

PLAYFUL SCIENCE David Featonby UK

Our stall will offer a range of games and toys based on scientific principles for everyone to try. Some are skill based , while others rely on somewhat random science to achieve success. Maybe some could be items for your Christmas list!!

ROLLER BALL



A large ball bearing is rolled between two rods which form an upwards track!! The ball appears to roll uphill!! The rods are pulled apart so that as the ball rolls it moves down between the rods even though the rods themselves present an uphill gradient . As the ball rolls it slips through the rods, its centre of mass falls , i.e getting nearer to the ground as it moves, and it eventually falls through the rods.... This is a test of skill to get the ball as far down/up the rails as possible. An energy transfer problem, related to centre of mass. A good game for a fundraising fair.

Key Words: Centre of Mass, Energy

MAGNETISM

Magnetic Top and Snake.



The spinning top has a magnetic axis so is able to move the snake as it rotates. This is simple fun which illustrates the nature of magnetism as a non-contact force. This is the principle which the **magnetic top and spiral** game utilises. The axis of the top is a magnet so the top follows the steel spiral which is marked with scores, the aim being to get the top to finally come to rest at a high score.. It is impossible to predict , so the highest score is obtained more by luck than skill...but it is interesting to watch.

Key words : Magnet non-contact force

Balance of Power

The challenge is to place magnets on the holes in the cubes on a grid and maintain stability. Players try to read magnetic fields so that removing or adding metal balls does not affect the stability . The set up shown has the “holes” in the cubes as widely separated as possible. However, difficulty can be increased by rotating the cubes.in their positions.

Key words : Magnetic fields



LIGHT : Khet



KHET is a game with mirrors . Players have control of a laser beam from the corners of the board which passes towards the mirrors mounted on the red and grey holders, which can be moved around the board. The aim of the game is to reach the target by reflecting the laser beam off these different angled mirrors before your opponent. By moving your own coloured holders you can divert your opponent's beam or target your own. The simple laws of reflection are applied

Key words : Laws of reflection

BALANCE AND EQUILIBRIUM

There are various games balancing objects on a table or on themselves. Here is a selection to test your appreciation of moments about a fixed pivot. Some are commercially available, but others can be made from simple components

Bamboleo /Balancing Board/Rock for Fun

Different sized objects are placed on a balanced board or removed from it. The aim is to keep the board balanced on its support while this takes place, A cheaper version simply uses a board suspended on a string and could easily be made by a class, ..a game of "chance, strategy and skill" ..I'd add and a steady hand.

The degree of difficulty depends on the sizes and shapes of the objects and the roughness of the surface

A similar (even cheaper!) game is "Rock for Fun" which has a model tower to which small plastic men are added

Key words : Moments , balance , equilibrium



Hamster ROLL



In this game objects are balanced on a large circular holder in sequence by alternate players. The holder rotates slightly as each additional block is positioned. The aim is not to let the black cone fall, or to get all your blocks on the holder.

Players place the different shaped blocks on in turn according to the roll of a dice. Any which fall are returned.

Key Words: balance , moments , stability

SPINNING TOPS COMPETITIONS



The fact that tops keep spinning leads to endless possibilities for competitions for pupils to keep their top moving for the longest time. A simple competition can be played with just a set of similar tops. (Photo 1) Maybe this originated with a thrown top, extending to a whipping top where the extra energy comes from the whip (Photo 2). This can be extended to include spinning simple twist tops “upside down” Great to illustrate the conservation of angular momentum. Photos 3 and 4 show some tops which are propelled by blowing and so will spin for a long time

Key words : Stability , spin



2



3



4

Battle tops



Tops are set spinning against each other to see which can remain upright for longest. Their ability to re-erect after an encounter illustrates the principle of conservation of angular momentum. There are many versions of this game on the market today. Often, they are provided with an “arena” for the tops to battle against each other

Key words : Stability , spin conservation of angular momentum

Suma Wrestling tops



Similar to battle tops, these wooden tops wrestle against each other transferring momentum until one of them is ejected from the ring.

Key words : Conservation of Angular Momentum



Toupie Golf



Moving a spinning top across a board into a hole may seem simple enough but a spinning top on an incline does not travel in a straight line in the direction of the slope.

Key words : Vector product , angular momentum

Top Maze

This is the next level up from Toupie Golf. By tilting the wooden maze the idea is to negotiate the top around the maze to the centre. The problem is that the top moves at right angles to the tilt of the slope, similar to the Toupie golf game

Key words : Stability , spin, vector addition



Tower of tops (Twister Tower)



Tops are placed on top of each other as their size reduces. The challenge is how many can be placed like this.

This is a good demonstration of the stability of spinning tops.

Key words : Stability , spin



ELECTRONIC TOPS



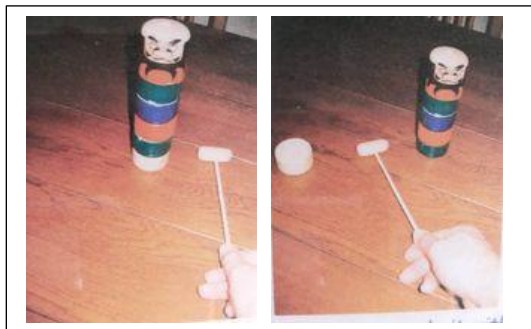
Several games are possible with these **i-tops** which can reveal the number of turns, turns per minute and other characteristics. They operate using the earth's magnetic field to record the number of times the top passes through the magnetic meridian

In the photograph the spinning top has recorded that 142 revolutions have taken place since the start.

The number is displayed using flashing LEDs which are synchronised with the spin.

Key words : Estimation, magnetism

NEWTON'S LAWS and Japanese Nursery Toy



The Japanese tower provides a good discussion of Newton's Laws as well as plenty of fun. The idea being to knock the lowest layer away without the top toppling. The key is impulse and the greater difficulty as the tower gets smaller due to the decrease in mass. Which of Newton's Laws applies here?

Key words : Newton's laws , $F=ma$, impulse , inertia

TOPNOSIS

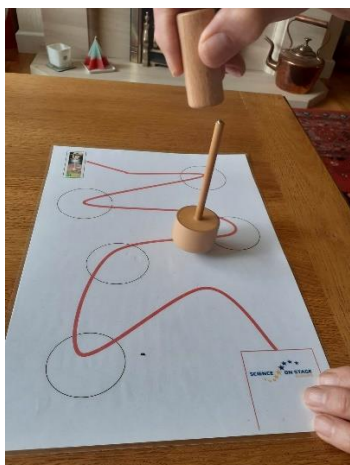


This offers the opportunity to set a world record keeping a top in motion over long periods of time. The energy loss is compensated by sliding the top down the slope of the board.

Because of this energy compensation mechanical tops may be thrown from one board to another offering a great opportunity to demonstrate the conservation of angular momentum

Key words : Stability , energy

TOP SPEEDY



In this top from Romania, made with a heavy base unit, there is a small steel ball bearing in the top of the shaft of the spinning top. A magnet held above it as shown is there to drive the top around the red route shown on the paper, the idea being to get the top to follow the line on the paper using a magnet.

Not so easy as the forces involved do not produce

Key words : Motion , magnetic fields

FOOTNOTE

I hope to bring most of these challenges and maybe more , but cannot guarantee that I will have everything with me.

Contact me if needed via da.featonby@gmail.com, with the title "playful science"