STEM to the Rescue

STEM Activities for Use with the 2020 Hess Ambulance and Rescue Truck

Written by
Gregory L. Vogt, Ed.D.

Baylor College of Medicine

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Author: Gregory L. Vogt, Ed.D.
Editors: Nancy P. Moreno, Ph.D., James P. Denk, M.A., Baylor College of Medicine, and Justin A. Mayer, M.B.A., Hess Corporation
Designers: Martha S. Young, B.F.A., Abby Fleet, Travis Kelleher, and Jose Chavero Rivera, M.F.A.

Center for Educational Outreach
BAYLOR COLLEGE OF MEDICINE
One Baylor Plaza, BCM411
Houston, Texas 77030
713-798-8200 | 800-798-8244 | edoutreach@bcm.edu
http://www.bioedonline.org | http://www.bcm.edu/ceo

HESS CORPORATION
1185 Avenue of Americas, 40th Floor
New York, New York 10036
stem@hess.com
www.hess.com | www.hesstoytruck.com/stem

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The order of the activities may be changed if it is determined that it will create a more logical progression.

The 2020 Hess Ambulance and Rescue truck is available at www.hesstoytruck.com while supplies last.

To download the previous, Hess Toy truck STEM guides, visit the following sites.

Force, Motion, Friction and Energy **(2016)**
http://www.bioedonline.org/lessons-and-more/focus-on-stem/force-motion-friction-and-energy/

Simple and Complex Machines **(2017)**
http://www.bioedonline.org/lessons-and-more/focus-on-stem/simple-and-compound-machines/

On the Road with Vehicle Performance **(2018)**
http://www.bioedonline.org/lessons-and-more/focus-on-stem/on-the-road-with-vehicle-performance/

Towing The Load With the Hess Tow Truck Rescue Team **(2019)**
http://www.bioedonline.org/lessonsand-more/focus-on-stem/towing-theload-with-the-hess-tow-truck-rescueteam/

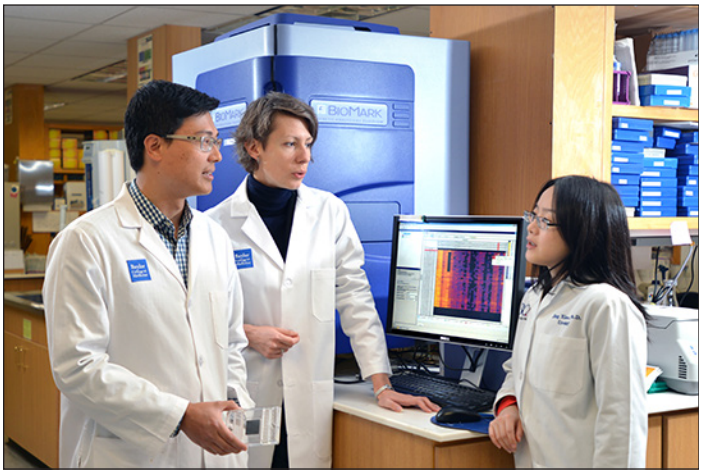
STEM is an acronym used to identify the academic subjects of science, technology, engineering and mathematics. By highlighting the inter-relatedness of these subjects, the STEM acronym encourages schools, districts and educators to integrate STEM content rather than teach each subject separately.

The STEM approach is important for workforce development and economic growth. Many careers are available in STEM-based fields, and forecasts indicate that in the future, there will be more STEM-based jobs than qualified workers to fill them.

BAYLOR COLLEGE OF MEDICINE

Baylor College of Medicine (Baylor) is a health sciences university that creates knowledge and applies science and discoveries to further education, healthcare and community service locally and globally. In addition to its School of Medicine, Baylor includes a Graduate School of Biomedical Sciences, School of Health Professions, and National School of Tropical Medicine.

Located in the heart of the Texas Medical Center, the world's largest health sciences complex, Baylor is surrounded by leading healthcare and research institutions. That concentration of expertise has helped support the development of collaborations that advance every aspect of the College's mission.



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With seven affiliated teaching hospitals and partnerships with major institutions, such as the University of Houston, Rice University and NASA, Baylor has a diversity of resources unparalleled at other academic health centers. The College also partners with community leaders to serve Houston, Texas, and the world through outreach initiatives, innovative healthcare delivery models and research focused on specific community needs. Its educational outreach programs reach students at all levels, from elementary school through college, creating a pipeline of learners interested in science and medicine.

Baylor is ranked by the National Institutes of Health at #1 in Texas, and #21 in the nation among research intensive medical schools. Seven departments rank in the top 20, including a ranking of #1 in genetics. *US News & World Report* ranks Baylor at #1 in Texas, and in the nation at #16 in research, #5 in primary care, and #10 in pediatrics.

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The Center for Educational Outreach at Baylor College of Medicine provides a wide range of educational programs and resources that help prepare and encourage students to pursue careers in medicine and the health sciences. Offerings include teacher professional development and curricular materials that improve the STEM content knowledge and skills of K–12 students. Educators can earn continuing education credits via the Center's face-to-face workshops or online courses, some of which are tailored to meet the needs and requirements of individual schools or school districts.

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Teacher resources. BioEd Online℠ and SuperSTAAR℠, dynamic STEM teacher websites that provide coursework, streaming video presentations, teaching slide sets, inquiry-based classroom activities and complete teaching modules for grades pre-K to 12. BioEd Online materials feature an integrated, hands-on approach to teaching STEM. Each inquiry-based unit is aligned with national and state science education standards. ■

HESS CORPORATION

Hess Corporation is a leading global independent energy company engaged in the exploration and production of crude oil and natural gas. At Hess, social responsibility (SR) means maintaining the highest standards of corporate citizenship as we work to deliver the energy the world needs – energy that is fundamental to advancing economic progress and improving living standards. SR, which is one of the six Hess Values, is foundational to the culture of our company and to our engagement with the communities where we operate; it includes protecting the health and safety of our workforce, safeguarding the environment and creating a long lasting positive impact on our communities. In 2019, our social investments totaled $7.7 million, with $2.6 million going toward education projects. Above all, we continue to be a company that cares about its people, its impact on the community, its reputation, and about doing the right thing. We are proud of our achievements, having been recognized as one of the **100 Best Corporate Citizens** by 3BL for 13 consecutive years, along with 10 consecutive years as a member of the **Dow Jones Sustain¬ability Index North America**. In addition, Hess has been recognized as one of **America's Most Responsible Companies** by Newsweek Magazine and ranked a **Top 50 Employer** by *STEM Workforce Diversity Magazine* (12 consecutive years), *Equal Opportunity Magazine* (3 consecutive years), *Minority Engineer Magazine* (3 consecutive years), *Women Engineer Magazine* (11 consecutive years) and *Careers & the disABLED Magazine* (7 consecutive years).

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THE HESS TOY TRUCK STORY

The Hess Company was founded in 1933 when Leon Hess bought a second-hand truck and started a business delivering fuel oil to homes in New Jersey. By the time Mr. Hess passed away in 1999, at the age of 85, Hess Corporation had grown into one of the world's largest energy companies including oil exploration, production, storage and more than 1,300 gas stations along the east coast. Not long after opening the first Hess branded gas station in 1960, Leon Hess decided to offer families a fun, high quality and affordable toy for the holidays as a goodwill gesture to customers. With that decision, he created a toy for kids of all ages, the Hess Toy Truck, which has become a hallmark of the holiday season, with a new model released each year. Leon Hess wanted a toy truck made with outstanding craftsmanship and innovative use of electronics. And he wanted to offer it at a price families could afford, and with batteries included, a concept that endures to this day 56 years later. The Hess Toy Truck remains a beloved holiday tradition and among the largest selling toys in the country every year, now offered exclusively at www.hesstoytruck.com.

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HOW IT'S MADE

It takes a long time (and a lot of STEM) to create a Hess Toy Truck. The process of developing each new toy starts two to three years before the truck goes on sale. Some trucks have taken as long as six years to go from concept to market. Initial drawings and feature concepts are reviewed, and the toys begin to evolve. The top two or three designs go to the next round, where they are transformed from drawings to handmade models. The models are evaluated for safety, functionality, playability, durability and value. Eventually, the new Hess Toy Truck is chosen. A Hess Toy Truck is generally comprised of up to 300 small, hard plastic pieces. A tooling, or mold, for each piece must be cut to precise measurements. Once the toolings are made and tested, the pieces are produced and meticulously assembled. Then, as anyone who has unpacked a Hess Toy Truck knows, the final toy is placed—very carefully—into the toy box. ■

TOOLS TO TEACH STEM

Hess Toy Trucks are much more than collectors' items. They are useful teaching tools that offer a variety of practical and fun ways to teach STEM subjects, such as force and motion, and simple and complex machines. STEM is the acronym for science, technology, engineering and mathematics. It denotes an integrated approach for developing many products and processes we depend upon each day. It is also one of the fastest growing categories for jobs.

Activities in this guide use the 2020 Hess Ambulance and Rescue truck explore practical transportation issues, such as force and motion, road surfaces, and map skills as they relate to emergency medical services. The activities can be used sequentially as a unit or inserted into an existing curriculum. While designed for grades K–5, they can easily be adapted for higher and lower grades. All activities support the Three Dimensions of Science Learning in the Next Generation Sci-ence Standards. Some include student pages that can be used for assessment or placed in science notebooks.

