



Teacher's Guide for:
Launching Water Balloons

Note: All activities in this document should be performed with adult supervision. Likewise, common sense and care are essential to the conduct of any and all activities, whether described in this document or otherwise. Parents or guardians should supervise children. Rock-it Science assumes no responsibility for any injuries or damages arising from any activities.

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Title Page of Video

(Numbers in the text are **time codes**, so you can refer back to the video.)

[00:03:09]

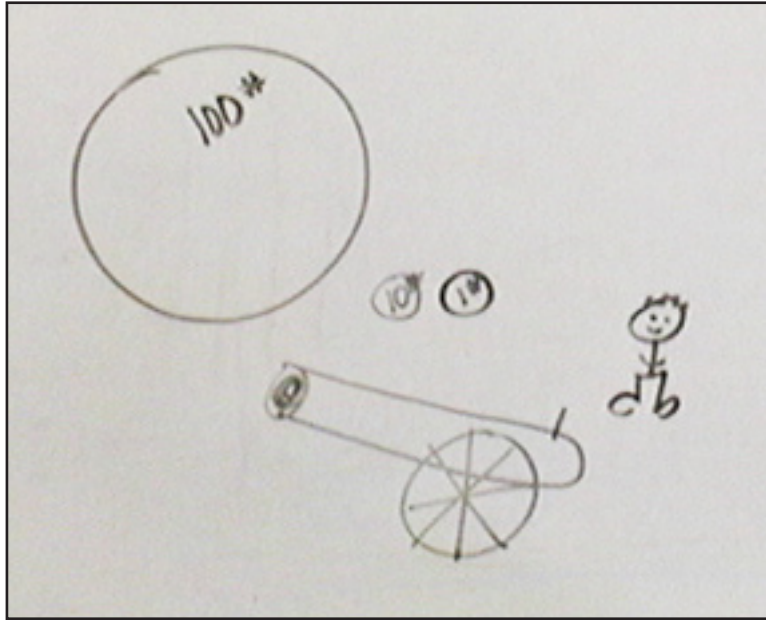
Launching Water Balloons
filmed July 2011

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Intro Quick Recap:



- Suppose you had a couple of balls to throw. One weighs one pound, and the other weighs one hundred pounds.
- It would be really hard to throw the hundred-pound ball because you could hardly pick it up.
- What if you had two balls, and one of them was one pound and the other was ten pounds.
- You could probably throw the one-pound ball a long way, and the ten-pound ball only a little way.
- But what if, instead of using your arm, you had something like a cannon that could shoot either ball?
- Which would go furthest? A ten-pound ball might go further because it's heavier and can shoot through the air better. But the one-pound ball is a lot lighter, so it should take off faster at the beginning, so it might go farther.

Experiment Quick Recap: "Launching Water Balloons"

- Instructor shows students an oversize slingshot made of surgical tubing, with a leather pouch, similar to the "t-shirt cannons" used at sporting events.
- One end of the tubing is fastened to a secure object, while the other is held by an assistant (This is how we did it in this particular class. Alternatively, both ends could be fastened to secure objects, or they could both be held by people).
- With the two ends held securely, each student takes a turn pulling back on the pouch and releasing it so they can get used to how it feels.
- Then everyone goes outside, where there is a large metal hoop (about twice the diameter of a basketball hoop) attached to the top of a tall ladder. A large slingshot is attached to either side of the hoop. The rubber tubing is long enough for the pouch to be reached by a student standing on the ground.
- There is also a piece of tubing tied to the handle of the pouch, and the Assistant holds the other end of it to keep the pouch itself from going through the hoop when the student releases it.
- The angle at which the Assistant holds the anchor line affects the path of the projectile through the hoop. If the student is short, the Assistant holds the end of the anchor line lower.
- Each student takes a turn launching a small water balloon through the hoop.
- After each student launches their balloon, they go to the opposite end of the parking lot to try to catch the water balloons being launched by the other students.
- After each student has had at least one turn, they go back inside.



Water balloon flies through hoop.

Equipment List: "Launching Water Balloons"

Items needed for Instructor:

- Oversize slingshot (about 10 ft. long) made with surgical tubing and a leather pouch.
- Giant slingshot attached to a ladder with a hoop at the top and a very heavy weight at the bottom to keep it from moving. (This item was specially constructed at Rock-it Science from available materials and is too complex for instructions to be included here.)
- Painter's extension pole with a hook on the end to detangle the tubing if it gets caught in the hoop.
- Bucket, 5-gal. for water balloons

Items needed for Students:

Consumables (per student):

- Balloons, 11", at least one per student, plus extras in case they break.

