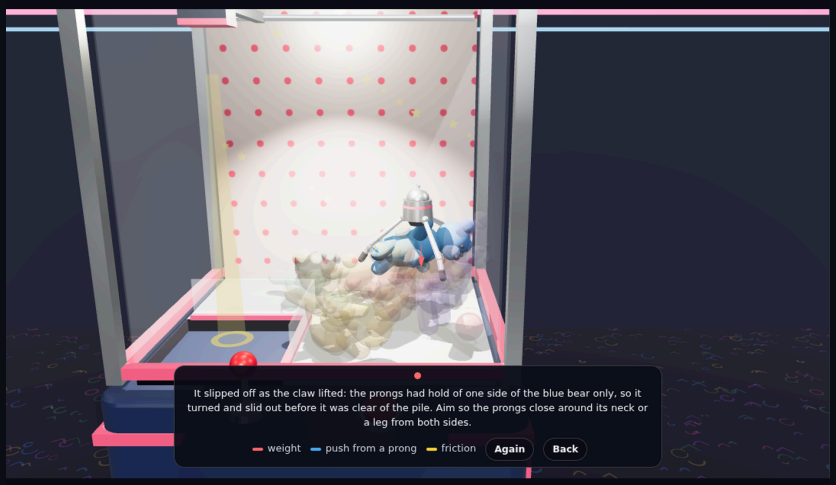
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Claw Game Maker: Why Did the Bear Drop?

Grades 6-8 · 45 minutes

Physical science · Engineering



Slides, rubric and answer key **Print and go** **No student accounts**

Chromebook friendly

What's included

- A one-page overview: objectives, essential question, vocabulary, standards and assessment
- A 45-minute lesson sequence: warm-up, direct instruction, guided practice, independent practice, closure
- Slides for the board: a PowerPoint file that also opens in Google Slides
- A student worksheet with a QR code and a bench table to fill in
- A 3-question exit ticket, two to a page, with an answer key
- A rubric: 3 criteria, 4 levels, scored out of 12
- Differentiation for English learners, students with IEPs or 504 plans, and students who need more support or more challenge
- Cross-curricular extensions, and notes for teaching it in grades 4 and 5 and in high school physics
- Standards: NGSS

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Everyone has lost a bear to a claw machine. Students play one with real physics, and when the bear slips a replay draws the forces: its weight, the push from each prong, and the friction that push could make. On the Grip Bench they turn the grip down until the bear slides and up until it holds, and find the line where friction runs out. By the end they can say what holds a prize up, and what sets the limit.

At a glance

ESSENTIAL QUESTION

The claw squeezes sideways. What holds the prize up, and what sets the limit?

OBJECTIVES

Students will be able to:

- explain that friction between the tips and the prize is what holds it up, and that the push sets how much friction there can be
- read a replay's arrows for weight, push and friction and say which one ran out
- find a bear's holding grip on the Grip Bench and compare it with the bear's weight
- change one variable at a time (the grip, the mass or the tips) and say what changed

VOCABULARY

Weight, Newton (N), Friction, Grip, Limit

STANDARDS

MS-PS2-2

TIME AND MATERIALS

45 minutes, grades 6-8.

- One computer or Chromebook per student
- A projector
- The worksheet and exit ticket, one copy each per student
- The rubric, one copy per student if you grade the work

PREP

Make copies of the worksheet and exit ticket. Before class, open mytekdev.com/try/clawmaker?lesson=why-did-the-bear-drop&ref=tpt-clawmaker-1 once on a student computer: press Play, steer with the arrows, press Drop, and when a prize slips press Why did it drop? Then open Test and run the Grip Bench once at the grip it shows. About five minutes.

ASSESSMENT

- Formative: the questions under What to look for, asked while students work, and the exit ticket (answer key included).
- Summative: the worksheet, scored with the rubric.

TECHNOLOGY AND PRIVACY

Runs in any browser with WebGL, Chromebooks included, with nothing to install. Students need no account and no email: the link works signed out, and nothing they do is stored on our server unless they choose to save.

