



Forces in action

HOW TO CREATE YOUR ELEMENTS

STORAGE

For these sequences, the material created should fit in a box (or a shoebox).

CRAFT THE ELEMENTS

A. Studing the forces in action (Sequence 1)

In this experiment students will throw balls with different weights directly downward into a box full of sand. As the weight of the ball increases, the size of the impact crater changes, assuming the ball is always dropped from the same height as measured from the top of the sand box to the bottom of the ball. The reason behind this experiment is to determine the relationship between the mass of the ball to size of the impact it made on the sand:

- the size of the impact is different when the mass of the ball is different, but the height at which the ball is dropped is the same.

Pay attention:

The experiment is limited to the depth of the sand box, which is only 10 centimetres.

Materials used in the experiment:

- 1 heavy ball (tennis ball, or billiard ball, or squash ball, or golf ball).



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SCIENCES

- 4 balls of the same size (diameter) as the heavy ball made of different materials: plastic, polystyrene, paper, aluminium, sponge, rubber, plaster, glass, stone.
- Meter stick.
- Balance.
- Sand.
- Box.
- Black marker.

Method: measure the mass of objects:

1. Measure the mass of the balls by placing on the scale.
2. Grab the black marker and label each one respectively from lowest weight being 1 to the highest weight being 5.
3. Measure the diameter of the impact when the mass of the ball is different, but the height at which the ball is dropped is the same.



Conclusion:

The size of the impact is different when the mass of the ball is different, but the height at which the ball is dropped is the same.



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MY BOX OF STEAM (project nr. 2022-2-EE01-KA220-SCH-000099273) is funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

B. Forces in action-Build a measuring instrument (Sequence 2)

TOOLS AND APPLIANCES

1. Calibrating weights
2. Clear Tape
3. Scissors

MATERIALS AND PARTS

1. Piece of thick card
2. Paper fastener
3. Graph Sheet
4. Elastic (Rubber) Band
5. Card pointer
6. Paper Clips
7. String or Cotton Thread

INTRODUCTION

A spring balance is a weighing equipment used to measure the weight of different objects. Explore the difference between mass and weight along with the working of an ancient balance.

PRECAUTIONS

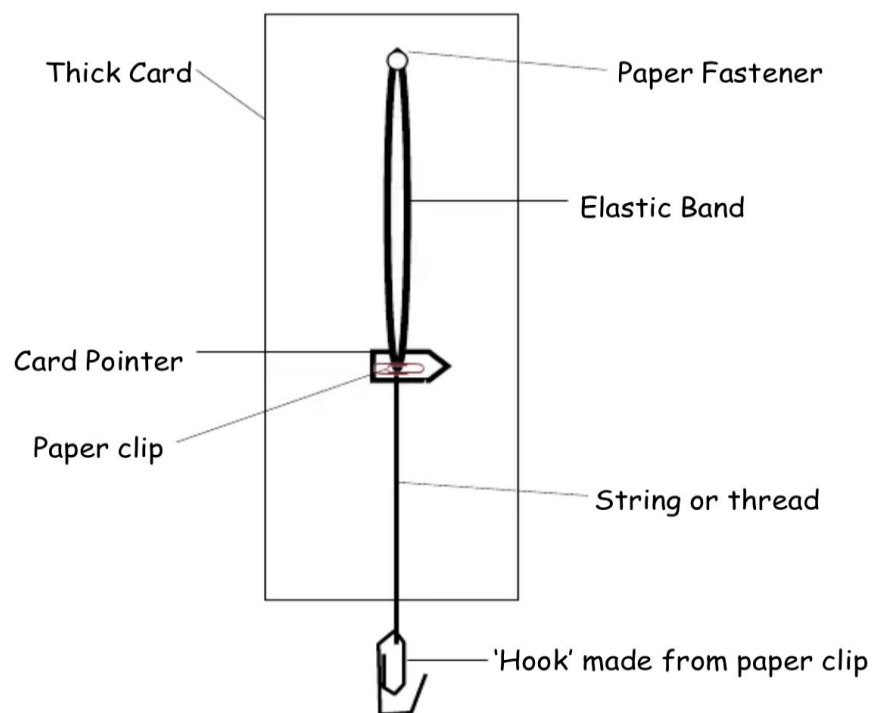
1. Be careful while using scissors
2. Beware of the paper clip that will be used. Its edge could be sharp.