Other (per student):

- (None)

Prep Work:

- Construct large slingshot device with metal hoop on ladder.
- Inspect all surgical tubing, especially knotted areas, to make sure it's not cracked or torn.
- Make water balloons with varying amounts of water, but underfill them so they don't break easily.

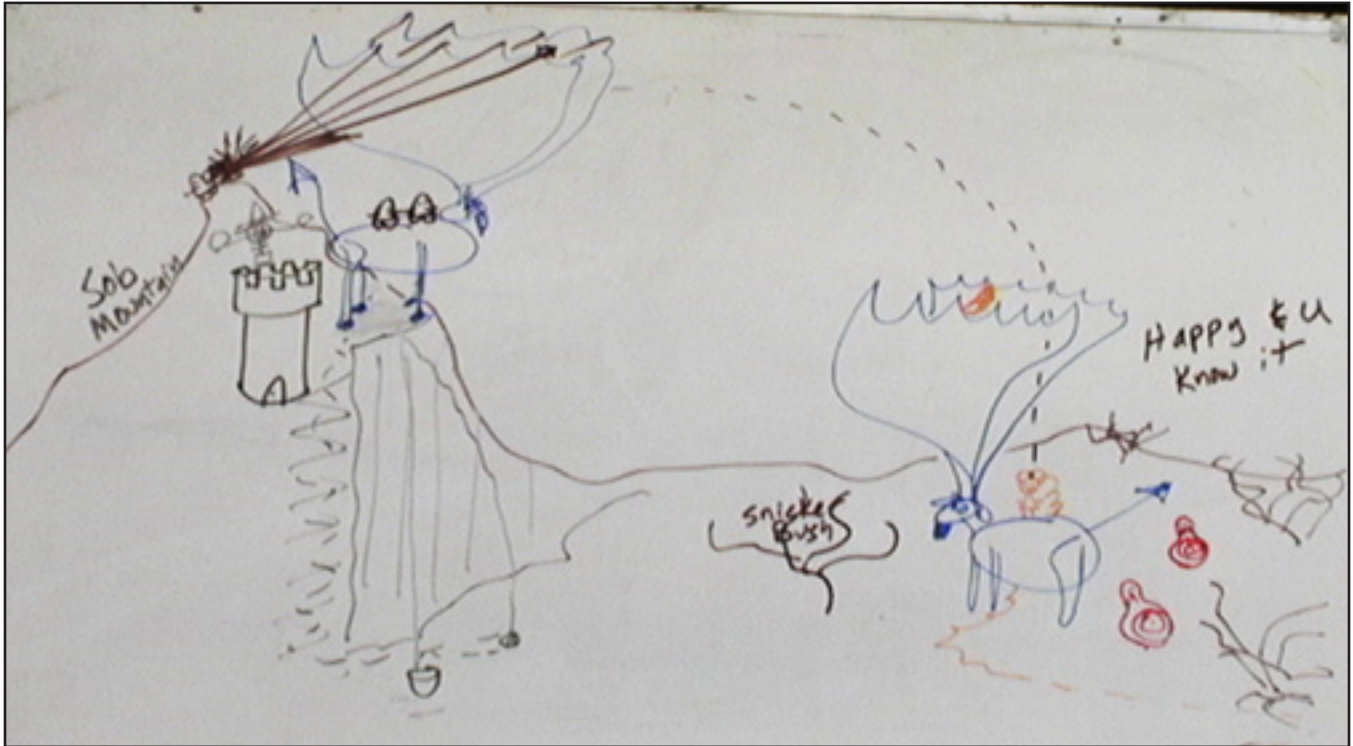


Oversize slingshot.



Giant slingshot with hoop.