The Ambulance pays tribute to all first responders. The heavy-duty Type I truck-style medical transport includes an oversized passenger compartment that doubles as a carrier for its Rescue partner. Designed for high visibility, the bright, attention-grabbing red and white cab coloring is accompanied by an eye-popping 70 lights! For the first time ever, four different flashing light patterns are included; each activated in tandem with a unique siren sound via the four cab-mounted buttons. A switch under the chassis activates lights in steady mode and for the first time ever, a "Mute" mode is included to keep those amazing lights flashing without the accompanying siren sounds. The sparkling chrome accents add impressive detail to the heroic vehicle. A top-mounted button at the rear of the see-through passenger compartment releases the rear door which acts as a ramp for the Rescue.

The accompanying Rescue is a rugged on/offroader pickup truck with a fold-down tailgate and a pull-back motor that can be revved-up and released to create fun wheelie-popping action! Its bright red color is complemented with sparkling chrome-look accents and another 26 lights that work in steady mode.

STEM CAREERS

Skilled workers for STEM fields are always in demand, with job openings exceeding the number of prepared candidates.In combination with the 2019 Hess Tow Truck Rescue Team, this guide provides powerful, stimulating STEM learning experiences that relate to many STEM fields, such as the "Select Careers" listed below. These careers require competency in science, technology, engineering, math, and art. ■

Hess Toy Truck Video Lessons

Demonstrations of the science and technology of Hess Toy Trucks are available at the following site.
https://www.youtube.com/user/hesstoytruck

SELECT CAREERS

Automotive Technologist
Biologist
Chemist
Civil Engineer
Computer Scientist
Drilling Engineer
Electrical Engineer
Environmental Scientist
Geoscientist
Graphic Designer
Manufacturing Engineer
Marketing Specialist
Mechanical Engineer
Medical Scientist
Petrophysics Engineer
Robotics Engineer
Safety Engineer
Software Developer
Structural Engineer
Technical Writer
Theme Park Designer
Toy Designer
Transportation Engineer
Website Developer

1. Rolling, Rolling, Rolling

STEM CONCEPTS
S – force, motion, friction, experimenting
E – constructing inclined plane
M – measuring distance and angles

The 2020 Hess toy trucks are very useful for conducting simple investigations into force and motion. The Ambulance is a free-wheeling truck toy whose wheels turn as the toy is rolled across the ground. With a fast push, the wheels turn rapidly; with a slow push, they turn slowly. On the other hand, the wheels of the Rescue truck are powered. Pulling the truck backwards across a surface enables energy to be stored in the rear wheel mechanism, which then makes the wheels turn in a forward direction when the truck is released. The initial speed of the truck depends upon how much energy was stored during the windup.

Despite their apparent simplicity, the motions of the two trucks are quite complex when we consider all the forces involved. The Ambulance's motion begins when a force is imparted on it. The greater the push, the farther it rolls. Its wheels turn easily to reduce friction. Friction is a force that works against the force propelling the Ambulance. The level of friction imparted is determined largely by the surface on which the Ambulance rolling. Smooth tile floors offer less friction or drag on the truck than carpeted floors. To a much lesser extent, air resistance also offers friction. Eventually, the combined forces of friction overcome the initial push and bring the Ambulance to a stop.

Gravity is another force that may impact the Ambulance's motion. If the surface is perfectly level, gravity has little effect. However, if the surface is tilted even slightly downward or upward, gravity has a major effect. On a downward slope, gravity adds extra force to the Ambulance, causing it to roll farther before it stops. On an upward slope, the Ambulance must climb higher from the center of Earth's gravity, and it will roll a shorter distance.

These same factors also appy to the Rescue truck. However, the truck's powered rear wheel mechanism adds complexity to its force and motion. Potential energy (also known as "stored energy") is stored in a spring when the truck is pulled backward. When the truck is released, the potential energy is converted into kinetic energy (also known as "energy in motion"). The rubbery surface of the rear drive wheels grab the road surface (friction) and push the truck forward. In this case, friction helps the truck move. However, when the kinetic energy runs out, the truck coasts and the same kind of friction that stops the Ambulance brings the Rescue truck to a stop.

THE QUESTION

How far will the Hess Ambulance roll with different angles of an inclined plane?

SUGGESTED GRADE LEVELS

K–5

MATERIALS

- 2020 Hess Ambulance toy
- Inclined planes (about 3 to 4 feet long and 8 inches wide) consisting of stiff cardboard from flattened cardboard boxes, school project boards, or wooden boards
- Yardsticks, meter sticks, or tape measures
- Protractor
- Masking or painter's tape
- Boxes, books, other objects to elevate the inclined planes
- Student data sheets and pencils

MANAGEMENT TIPS

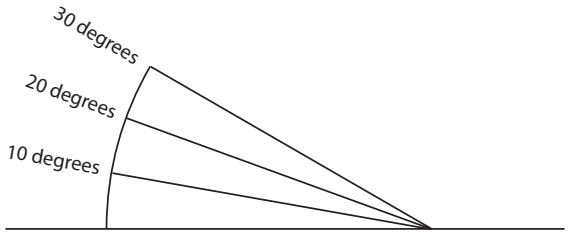
- A large open space with a smooth floor such as a gym, cafeteria, or hallway is needed for the Ambulances to run.
- Set up several inclined planes at different angles so that several teams can work at the same time. If students are conducting the activity at home, the slope of a single inclined plan can be changed to create different angles.
- Help younger students measure the distances their trucks roll at each station by placing tape marks on the floor at 1-foot intervals. If the floor is tile, students can count the number of tiles their trucks roll. Older students can measure distances with the yardstick, meter stick or tape measure.
- Have teams make a practice run before starting the investigation.
- If using corrugated cardboard for the inclined planes, make sure the corrugations run parallel to the long direction of the

Continued

planes. To make an extra stiff and durable plane, tape two piece of cardboard together.

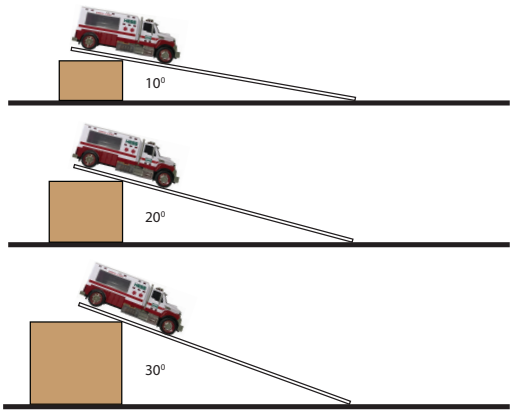
PROCEDURE – Free Wheeling Ambulance

1. Prepare the inclined planes. Set up boxes, book stacks, or other objects to support the incline planes at different angles (for example, at 10, 20 and 30 degrees). Use tape to anchor the supports and inclined planes to the floor.



2. Show teams how to place their Ambulances (without Rescue trucks inside) on the inclined planes. Provide the following instructions.
   a. The Ambulance should point straight down the inclined plane.
   b. The rear of the Ambulance should align with the upper end of the inclined plane.
   c. When students have properly placed the Ambulance, they should release it so that it can freely roll down the plane and across the floor.
   d. When the truck stops rolling, students should measure the distance it rolled from the bottom of the inclined plane and record their measurements on the student data sheet.

3. When teams finish at one station, they should move on to the other stations and follow the same procedure to measure how far the Ambulance rolls.



WRAP IT UP

Draw a table on the board with three squares for each team. Have each team fill in the distance its Ambulance rolled for each inclined plane.

Can you see a pattern in the distance the Ambulance rolled from the three angles?

	TEAM 1	TEAM 2	TEAM 3	TEAM 4	TEAM 5	TEAM 6	TEAM 7	TEAM 8
10^0								
20^0								
30^0								

From which inclined plane did the Ambulance roll the farthest? (The steepest inclined plane.)

From which plane did the Ambulance roll the shortest distance? (The lowest inclined plane.)

Ask students to explain their results.

a. What caused the Ambulances to roll? (Gravity.)
b. Why did the Ambulances roll farther on the steepest inclined plane? (The steepest inclined plane moved the Ambulances higher off the floor than the other planes did. On the steepest plane, the Ambulances picked up more kinetic energy, which caused them to roll farther.)
c. What caused the Ambulances to stop rolling? (Friction.)

EXTENSIONS

- Will the addition of extra weight affect how far the Ambulance rolls? Have teams select one inclined plane and load the Rescue truck inside the Ambulance. Have them compare the distance the Ambulance rolls from this plane with and without the Rescue truck.
- Compare the distance the Ambulances roll on a hard floor and on a carpeted surface. ■

2. Hill Climb Trials

STEM CONCEPTS
S – force, motion, friction, experimenting
E – constructing inclined plane
M – measuring distance and angles

When there is a particularly bad incident, like a flood, earthquake, major storm, etc., a vehicle like the 2020 Hess Rescue truck is the preferred choice for first responders who need to arrive on scene quickly. It is rugged and capable of driving under the worst conditions. The Hess Ambulance combines a first aid station with a hospital emergency room, and it can transport seriously injured or sick people to hospitals for specialized care. However, it is much more limited than the Rescue truck in where it can go.

Hill climbing is one of the big challenges for the Rescue truck. Going up a hill is a snap for just about any truck on a dry, paved road, but an unpaved hill is another matter. If you have ever tried to walk up a sand dune, you will understand the challenge: climb two feet, slip back one. Hill surfaces can consist of a wide variety of materials, such as sand, rocks, dirt and plants. On rainy days, the challenge is mud. During winter, the challenge is snow and ice. Finally, the vehicle must contend with the steepness of the hill. Gravity exerts a force opposite to the force of the wheels as the Rescue truck endeavors to climb. The steeper the hill, the more gravity pulls the truck back.

