6. Performance objective details vary by grade but the general goals of each Concept are below:

SC-S1C1 — Observe, ask questions, and make predictions.

SC-S1C2 — Participate in planning and conducting investigations, and recording data.

SC-S1C3 — Organize and analyze data; compare to predictions.

SC-S1C4 — Communicate results of investigations.

Also specifically for 3rd grade:

SC03-S5C3-01 — Demonstrate that light can be reflected (with mirrors).

SC03-S5C3-02 — Describe how light behaves on striking objects that are: transparent, translucent, and opaque.

PRE-PERFORMANCE CLASSROOM ACTIVITIES

Included in this resource guide are a variety of activities created to correspond with the Arizona College and Career Readiness Standards to enhance the students' growth, reading skills, and overall comprehension.

Questions to Ponder…

Question 1 – What is magic? Do any of you know how to do a magic trick? If so, what makes it "magic"? (**Grades 1-6.SL.1**)

Question 2 – How do magicians create magic tricks? Do they have magical powers or are they using science to trick us? (**Grades 1-6.SL.1**)

Activities to Explore…

Magicians use the scientific method when they are trying to find out if a magic trick will work. Try the Mobius strip experiment on page 7 to introduce your students to the scientific method if they are not familiar with it. If they already are familiar with the scientific method, the Mobius strip experiment can still be surprising – even for adults!

Standards Implemented: Grades 1-6 SC-S1C1, SC-S1C2, SC-S1C3, SC-S1C4
Approximate time: 45-60 min
Materials needed are detailed on page 7.

Magicians use science to fool their audience into thinking magic is real. Using light is a common way to help create an illusion. Try the penny trick on Page 8 to use light and water to make a penny disappear!

Standards Implemented: Grades 1-6 SC-S1C1, SC-S1C2, SC-S1C3, SC-S1C4, SC03-S5C3-02
Approximate Time: 15-20 min
Materials needed are detailed on page 8.

Light and water can also give the illusion of breaking objects without actually breaking them. Try the broken pencil trick on page 8 to show your students how light and water can work together to create science magic!

Standards Implemented: Grades 1-6 SC-S1C1, SC-S1C2, SC-S1C3, SC-S1C4, SC03-S5C3-02
Approximate Time: 15-20 min
Materials needed are detailed on page 8.

POST-PERFORMANCE CLASSROOM ACTIVITIES

Questions to Discuss

Question 1 — Now that you've seen the show, how do magicians create tricks? Do their tricks always work? **(Grades 1-6.SL.1, Grades 1-6.SL.2)**

Question 2 — Mirrors are important to many magic tricks. How can magicians use mirrors to make magic? **(Grades 1-6.SL.1, Grades 1-6.SL.2, SC03-S5C3-01)**

Question 3 — After everything that Bill taught us in the show, do you think the teacher was really floating in mid-air at the show? What hypothesis do you have for how the teacher was able to float? **(Grades 1-6.SL.1, Grades 1-6.SL.2; Grades 1-6 SC-S1C1)**

Activities for the Classroom

Causing objects to float in the air is a common magician's trick. With the Floating Egg trick on page 9 you may not be able to make the egg float in the air, but you can use some science knowledge to make the egg float in water!

Standards Implemented: Grades 1-6 SC-S1C1, SC-S1C2, SC-S1C3, SC-S1C4
Approximate Time: 15-20 min
Materials needed are detailed on page 9.

Air can be a powerful tool in magic tricks. Try out the Keeping Dry trick on page 9 to show your students one of the amazing properties of air.

Standards Implemented: Grades 1-6 SC-S1C1, SC-S1C2, SC-S1C3, SC-S1C4
Approximate Time: 15-20 min
Materials needed are detailed on page 9.

Utilizing math can make for some powerful magic tricks as well. Amaze your students with your mental powers by trying out "I've Got Your Number" on page 10. Then have the students try it themselves and see if they can figure out why and how the trick works.

Standards Implemented: 2.NBT.B.7, 3.NBT.A.2, 4.NBT.B.4, MP.7
Approximate time: 20-30 min
Materials Needed: Directions on page 10, pencils and paper or whiteboards and markers

MOBIUS STRIP EXPERIMENT

In this experiment students will go through the scientific method to solve a problem and reach a conclusion.