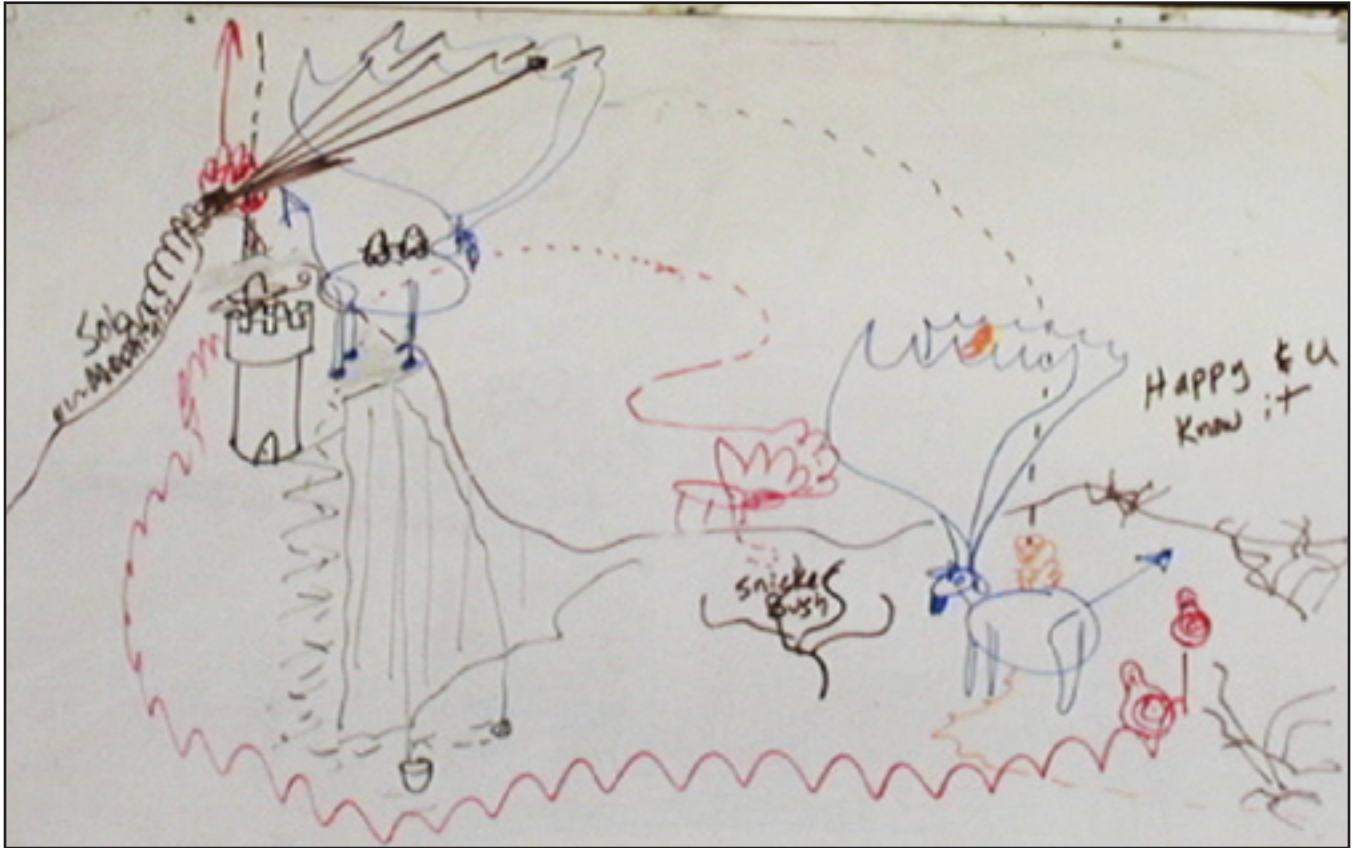
Story Quick Recap: "Jack and Jill and the Slingshot Moose"



Part 1:

- Jack and Jill were raising a herd of moose that had really big antlers, so big you could stretch a hammock between them.
- The moose eat the candy bars that grow on Snickers bushes.
- Evil Mister Fred's castle is on top of nearby Sob Mountain, next to a cliff.
- The minions like to play baseball, but if their ball goes over the cliff, they have to throw one of the minions down to get it because it's faster than going down the winding path.
- If the minion lands on his head, it's okay because they have hard heads. Then they have to bring the ball back up the path to the top.
- Jack and Jill's moose are singing happy songs, and they sing really loud, especially at night. This drives Evil Mister Fred crazy.
- Evil Mister Fred sends his minions to steal one of the moose. They bring it back up to the mountain, and Evil Mister Fred glues its feet to the ground so it can't escape.
- Then he puts a bunch of rubber bands on the moose's antlers to make a slingshot.
- He uses the slingshot to launch a minion over to where Jack and Jill are, and the minion tries to hit Jack and Jill and the moose with his baseball bat, or knock the candy bars off the Snickers bushes.
- Jack and Jill also have some Kick-Mes with them.

