

brackitz®

Rescue!

U3 L3
V2.3



LESSONS

PULLEYS & CRANKS



★ Lesson 3: Rescue! ★

Students consider how to use pulleys to complete a rescue!

Objectives:



Students will build with pulleys to better understand using simple machines to make work easier in a vertical direction. Students also practice design thinking with a need and some specific design criteria.

Vocabulary used in this activity:

Situation, solve/solution, simple machine, pulley, design, model

Standards

ECERS-R **Language-Reasoning:** Books and pictures, Encouraging children to communicate Using language to develop reasoning skills | **Activities:** Fine Motor, Art, Math/Numbers | **Program Structure:** Group time

NGSS **K-2nd Engineering Design:** K-2-ETS1-2 Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
K-2-ETS1-1 Ask questions, make observations, gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

CCSS-Math K Practice.MP5, K Practice. MP7, 1. MD.A.1, 1.MD.A.2, 1. MP8, 1.MP.5

CCSS-ELA SL.K.1, SL.K.1.A, SL.K.1.B, SL.K.5, SL.K.6, SL.1.1, SL.1.1.A, SL.1.1.B, SL.1.5, L.1.1i, CCRA.L.6, L.1.5c

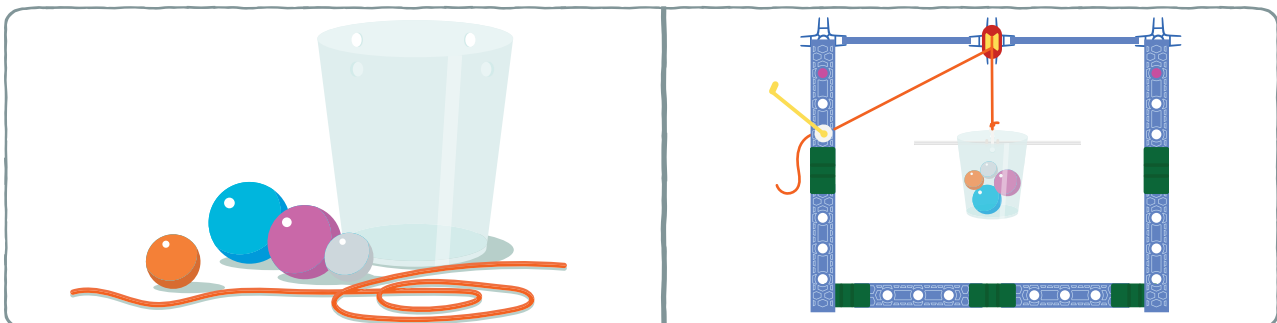
Time needed: 35-40 minutes

Materials and Supplies: Gingerbread friend, paper, pencils/crayons, simulated canyon or hole (box) set up on the floor below a counter/table/bookshelf edge. Each group will need a tray of Brackitz planks, 3, 4 and 1-way pivoting hubs, and access to the pulley, crank, string, and pulley-wheel connectors, simulated rescue items (small toys, marbles, or pebbles).

Resources/Optional Reading: Amanda Askew's Cranes ([Mighty Machines](#))

Set-up and Preparation: Help students cooperatively form groups of 2-3 to work together.

Background Knowledge: Prior to this lesson, students do not need special background knowledge. Introducing students to the Gingerbread friend from Unit 1 and transportation and simple machines in Unit 2 can be very helpful.



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35-40 minutes

Whole Class

10 minutes



"In the last lesson, we practiced thinking about when our Gingerbread friend would need a pulley to take things somewhere where s/he can't go. Today I'm going to model a situation that we need to help our Gingerbread friend solve. Gingerbread's best friend has fallen down into a deep hole. Rescuers will be figuring out how to dig her out, but it will take several days, and Gingerbread's friend needs food, water, and blankets. Gingerbread can't get too close to the edge and fall in. And s/he can't go down there - s/he might fall and get hurt. What can we think of that will stay away from the edge but get the supplies down there?"

Instructor Notes and Tips

If student ideas tend towards the fanciful, ask specifically, "How can we use the pulley to help get Gingerbread's friend what she needs safely?"

Invite students to use the Brackitz pulley pieces to act out ideas of how to lower items into the hole, without building a structure to operate it at this point.

Lead students to the idea of something that can be operated that also maintains some distance from the edge. **Crane!**

Group Exploration

10 minutes



"In real life, we use cranes to lower supplies into canyons and holes during rescues.

Design on paper what it would look like to use the Brackitz pieces to make a crane to help with this rescue. In order for your design to help, it has to keep Gingerbread away from the edge, and be able to lower some things down to Gingerbread's friend in the hole."

It will be useful to have read the Cranes book before this lesson and possibly to refresh that cranes work with pulleys.

Remind students that pulleys are simple machines that make it possible to move things up and down smoothly. Remind students that one criteria is that Gingerbread cannot go down to the hole to help - s/he has to stay away from the edge during this rescue.