You will need per student or pair/group of students:

- A sheet of 8.5 x 11 paper, scissors, pencils, tape

Observation & Question

If I cut something in half, then I have two separate but equal pieces. This is a fairly basic concept in math that students should be familiar with. Discuss some examples with the students if needed.

Can I cut a strip of paper in half and have a different outcome?

Tell students that they will be making three different rings of paper and predicting the outcome of cutting them in two. One ring will be made with no twist, one ring with half a twist before taping, and the last ring with a full twist before taping.

Hypothesis/Experiment

Students will need to create their rings before they can make an informed prediction (hypothesis). To assemble rings follow these steps:

1. Cut three 1 inch strips from the long side of the piece of paper.
2. Create the first ring by just taping it end to end to make a circle.
3. Create the second ring by turning the end of the paper one time before taping the ends together to create a ring. Be sure to tape across the entire width. This is the half twist ring.
4. Create the third ring by turning the end of the paper two times before taping the ends together to create a ring. Be sure to tape across the entire width. This is the full twist ring.
5. Have students draw a line down the middle of each ring and continuing it until it reaches the tape again.

Give students time to look at the rings and explore them before predicting. They can record observations about their rings and then make a hypothesis about what will happen when they cut each ring.

Analysis & Conclusion

Now have students fold a small section of the first ring and snip along the line. Then they should unfold the ring and put the scissors through the cut that was made so the line can be cut lengthwise by the scissors following the line all the way around and back to the tape. Have students record the results for the first strip and repeat the steps for cutting with the other two strips.

Discuss the outcomes with students, they may be surprised and confused about the results. Have them compare and analyze their results with their hypothesis. The Mobius strip is the second ring because by creating the half twist the paper only has one edge and one side. Real life applications of the Mobius strip are filmstrips and machinery belts. In the past Mobius strips were used for typewriter ribbon, printer cartridges, and continuous loop recording tapes to make more long lasting products since both sides of would be utilized. Students can research Ferdinand Mobius or topology to find out more!

LIGHT AND WATER TRICKS

The Disappearing Penny

Materials
Quart (liter) jar with lid, tap water, penny, helper

The Setup
1. Fill the jar with tap water. Put the lid on the jar.
2. Place the jar and penny on the table in front of you.

Magic Science Time!
1. Get a student from the class to assist you.
2. Have the student examine the penny and confirm that it's a real penny.
3. Have the student place the penny on the table. Ask "Can you see it?"
4. Place the jar filled with water on top of the penny.
5. Have the class predict if the student will still be able to see the penny.
6. Have the student look through the water from the side of the jar and see if the penny is there or gone.

Discussion
- Where did the penny go?
- Why can't the student see the penny through the clear water?

Explanation
When light travels from air to water, light bends toward the normal, a line perpendicular to the surface. Traveling from water to air, light bends in the opposite direction, away from the normal.
This trick works because at a certain angle, when light travels from a more dense substance (water), to a less dense substance (air), it no longer refracts but will reflect. **Reflection** is the bouncing back of light from a surface. When the image of the penny comes toward the side surface of the jar at too great an angle, reflection rather than refraction occurs, and the image cannot be seen outside of the jar.

The Broken Pencil

Materials
A glass, tap water, pencil

The Setup
1. Fill the glass about two-thirds full of tap water.
2. Place the glass of water and pencil on the table.

Magic Science Time!
1. Hold the pencil in front of you. Tell the class, "I am going to break the pencil by simply sticking it in this glass of water."
2. Hold the pencil upright in the water so that the tip is about halfway between the surface of the water and the bottom of the glass. Make sure the pencil is near the back of the glass, away from the class.
3. Move the pencil back and forth in the water, keeping it upright. Ask them what they see. It will appear as though the pencil is broken when in the water.
4. Remove the pencil from the water

Discussion
- Did the pencil really break when it was placed in the water?
- If not, then why did it look like the pencil was split in half?

Explanation
This trick works because of **refraction**. Light travels in straight lines, but when it travels from one transparent substance to another the light rays bend. This is refraction. When light travels from a more dense transparent substance, such as water, to a less dense substance, such as air, the light refracts, or bends noticeably. Light travels at different speeds in substances with different densities.
Light reflected from the pencil appears to the class to be in one place when it travels to their eyes through the air, and in another place when it is refracted through water.