Lesson sequence

MINUTES	STAGE	WHAT YOU DO	WHAT STUDENTS DO
0 to 5	**Warm-up** Hook	Show the title, essential question and Today I can slides (about 1 minute). Then the warm-up: why did the bear slip? Collect ideas without judging them.	Write an idea on the worksheet.
5 to 12	**Direct instruction (I do)** Model it	Project the app and play once. Press Why did it drop? and show What the arrows say: the red arrow is the weight, the blue arrows are the push from the prongs, the yellow arrows the friction. Then The Grip Bench: what one grip and one prize look like on Test. > **It's working when:** Press two fingers together on a pencil and lift. The squeeze is sideways; what lifts the pencil is friction.	Fill in the vocabulary.
12 to 22	**Guided practice (We do)** One play together	Students open the link or scan the QR code. The guide walks one play: Play, steer with the arrows, Drop, watch the carry, then Why did it drop? on a loss or Play again on a win. Walk the room and ask students to read the sentence under their replay aloud. > **Watch for:** Students who keep playing instead of reading the replay. Three plays, then the replay of the last loss.	Follow the guide and write the reason the card gave.
22 to 38	**Independent practice (You do)** The bench table	Students open Test and the Grip Bench with the bear. Guess, run it at the grip shown, then turn the grip down until it slips and up until it holds, filling in the table. Then bare metal tips at the holding grip, and the mass doubled in the prize's card. > **If they ask:** "The bear held at 0.9 N and slid at 0.6 N. Its weight is 1.8 N. Why can a push smaller than the weight hold it up?" The line	Fill in the bench table and write what changed.
38 to 45	**Closure** Showcase and exit ticket	Show the Showcase slide and take two or three answers. Go back to the warm-up ideas and mark the ones the replay ruled out. Hand out the exit ticket.	Answer the exit ticket.

Before you teach: a ten-minute walkthrough

Open mytekdev.com/try/clawmaker?lesson=why-did-the-bear-drop&ref=tpt-clawmaker-1. A claw machine in a room, seen the way a player sees it: a 70 cm box, three rubber-padded prongs parked closed over the chute, and a pile of bears, ducks and capsule balls.

1. **Play.** Press `Play`, steer with the arrows, press `Drop`. The claw closes, lifts, holds, carries to the chute and lets go.

2. **The replay.** On a loss, press `Why did it drop?`. The last seconds play again at quarter speed with arrows: weight down from the middle, push in from each prong, friction up along the tips, and one sentence.
3. **The bench.** Open `Test`. The Grip Bench puts one bear under the claw at the grip shown. Guess, run it, and read held or slipped with the push and the friction the tips made.
4. **Down and up.** Turn the grip down to 0.6 N: it slips. Up to 0.9 N: it holds. The bear weighs 1.8 N.
5. **One variable.** In `Build`, `Claw`, pick bare metal tips and run the bench at 0.9 N again: it slips. The push is the same; the friction is not.

> The friction the replay draws is what the contact could have made at that push. Whether the prize held is what the physics decided.

Background for the teacher

The prongs squeeze the prize sideways. The upward hold is friction, and the most friction a contact can make is the push times how grippy the two surfaces are (the coefficient of friction). A 180 g bear weighs 1.8 N; with three rubber tips on plush, pair friction about 0.7, each tip must push about 0.8 N before friction alone can match the weight. On the bench it holds from about 0.9 N, because the prongs push at a slant.

Curled tips change the story: they can close under a prize and carry it on their shape, so a round capsule ball holds at 0.3 N. That is the next part of this series, Squeeze or Cradle? Here the bear is held by the body, on its back, so friction does the work.

The app's friction numbers are typical values for each surface, averaged for each pair, and the prizes are stiff. Real plush squashes, and the prongs sink in, which helps a grab. How it works in the app says so.

What to look for

Ask these while students work. A student who has understood the lesson can answer them without help:

- Which way does the push arrow point? Which way does the friction arrow point?
- What was the lowest grip that held the bear? What is the bear's weight?
- Why can a push smaller than the weight hold the bear up?
- What changed when you swapped the tips for bare metal?
- What would happen with twice the mass at the same grip?

> The third question is the real test: a student who can say that three tips each make friction, and that friction can be bigger than the push, has it.

Cross-curricular extensions

- Math: the bear held at 0.9 N and weighs 1.8 N. How many newtons of friction did each of three tips make, at least?
- Engineering: list three ways to make the same claw hold a heavier prize without turning the grip up.
- History: read how the first crane games of the 1920s and 1930s were called diggers, little steam shovels in a glass case.
- English: write the replay sentence for a play of your own, in your own words.

Vocabulary

Weight	The force of gravity on the prize, pulling it down. A 180 g bear weighs about 1.8 newtons.
Newton (N)	The unit of force. A small apple weighs about 1 N.
Friction	The force between two surfaces that resists sliding. It is what holds the prize up in the claw.
Grip	How hard each prong pushes on the prize, in newtons. The push is sideways; friction turns it into a hold.
Limit	The most friction a push can make: the push times how grippy the two surfaces are. Above it, the prize slides.