Story Quick Recap (cont.)



Ending:

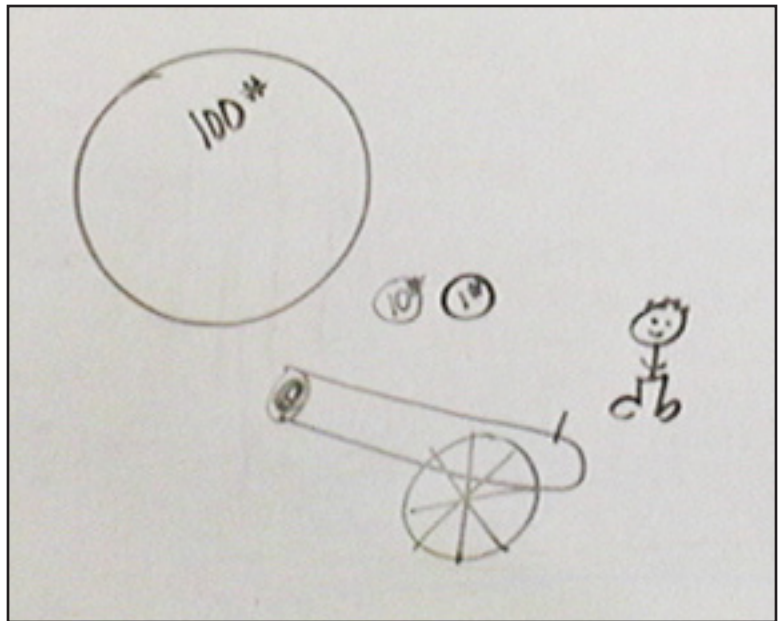
- The Kick-Mes want to be launched from Evil Mister Fred's slingshot moose, so Jack and Jill let them go over to his mountain and ask.
- Evil Mister Fred figures the Kick-Mes would make good ammo, so he says okay.
- He loads up about a hundred Kick-Mes in the slingshot and the minions pull it back.
- The Kick-Mes keep telling the minions to pull back further and further, until the moose's antlers start to curve backward.
- Evil Mister Fred sees this and yells to the minions to not fire, but the minions only hear the word "fire," so they let go.
- Because of the way the moose's antlers are bent, the Kick-Mes shoot straight up, instead of toward Jack and Jill.
- The recoil causes the moose's feet to come unglued, and he jumps off the cliff and uses his big antlers to fly safely down and land in a Snickers bush.
- When the Kick-Mes come back down, they land on Evil Mister Fred, pushing his hat down over his head, and his head into his body, so he looks like just a hat with feet.
- The minions started fighting over the hat, hitting each other and the hat with their baseball bats.

Transcript: Intro

[00:11] Okay, let's suppose this is you. And you've got a couple of balls to throw. There's one ball, and there's the other ball. This ball weighs one pound, and this ball weighs a hundred pounds. Of course, it's really going to be hard to throw a hundred-pound ball, because you could hardly pick the thing up. You could roll it, maybe, but it's way too heavy.

What if we had two balls, and one was one pound and one was maybe ten pounds? You could probably throw the one-pound one a long ways and the ten-pound one not so far. But what if, instead of using your own arm, you had something like a cannon. And you could shoot either the one-pound ball or the ten-pound ball. Which one would go the furthest? Well, that's what we're going to find out today.

A ten-pound ball seems like it might go further, because it's heavier and can shoot through the air better. But the one-pound ball is a lot lighter, so it should take off faster at the beginning, and it might go farther itself. Who knows? We'll see. But first, we need a crazy story.



A one-pound ball, a ten-pound ball, a hundred-pound ball, and a cannon.

Story: "Jack and Jill and the Slingshot Moose"

[03:47] Once upon a time, Jack and Jill were raising moose. If you have more than one moose, is it moose, or is it mooses? Or is it just a moo? [Student: *It's moose.*] It's a moose? So you could have a whole herd of moose? Or you could have one moose. Cool.

