

Tour:

Math to the Moon

Destination:

Johnson Space Center - Houston, Texas, USA

Specialization:

Math, Robotics, Engineering, Physics, Science & Design

Itinerary:

7-days/6-nights in Houston, Texas

Availability:

Year-round; Sunday departures

Math to the Moon with NASA - Johnson Space Center							
Day		Morning		Afternoon		Evening	
1	Sun	Travel to Houston; transfer to hotel and check-in			Welcome & Safety Orientation	Dinner on Own to accommodate late arrivals	
2	Mon	Team Briefing - Welcome to NASA	JSC Private Tour	One-stage Rocket Build	Thermal & Cryogenic Design Challenge	Free Time	Pizza Party
3	Tues	Rocket Launch	Lunar Habitat Challenge			Local Dinner	Baybrook Mall
4	Wed	NASA Guest Speaker	Robotic Design, Construction & Coding			Dinner & Bowling	
5	Thur	Neutral Buoyancy Lab Tour	Robotics Competition	Astronaut Training / Dive Session		Local Dinner	Movies / Cinema
6	Fri	Brunch with an Astronaut with Q&A	Starship Gallery Tour & Independence Plaza Tour	Graduation Ceremony	Free time to explore Space Center Houston Museum	Dinner & Kemah Boardwalk	
7	Sat	Depart Houston, Texas for Home					



As with all sample itineraries, please be advised that this is an 'example' of a schedule and that the activities and hotels shown may be variable dependent upon dates, weather, special requests and other factors. Itineraries will be confirmed prior to travel.

OVERVIEW: Students participating in **Math to the Moon** will experience a 5-day mathematics mission at NASA's Johnson Space Center. Walk in the footsteps of incredible mathematic heroes as we take a good look at math through the eyes of NASA. Create and launch a rocket, spend a day with robotics construction and coding, build a thermal heat shield and more. Each day will be spent inspired by the elements of Space Center Houston. During our program we will experience life just as a working NASA team does - operating within a NASA budget, knowing that funds or supplies for your projects may be decreased at any time due to budget cuts, safety regulations, or any other experience representative of the real NASA world. It's a truly awesome week dedicated to Math, Robotics, Physics and STEM studies.

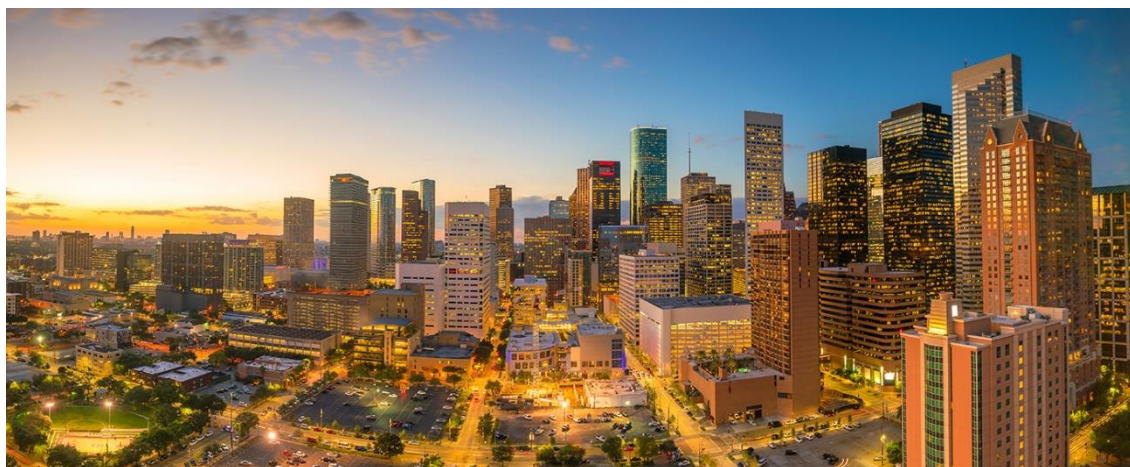
Key Math Initiatives: Robotics, Computer Coding, Trigonometry, Geometry, Algebra, Physics, Engineering, Graphing and Measurement

Skills Required: Teamwork, problem solving, fiscal responsibility, communication, adaption to unexpected problems, the drive to be successful, and most importantly, the ability to have fun through STEM elements!