The key to climbing unpaved hills is friction. Friction is the resistance felt as one object or surface passes over another. The knobby tires of the Rescue truck create friction with the ground, even though the surface is slippery. This friction keeps the truck from rolling backward and enables the truck's kinetic motor to propel it upward. A full-size Hess Rescue truck would have four-wheel drive, meaning that all four wheels use their friction with the hill surface to propel the truck. The toy version of the Hess Rescue truck has only rear-wheel drive.

In this activity, teams will test and evaluate the Hess Rescue truck's capabilities on different road surfaces.

THE QUESTION

How high can the Hess Rescue truck climb?

SUGGESTED GRADE LEVELS

K–5

MATERIALS

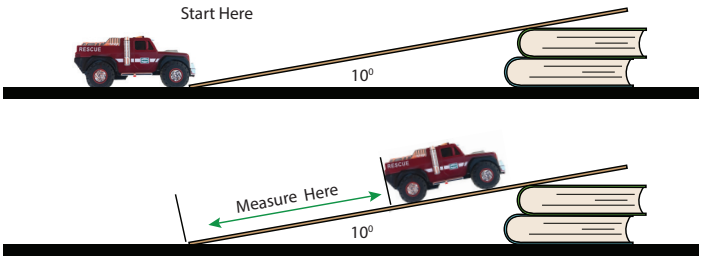
- Six inclined planes made from cardboard boxes or old project display boards, each measuring about 12 by 36 inches
- Rulers
- Masking or clear plastic tape
- Road surface materials:
  Aluminum foil
  Wax paper
  Sand paper sheets (9 x 11-inch sheets available from hardware or home improvement stores)
  Paper towels
  Plastic wrap
- Small stacks of books or other objects to support the upper ends of the inclined planes
- Student data sheets

MANAGEMENT TIPS

- Prepare six cardboard inclined planes for student teams to test their Rescue truck's hill-climbing abilities. For added strength and durability, make sure the corrugations in the cardboard run parallel to the long direction of the inclined planes. Leave one inclined plane with its natural paper surface. Cover each of the remaining inclined planes with one of the following: aluminum foil, wax paper, sand paper sheets, paper towels, or plastic wrap. (Note: If students are conducting this activity at home, instruct them to use the same inclined plane for every trial; they can simply change the surface for each trial.)
- Place the inclined planes in different locations on the floor. Use masking tape to secure the planes to the floor so that the angles don't shift. Use supports like books to raise the upper end of the inclined planes to create a slope angle of approximately 10 degrees.

Continued

- If working with younger students, draw parallel lines across each ramp surface at 1-inch intervals. The lines also are handy for older students, but they might prefer to use a ruler to measure. For each climb trial, teams will observe where the Rescue truck stops on the inclined plane. Measuring from the truck's rear bumper, students will count the number of lines crossed (or measure the distance with a ruler). Students should test the truck's climbing capacity three times on each surface. Older students should calculate the average distance traveled over the three attempts.



PROCEDURE

1. Explain the activity to the teams. They will test their Rescue truck's hill climbing ability on six different hills. Each hill has the same incline angle, but the hill surfaces are different.

2. Demonstrate how to conduct the tests.
   a. Show students how to storing potential energy in the truck's motor. Push the truck backward against the floor.
   b. Use your thumb to prevent the rear wheels from spinning until the motor is fully wound (when you hear clicking sound).
   c. Move the truck to the starting point at one of the hills. Release the truck and measure how high it runs up the hill.
   d. Show how to measure the distance from the rear bumper to the bottom of the hill. Have students record their measurements on the data sheet.
   e. Have teams start their investigations by picking one inclined plane. After running three trials on that surface, instruct teams to move to an inclined plane with a different surface.

WRAP IT UP

- Discuss team results.
- Which hill was the easiest to climb?
- Which hill was the hardest to climb? Have students explain why they obtained different results for each surface. Encourage them to use the term "friction" in their explanations.

EXTENSIONS

- Have each team pick one road surface and change the angle of the hill to investigate how hill steepness impacts how high the Rescue truck can climb.
- Wet the wax paper surface with a water mist spray bottle or damp cloth. Have students investigate and discuss how this changes the truck's climbing ability. ■

Hill Climb Trials Data Sheet

Name: _____

Record how high the Rescue truck ran up each inclined plane.
Make three trial runs for each inclined plane

Climb Trial - plane cardboard

	inches	Average
	inches	
	inches	

Climb Trial - alumimum foil

	inches	Average
	inches	
	inches	

Climb Trial - wax paper

	inches	Average
	inches	
	inches	

Climb Trial - sand paper

	inches	Average
	inches	
	inches	

Climb Trial - plastic wrap

	inches	Average
	inches	
	inches	

Climb Trial - paper towel

	inches	Average
	inches	
	inches	

On which hill surface did the truck climb the highest? _____

On which hill surface did the truck climb the least? _____

Explain why the truck climbed higher on some hills and not on others.

_____

_____

_____

_____

3. Washout

STEM CONCEPTS
S – force, motion, energy, experimenting
E – constructing jump plane
M – measuring distance and angles

Emergencies come in all possible forms. Hurricanes, fires, earthquakes, tornadoes, floods, volcano eruptions, droughts, lightning strikes, and automobile crashes, are just a few of the possibilities. Emergency responders must be ready for anything. They also must know their rescue truck's capabilities, because some emergencies require highly skilled driving just to reach the emergency site.

Rescue truck driving skills include:

- High-speed driving through traffic on city streets
- Driving on a variety of difficult road surfaces, such as snow and ice, wet streets, gravel, sand, dirt, etc.
- Climbing or descending steep inclines
- Crossing swollen streams or flooded streets

In this activity, student teams will practice making jumps with their Rescue trucks. Here is the scenario.

- Help is needed in a small rural community that has been hit with heavy rains.
- The only road leading to the town crosses a small river.
- Rising floodwaters have washed out the bridge into the town.
- Water is too deep and flowing too fast for a water crossing.
- The only way to get across the river is to use the Rescue truck to jump the gap where the bridge used to be.

Important Safety Note: In real life, jumping vehicles is extremely hazardous. It should be attempted only by professional stunt drivers.

THE QUESTION

Can the Hess Rescue truck jump over the gap created by a washed out bridge?

SUGGESTED GRADE LEVELS

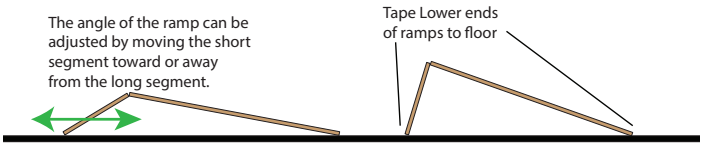
3–5

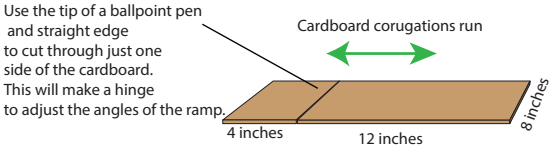
MATERIALS

- 2020 Hess Rescue truck
- Masking tape
- Used project display boards or other cardboard
- Scissors
- Rulers
- Ballpoint pens
- Student investigation sheet

MANAGEMENT TIPS

- Prepare two launching ramps from the cardboard to demonstrate the construction technique and how the ramp angles can be adjusted.
- Start with two cardboard rectangles, 16 x 8 inches in size. Make sure the cardboard corrugations run in the long direction.
- Four inches from one end, use a ruler and a ballpoint pen to draw a line across the cardboard. Press hard enough break through the top paper layer and the corrugations. This will make folding easy and neat.
- Tape the launching ramps as shown in the diagram to a long tabletop or the floor. The gap between the ramps should be equal to one Rescue truck length.
- Refer to the illustrations to see how to adjust the ramp angle.
- Prepare a separate long piece of cardboard or a wooden board to serve as an acceleration ramp. The ramp should be 3 to 4 feet long. If using cardboard, remember that the cardboard corrugations should run in the long direction of the ramp. Cardboard is stronger when the corrugations run in this direction.





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PROCEDURE

1. Explain the emergency scenario to your students. Tell them that they will practice making jumps across the gap left by the washed-out bridge. Show teams the simulated bridge gap made of cardboard. The objective for each student or group of students is to figure out how to make the Rescue truck jump the gap successfully.

2. Provide each groups or student with project display boards or cardboard to make their own jumping ramps. Have students cut two rectangular pieces of cardboard about 16 inches long by 8 inches wide. Instruct them to be sure the cardboard corrugations run in the long direction of the rectangle.

3. Using the tip of a ballpoint pen and a ruler straight edge, students should draw a line across the cardboard, 4 inches from one end. They should press hard to break through the top paper and into the corrugations. This will make it easy to bend the cardboard along the line.

