Station #1. Catapult (Hall Activity-15 minutes)

Supplies:
1 or 2 Catapults
Measuring tape
Masking tape
Nerf ball
Cotton ball
Small marshmallow
Weigh Scale (digital is easiest, but delicate and expensive)

1. Set up marks on the floor—5', 10' and 15'
2. Examine catapults—look at how they work
3. Set up a table in your lab notebook like this:

Weight:	**Nerf ball**	**Marshmallow**	**Cotton ball**
#1 (A)			
#2 (B)			
#3 (C)			
Average Weight:			

4. Weigh each ball three times and get the average weight (AVERAGE= (A+B+C)/3) for each ball.

5. Set up a second table in your lab notebook that looks like this:

Distance:	**Nerf ball**	**Marshmallow**	**Cotton ball**
#1 (X)			
#2 (Y)			
#3 (Z)			

6. Determine which ball (Nerf, marshmallow or cotton) travels furthest by shooting each object three times. Take the average of the three tries to get the average distance (average=(X+Y+Z)/3).

7. Which ball traveled the furthest? Why do you think this is so?

8. Which catapult shot the balls the furthest? Number 1 or Number 2? Why do you think this is so?

Note to instructor: Thames & Cosmos catapult is sturdier than the Steve Spangler one, but the T&C one works better with the balls that come with it, which are small and hard. The SS one you can use the balls listed above.

Station #2: Pulleys & Legos (15 minutes)—Students pick which station (A or B) they want to work at. If they finish up with the pulleys, they can start building with the Lego kits.

A. Pulleys

Supplies:
Pulley discovery kit
Ceiling hook
Rope
2 soda bottles (full of equivalent amounts of water)
Scissors

1. Set up the pulley system with one pulley.
2. Attach a bottle to the end of the pulley.
3. Attach the second bottle to a piece of string, then tie to the same hook as the pulley.
4. How hard is it to pull it up?

Repeat with a dual and then a triple pulley system.

Why do you think this is so?

Note to instructor: this only takes about 2 minutes to 'test'. Either have another set of things to pull up, try different configurations, or plan to move on to more lego kit building.

B. Lego kits

Supplies:
MNS kits
MNS books

1. Pick a model to build
2. Build it according to the attached instructions

Station #3: Bouncing Balls and Balancing Seahorses

A. Make a bouncy ball-(10 minutes)

Supplies:
4 ball molds
Powder from the kit (polymer)
4 cups of water
Paper towels
Measuring tape
Thermometer
Stop watch

1. Pour the powder into the ball mold.
2. Put the filled mold into a cup of water. Make sure the water covers the mold completely.
3. Let it sit in the water for 1 minute.
4. Remove and let dry in the mold on a paper towel for 3 minutes, then remove from mold and let dry another 5-10 minutes (do the Seahorse experiment while you wait).
5. Read the temperature in the room.
6. Test how high your ball will bounce by:
    a. Dropping it from about waist high
    b. Dropping it from about head high
    c. Write this down in your lab notebook
7. Take the ball home and freeze it for one hour.
8. Repeat Step #6.
9. Did the ball bounce higher when it was cold (just out of the freezer) or when it was at room temperature? Write down your result and bring it to the next session.

B. Balance a seahorse (takes less than 5 min)

Supplies:
Plastic seahorse
Plastic bucket, string and two plastic coins
Stop watch

1. Put the seahorse on your index finger, using the belly as the balance point. Is it hard to balance?
2. Now consider what would happen if you hang the bucket and coins off of the tail of the seahorse. Will it be easier or harder to balance the seahorse? What is your prediction? Write this down in your notebook.
3. How long can you balance the seahorse with no weights on it? Repeat three times. Write results in your lab notebook.
4. Now, hang the bucket and coins off of the seahorse tail and try balancing it again.

Balance time (seconds)	No weights	With the bucket weights
#1		
#2		
#3		
Average:		

5. Has the average length of time the seahorse will sit on your finger changed? Why do you think this is so?