Day 1

Dinner on Own

Houston.... A sprawl of concrete and superhighway? Intense summer heat? Yes - Houston has some of that. But the USA's fourth-largest city (5 million in the metro area) is also a multicultural, zoning-free hodgepodge where in one strip mall there might be a Vietnamese grocery, a Venezuelan empanada stand and a big-beef meat market. Eat at great ethnic restaurants or shop in arts-and-antiques neighborhoods. See world-class paintings and funky folk car parades. Then just down the road a bit you can walk the beaches of Galveston Island and visit the astronauts at Space Center Houston. Often described as a "sprawling Texas town," the greater Houston area covers more ground than any other major city in America.



Houston is a city whose very existence has always depended on wild speculation and boom-and-bust excess. Founded on a muddy mire in 1837 by two real estate-booster brothers from New York – their dream was to establish it as the capital of the new Republic of Texas – Houston was soon superseded by the more promising site of Austin, even while somehow establishing itself as a commercial center. Oil, discovered in 1901, became the foundation, along with cotton and real estate of vast private fortunes, and over the next century wildly wealthy philanthropists poured cash into swanky galleries and showpiece skyscrapers. Locally produced oil and gas products exported from the Houston Ship Channel have long fueled the city.



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A Hammock Expeditions Company
North Carolina, USA

P: 417.598.9598
E: info@STEMstudytours.com
W: www.STEMstudytours.com

In 1958, President Lyndon Johnson (a Texan) located the National Aeronautics and Space Administration (NASA) here. Houston is also a multicultural city home to some of the nation's largest Asian, Arab and Latin American populations. But its culture is not limited to diverse population — it also boasts a world class symphony and theater district that includes a full-time ballet company and opera.

Houston is a beast of a place, choked with rings of highways and high on humidity. Despite this, its sheer energy, its relentless Texas pride, and above all, its refusal to take itself totally seriously, lends it no small appeal. For visitors, its well-endowed museums, highly regarded performing arts scene, and decent nightlife mean there is always something to do. www.visithoustontexas.com

Did you know?

- ✓ Houston is the fourth most populous city in the nation (trailing only New York, Los Angeles and Chicago), and is the largest in the southern USA.
- ✓ If Houston were an independent nation, it would rank as the world's 30th largest economy.
- ✓ Houstonians eat out more than residents of any other city. While here you can choose to indulge in one of the more than 11,000 restaurants ranging from award-winning and upscale to memorable deli shops.
- ✓ Houston has a Theatre District second only to New York City with its concentration of seats in one geographic area. Located downtown, the 17-block Theatre District is home to eight performing arts organizations with more than 12,000 seats. Houston has more than 500 cultural, visual and performing arts organizations.
- ✓ More than 90 languages are spoken throughout the Houston area.
- ✓ Houston is home to the Houston Livestock Show and Rodeo. The largest rodeo in the world, it attracts more than 1.8 million visitors each year.
- ✓ Houston is home to the Texas Medical Center, the largest medical center in the world, with a local economic impact of \$10 billion. More than 52,000 people work within its facilities, which encompass 21 million square feet. Altogether 4.8 million patients visit them each year.
- ✓ When comparing Houston's economy to a national economy, only 21 countries other than the United States have a gross domestic product exceeding Houston's regional gross area product.
- ✓ Home to more than 5,000 energy related firms, Houston is considered by many as the Energy Capital of the world.
- ✓ The Port of Houston is the tenth largest port in the world.



Groups will generally arrive in Houston in the late afternoon.



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HOTEL OPTIONS

Please let us know the specific hotel you wish for your lodging to be located in when requesting a quote. **Each option has a different evening meal and activity plan associated with the property.** Your hotel accommodation will be confirmed to you after initial deposits are received.

Sample Hotel – Springhill Suites Houston NASA / Webster - Just 3-miles from the Johnson Space Center, the Springhill Suites hotel provides easy access to several attractions nearby. All rooms contain two queen beds plus a pull-out sofa sleeper. Students will sleep quad occupancy; staff will sleep double occupancy. Amenities include free high-speed internet access, cable television, hair dryers, in-room coffee maker, mini-fridges and microwaves, business center, guest laundry, small outdoor pool, sundry shop and meeting rooms. [WEBSITE](#)



Sample Hotel – Courtyard by Marriott – This lovely hotel is located directly across the street from the Space Center allowing for participants to **walk** (approximately 5 minutes) to their daily sessions. Amenities include ergonomic workspaces, complimentary high-speed Wi-Fi access, an in-house Bistro & Bar, a sparkling outdoor pool, 24-hour fitness center, convenience shop and more. Students will sleep quad occupancy in rooms with 2 queen beds; staff will sleep double occupancy. You'll want to have everyone bring rain gear in case of inclement weather as we will be walking to the space center daily. [WEBSITE](#)