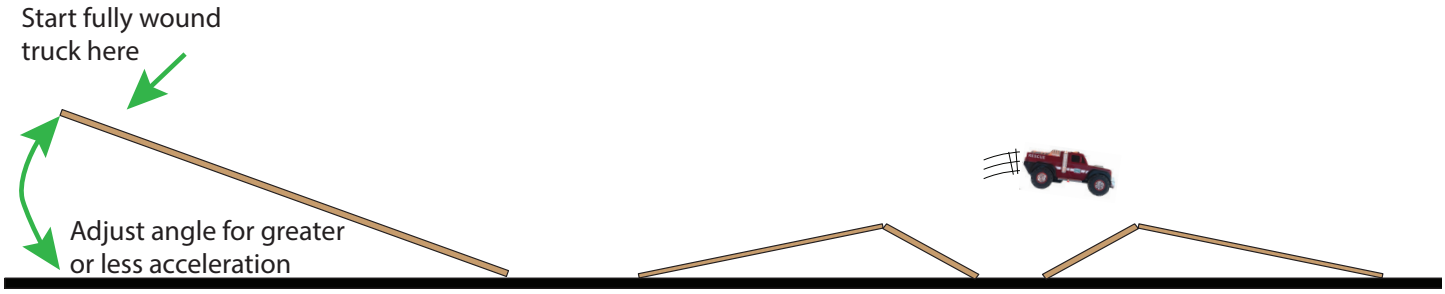
4. The ramps should be taped to the floor along their short edges, so they are facing each other. The angle of the ramps can be adjusted by positioning the shorter segment closer to, or farther away from the long ramp.

5. If students do not already know how to add potential energy to the Rescue truck's pull-back spring motor, demonstrate how to do that.
   a. Point out that each time you pull the truck backward, you must press one of the wheels with your thumb to keep the rear wheels from spinning when you lift the truck to wind the motor.
   b. When you hear clicking, the motor is fully charged with potential energy.
   c. When the wheels are released, the potential energy stored in the spring converts the potential energy to kinetic energy, propelling the Rescue truck forward.

6. Students should place their fully charged trucks in front of the low end of one of the ramps. Upon release, the Rescue truck will shoot up the ramp to make the jump.

7. Have teams try different ramp angles for their jumps. Can the trucks clear a longer gap? What are the challenges? Does aiming the Rescue truck make a difference in whether it successfully makes the jump and lands upright on the other side?

8. Challenge students to make longer jumps by providing a long piece of cardboard or a wooden board to act as an acceleration ramp (like a snow ski jump; see illustration). A fully wound Rescue truck released at the top of the ramp will get an acceleration assist from gravity. The steeper the launching ramp, the more potential energy will be added to the Rescue truck, the faster it will travel when released, and the further it will be able to jump.



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WRAP IT UP

Review the relationship between potential and kinetic energy. The fully wound spring in the Rescue truck is charged with potential energy. Potential energy is stored energy. When the spring is released, the spring rapidly unwinds and transmits kinetic energy (energy in motion) to the rear wheels.

Discuss the relationship between ramp angle and the distance the Rescue truck is able to jump.

Ask, Could this be the start of a science experiment? The angle of the ramp is the independent variable and the distance the truck jumps is the dependent variable. Another independent variable is speed. With an acceleration ramp (step 8), the fully charged truck will gain additional speed. How much speed is gained depends upon the ramp angle. As before, the dependent variable is distance jumped by the truck.

EXTENSIONS

- In stunt auto shows, daredevil drivers use launching ramps to jump their cars over lined-up old cars or busses. Rescue teams would never do this, but just for fun, two or three Hess Ambulances or other toy vehicles could be lined up side-by-side for a jumping show. Pretend the vehicles have been used so much that they are worn out and have been replaced with new ones.
- Have students add weights, such as pennies, to the rear of the Rescue truck to investigate how extra weight affects its ability to jump. ■

Washed Out Bridge Gap Investigation

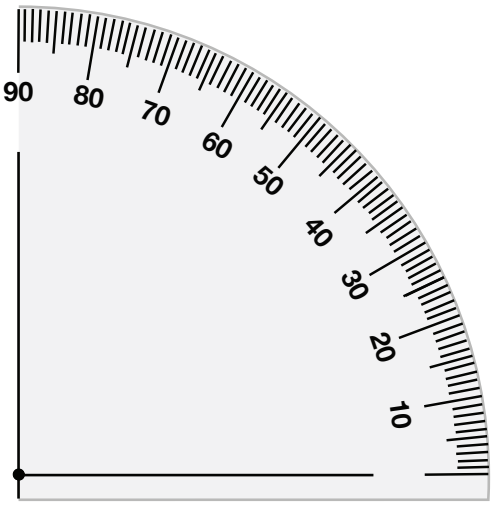
Instructions: Measure the best conditions for jumping the longest washed out bridge gap by changing, one at a time, the height, length, and angle, and observe the distance the truck jumped. Record your results below for each jump attempt.

DATA Sheet Code:

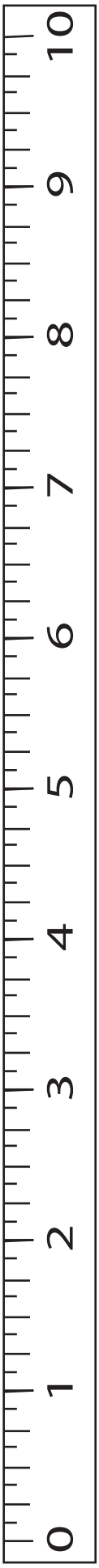
Height (H): Height above floor of front end of Rescue Vehicle bumper.
Length (L): Length of inclined plane from Rescue Vehicle front bumper to lower end of plan.
Angle (A): Angle of inclined plane with the floor as measured with a protractor.
Distance (D): Distance Rescue Vehicle successfully jumped across gap.

Trial	H	L	A	D
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

Protractor



10 Inch Ruler



4. Round About

STEM CONCEPTS
S – motion, inertia, observation
E – attaching and using tether
M – measuring distance and angles

We all have had this experience: while we are riding in a passenger seat of a car, the driver makes a quick left turn onto a cross street. Even with a seatbelt on, your body pushes on the righthand door. Or, does it? This common experience works in both directions. A quick right turn will cause your body to push to the left.

This effect is sometimes incorrectly called "centrifugal force." That term usually refers to an outward force produced by an object when it is traveling on a curved path. It sounds scientific, but the force doesn't exist. Something else is happening.

The great English scientist Sir Isaac Newton (1642-1727) developed laws of motion that apply to all moving objects. Newton's first law of motion provides the needed clue to what is actually happening. The law states:

> *"Every object persists in its state of rest or uniform motion in a straight line unless it is compelled to change that state by forces impressed on it."*

While various Internet sites state this law in different ways, its essence is usually described consistently. The first law is called the "law of inertia," because that is clearly what Newton was talking about. Inertia is a property of all matter. Because of inertia, matter remains in a state of rest or in a state of straight-line motion unless it is acted upon by an external force. Notice the similarity of Newton's law of inertia to the automobile scenario presented above.

Imagine a ball attached to a string. You hold the opposite end of the string and twirl the ball in a circle. You can feel the ball pulling on your hand as the ball circles. If you let go of the ball, the ball does something surprising. If the ball were really pulling on your hand ("centrifugal force"), the ball would fly straight away from you. Instead, the ball continues in the same direction it was traveling at the moment of release. It follows a straight path that is tangent to the circle. It does so because the real force is your hand causing the ball to constantly change direction and travel in a circular path. When released, that force on the ball is gone and it travels in a straight line.

Look at the two diagrams below. In the first, the ball is circling because of the inward force exerted by your hand (green dot). In the second diagram, the string breaks and that inward force is gone. In which direction will the ball travel? The answer is C.

In this activity, students will discover which direction a Rescue truck travels when it is attached to a string and the string is released.

THE QUESTION

In what direction will the Rescue truck travel?

SUGGESTED GRADE LEVELS

3–5

MATERIALS

- 2020 Hess Rescue truck
- 6 feet of string
- Masking tape

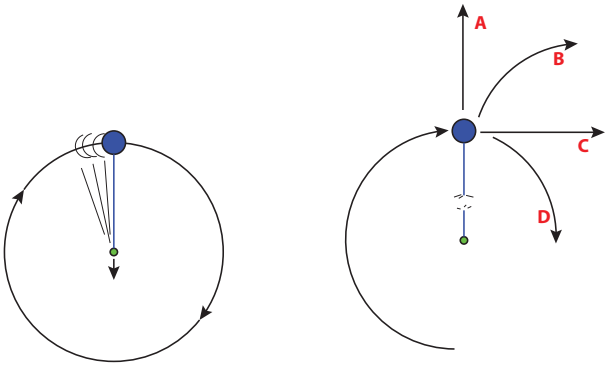
MANAGEMENT TIPS

- Practice running the Rescue truck tied to a string to get used to its movement.
- A longer string makes a large arc. Shortening the string makes a tighter arc.
- Be sure to let go of the string before the truck uses all of its kinetic energy. It is important to be able to observe the truck run several feet after it is freed from the force exerted by the pulled string. This activity can be conducted by students working individually or in teams.

Continued

PROCEDURE

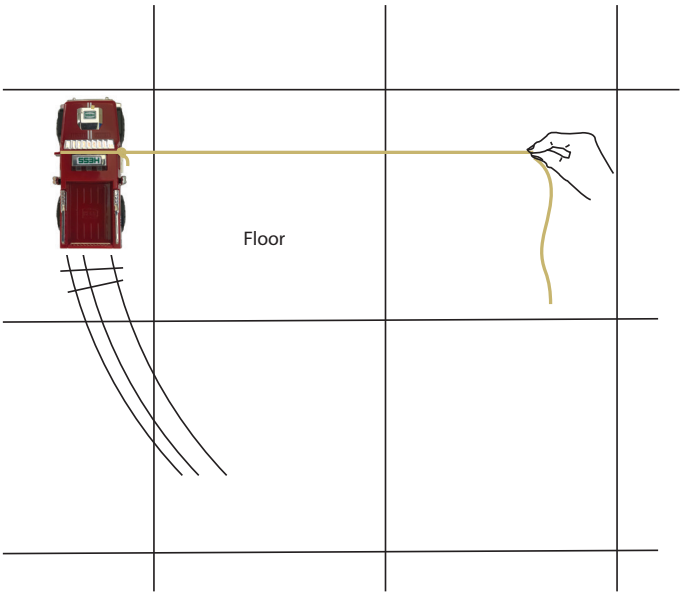
1. Copy the two circle diagrams below on the board. Ask students which path the circling ball will take if the string is broken. Do not tell them the correct answer. That will be up to them to find out.