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STEP 1 - MAKING THE FRAME AND THE MEASURING INSTRUMENT

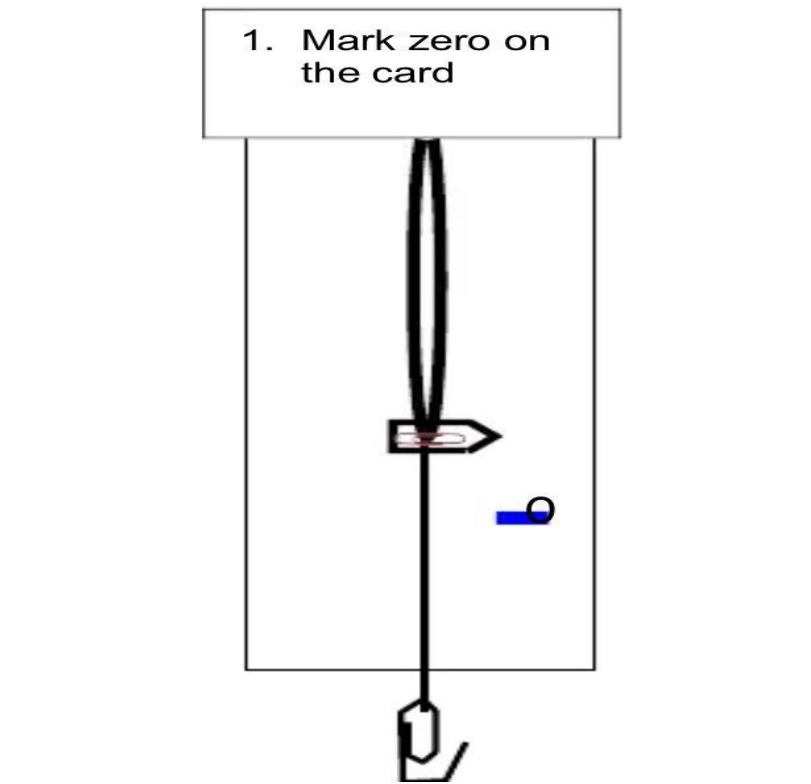
1. On the 20 cm x 30 cm cardboard, attach the paper fastener.
2. Hang the elastic band from the paper fastener and secure it with a clear tape.
3. Cut a 20 cm long thread.
4. Tie one end of the thread to the elastic band and tie another knot to the string near the elastic band. Attach to this knot a card pointer (marker), using a paper clip.
5. Tie a paper clip to the free end of the string. The paper clip acts as a hook for lifting weights.



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STEP 2 - CALIBRATE USING KNOWN WEIGHTS

1. Hang a weight of about 50 g to 100 g from the hook. Lift the weight 2-3 times to stabilise the system before taking any readings.
2. Remove the weight and mark the spot corresponding to 0 g weight.



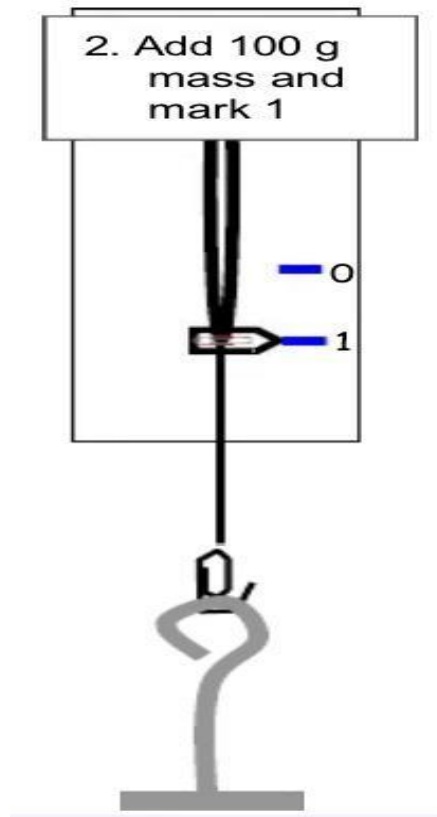
3. Now add a 100 g weight (or 100 ml of water) and mark the spot corresponding to that.
4. Repeat the same with 100 g, 150 g and 200 g.



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STEP 3 - READINGS WITH ELASTIC BAND

1. Count the number of horizontal lines between 0 g and 100 g. Each line is separated by 1 mm from the other.
2. Divide with the number of horizontal lines between 100 g to 200 g to translate the mm moved on the graph to weight.
3. You can use a graph sheet to divide with the number of horizontal lines between 0 g and 100 g (and between 100 g to 200 g).



PLAY:

Use your spring balance to measure the weights of different objects around you, for example - a heavy ball (tennis ball, or billiard ball, or squash ball, or golf ball), balls of the same size (diameter) as the heavy ball made of different materials: plastic, polystyrene, paper, aluminium, sponge, rubber, plaster, glass, stone.

DIFFICULTIES

The rubber band can age and lose its elasticity. Also, if expanded beyond its elastic limit, it will not give accurate results. Replace the rubber band in such cases.

4. We can replace the elements with some very cheap ones:

- replace the elastic (Rubber) band with a spring
- replace the piece of thick card with a syringe



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