Sample Hotel – Holiday Inn – This fabulous property has contemporary rooms featuring desks and flat-screen TVs, plus microwaves, minifridges and coffeemakers. The property has free WiFi, an on-site restaurant and bar, fitness center, indoor pool and hot tub, sundry shop, guest laundry and more. It's conveniently located near the Baybrook Mall (1.5 miles). Students will sleep quad occupancy in rooms with 2 queen beds; staff will sleep double occupancy. Breakfasts and most dinners will be served at the hotel. [WEBSITE](#)



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All breakfasts will be served at your hotel. When selecting your preferred lodging property, please know that each of our hotels offers an independent evening dining and activity plan. Choose the option that best suits your group's needs but please be advised that activities are always subject to change.

SPRINGHILL SUITES GROUPS	COURTYARD GROUPS	HOLIDAY INN GROUPS
SUN - Dinner on own to accommodate flight times	SUN - Dinner on own to accommodate flight times	SUN - Dinner on own to accommodate flight times
MON - Pizza Night	MON - Pizza Night	MON - Pizza
TUES - Dinner & Baybrook Mall	TUES - Dinner & Baybrook Mall	TUES - Hotel Dinner & Bingo or Swimming
WED - Dinner & Bowling	WED - Dinner & Bowling	WED - Catered Dinner at Hotel & Bowling
THUR - Dinner & Cinema	THUR - Dinner & Open Evening	THUR - Hotel Dinner & Quiz, Talent or Presentation
FRI - Dinner & The Kemah Boardwalk	FRI - Dinner & The Kemah Boardwalk	FRI - Dinner & The Kemah Boardwalk

After check-in, we'll have our Welcome, Safety & Orientation Meeting. Dinner is on your own this evening to accommodate various arrival times. If you would like us to make a reservation on your behalf, simply let us know. We are delighted to help and have great dining options set up for just this reason. Groups will want to get a great night's rest this evening because tomorrow, it's full steam ahead with Math to the Moon at Space Center Houston!

Days 2 through 6

Breakfast, Lunch & Dinner

Rise and shine Houston! We'll kick off our week by learning a bit about NASA's Johnson Space Center on a private tour.

Johnson Space Center – The Lyndon B. Johnson Space Center (JSC) is the National Aeronautics and Space Administration's (NASA's) center for human spaceflight training, research and flight control. The center consists of a complex of 100 buildings constructed on 1,620 acres (656 ha) in Houston, Texas. Johnson Space Center is home to the United States Astronaut Corps and is responsible for training astronauts from both the U.S. and its international partners. It is often popularly referred to by its central function, 'Mission Control.'



The center, originally known as the Manned Spacecraft Center, was constructed on land donated by Rice University and opened in 1963. On February 19, 1973, the center was renamed in honor of the late U.S. president and Texas native, Lyndon B. Johnson. JSC is one of ten major NASA field centers.

Johnson Space Center has its origins in legislation shepherded to enactment in 1958 by then-US Senator Lyndon Johnson. After President John F Kennedy made the goal in 1961 to put a man on the Moon by the end of the decade, the Space Task Force was formed to lead the Apollo Project. The group would need test facilities and research laboratories suitable to mount an expedition to the moon. In July 1961, NASA Administrator James



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Webb headed the site selection team. Requirements for the new site included the availability of water transport and an all-weather airport, proximity to a major telecommunications network, availability of established industrial workers and contractor support, an available supply of water, a mild climate permitting year-round outdoor work and a culturally attractive community. Houston was selected and announced in September 1961. The land for the new facility was donated by Rice University and was situated in an undeveloped area 25 miles (40 km) southeast of Houston near Galveston Bay. Construction of the center began in April 1962 and the facility was officially opened for business in September 1963. When opened, the 1,620-acre (660 ha) facility was originally designated the Manned Spacecraft Center (MSC) and was to be the primary center for U.S. space missions involving astronauts.

The center's Mission Control Center has been the operational hub of every American human space mission since Gemini IV. The control center manages all activity on board the spacecraft and directs all space shuttle missions. Mission Control Center was constructed in 1962. By 1965, JSC was fully operational and has been responsible for coordinating and monitoring every crewed NASA mission since the Gemini Project.