Adapted from *Bill Blagg: The Science of Magic Resource Guide*

The Floating Egg

Materials
Quart (liter) jar, tap water, scissors, ruler, masking tape, ½ cup salt, felt-tip pen, uncooked egg, large spoon

The Setup
1. Fill the jar half full of water
2. Cut a 3" piece of tape and stick it to the outside of the salt container. Use the pen to write on the tape, "Magic Swimming Powder."
3. Place the egg and spoon on the table.

Magic Science Time!
1. Tell the class, "I am going to teach an egg how to swim."
2. Begin by showing the class that the egg doesn't know how to swim by placing the egg in the jar filled with tap water. The egg will sink to the bottom. Remove the egg from the jar with the spoon.
3. Tell the class that for the egg to swim you need to add magic swimming powder to the water. Pour the salt in the water and stir with the spoon. Have the class help you say some magic words!
4. Place the egg in the water. The egg will float!

Discussion
- How did the magic powder help the egg float?
- What was created by mixing the powder in the water?
- Why didn't the egg float without the powder?

Explanation
All matter floats or sinks depending on its density. Less dense substances float on more dense substances. The egg floats in salt water because the egg is less dense than the salt water. However, the egg is denser than tap water, so it sinks.
Salt water is a **solution** that contains both salt and water. A solution occurs when a solid is dissolved in a liquid.

Keeping Dry

Materials
Paper towel, drinking glass, plastic tub or bucket filled with enough tap water to reach the height of the glass

The Setup
1. Place the materials on the table

Magic Science Time!
1. Crumple the paper towel and place it in the bottom of the glass.
2. Turn the glass over and make sure that the paper will stay in place at the bottom of the glass.
3. Slowly lower the upside-down glass into the tub of water. Keep the glass as straight up and down as possible, until the entire glass is under the water.
**Good time for discussion topic #1*
4. Take the glass out of the water and let the water drip off the glass.
5. Turn the glass right side up and remove the paper towel. Let the students feel the paper towel to determine if it is wet or dry.

Discussion
- Will the paper towel in the cup get wet? Why or why not?
- Why didn't the paper towel get wet when it was placed in the water?

Explanation
Air takes up space. The glass is filled with air when it's right side up and when it is upside down. When you turn the glass over and slowly lower it into the water, air remains in the glass.
The water cannot enter the glass because of the air inside the glass. The air creates pressure that is greater than the pressure of the water trying to get in. The towel in the top of the glass stays dry. If you were to tilt the glass on its side in the water, air would exit the glass and form bubbles. Water would then be able to enter the glass and soak the paper towel.