Okay, so Jack and Jill are raising moose. They're blue moose, because it's cold. And a moose has a fat body, and mooses have tails with arrows on the end. And mooses have mustaches -- no, goatees. And they've got ears that lay down. And he's got antlers. There's one, and the other guy's behind it. There.

Jack and Jill have been raising their moose to have really big antlers. And it's kind of neat, because you could put a hammock between the two antler pieces, and you could sleep up there. There's Jack. He's taking a nap. And here's Jill. She's riding on the moose. There.



Moose with Jack in the hammock.

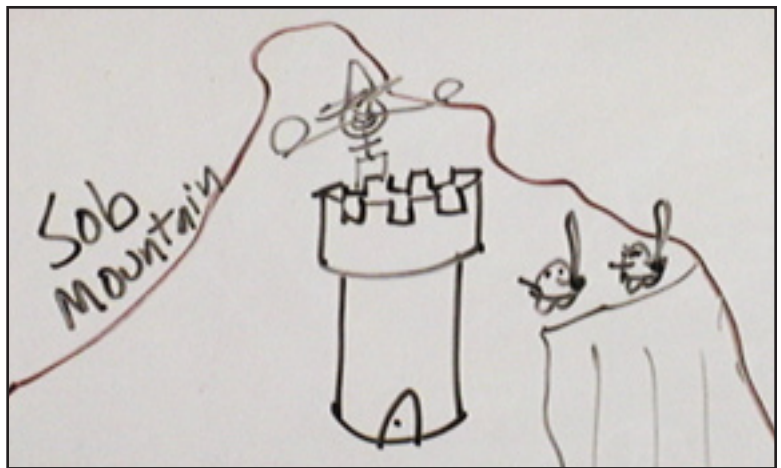
And they've got a bunch of them. I wonder what mooses eat. [Student: *Grass.*] They eat grass? Okay, these moose only eat candy bars. They eat Snickers. So it's a Snicker bush. So where they live, there are



Snickers bush.

Snickers bushes everywhere. And there's a mountain nearby. So they have to take their moose out to where there's lots of fresh Snicker bushes. And moose eat the Snickers off the bushes. [Student: *Why don't we name it Snicker mountain?*] Well, it's not going to be Snicker mountain, because somebody who doesn't snicker lives there. Can you imagine who doesn't snicker? [Students: *Evil Mister Fred.*] Yes.

And Evil Mister Fred lives over here. What's the opposite of snicker? It's cry, I would think. [Student: *Sob?*] Sob. Oh, Evil Mister Fred lives on Sob Mountain. [Student: *There should be a cliff.*] Oh, he could have an evil cliff there. There's a cliff. And he could kick his minions down the cliff. He's got his minions, and they like to play baseball, right up here at the top of the cliff. And if they accidentally miss the ball, the ball would go over the cliff -- aaaaaaaa -- crash! And then the minions would have to go down and get it.



Evil Mister Fred and his minions on Sob Mountain.

Well, it's a long ways down on this zigzag trail -- zigzag, zigzag, zigzag, zigzag, zigzag. And the minions have discovered that if you drop another minion head-down -- zzhoooooo -- donk! He'll live,

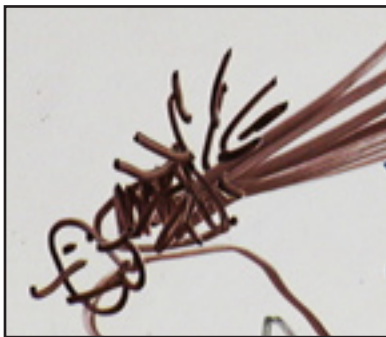
because they have really hard heads. So they choose a minion, they drop him head first -- yaaaaaaa -- doonk! And you have these minion-shaped holes in the ground where they've landed. And he has to pop out, grab the ball, and then he has to run back up the zigzag trail to play baseball.

And Evil Mister Fred noticed that Jack and Jill have got all their moose over there, and the moose are getting bigger and bigger. And the moose are learning to sing. These are singing moose. And they sing really loud. And they sing good songs, and they like to sing mostly at night. What would be a horrible song for Evil Mister Fred to hear? *[Student: Happy and You Know It!]* Happy and You Know It. So the moose are all singing, "Happy and You Know It," which drives Evil Mister Fred nuts, because he hates it when people are happy. And the moose are all singing happy songs.