In addition to housing NASA's astronaut operations, JSC is also the site of the former Lunar Receiving Laboratory, where the first astronauts returning from the moon were quarantined, and where the majority of lunar samples are stored. The center's Landing and Recovery Division operated MV Retriever in the Gulf of Mexico for Gemini and Apollo astronauts to practice water egress after splashdown.

The Johnson Space Center is home to Mission Control Center, the NASA control center that coordinates and monitors all human spaceflight for the United States. MCC directs all Space Shuttle missions and activities aboard the International Space Station. The Apollo Mission Control Center, a national historical monument, can be found in building 30. From the moment a spacecraft clears its launch tower until it lands back on earth, it is in the hands of Mission Control. The Mission Control Center houses several Flight Control Rooms, from which Flight Controllers coordinate and monitor the spaceflights. The rooms have many computer resources to monitor, command and communicate with spacecraft. When a mission is underway the rooms are staffed around the clock.

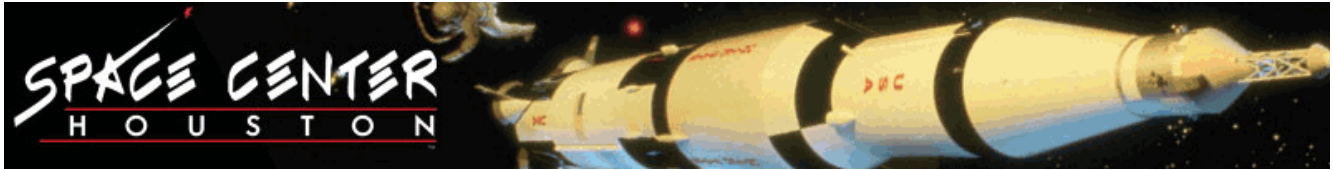
The center also handles most of the planning and training of the US astronaut corps and houses training facilities such as the Sonny Carter Training Facility and the Neutral Buoyancy Laboratory, which is a critical component in the training of astronauts for spacewalks. The Neutral Buoyancy Laboratory provides a controlled neutral buoyancy environment in a very large pool containing about 6.2 million US gallons (23,000 m³) of water where astronauts train to practice extra-vehicular activity tasks while attempting to simulate zero-g conditions. The facility provides pre-flight training in becoming familiar with crew activities and with the dynamics of body motion under weightless conditions.

The visitor's center of Johnson Space Center is Space Center Houston, since 1994.



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Space Center Houston - Space Center Houston is the visitors' center of the Johnson Space Center, NASA's center for human spaceflight activities. www.spacecenter.org

Space Center Houston will be your home for the next five days. Each day we will have the opportunity to work with specialists and astronauts to learn and study in this world-renowned facility. We will be working and competing on PROJECT WORK for Math, Robotics, Engineering, Physics, Space Science and Design objectives. Teachers are encouraged to participate.



Math to the Moon includes the following:

- Exciting math & engineering-based activities
- Behind-the-scenes, hands-on access to "the real thing" with tours of actual astronaut training and work facilities at NASA's Johnson Space Center
- Interactive, project-based learning that includes sustainable habitat construction, strategic scientific planning and investigations, SIM activities, "astronaut training," collaborative teaming and global awareness development
- Brunch with an Astronaut
- Exclusive expert guest speakers with Q&A opportunities
- Graduation certificate and medals for winning team

KEY ASPECTS

"Go" for Launch!

Participants will engineer, build and launch a one-stage rocket. Students will perform stability tests to ensure their rockets are flight-ready and work through calculations to determine apogee, or maximum altitude.

Roving Robotics

Participants will explore and accomplish tasks in space using a robotic rover based on a given set of parameters. Students will learn the math calculations needed to traverse the space field and to use sensors to improve accuracy. They also will translate the mathematic calculations into the coding instructions for their robot to ensure mission success!



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Bring the Heat!

Getting back to Earth is no easy task. Heat shields must withstand temperatures of over 1000 degrees Fahrenheit (537 degrees Celsius) during re-entry into Earth's atmosphere. Students will design, build, test, re-design and re-test heat shields to ensure astronaut safety during re-entry.

Science Modules

In addition to Math, space exploration involves physics, chemistry, biology and many more fields of STEM study. The science modules allow students to accomplish smaller tasks related to revealing the unknowns of space. Participants will work in teams to solve these mysteries and receive bonuses to use in engineering challenges.