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Group Challenge

15 minutes



"Ok, now build your crane! In order for us to know it's a good design, it needs to be able to lower these (model) rescue items, and Gingerbread needs to be able to stay away from the edge when s/he is using it to help the friend in a hole."

Using the pulley takes some fine-motor control and practice. Be prepared to guide students and groups to practice this until they achieve success.

Reflection



5 minutes



"Where are cranes used in real life? Would a story like this ever happen? Tell me how."

You can share stories about disaster areas that people wanted to send help to, but couldn't risk being in, or the story of trapped miners who needed weeks of supplies before they could safely be rescued.

CHALLENGE ADVANCED STUDENTS

In the group challenge, you may ask students to consider designs that can sit at the edge of a surface for this rescue operation. Give them examples of the Sky Crane or Over-the Edge lifter.

SIMPLIFY FOR YOUNGER GROUPS

In discussion, use the suggested book, Cranes! (Mighty Machines) to help guide students to real world solutions.

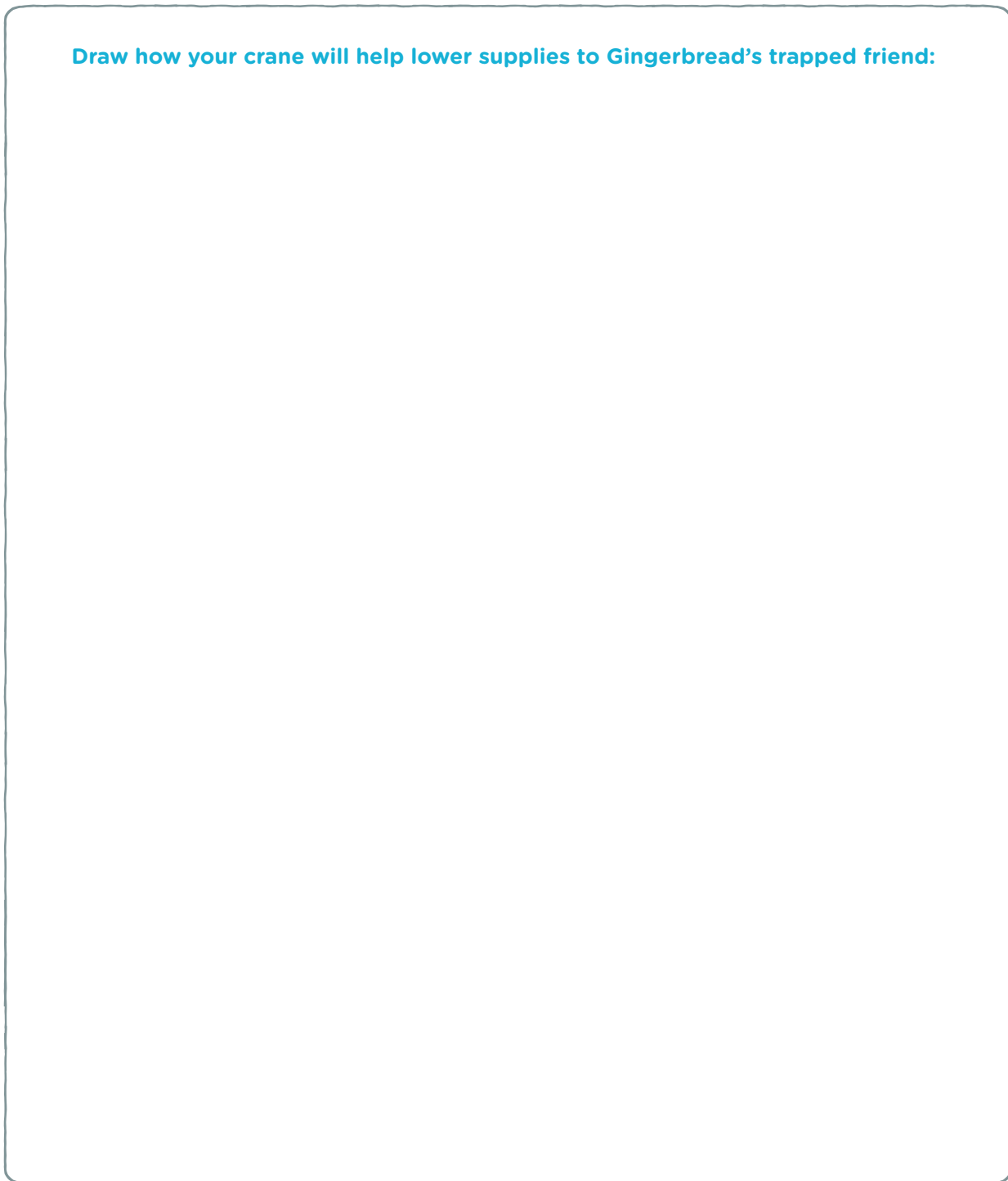
In the group challenge, any crank and pulley assembly will do, even if it looks a lot like the elevator from previous lessons.

Name

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Student Worksheet

Draw how your crane will help lower supplies to Gingerbread's trapped friend:



Name

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Student Worksheet

Draw a place where cranes are used in real life:

