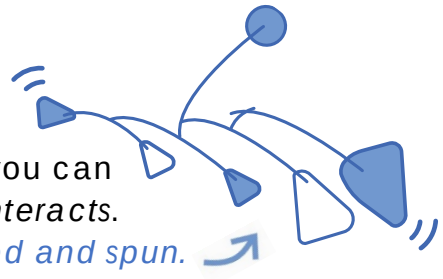
GEARS & PULLEYS TINKER SET

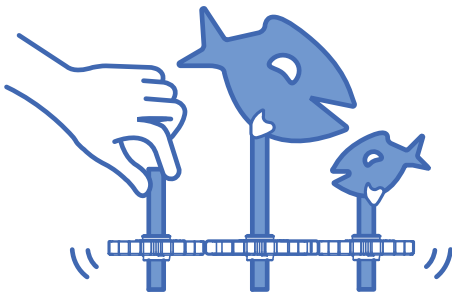
# DESIGN & ENGINEERING CHALLENGE

## THE CHALLENGE

*Design and build a kinetic sculpture with your gears and pulleys tinker set.*



**Kinetic Energy** is energy in motion. With your gears and pulleys, you can harness this energy to power animated sculptures and art that *interacts*.
*Art doesn't have to stay flat – Alexander Calder's* ***mobiles*** *rotated and spun.*



Connect dowels with yarn, tape or tubing.

## PROCEDURE

- Make sure you have built a **Tinker Set** for use on this challenge.
- Cut out the example gears and pulleys below to plan your design. Use an **engineering notebook** page to sketch out ideas.
- Tap a **dowel** into each gear or pulley's **center hole** – *use different heights depending on what you want higher in your sculpture.*
- Attach drawings, fabric or clay figures to the dowels. Note the direction of **rotation** – *how can you make art,* ***interact****?*

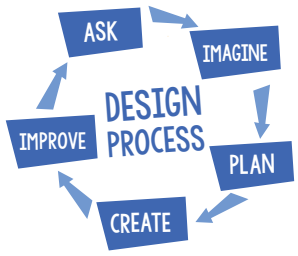

**Tapping Block**

### Challenge Supplies

Gears and Pulleys Tinker Set with base, dowels, sculpture materials (paper, clay, pipe cleaners, string, recycled materials), glue, tape