NASA Exclusives: Behind-the-Scenes Reality Tours

Students will tour NASA's Johnson Space Center with stops at historic Apollo era Mission Control, Neutral Buoyancy Laboratory and the Space Vehicle Mock-up Facility including its full-size training modules of the International Space Station. They will see rockets up-close that were used in early space exploration and experience the space shuttle replica Independence atop the historic Boeing 747 shuttle carrier aircraft.

Lunar Living

What is it like living in space? How do astronauts get enough clean water and air? How do astronauts communicate and work with peoples from different cultures? Students will participate in SIM scenarios and build their own functioning Lunar habitat that sustains core areas of life while maintaining cultural and global awareness.

Team Building

A critical aspect of being an astronaut is being able to work with teammates to ensure the mission is a success. Each day students will be engaged in team building activities to learn how to listen, communicate, collaborate and solve problems together.

Independence Plaza

Get a rare glimpse into the shuttle program with a tour of Houston's international landmark exhibit Independence Plaza. Students will go inside the high-fidelity shuttle replica Independence, mounted on top of the historic and original NASA 905 shuttle carrier aircraft, and then explore the giant plane. It is the world's only shuttle mounted on an SCA and the only one allowing the public to enter both.

Starship Gallery

Students will see and touch real moon rocks and flown spacecraft while learning about the history of space flight.

Brunch with an Astronaut

Dine with a NASA astronaut and hear their first-hand stories about space exploration.

Graduation

Celebrate your students' achievements at Space Center graduation surrounded by one of the world's most comprehensive collections of space suits in the Astronaut Gallery. To commemorate the special experience, students will receive certificates and medals.



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Our NASA program will run Monday through Friday, from 8:30AM to 5PM. Lunches will be at the “Zero-G Diner” and are **included** in your package. In the evenings, please know that we encourage you to participate in our evening event program. If you opt to do something different, please let your Ambassador know once you arrive in Houston. They will be able to assist you in achieving best rates for added transportation and extra requirements.

ACTIVITY LIST

Rocketry

- ❖ This activity puts students in the mindset of how we will get to Mars by making connections to the Space Launch System rocket that NASA is currently working on.
- ❖ Students design and build their 1 or 2-stage Load Star rocket from various pieces available at the “Acquisition Office” (AO). Each piece is priced differently so they must keep track of their \$600,000,000 budget for the week. More important pieces cost more money.
- ❖ Students have the option of putting items such as digital altimeters in their payload bay.
- ❖ Students find the mass of their rocket because each rocket is different, and their payload will impact the center of mass and center of pressure.
- ❖ Students will conduct a swing test of their constructed rocket to determine the center of gravity
- ❖ Students will conduct a balance test to find the center of pressure
- ❖ Students will calculate apogee using the Estes Alti Trak to find the angular distance. This information along with the baseline distance will help them determine the altitude of their rocket. *We will have digital sensors as an option for the payload so they can compare their math to the digital recording.

Heat Shield Design

- ❖ This activity makes connections to heat shield design that is critical for entering the Lunar and/or Martian atmosphere.
- ❖ Students review what materials are good conductors and insulators of heat energy.
- ❖ Students work within size (L,W,H) restrictions, materials, and cost as they purchase their materials from the AO.
- ❖ Students use Vernier interfaces, a thermocouple sensor and an infrared thermometer to take the temperature of their “eggstronaut” during the 2-minute burn test.
- ❖ Students can analyze their data after the burn to determine what worked and what didn’t on their Surface Pro computers.
- ❖ The team with the smallest change in temperature, wins.
- ❖ Before students start designing their heat shields, they will collect specific heat data for the materials that are offered at the store. This will help them decide which ones put together will give them the best results.
- ❖ Students will present their data to the group to explain each of their tests and why the materials did or did not protect their eggstronauts.

Cryogenics Capsule Design

- ❖ This activity connects to the extremely cold environment of Space as engineers determine what materials work best to protect the astronauts.
- ❖ Students design and build their capsules with a marshmallow astronaut and a thermocouple sensor before the capsule is sealed up and placed in the liquid nitrogen for a 2-min test.



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- ❖ Students work within size (L,W,H) restrictions, materials, and cost as they purchase their materials from the AO.
- ❖ The group with the smallest difference in temperature wins.

Lunar Habitat Design

- ❖ Students conduct research on various aspects of what would be needed for a livable habitat for an astronaut crew of 6 for two years. This includes water systems, life support systems, communication, transportation, radiation, agriculture, physical activity, living quarters, etc.
- ❖ Students design their habitat and then construct it using materials from the AO.
- ❖ Students can add LED's lights, copper tape, lithium batteries, and motors.
- ❖ Students present their habitat designs to a panel of judges to see how they met the requirements.