Adapted from *Bill Blagg: The Science of Magic Resource Guide*

I'VE GOT YOUR NUMBER ACTIVITY

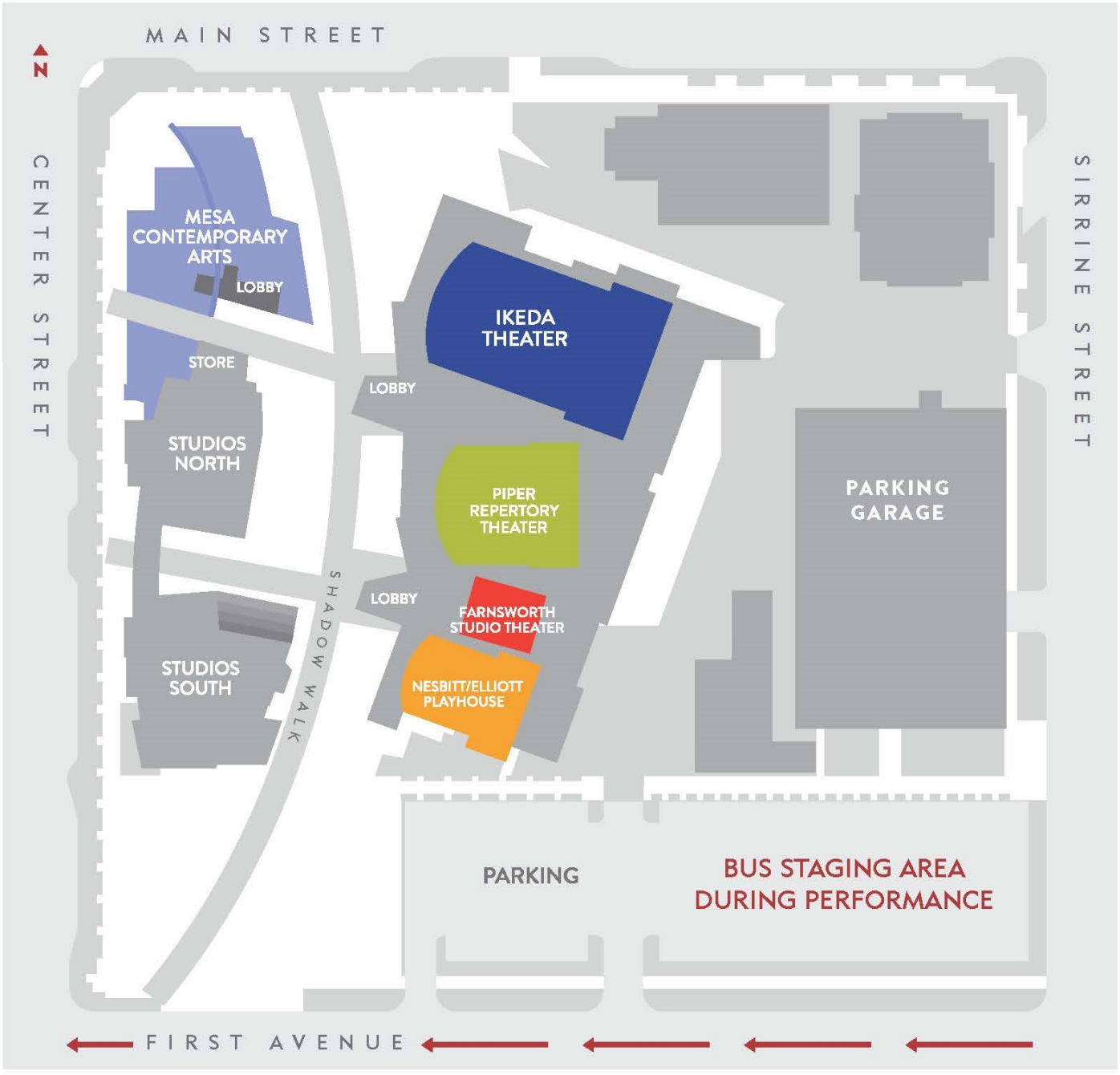
Tell your class that you can read their minds. Use this number pattern trick to make it appear that you know the answer to the math problem they solve secretly.

1. Choose a student volunteer.
2. Have the student secretly write down a three digit number on a piece of paper or whiteboard. The number needs to have all different digits. For example, 573 is okay but 334 is not. If you like the student can show this to the rest of the class as long as you can't see the number.
3. Now have the student reverse the number and write that down as well. So if the number was 573 then the new number is 375.
4. Tell the student to subtract the smaller number from the larger one.
5. Have the student tell you the last digit in the answer and using the information below you should be able to then correctly say the entire answer to the class. *The pattern trick: When you take a three digit number, reverse it, and subtract the smaller the middle digit is always 9. Also the two outside digits always add up to 9 so if the student tells you the last digit you can either subtract that from 9 to find the first digit or use fact families for 9 to find the first digit. So with the example number 573 you would subtract 375 and get 198. If the student told you 8 you would already know the middle digit is 9 and find the first digit by solving either 9-8=1 or 8+ ? =9. Then you would know the answer is 198 without knowing either of the other numbers. Amazing! If a student happens to pick a number with a 9 in the middle and consecutive numbers on the number line in the hundreds and the ones (like 695) then the answer will be 99 every time. So if the student says the last digit is 9 then the answer must be 99.*
6. After student amazement calms down, teach them the trick and have them try it out themselves. Ask students if they can figure out why the middle digit is always 9! Also see if they can figure out why certain numbers give them the answer of 99.

Adapted for the classroom from *Magic Up Your Sleeve* by Helaine Becker

BUS PARKING MAP

MESA ARTS CENTER



STEPS TO UNLOAD

1. Enter the drop off area by coming in westbound on 1st Avenue.
2. Pull up to the curb marked with cones and wait until notified to unload passengers.
3. Await parking direction from MAC security

STEPS TO PICK UP

1. Passengers will exit the theater and meet buses in the bus parking lot area.
2. Wait for clearance to depart.

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THANK YOU!

Questions? Please contact Engagement at:

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