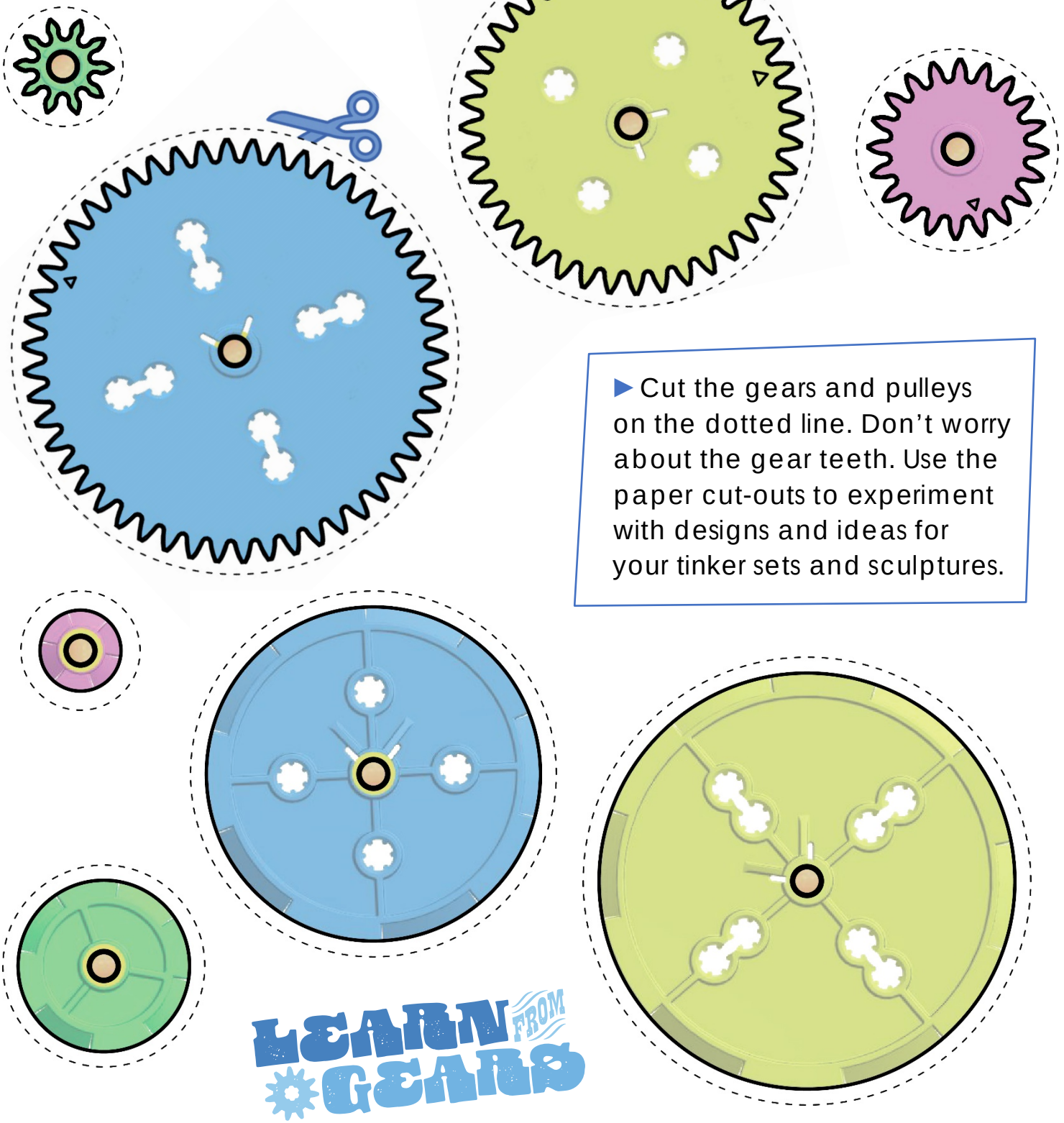
### The Engineering Design Process:

You will be using the **Engineering Design Process**. What does that mean? Your design is never finished (it can always be improved). There is no such thing as a perfect design. Fill out a new *Engineering Notebook* page each time you design/redesign your **Gears & Pulleys Tinker Set**.



# DESIGN & ENGINEERING CHALLENGE

## CUT OUT ACTIVITY



▶ Cut the gears and pulleys on the dotted line. Don't worry about the gear teeth. Use the paper cut-outs to experiment with designs and ideas for your tinker sets and sculptures.

LEARN FROM GEARS

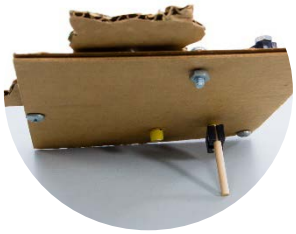
## EXAMPLES

**Kinetic Sculptures** can do more than just spin – use your gears and pulleys' direction of rotation to make art that *interacts*.

These wings flap back and forth.

These bees circle the flower and each other.

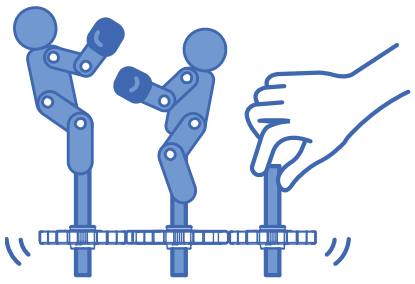
Use recycling bin innovation to hide or add mechanisms.



## ZOOPRAXISCOPE

The **Zoopraxiscope** (invented by Eadweard Muybridge) was the first movie projector. Drawings on the circle blur and "move" when **rotated** by a center dowel.

