

Film script – Numeracy through Science

Pendulum – what makes it lazy?

People relate easily to a swinging pendulum, because as children they have been on a swing in a playground.

To make a simple pendulum, thread a bead on a length of string and clamp the string as shown.

Use the stopwatch on a smart-phone to record time.

When the pendulum is swinging freely record the time for 10 “return journeys”.

Shorten the string, and measure the new length.

Then when it is swinging freely record the time for 10 “return journeys”.

Dividing the times by 10 gives the value of the “period”.

Compare the period of the longer and shorter pendulums to answer the question. The longer pendulum is the lazy onethe short one is always busy.

Rolling Jars of sugar

If four jam-jars roll down a ramp, will they all get to the bottom at the same time. It might depend on how much sugar they contain.

A bag of sugar and 4 identical jars are needed.

Start by filling one jar with sugar.

Then share this sugar fairly between the other 3 jars.

Add “one-third” and “one-third” to get “two-thirds”.

Now fill one of the empty jars and we are ready to roll.

The tilt of the ramp may be adjusted by adding more books.

A towel rolled up, provides a cushion so that the glass won't break.

A broom handle may be used to “start the race”.

Small variations in tilt of ramp give rise to different “photo-finishes”.

Careful observation of the sugar in the jars when they are rolling, reveals why the jar with least sugar, makes slowest progress.

The sugar “cascades” over on itself and this acts like the brakes of a bicycle slowing it down.

There is no opportunity for cascading in the empty and full jars.
The jar that is two-thirds" full of sugar needs stronger "brakes" than is offered by the slight cascading of sugar in this jar.

Reflections in two mirrors

When we look in a mirror, we see an image of ourselves.
If a second mirror is placed at right-angles to the first, there is a lot more to see.
The person can now see a second image in the second mirror and a third image in the corner (where the 2 mirrors meet)
A "fly-on-the-wall" will see 4 people at 90 degrees.
(.....1 real person and there 3 images....)
If we rotate one mirror so that they stand at 60 degrees to each other, the person will observe 5 images of themselves.
A "fly-on-the-wall" will see 6 people at 60 degrees.

Explore what happens at 45 degrees.
Predict what happens at 30 degrees.
Test your prediction.

Real Graphs from Real Data

This activity introduces how graphs come about.
Plastic cups are used with a "doorway" cut in each.
A marble rolls down a "groove" and enters the doorway and moves the cup across the table.
The distance moved is recorded each time by a dot on a page.
Several trials are done with a single cup.
Then the marble moves 2 cups then 3 then 4.
Each time the same tilt of ramp is used.
An "average" dot is used to represent each group of dots. A pattern develops.
We add "keywords" like "Distance" and "number of cups" to the page.
The end result is a graph of real data.

Make your own Music

We can make a simple musical instrument using lollipop sticks, elastic bands and straws.

Cut the straws shorter as shown.

Stretch a flat elastic band (No. 32 is ideal) so that it runs the full length of one lollipop stick.

Place one straw under the elastic band near one end.

Place the other straw above the elastic band near the other end.

Place the second lollipop stick on top.

Wrap two small elastic bands around each end to hold everything in position.

Bring the “sound-sandwich” near your lips and blow air through it.

By moving one straw closer to the other, the length of elastic that is free to vibrate is shortened.

A higher pitched sound will be heard as a consequence.

Try playing a tune.

Let's go for a spin

Join two plastic cups together as shown, with Sellotape or electrical tape.

Join 5 or 6 elastic bands together as shown.

The elastic serves as a catapult or launcher.

Wrap some of the elastic around the middle of the cups.

Stretch the rest of the elastic and hold this end firmly between finger and thumb.

When you are ready, release your grip on the cups and watch them fly.

Aim higher if you want them to fly for longer.

Face into a gentle breeze if you want them to “loop-the-loop”.

Small ball, big bounce

When balls fall they bounce.

However they usually rise to only a fraction of their original height.

Great fun can be had by dropping 2 balls at the same time if the smaller one sits on top of the bigger one.

A tennis ball and basketball work well.

Quick reactions are needed if the tennis ball is to be caught before it lands.

One option is to focus on “hand-eye-co-ordination” and having fun with sport.

A second option is to mark out 4 zones and record how many times the ball lands in each zone.

Much can be learned about statistics and probability even without mentioning the words.

Don't let the ladder slip

If you ever need to climb a ladder it is important that it doesn't slip.

Friction between the ladder and the floor reduces the risk of slipping.

How can we measure friction?

This activity looks at using rulers to measure friction.

Place a block on a ramp and tilt the ramp slowly until slipping just occurs.

Measure the lengths X and Y as shown and divide Y by X . Record the answer.

Repeat the process many times and find an average.

The two materials with the highest number have the greatest friction and are the most suitable for the purpose.

How to balance the see-saw

When the weights at each end of the see-saw are the same it balances easily.

If one side carries a weight twice as heavy it needs to move closer to the centre (pivot).

How close?

Half way.

Make your bridge strong

How strong is a sheet of paper?

It depends on how you use it.

Look at the 4 options shown in the picture.

Test the strength of each option with coins.