2. Show a Rescue truck with a string attached. Look closely at the photograph to see the recommended position of the string. Attach the string by forming a loop in one end and slipping the other through the loop to form a lasso. Place the loop around the truck along the windshield and just behind the front wheels. Use masking tape to hold the string securely. Be sure the string and tape do not interfere with the turning of the wheels.

3. Have teams work on a hard, smooth floor. (If students are conducting this activity at home, a family member should help as a second team member.) One student will hold the string while another charges up the truck's spring motor by pulling the truck backwards on the floor until clicks are heard. Remind students to hold the rear wheels in place while charging the truck's motor. After hearing the motor click, the student should set the truck on the floor with the string stretched. The truck should be aimed perpendicular to the string.

4. At the count of three, the have the student release the truck. The string will cause the truck to travel in a circle. The radius of the circle will depend on the length of the string. (The length of the radius is the distance from the string-holding student's hand to the truck.) Have teams try different lengths to see which works best.



5. After teams have practiced, have them conduct the test. The "driver" should charge the Rescue truck and release it on the count of three. Part way through the arc traveled by the truck, the student holding the string should let it go. Which way does the truck travel now?

Continued

6. After teams make several runs, review the diagram under procedure step 1. Which path does the truck take when the string is released?

WRAP IT UP

Discuss student observations from the test runs. Why does the truck go in a straight line when the string is released, even though it previously was traveling in a circle? Refer to Isaac Newton's first law of motion. When there is no external force causing the truck to change direction (curving), the truck should travel in a straight line. Refer to the ball on a string illustration on the board. Ask which path is correct. (C)

Do the students' discoveries about motion have any practical applications?

- NASA (the National Aeronautics and Space Administration) has very important uses for this knowledge. Spacecraft are able to orbit Earth because of gravity and the forward motion imparted by the launch vehicle. Gravity is like the string in the truck investigation. If Earth did not have gravity, a spacecraft launched above Earth and aimed parallel to the ground would follow a straight line and travel into deep space. Because Earth does have gravity, it pulls (exerts a force) on the spacecraft, causing a curved path that circles (orbits) Earth.
- What about the Rescue truck? Are there any applications here? Yes! Rescue trucks moving high speed through traffic will constantly have to weave to the right and left, speed up and slow down. If the gear and medical supplies onboard are not properly secured, equipment will be damaged and supplies ruined. That is why ambulance drivers must master how to stow equipment and supplies.

EXTENSIONS

- Make a ball and string to demonstrate Newton's first law. Attach a string to a small ball. If you have a wiffle ball, just tie a string to it. A tennis ball can be used if you shove a sharp knifepoint into the ball and pass a knotted string into the slit. The slit will close around the knot. Demonstrate by twirling the ball in a circle. Have students watch closely and then release the string.
- More information about Newton's laws of motion can be found at this NASA site. https://www.grc.nasa.gov/www/k-12/airplane/newton.html ■

5. 9-1-1

STEM CONCEPTS
T – planning mission tools
E – attaching and using tether
M – measuring cargo volume, calculations

Rescue vehicles come in various sizes, suitable for many missions. Some are part of urban or rural fire departments, while others serve large industrial complexes, airports, railroads, etc. The 2020 Hess Rescue truck is based on a light duty rescue vehicle. It works in conjunction with the Hess Ambulance to provide emergency medical service.

The Hess Rescue truck is a high-powered pickup-style vehicle with a large bed to carry critical equipment to incident sites. It also can carry two or three highly trained rescue workers. When a 911 call comes in, the description of the emergency tells the team what kind of specialized equipment may be needed for the rescue. The truck can be loaded quickly and leave for wherever it is needed. The ambulance also is dispatched to the incident site.

The equipment loaded on smaller rescue vehicles often includes general gear such as flashlights, hand tools and incident-specific tools such as climbing gear, "jaws of life," and hydraulic jacks. In this activity, teams will have to decide what gear to load on to their Hess Rescue trucks to meet the needs of a particular 911 emergency call.

THE QUESTION

What tools and equipment should be loaded on a Hess Rescue truck responding to a 911 emergency call?

SUGGESTED GRADE LEVELS

3–5

MATERIALS

- 2020 Hess Toy Rescue truck
- Mission Specific Equipment List
- Foot-long ruler
- Home Base Equipment Inventory
- Emergency cards (printed on cardstock)

MANAGEMENT TIPS

- If working with younger students, explain the purpose of any item on the Home Base Equipment Inventory with which they may not be familiar.

PROCEDURE

1. Have teams examine their Rescue vehicles. As a class, have them share their observations. Where can equipment and supplies be stored? (Don't forget the cabin.)

2. The back end of the Rescue vehicle is the main cargo section. Have teams estimate the volume of this section by multiplying its inside length, times its width, times its height in inches. Student answers will be approximately 3 cubic inches. (Length 2", Width 1.5", Height 1 inch).

3. Tell students that if the truck were full size, each cubic inch would equal 20 cubic feet, or 60 cubic feet in total. Distribute the Home Base Equipment Inventory and have students write "60" in the space at the bottom for the cubic feet of the cargo section.

4. Distribute the blank Mission Specific Equipment List to each team. Explain how it is to be used. Each team will receive a different 911 emergency call detailing an emergency situation. Teams will decide what equipment is most appropriate to handle their specific incidents. The Hess Rescue vehicle does not have enough cargo space to carry all items on the Home Base Equipment Inventory, so students will have to decide on what items are most critical.

5. The list is divided into two sections. The top section includes small items that can fit into the vehicle cabin. Students can take as many items from this list as they wish. The bottom list includes large items that can only fit in the Rescue truck's cargo section. Each item has a number indicating the amount of space (in cubic feet) required to carry it. Teams may choose no more than 60 cubic feet of equipment for their vehicles. (Note: For

Continued

this activity, the large pieces of equipment are assumed to have a uniform shape. In real life, some items are long and narrow, others wide and shallow, etc. Including actual shapes and dimensions would make the activity too complex. Real-life rescue workers, through training and experience, understand shapes and know how to load and secure the selected equipment.)

6. Give teams about 15–20 minutes to discuss options and complete the Mission Specific Equipment List.

WRAP IT UP

Have each team describe the nature of its 911 call and identify the equipment it has chosen for the rescue.

Encourage class discussion by having teams ask each other about how or why they chose some of the equipment for their Hess Rescue trucks.

EXTENSIONS

- What equipment should be carried on the Ambulance? Have teams search the Internet to investigate the kinds of equipment ambulances carry. The following website is provided by the American College of Surgeons, Committee on Trauma. https://www.facs.org/-/media/files/quality-programs/trauma/publications/ambulance.ashx
- Learn about 9-1-1 calls by exploring this site. https://www.911.gov/

Home Base Equipment Inventory

Select the equipment you will need for your 911 call rescue mission. Your rescue vehicle will not hold all of the equipment below. Pick only the essential items needed for the rescue you have been assigned to.

Note: First aid and other medical supplies are limited because the ambulance will also be dispached to the emergency scene. The ambuance carries extensive first aid and medical supplies to sustain injured persons during transport to a hospital emergency

Inventory: Al of these small items can fit in the Rescue Vehicle's cabin or be worn by EMTs.

- ☐ Animal Tranquilizer Kit
- ☐ Arm and Leg Splints
- ☐ Arm Slings
- ☐ Binoculars
- ☐ Compass
- ☐ Disinfectant
- ☐ Duct Tape
- ☐ First Aid Kit
- ☐ Flashlights
- ☐ Gloves
- ☐ GPS Unit
- ☐ Hard Hats
- ☐ Knife
- ☐ N95 Filter Masks
- ☐ Road Flares
- ☐ Search and Rescue Dog
- ☐ Signal Flares

Inventory: Large items that only fit in cargo section. Numbers indicate the number of cubic feet of space each takes up. Do not excede volumn capacity of cargo section.

- ☐ Animal cages (5)
- ☐ Animal Feed (2)
- ☐ Axe (1)
- ☐ Chain Saw (4)
- ☐ Climbing Harness (2)
- ☐ Climbing Rope (3)
- ☐ Drinking Water (5)
- ☐ Extension Cords (2)
- ☐ Fire extinguishers (6)
- ☐ Flood Lights (8)
- ☐ HAZMAT Suits (6)
- ☐ Hydraulic Jack (4)
- ☐ Jaws of Life (6)
- ☐ Life Rings (3)
- ☐ Life Preservers (4)
- ☐ Life Raft (10)
- ☐ Megaphone (1)
- ☐ Metal Cutting Saw (4)
- ☐ Pick and Pry Bar (2)
- ☐ Oxygen Breathing Gear (8)
- ☐ Shovel (2)
- ☐ Sledge Hammer (1)
- ☐ Stretcher (10)
- ☐ Tarps (3)
- ☐ Towels/Blankets (4)
- ☐ Ventilators (8)

Rescue Truck Cargo Section volume: _____cubic feeet.

Selected Equipment volume:_____ cubic feet.

Mission Specific Equipment List

911 Call - What is the Emergency?

Describe the emergency below.