*How could you animate your kinetic sculptures? With boxers in a ring, or twirling ballet dancers?*



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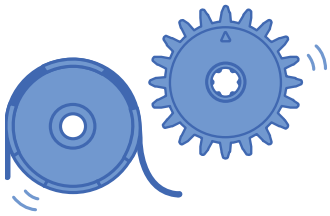
# DESIGN & ENGINEERING CHALLENGE

## THE CHALLENGE

*Design a gears and pulleys inspired attraction for the hip, new theme park **Darren Lake**.*





## PROCEDURE

- Make sure you have built a **Tinker Set** for use on this challenge.
- Cut out the example gears and pulleys below to plan your design. Use an **engineering notebook** page to sketch out ideas.
- Your attraction must utilize gears and pulleys in its operation. Demonstrate with your TeacherGeek tinker set how you can change speed and direction, or transmit force.
- Do not mesh gears with pulleys on the same base – if combined in your attraction's design, keep each separate.
- You will have _____ to complete the challenge.

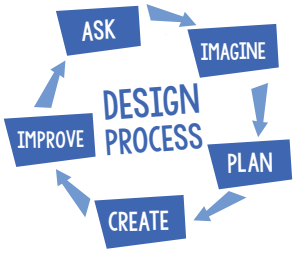
  *Fill in how much time you have*

### Challenge Supplies

Gears and Pulleys Tinker Set with base, dowels, cut out sheet, Engineering Notebook Pages, pencil, pen

### The Engineering Design Process:

You will be using the **Engineering Design Process**. What does that mean? Your design is never finished (it can always be improved). There is no such thing as a perfect design. Fill out a new *Engineering Notebook* page each time you design/redesign your **Gears & Pulleys Tinker Set**.



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# DESIGN & ENGINEERING CHALLENGE

## CHALLENGE IDEAS

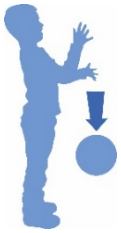
*These ideas are just to get you started – what else can you design for an amusement park using gear and pulley sets?*

### ▶ Rock Your Roller Coaster

*Control the thrills on your personal roller coaster design.*

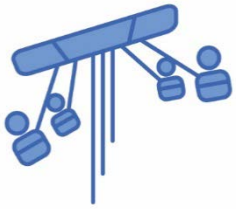
Roller coaster cars have no power source of their own. They reach thrilling speeds using **gravity**, **kinetic energy, gears** and **pulleys** to lift, transmit force and increase speed.

**Potential Energy** is stored energy, ready to be put in motion.



**Kinetic Energy** is energy in motion.

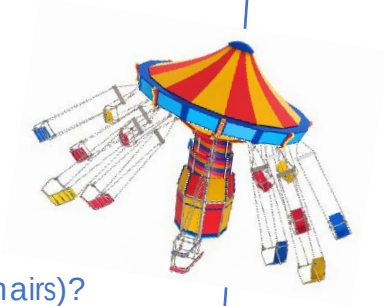
How could you get coaster cars to the top of the **incline** (lift hill)?



### ▶ Swingin' Party Down the Line

*Whee! Try not to get sick on this whirling rotary ride.*

Chair swing rides tilt and whirl, flying guests in circles. The transfer of force through **pulley systems** use **simple** and **cross belt positions** to pull and drag.



How could you use pulleys to lift and lower **loads** (chairs)?

### ▶ Around and Around We Go!

*Is there anything more relaxing than a spin on a Ferris Wheel?*

Passengers complete one full wheel **revolution** each trip, much like a giant gear. Smaller **input gears** transmit power over distance, allowing the wheel to turn.

How would you change the wheel's **direction**?

## DESIGN PROCESS

*Sketch, Write and Design your park attraction ideas below.*

**▶ Need More Room?**
Print Extra Engineering Notebook Sheets:
teachergeek.org/engineering_notebook.pdf