So Evil Mister Fred sends his minions over there and they steal one of the moose. And they put the moose on top of the cliff, and they don't want the moose to run away. I've got to erase a couple of our minions here. And he glued its feet to the ground. So we've got our moose with the goatee and the giant horns. There.

And Jack and Jill looked up there, and there was their moose. And he's sad now, because Evil Mister Fred has glued his feet to the ground. There's minions on top of the moose, and Evil Mister Fred wants to use this moose as a weapon against Jack and Jill and the other moose. So he put a bunch of rubber bands on the moose's horn things here. And he created a giant moose slingshot. *[Student: Is he going to slingshot the moose?]* Nope! He's going to slingshot minions.

So the minions have to pull back the slingshot, and they have one minion in the basket with about ten baseball bats. And Evil Mister Fred says, "Ready,



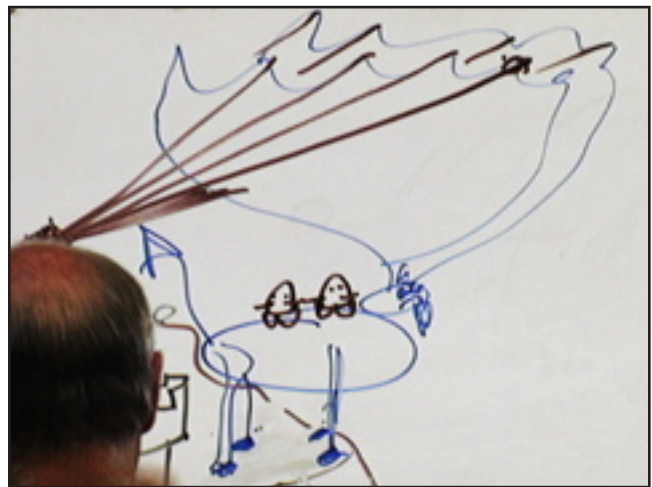
Minion in basket with bats.

get set, go!" And they go whoom! And they shoot out the minion -- yaaaaaa -- and the minion comes down -- crash! And they try to hit other mooses and Jack and Jill, or knock the Snickers off the Snicker bushes. And then the minion gets up and runs away.

And Jack and Jill don't like this. First off, they don't like that somebody stole one of their moose, and they don't like that somebody's shooting minions at them with baseball bats. And they want to stop Evil Mister Fred.



Minions land head-first.



The slingshot moose with his feet glued to the ground.

Should we introduce some Kick-mes in it, too? Would that be good, or no? [*Students: Yes.*] We'll put some Kick-mes here, just running around in case you need a Kick-me. You should always have a spare Kick-me. Okay, now if you could get anything you want from the Acme Store of Everything and stop Evil Mister Fred from shooting minions and baseball bats at you, what would you do?



Kick-Mes.

Imagination and Brainstorming Time

[08:59] [*Students make suggestions*] (THERE ARE NO WRONG ANSWERS! Whatever they say, you should reply: “That’s a good idea,” “They might do that,” etc. After brainstorming, proceed with the experiments, then finish the story.)

We'll leave this To Be Continued . . .

Experiment: "Launching Water Balloons"



Slingshot with pouch.

[10:26] This is a type of slingshot. You can use it like if you're at a football game, and you've got two big guys to hold the handles, and someone else to pull back this part and smack them. T-shirt cannons. *[Assistant holds one side of the slingshot and attaches other end to the handle of a cabinet, while Instructor holds the pouch and pulls back on it.]* And we can pull it back, and let's see what we're going to smack here. *[Instructor releases the pouch and it smacks the table between the cabinet and the assistant.]*

We want you to see what that feels like. So make a line back there. *[Students line up, and each one takes a turn pulling back on the pouch and releasing it. Then they retrieve the pouch and hand it off to the next student in line.]*



Pulling back on the pouch.



Now, we're going to go outside and try it with the one that's on the ladder outside. *[Student: Are we going to climb up the ladder?]* No, you're not going to climb up. *[Student: Are you going to climb up?]* No, I'm not going to climb up. Nobody's going to climb up.

[Outside, there's a large hoop affixed to the top of a tall ladder, with a slingshot attached to the sides of the hoop, so that when the pouch is released the projectile will shoot through the hoop.]