VEX Coding and Robotics

- ❖ VEX IQ robots are used in this activity.
- ❖ The first challenge is coding the robot to get through a Lunar course that meets requirements such as calculating speed, turns and various obstacles.
- ❖ Use Easy C programming software, which allows for drag and drop or actual script coding for the indoor challenge course.
- ❖ The second robotics challenge involves students receiving points for recovering and correctly identifying different rock samples on the Mars Yard.
- ❖ Students must design and build a VEX robot, which has an end effector that can recover these rock samples and return them to base. Students use the remotes for this part of the challenge because it takes place outside on the Mars Yard terrain.
- ❖ Additional points are added based on if they correctly identify the rocks recovered.

Scuba & Water Robotics

- ❖ Students learn basic scuba skills in the shallow end of the pool. For example, removing their regulator, removing their mask and clearing it of water.
- ❖ Students will remain in their teams as they work against the clock to put together a mock airlock underwater. Once they are finished, all the team members must get through the airlock to retrieve samples from the mock asteroid (climbing wall) and return through the airlock.
- ❖ While half of the students are diving, the other half are completing the Sphero water robotic engineering challenge. Students must design and build a transport system out of limited materials to move a payload across the pool using their waterproof robot. The fastest team with the largest payload wins.

Tours

- ❖ Historic Mission Control
- ❖ Space Vehicle Mockup Facility
- ❖ Rocket Park
- ❖ Neutral Buoyance Laboratory
- ❖ Starship Gallery
- ❖ Independence Plaza



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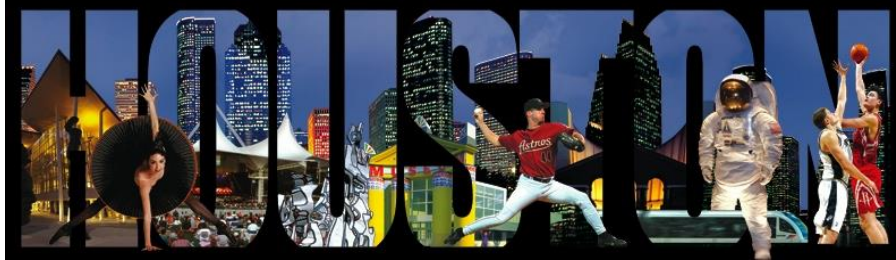
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Day 7

Breakfast

Lunch on Own

Good morning Houston! This morning we'll start to say goodbye to fabulous Houston. We'll wave goodbye to our new friends as we leave for the airport and hopefully, take away memories that will last a lifetime!



Need more Texas time?

Want to spend a bit of extra time in Houston now that you're here? We're delighted to help you and can offer an entire range of STEM, historical, arts and cultural opportunities for your school. Just let us know your interests. From student service and mission projects to marine biology educational opportunities, we'd love to help set your school up for success!

Many schools also like to extend their time in Texas by moving on to San Antonio, Austin or even the Dallas-Fort Worth area. If that sounds like you, please let us know and we will be happy to set up a customized extension just for your school and based on your needs.



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MATH TO THE MOON – HOUSTON, USA

Minimum Booking Numbers:

20 students
Ages 14 - 18

What's Included:

Round-trip flights or motorcoach transfers
6-nights' accommodation in destination
Breakfasts, lunches & dinners starting on Day 2 and ending with
Breakfast on Day 7
Airport transfers and transportation as shown on itinerary
5-Day NASA Johnson Space Center Master Class Series at Space Center
Houston with programming as shown in Sample Itinerary
Graduation Brunch & Ceremony with Certificate Presentation
Evening entertainment program per hotel selected
Personal Tour Ambassador
Fund-a-Forest: A tree is planted in the name of each guest
Dollar\$ For Scholars: \$2 donation in the name of each guest
24-hour emergency cover

What's Not Included:

Fully comprehensive insurance (mandatory)
Transfers to/from home airport
Transportation for activities not shown in the itinerary
Cost of visas, full or collective passports
Cost of inoculations or medication required for travel
Sightseeing / Entertainment Options not shown in Itinerary
Hotel incidental deposits & bills – meals, mini-bar items, recreation
charges, purchases billed to room, etc
Any gratuities – drivers, hotel services, area guides, tour ambassador

As always, our staff are always available to you to answer any questions you may have regarding programming.
If we may serve you in any way, please do not hesitate to contact us.



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