_____

_____

_____

_____

911 Call - What equipment does your team need?

Make appropriate equipment selections from the Home Base Equipment Inventory and list the items below. If indicated on the Home Base Equipment Inventory, fill in the cubic feet below. These items can only be carried in the cargo section.

ITEM:	Cubic Feet	What will it be used for?

If needed, continue list on back of this sheet.

Cubic foot total of all selected cargo section items.

911 EMERGENCY REPORT

Call Received: 9:27 AM

Incident: Avalanche

Details: Avalanche at ski resort smashed buildings and ski lift towers. Several skiers are missing and feared buried in snow and ice. Help is needed to search slopes and rescue skiers.

Location: Winter Haven Ski Resort north ski run.

911 EMERGENCY REPORT

Call Received: 4:30 AM

Incident: Missing Spelunkers

Details: Cave explorer mapping team is 24 hours overdue to return to surface. Thunder storm struck the area on day three of the four-day mission. Water may be blocking some passage ways.

Location: Blue Mounds Cave.

911 EMERGENCY REPORT

Call Received: 8:17 PM

Incident: Car Accident Pileup

Details: Winter whiteout conditions on freeway I45 led to major accident. At least thirty cars and trucks crashed into each other. Some vehicles slid down steep embankment. Tanker truck spilled dangerous chemicals. Many people injured. Some are trapped in their cars. Ambulances on the way.

Location: Spring Green Village riverside.

911 EMERGENCY REPORT

Call Received: 11:23 PM

Incident: Earthquake

Details: Moderate earthquake 15 miles from the city. Homes in older neighborhood of Bay View received extensive damage. Rescue crews are needed to search damaged and collapsed homes for trapped people and free them. EMS ambulances on the way.

Location: North Ridge City

911 EMERGENCY REPORT

Call Received: 11:36 AM

Incident: Pickup Truck Stuck in River

Details: Driver of pickup truck tried to cross swollen stream. Truck engine died as water reached window depth. Driver trapped inside pickup truck. Truck in danger of being washed downstream toward waterfall.

Location: Cow Creek two miles north of city on county road 67.

911 EMERGENCY REPORT

Call Received: 7:54 AM

Incident: Forest Fire

Details: Camp site fire ignited nearby woods at Eagle's Nest State Park. Car and camper trailer burned. No sign of campers. Fire crews on scene. Need help in locating campers. Suspect fire blocked outbound road causing campers to evacuate the campground toward box canyon.

Location: Eagle's Nest State Park, Campground 3.

911 EMERGENCY REPORT

Call Received: 5:37 PM

Incident: Flood

Details: Heavy rain caused reservoir north of the village of Spring Green. Flooding along Sleepy River has caused several river bank homes to be flooded and surrounded by chest deep water. Residents needing rescue are sitting on their house roofs

Location: Spring Green Village riverside.

911 EMERGENCY REPORT

Call Received: 9:41 PM

Incident: Tornado

Details: Tornado badly damaged recreation pavilion at the park. Picnickers sheltered in pavilion basement. Trapped inside by debris. Roads to the park are blocked by fallen trees, broken fences, and collapsed park sheds. Weather bureau estimates the storm was an F2 on the Fujita Scale,

Location: Grant Park.

911 EMERGENCY REPORT

Call Received: 9:45 AM

Incident: Lost Child

Details: Family on camping vacation on Cottonwood Creek. Parents woke up and discovered four-year-old son missing. Camper door unlocked and left open. Boy sleep walks. Favorite teddy bear missing as well. Parents assume child wandered off during night. Search near campsite unsuccessful. Ground dry. No tracks.

Location: Cottonwood Creek Campground, Cottonwood Canyon

911 EMERGENCY REPORT

Call Received: 6:00 AM

Incident: Car down steep ravine

Details: Driver on way to work spotted upside down car at ravine bottom. Ravine slope too steep to climb down. Driver could hear weak calls for help. Victim sounds like young male. Says doors jammed and can't get out. Arm may be broken. Head and chest hurt.

Location: Cougar Mountain Pass

911 EMERGENCY REPORT

Call Received: 5:37 PM

Incident: Injured Elk Hunter

Details: Sixty-six-year-old hunter injured in fall. Broken leg. Leg wedged between large rocks at bottom of short cliff. Other hunters not able to free him. Rock cliff 200 yards north of U.S. forest road FR288. Injured hunter may have hypothermia.

Location: State road 95 to FR288. Three miles up 288.

911 EMERGENCY REPORT

Call Received: 12:18 PM

Incident: Tourist Helicopter Crash

Details: Airport received radio call from helicopter pilot. Malfunction caused emergency landing on narrow ledge. Rotor blade clipped rock wall and caused hard landing. Four tourists and pilot received mostly minor injuries. One bad back. Ledge part way up rocky mountain wall. Not safe to climb up or down.

Location: Cascade Mountain Park, north slope, below observation point.

6. Ambulance Service

STEM CONCEPTS
E – mapping skills
M – measuring distance, calculating time

Ambulance crews do much more than just respond emergency situations. For example, they may also function as non-emergency patient transporters. Imagine a person entering a local 24 hour healthcare emergency center. The attending doctor, physician assistant and/or and nurse provides immediate care by diagnosing the problem and starting initial treatment. The care team eventually determines that the patient requires more specialized care, available at a local or regional hospital, and requests an ambulance to transport the patient. After the patient is prepared for travel, the ambulance crew brings the patient to the hospital. (A "patient" is anyone who is waiting for, or receiving health care.)

The 2020 Hess Toy Truck Ambulance is ideal for this kind of medically-related transportation. The Ambulance has emergency lights and sirens, which inform other drivers that the vehicle is responding to an emergency. In this case, since the patient is stabilized, only the lights are needed to alert traffic that an Ambulance is coming. The Hess Ambulance can run with only the lights on by utilizing the "mute" mode switch on the undercarriage.

Ambulance crews must know the cities or countryside they serve. Even with a non-emergency transport, time is important, and getting lost on the way to the hospital is unacceptable. Maps and navigation systems are important tools, but drivers still must be familiar with local streets and highways, and possible traffic conditions.

In this activity, student teams will practice route-finding for a patient transportation assignment. They will receive a map for a portion of Houston, Texas. At the center of the map is the Baylor St. Luke's Medical Center McNair Campus hospital, part of Baylor College of Medicine's clinical operation. The hospital features a wide range of advanced and basic medical services, including state-of-the-art specialties such as orthopedic surgery, neurology, urology, internal medicine, etc.

Student teams will be assigned to pick up non-emergency patients from different parts of the city and transport them the Baylor St. Luke's Medical Center McNair Campus hospital. In each case, students will have to identify the best route to the hospital and determine how long it will take to get there. As in all cities, travel time will be based partly on posted speed limits and traffic conditions. During rush hour, traffic can be very slow, so the best way to reach the hospital may not always be the shortest way.

THE QUESTION

What is the quickest route to the Baylor Medicine McNair campus hospital?

SUGGESTED LEVELS

Grades 3–5

MATERIALS

- Houston map
- Speed chart
- 12" string
- Student page
- Patient transport assignment slips

MANAGEMENT TIPS

- Project the Houston map on a screen and explain this process for measuring distance. Use a piece of string to measure a road segment. Place the measured string over the scale in the lower left of the map. Measure the distance in whole miles and quarter-mile increments. Do not try to be more accurate than quarter miles.
- Use the distance measurement to determine, in minutes and seconds, how long it will take to drive the Hess Ambulance from one end of the segment to another.
- Divide the total number of seconds by 60 to get minutes. The remainder will be in seconds. For example, 628 seconds becomes 10 minutes, 28 seconds.
- Remember to discuss the time of day, and have students consider that as part of the assignment. It will either be non-rush hour or rush hour. Show students the speed charts and discuss the speed differences.

Continued

PROCEDURE

1. Ask students to describe what they saw and heard when an ambulance has passed by them. If the siren was not on, why not? Use this discussion to introduce the role of ambulances in non-emergency patient transport.

2. Distribute the Houston, Texas street map to your students. Review its components: map scale, legend, compass rosette, hospital, street names and highways. Circles with numbers indicate patient transport assignment locations.

3. Explain that each team will be assigned to transport three patients to the hospital. On a data log, they will report the assignment number, the streets chosen to transport the patient to the hospital, and how long in minutes and seconds it took to deliver the patient to the hospital's ambulance drive.

4. Demonstrate on the screen how to begin by picking assignment numbers. Show teams that alternate routes can be taken to the hospital. The goal is to pick the route that takes the least amount of time.

5. Each team must do the following.
   a. Pick the route.
   b. Measure the distance of each road segment taken.
   c. Add up the times required to complete each segment.
   d. Write a description of the route taken, the distance, and the time required in the logbook.

6. Show students how to complete the logbook by projecting the following example. The log has room for four entries. Not all four entries may be needed to complete the log for a transport assignment.