Differentiation

ENGLISH LEARNERS

- Keep the vocabulary slide up, and point at the red, blue and yellow arrows as you say weight, push and friction.
- Pair each learner with a partner who reads the replay sentence aloud.
- Accept the bench table as numbers with held or slipped circled.

STUDENTS WITH IEPS OR 504 PLANS

- Pair students, one steering and one writing.
- Zoom the browser to 150%.
- Allow three bench rows instead of six where the IEP allows a modified assignment.

STUDENTS WHO NEED MORE SUPPORT

- A sentence starter: "The bear slid because the friction was less than ___."
- Run the first bench row together on the projector.
- Set the level to Kid in the header: the grips read weak, medium and strong.

STUDENTS READY FOR MORE

- Work out the friction line: weight divided by three prongs and the grippiness, and compare it with the bench.
- Bench the capsule ball and explain why it holds at a far lower grip than the bear.
- Solve the Hold the bear puzzle under Puzzles.

Adapting for other grades

Younger students: In grades 4 and 5, set the level to Kid, do the guide and three bench rows at weak, medium and strong; drop the third rubric row; total 8, and 6 meets the objectives.

Older students: In high school, switch the level to High school: the bench shows the line a straight squeeze would need, and the replay adds the turning push when a grab is off the middle.

Student worksheet

Name: _____ Date: _____

Open the app: scan the QR code, or go to mytekdev.com/try/clawmaker?lesson=why-did-the-bear-drop

Essential question: The claw squeezes sideways. What holds the prize up, and what sets the limit?

Warm-up: A claw lifts a bear and it slips out. Why? _____

1. **Vocabulary.** Weight, newton, friction, grip, limit: write each in your own words.

2. **The replay.** After a lost play, press Why did it drop? Copy the reason, and say which arrow ran out.

3. **The bench table.** Six rows: the grip, your guess, held or slipped, the push and the friction. Find the lowest grip that holds the bear.

4. **One variable.** Bare metal tips at the holding grip: _____. Mass doubled at the holding grip: _____.

1. The bear weighs 1.8 N and held at a grip under 1 N. How?

2. What changed when you swapped rubber for bare metal, and why?

Exit ticket

Name: _____

1. What holds the prize up in the claw? (A) the push from the prongs (B) friction between the tips and the prize (C) the cable

2. The most friction a tip can make depends on (A) the push and how grippy the surfaces are (B) the color of the prize (C) how fast the claw lifts

3. The same grip holds the bear with rubber tips and drops it with bare metal tips. Why?

Claw Game Maker: Why Did the Bear Drop?

Exit ticket

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Answer key: exit ticket

QUESTION	ANSWER	WHY
1	B	The push is sideways; friction is the upward force.
2	A	Friction's limit is the push times the coefficient for the pair of surfaces.
3	Metal on plush is less grippy	The same push makes less friction on the slippery pair, so it falls under the weight. A full answer names the push and the limit.

Rubric

Score each row from 1 to 4.

Name: _____

CRITERIA	4 EXCEEDS	3 MEETS	2 APPROACHING	1 BEGINNING
Data	Six bench rows with a guess beside each, the holding grip found to within one step, and the metal-tip and doubled-mass rows.	Six bench rows with the holding grip found.	Fewer rows, or the holding grip not found.	No bench rows.
Evidence	Reads a replay's arrows and names which force ran out, with the push and friction numbers from the bench.	Reads the arrows and names the force that ran out.	Names a reason without the arrows.	No reason given.
Explanation	Explains that friction holds the prize up, that the push sets its limit, and why a push smaller than the weight can still hold it.	Explains that friction holds the prize and the push sets the limit.	Says friction holds it with no limit.	Says the claw lifts it.

Total: ____ / 12. A score of 9 or more meets the objectives.

Standards

The lesson is built for MS-PS2-2: one variable at a time, and the motion that follows.

FRAMEWORK	CODE	GRADES	STANDARD	HOW THE LESSON MEETS IT
NGSS	**MS-PS2-2**	6-8	Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.	Students change the grip, the mass or the tips, one at a time, and record whether the prize held, with the push and friction the tips made.

Checked November 2026 against: NGSS MS-PS2-2, Motion and Stability: Forces and Interactions.

Optional: save student work in a free class

The whole lesson runs at the link on the worksheet, with no accounts and no sign-up.

To keep students' work, and see it all in one place, make a free class. It takes about ten minutes, once, and covers every lesson in this series: mytekdev.com/tools/class-setup

Students in a class open mytekdev.com/tools/claw-game-maker/lessons/why-did-the-bear-drop/start instead of the worksheet link. Each one gets their own copy of the starter, and the same link reopens it next time.

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