

Week 5: Engineering














July 22-28

Meet the people who design bridges, cars, and video games and learn how to think like an engineer.

Use the sheet below to mark off this week's activities as you complete them. See if you can get a BINGO!

Scan the QR code or visit www.michiganlearning.org/engineering to see the playlist of videos for this week.



| | | | | |
|---|--|--|---|--|
| Look for landmarks with ArchiTREKS |  60 mins. of activity |  Read for 20 minutes | Draw a family member's car | Watch Extra Credit |
|  Read for 20 minutes |  Watch Story Pirates | Write in binary with Career Girls | Watch DIY Science Time |  60 mins. of activity |
|  60 mins. of activity | Look up engineering careers |  HAVE FUN! (Free Space) | Watch InPACT at Home |  Read for 20 minutes |
| Build a bridge from outdoor materials | Find a creative solution in your hero story |  Watch Math Park |  Watch Story Pirates | Try DIY Science Time marble madness |
| Watch DIY Science Time |  Read for 20 minutes | Make an obstacle course |  60 mins. of activity |  Watch Math Park |

Why Consider AI Careers

The video "[Why Consider AI Careers](#)" teaches you about the role of AI in our everyday lives and the importance of encouraging women and girls to consider AI as a career possibility. AI careers work directly with computers and sometimes with different computer languages.

Try This!

One of the basic building blocks that computers use to send and receive information is called binary code. Binary code is a code with only two symbols. First, decode the message below using binary code. Then, try using binary code to send a short message to a friend!

Creating Secret Messages in Binary Code

| | | | | | |
|---|-------|---|-------|---|-------|
| A | 00001 | J | 01010 | S | 10011 |
| B | 00010 | K | 01011 | T | 10100 |
| C | 00011 | L | 01100 | U | 10101 |
| D | 00100 | M | 01101 | V | 10110 |
| E | 00101 | N | 01110 | W | 10111 |
| F | 00110 | O | 01111 | X | 11000 |
| G | 00111 | P | 10000 | Y | 11001 |
| H | 01000 | Q | 10001 | Z | 11010 |
| I | 01001 | R | 10010 | | |

DECODE THIS: 01000 00101 01100 01100 01111 _____

Now, try writing a short message to a friend:

A =     

The 0s and 1s of this binary code aren't the only way to make a binary code. Binary just means that there must be two options. Anything that can exist in two states or forms can be used. For example, you could replace the 0s with a heads-up penny and the 1s with a tails-up penny. What other items could you use to make a binary code?



Acting Out Structures



COLUMN



ARCH



COLUMN AND BEAM



DOME



TENSION



CANTILEVER



LOAD AND SUPPORT



VAULT / TUNNEL



COMPRESSION



FLYING BUTTRESSES

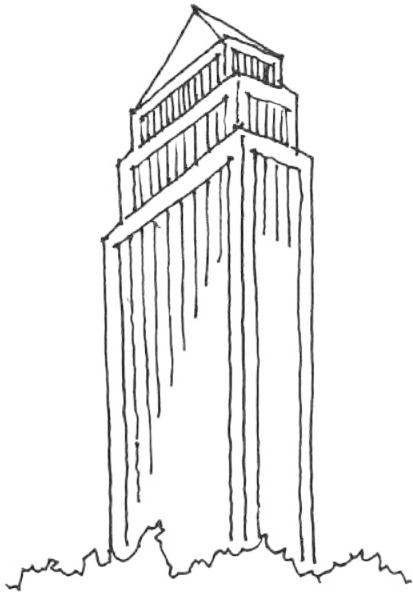
How does your house stay standing? Architects use structures like columns, beams, and arches to make buildings strong and be sure they last for many years. Grab a grown-up or a friend and try to make columns, beams, and arches with your body!



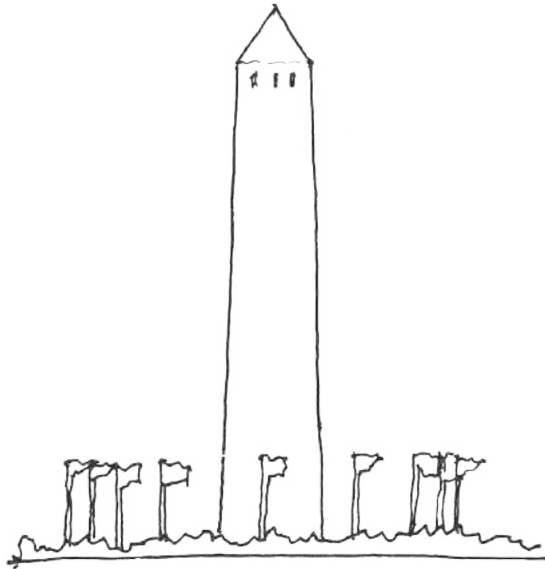
<https://michiganarchitecturalfoundation.org>



ArchiTREKS: Landmarks



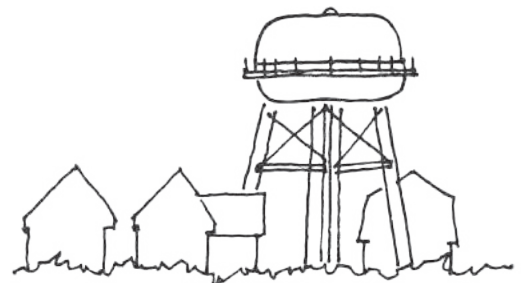
High-Rise Building



Monument



Church Steeple



Water Tower

These are examples of landmarks. What landmarks are in your neighborhood? Draw a picture of a local landmark!

DIY Marble Madness



FUN FACT

Before roller coasters were even invented, mountain-side railway cars carried coal in the mornings and provided joy rides for human passengers in the afternoon. The Mauch Chunk Switchback Railway was built in 1827 and could carry its passengers 50 miles per hour!

MATERIALS

- Marbles
- Straws
- Tape

DIFFICULTY



POTENTIAL AND KINETIC ENERGY

Energy stored in an object due to its position is potential energy. Energy that a moving object has due to its motion is kinetic energy. We can observe potential and kinetic energy conversions in many different places. Roller coasters, sledding, and even playing with dominos are familiar examples of potential and kinetic energy.

VISIT

DIYSCIENTIME.ORG
FOR MORE SCIENCE FUN!



ALABAMA PUBLIC TELEVISION

Why is wind energy becoming so popular?

**Answer on the next page*

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DIY *Marble Madness*



*Joke Answer -
Because it has so many fans!



EXPERIMENT

Step 1: Build a track that allows a marble to roll across the straws. Try to make a track 10 feet in length.

Step 2: Build a ramp for your track. This is where your marble will start and get its energy.

Step 3: Release your marble onto the track and observe the distance and speed your marble is able to reach.

Step 4: Did your marble make it the entire length of the track? How long did it take? Record your data into your science notebook.

Step 5: Redesign your track and ramp to increase the speed and distance the marble can travel.

WHY IT WORKS

Marbles have mass, and when you lift mass up off the ground, you increase the potential energy that mass has because of gravity. By adjusting the height of your ramp, you are able to increase or decrease the potential energy of the marble. Once the marble is released, it rolls down the track and the potential energy is converted into kinetic energy. If your ramp is tall enough and your track is built well, the marble may be able to successfully travel the entire track. With some simple adjustments, you can increase and decrease the speed of the marble.

EXTEND YOUR LEARNING

- What's the longest track you can build?
- Does the size of your marble change the distance that it can travel?
- Can you add hills to your track? How does that impact how the marble travels?
- Try building a second track and race a friend.

WORKFORCE CONNECTION

Hydroelectric power plants use gravitational potential energy to turn the blades of a turbine to generate electricity. A hydroelectric power plant has a water reservoir that sits above the turbines, giving the water potential energy. Scientists precisely regulate the flow of the water down and out of the reservoir, directing it across energy generating turbines. These scientist must precisely calculate the amount of water speed necessary to get the turbines moving to generate electricity.



THE HERO SIZED PROBLEM

Every story involves some sort of problem, but in a hero story that problem is SO HUGE that a whole community is in danger, and a hero needs to save the day! For more ideas on how to create a Hero Sized Problem, check out our Hero Stories videos at storypirates.com/storypiratesuniversity.

What is the **COMMUNITY** where your story takes place? A city? A town? An underground snow fortress? Use your imagination, then draw and label a picture or map!

Time
to Draw!



What is the **HERO SIZED PROBLEM** in the community?



CREATIVE SOLUTIONS

The Hero Sized Problems of today can't be solved just by punching, kicking, and blowing things up. Heroes need to be able to use their imaginations, and come up with creative ways to solve problems that nobody has ever thought of before. For more ideas on how to invent some **CREATIVE SOLUTIONS**, and then have your hero **TRY, FAIL, AND TRY AGAIN**, check out our Hero Stories videos at storypirates.com/storypiratesuniversity.

The **FIRST** solution the hero tried:

Unfortunately (what went wrong?):

The **NEXT** thing the hero tried:

Unfortunately (what went wrong?):

The solution that **FINALLY** worked:

It worked because:

it's Storytime

CHALLENGE

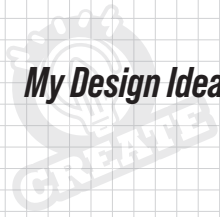
RUBE GOLDBERG MACHINE



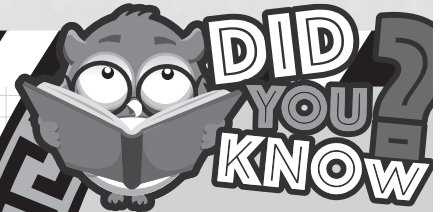
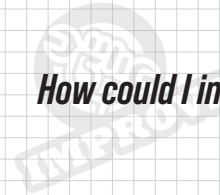
Scan here for instructions from Live From the Opera House Episode 305: Engineering

- Dominos or Blocks
- Ball
- Cardboard
- Duct Tape
- Balloon
- Push Pin

My Design Ideas:



How could I improve on my design for next time?



Engineers usually design or build things. Some engineers also use their skills to solve technical problems. There are different types of engineers that design everything from computers and buildings to watches and websites.

POWER UP WORDS

- Slope
- Tension
- Gravity



- › Civil Engineer
- › Mechanical Engineer
- › Roller Coaster Engineer

Learning Standards: Kindergarten; Forces and Interactions: Pushes and Pulls

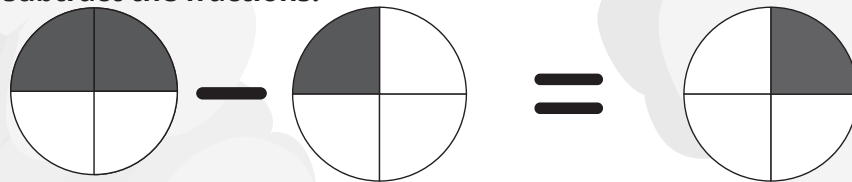
K-PS2-1 Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.
K-PS2-2 Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.



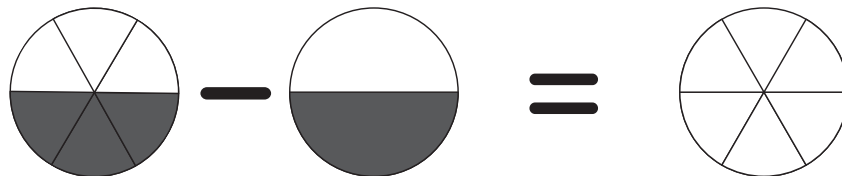
MATH PARK

Adding & Subtracting Fractions

Directions: Scan the QR code to watch the video, and then add and subtract the fractions.



$$\frac{4}{8} + \frac{1}{8} = \underline{\hspace{2cm}}$$



$$\frac{2}{4} + \frac{1}{4} = \underline{\hspace{2cm}}$$