Example of Completed Trip Log

Trip Log - Assignment 1

Date:___Today_____
Pickup Location Number:___1_____

Rush Hour ☐ **Non-Rush Hour** ☒

Street/Road/Highway, Interstate Name
From:__I _69_____
To:____HY 288_____
Distance:____0.5 mi_____
Time Required:___30 seconds_____

Street/Road/Highway, Interstate Name
From:___HY 288_____
To:__Old Spanish Trail_____
Distance:____1 mile_____
Time Required:____60 seconds_____

Street/Road/Highway, Interstate Name
From:__Old Spanish Trail_____
To:___Hospital_____
Distance:___0.75 mile_____
Time Required:____90 seconds_____

Street/Road/Highway, Interstate Name
From:_____
To:_____
Distance:_____
Time Required:_____

Total Distance:___2.25 miles_____
Total Time: _180 seconds or 3 minutes_

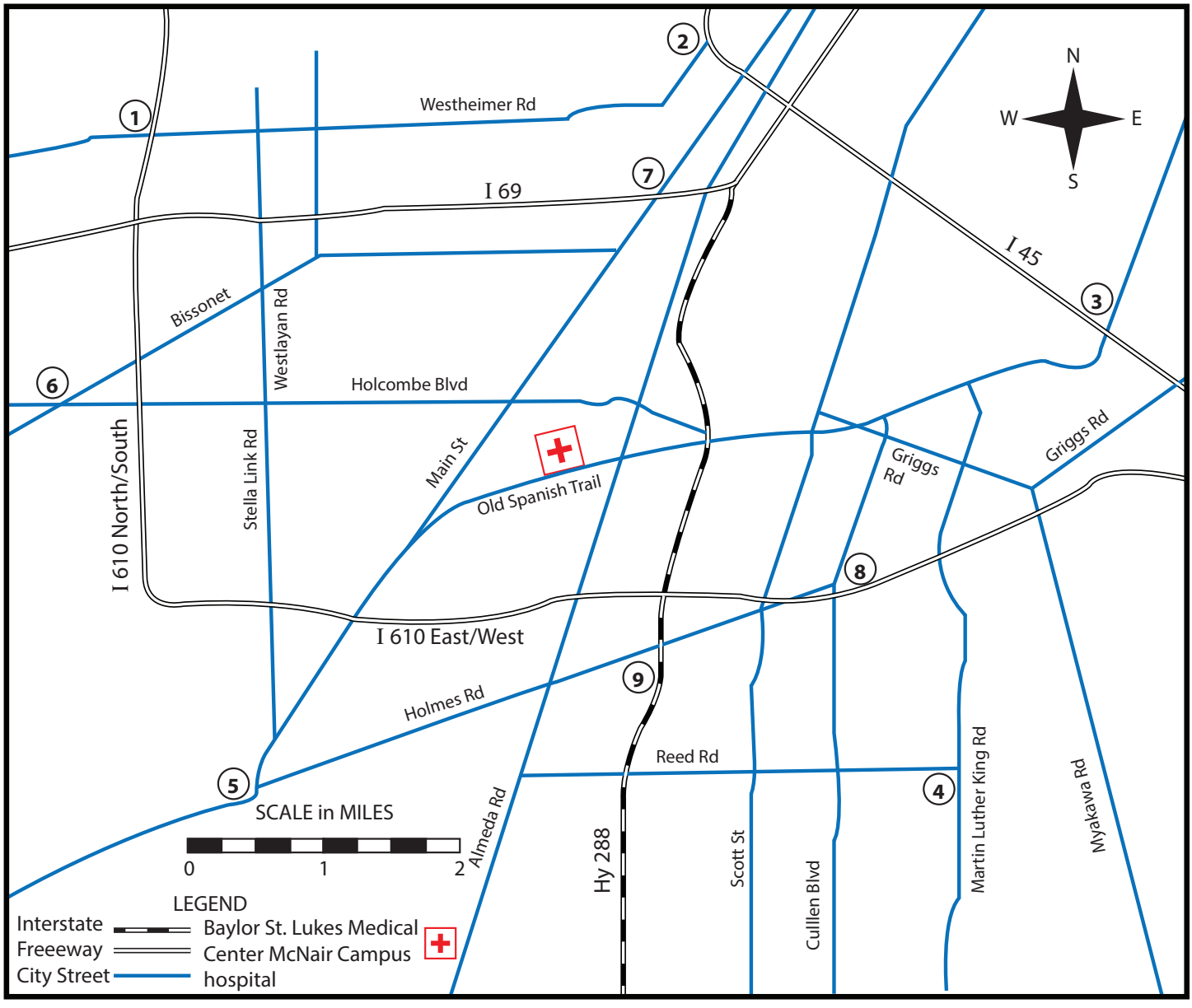
Continued

WRAP IT UP

Hold a class discussion about how students chose their routes to the hospital. Why is it important to pick the quickest route even for non-emergency trips? (Discomfort for the patient during transport. The ambulance might be needed elsewhere for an emergency. Longer trips cost more fuel, work hours for the crew, etc.)

EXTENSIONS

- The Baylor St. Luke's Medical Center McNair Campus hospital does not have an emergency room. Have students look up the locations of emergency rooms in your city. Discuss why it is important even for non-medical persons to know the locations of area emergency rooms.
- Learn about the Baylor Medicine McNair campus hospital at the following site.
  https://www.bcm.edu/healthcare/locations/baylor-medicine-at-mcnair-campus



INTERSTATE and FREEWAY Non-Rush Hour

Average Speed
60 miles per hour

1/4 mile	15 seconds
1/2 mile	30 seconds
3/4 mile	45 seconds
1 mile	60 seconds

INTERSTATE and FREEWAY Rush Hour

Average Speed
20 miles per hour

1/4 mile	45 seconds
1/2 mile	90 seconds
3/4 mile	135 seconds
1 mile	180 seconds

City Street Non-Rush Hour

Average Speed
30 miles per hour

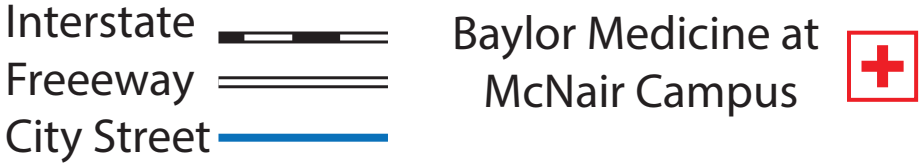
1/4 mile	30 seconds
1/2 mile	60 seconds
3/4 mile	90 seconds
1 mile	120 seconds

City Street Rush Hour

Average Speed
15 miles per hour

1/4 mile	60 seconds
1/2 mile	120 seconds
3/4 mile	180 seconds
1 mile	240 seconds

LEGEND



Patient Transport Assignment Strips

Instructions: Cut strips and place in a jar. Draw out three strips at random per team.

1 Non-Rush Hour Intersection of I 610 North/South and Westheimer St	1 Non-Rush Hour Intersection of I 610 North/South and Westheimer St
2 Rush Hour Intersection of Westheimer St and I 45	2 Rush Hour Intersection of Westheimer St and I 45
3 Non-Rush Hour Intersection of Old Spanish Trail St and I 45	3 Non-Rush Hour Intersection of Old Spanish Trail St and I 45
4 Rush Hour Intersection of Martin Luther King and Reed Rds	4 Rush Hour Intersection of Martin Luther King and Reed Rds
5 Non-Rush Hour Intersection of Holmes Road and Main St	5 Non-Rush Hour Intersection of Holmes Road and Main St
6 Rush Hour Intersection of Bissonet and Westlayan Sts	6 Rush Hour Intersection of Bissonet and Westlayan Sts
7 Non-Rush Hour Intersection I 69 and Main St	7 Non-Rush Hour Intersection I 69 and Main St
8 Rush Hour Intersection I 610 East/West, Cullen Blvd, and Holmes Rd	8 Rush Hour Intersection I 610 East/West, Cullen Blvd, and Holmes Rd
9 Non-Rush Hour Intersection of Holmes Rd and HY 288	9 Non-Rush Hour Intersection of Holmes Rd and HY 288

Trip Log - Assignment 1

Date:_____
Pickup Location Number:_____

Rush Hour ☐ **Non-Rush Hour** ☐

Street/Road/Highway, Interstate Name
From:_____
To:_____
Distance:_____
Time Required:_____

Street/Road/Highway, Interstate Name
From:_____
To:_____
Distance:_____
Time Required:_____

Street/Road/Highway, Interstate Name
From:_____
To:_____
Distance:_____
Time Required:_____

Street/Road/Highway, Interstate Name
From:_____
To:_____
Distance:_____
Time Required:_____

Total Distance:_____
Total Time: _____

Trip Log - Assignment 2

Date:_____
Pickup Location Number:_____

Rush Hour ☐ **Non-Rush Hour** ☐

Street/Road/Highway, Interstate Name
From:_____
To:_____
Distance:_____
Time Required:_____

Street/Road/Highway, Interstate Name
From:_____
To:_____
Distance:_____
Time Required:_____

Street/Road/Highway, Interstate Name
From:_____
To:_____
Distance:_____
Time Required:_____

Street/Road/Highway, Interstate Name
From:_____
To:_____
Distance:_____
Time Required:_____

Total Distance:_____
Total Time: _____

Trip Log - Assignment 3

Date:_____
Pickup Location Number:_____

Rush Hour ☐ **Non-Rush Hour** ☐

Street/Road/Highway, Interstate Name
From:_____
To:_____
Distance:_____
Time Required:_____

Street/Road/Highway, Interstate Name
From:_____
To:_____
Distance:_____
Time Required:_____

Street/Road/Highway, Interstate Name
From:_____
To:_____
Distance:_____
Time Required:_____

Street/Road/Highway, Interstate Name
From:_____
To:_____
Distance:_____
Time Required:_____

Total Distance:_____
Total Time: _____

7. Giving Thanks for Our Stars of Life

STEM CONCEPTS
T – online research
A – art and design
M – geometric shapes

The 2020 Hess Ambulance is decorated in bright colors with strategically placed emergency warning lights and loud sirens to attract attention. The colors, lights and sounds are important safety enhancements that enable the Ambulance to move quickly through heavy traffic to the site of an emergency, and to transport injured or critically ill people to a hospital or other medical facility.