An anchor line is attached to the pouch, to keep the pouch itself from going through the hoop, and the Assistant holds the anchor line while the student shoots a small water balloon with the slingshot. The angle of the



The Assistant holds the anchor line, also made of surgical tubing.

anchor line guides the trajectory of the projectile. After each student takes their turn, they go to the far end of the parking lot to try to catch the water balloons being shot by the other students. After each student has had at least one turn, they go back into the classroom.]

Well, that was kind of interesting, that the rubber to help make it not go through the hole is the steering rubber.



The pouch has a leather handle on the bottom so students can grab ahold of it.



Water balloon inside the pouch.



Water balloons are underfilled so they don't break easily.



Above: upper section. Below: midsection.



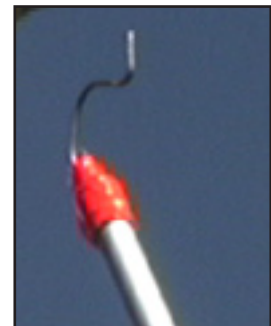
The structure is made of two ladders, one supporting the other.



The hoop is attached at an angle, tilting down toward the pouch.



A piece of steel rail provides weight.



A hook attached to a painter's extension pole is used to release snags.

End of Story

*** DO NOT * present this part of the lesson until after the experiments!**

[24:27] So Evil Mister Fred is shooting minions at Jack and Jill with a moose that he's glued to the top of the cliff. And the minions kind of like this as long as they land on their heads. If they land anywhere else, then they don't like it at all. Jack and Jill don't want it, and they say, "Kick-Mes, we need some help here. What can you do to get rid of that moose launcher?"

The Kick-Mes said, "I want to be launched on it!" And Jack and Jill said, "Well, of course you want to be launched on it." So they said, "Kick-Mes, run over there -- or bounce over there, since you have no legs. Boing, boing, boing, boing, boing. Maybe Evil Mister Fred will launch you."

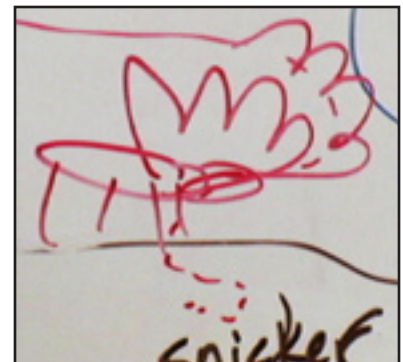


Kick-Mes in pouch, minions pulling.

So the Kick-Mes all bounced up the hill, and they said, "Hey, Evil Mister Fred, launch us, please!" And Evil Mister Fred said, "Well, it's more ammo, I suppose. Okay." So he loaded up the pouch with about a hundred Kick-Mes. There's Kick-Mes all stuck in the pouch. And the Kick-Mes said, "Pull further back! Further! Further! Further!" And they had to take about twenty minions to pull back, down the side of the mountain. And they're pulling it back as far they could. And the Kick-Mes kept saying, "More! More!" And by the time they pulled it all the way back, the moose's antlers were going way back like that.

And then Evil Mister Fred said, "Don't fire! No, don't fire!" And the minions only heard, "Fire!" of course. So they

let go. And when they let go, all the Kick-Mes shot straight up instead of towards Jack and Jill. And the recoil of all of this release on the moose's horns made the moose's feet come loose. And the moose shot forward. Luckily, he had big horns and he could fly. And he flew down and landed in a Snickers bush. He's flying with his own horns as wings.



Moose in Snickers bush.

Now there's a whole bunch of Kick-Mes up in the stratosphere going, "Yayyyy!" And sooner or later, gravity is going to take hold, and the Kick-Mes are going to come back down. There's about a hundred of them there, and they're hard to see. Of course, they do come back down. And they land on top of Evil Mister Fred -- bong, bong, bong, bong, bong! They're really happy, and they pushed his hat down over his head, and they pushed his head inside of his body, so he only looked like a hat with feet sticking out and a mustache. And the minions saw that and they said, "Oh, look! A new hat!" And they started fighting over the hat. "That's my hat!" "No, it's my hat!" And they're hitting the hat and each other with their baseball bats. And all they heard was a little voice inside the hat saying, "No! Mmmppphhh!" And they all lived happily ever after, except Evil Mister Fred. And the minions.



Evil Mister Fred's squashed hat.

End of Lesson