The Ambulance has another exterior feature that is not quite as noticeable but very important to the emergency medical technicians (EMTs) onboard. It is the Star of Life logo. Six Star of Life logos decorate the Hess 2020 Ambulance. There are two red logos on the storage compartment doors on each side of the Ambulance, and two additional logos embossed into the white rear door.

In addition to identifying the Ambulance as an emergency medical service (EMS) vehicle, the Star of Life logo has many hidden meanings. It consists of three narrow rectangles, merged into the shape of a star. The ends of each rectangle (points of the "Star") have their own special meaning.

The top point of the Star of Life represents **Detection**: people at the scene identify what has happened, what help is needed, and what hazards are involved. The second point (going clockwise) represents **Reporting**: people at the scene call 911 for help and explain the situation. The third point is **Response**: people at the scene provide first aid to the extent of their capabilities until the EMS team to arrives.

Point four represents **On-Scene Care**: the EMS team, consisting of Emergency Medical Technicians (EMTs), arrives and takes over first aid and other medical care. The EMTs then prepare injured or sick patient(s) for transport. Arriving at the scene is where the Hess Ambulance comes in. It is also central to the fifth star point, **Care in Transit**. This is when the EMS team transports the patient to a hospital or to a life flight helicopter. The Ambulance is filled with medical equipment and supplies to stabilize the patient. The sixth point on the Star of Life is **Transfer to Definitive Care** with specialized doctors at a hospital.

The Star of Life includes one additional symbol. In the center is a rod with a snake spiraling around it. This symbol represents the Staff of Asclepius. It is named for a figure of Greek mythology, the god of medicine and healing. In general, the staff of Asclepius represents healing and the profession of medicine.

Emergency Medical Technicians are very proud of the life-saving services they provide. In addition to the Star of Life logo, they display their pride by wearing a shoulder or breast insignia or patch with specially-designed artwork and words that identify their individual EMS teams and locations. In this activity, teams will design their own EMS team logos.

THE QUESTION

What will the patch representing your EMS team look like?

SUGGESTED GRADE LEVELS

K–8

MATERIALS

- Various art supplies such as paper, cloth, marker pens, fabric paint, etc.
- Designated space where teams can display their completed insignias

Continued

MANAGEMENT TIPS

- Make sure students understand the difference between EMS and EMT. EMS refers to the entire emergency medical system: trained personnel, ambulance and other rescue vehicles, medical and communication equipment, and hospitals. EMT refers to the emergency medical technicians that provide care for accident victims and those who have suffered serious medical conditions, such as heart attacks.
- Go online and find, print and display several examples of EMS insignias. Search for "ems patches."

PROCEDURE

1. Post pictures of sample EMS patches for students to view. Ask, What does the artwork tell you about the EMS team? Discuss the different patch shapes and colors, words, and symbols. Ask, What should a patch representing your EMS team look like?

2. Give students time to brainstorm ideas for their patch designs and team names. Team members should make sketches of their ideas. Be sure all team members try their hand at sketching.

3. After teams have decided on their patch designs, have them make large color sketches of their patches on copy machine paper. Post completed patches on the wall.

4. Have students design, write and send thank you notes or cards to local first responders for the work they do. Students should include their patches with the cards. First responders include fire, police, EMS, emergency room doctors and nurses.

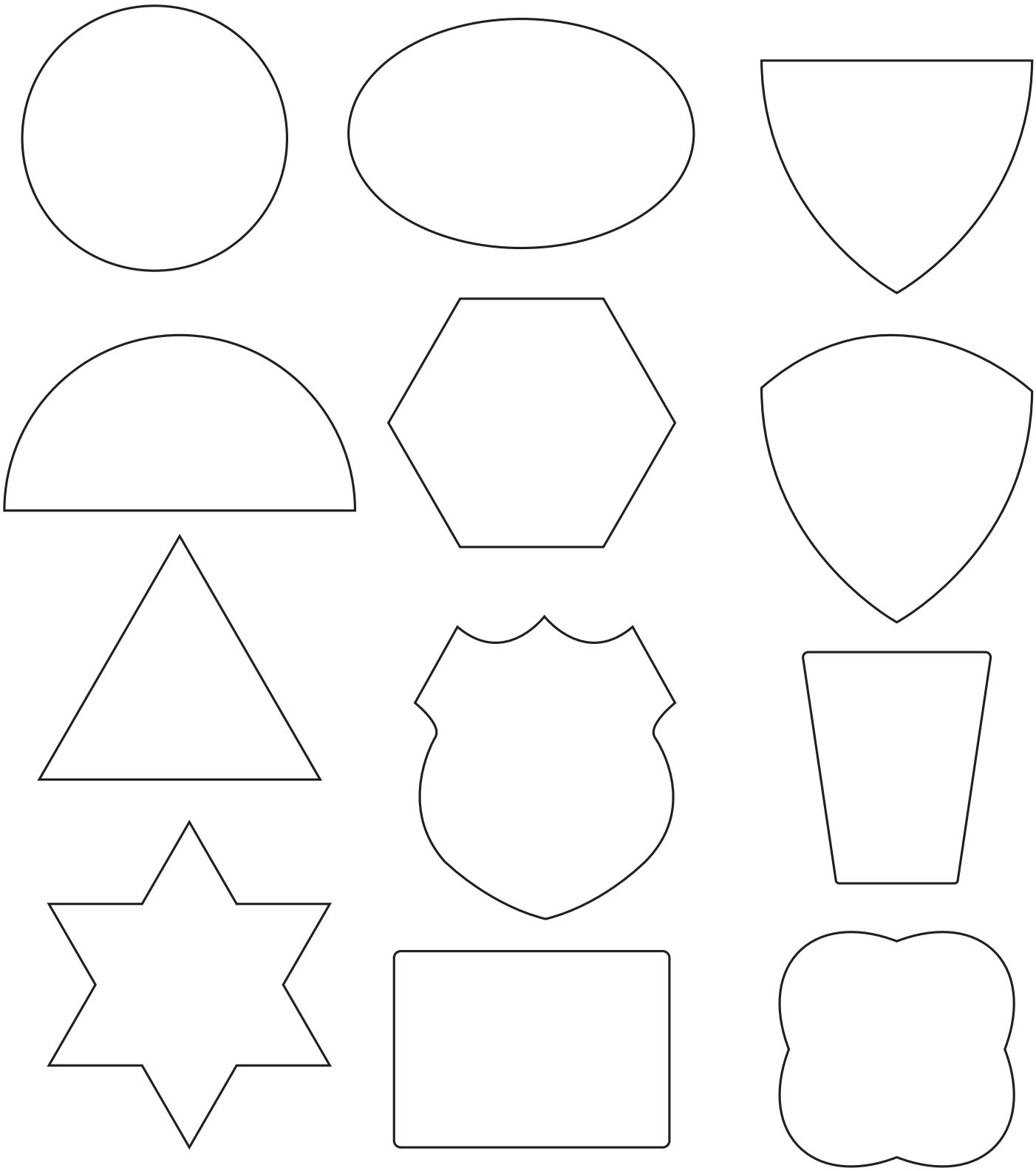
WRAP IT UP

Have each team make a brief class presentation on their patches, explaining why they chose a certain shape, symbols, words and colors. Many EMS teams and other first responder teams collect patches from other teams and frame them for display.

EXTENSIONS

- Learn about emergency medicine careers on Baylor College of Medicine's Emergency Medicine Department website. https://www.bcm.edu/departments/emergency-medicine
- Have students write letters to local or regional emergency medical services offices, explaining that they are learning about EMS careers. Have students ask if the EMS team can provide a team patch for display in the classroom.
- Invite a local EMS office to have a representative speak about EMS careers, demonstrate equipment, etc. Presentations could be done in person, if deemed safe, or through online meeting programs, such as Zoom or Google Classroom.
- If your school has a nurse (a member of the local EMS), invite her or him to talk with your class about responsibilities of the job. Consider having the nurse teach some basic first aid. ■

A Few Suggested Badge Shapes



GLOSSARY

Ambulance – A vehicle specially equipped with medical gear for administering first aid and for taking sick or injured people to a hospital or other medical facility.

Centrifugal Force – A motion-based effect that feels like an outward pulling force when an object moving in a straight line is made to follow a curved path.

Emergency Medical Service (EMS) – The combined system of EMTs, ambulances, hospital Emergency Rooms, fire and police.

Emergency Medical Technician (EMT) – Trained medical worker who provides first aid and other treatments at accident scenes, home, and public places.

Force – An interaction which, without interference, changes the motion of an object; has both magnitude and direction.

Friction – Force resisting motion or movement.

Gravity – An attractive force acting between all matter. The magnitude of this force between objects decreases with distance.

Inclined Plane – A simple machine with a sloped surface or ramp for moving objects. Roads climbing or descending hills are inclined planes.

Inertia – The property of mater to remain at rest or in motion unless acted upon by an unbalanced force.

Kinetic Energy – The energy of an object possesses due to its motion.

Newton's First Law of Motion – Objects at rest and objects in motion stay at rest or motion unless acted upon by an unbalanced force.

Potential Energy – The energy possessed by an object due to its position (elevation) interior stresses (wound spring, stretched rubber band, etc.), electric charge, etc.

Staff of Asclepius – A staff with a snake wrapped around it named for the Greek mythological god of medicine and healing.

Star of Life – The logo found on ambulances that represents six parts of emergency medical service – Detection, Reporting, Response, On-scene Care, Transit, Transfer to Definitive Care.