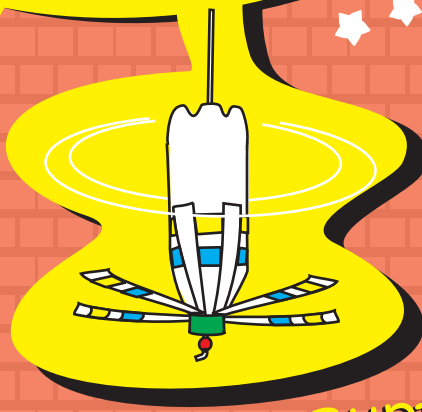
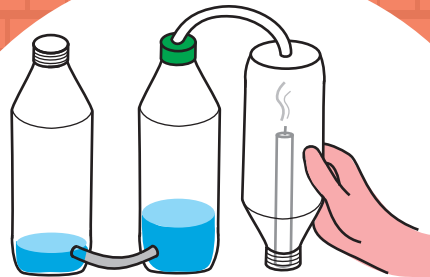


# Sci-fun



Arvind Gupta

Illustrations by Reshma Barve



**ARVIND GUPTA** graduated from the Indian Institute of Technology, Kanpur (1975) with a degree in Electrical Engineering. He has written 20 books on science activities, translated 150 books into Hindi and presented 125 films on science activities on *Doordarshan*.

His first book *Matchstick Models & Other Science Experiments* was translated into 12 Indian languages and sold over half a million copies. He has received several honours, including the inaugural *National Award for Science Popularization amongst Children* (1988), *Distinguished Alumnus Award of IIT, Kanpur* (2000), *Indira Gandhi Award for Science Popularization* (2008) and the *Third World Academy of Science Award* (2010) for making science interesting for children.

Currently he works at IUCAA's Children's Science Centre, Pune, and shares his passion for books and toys through his popular website <http://arvindguptatoys.com>

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This book was developed under a grant from the  
Navajbai Ratan Tata Trust.

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# SCI-FUN

**ARVIND GUPTA**  
ILLUSTRATIONS BY RESHMA BARVE

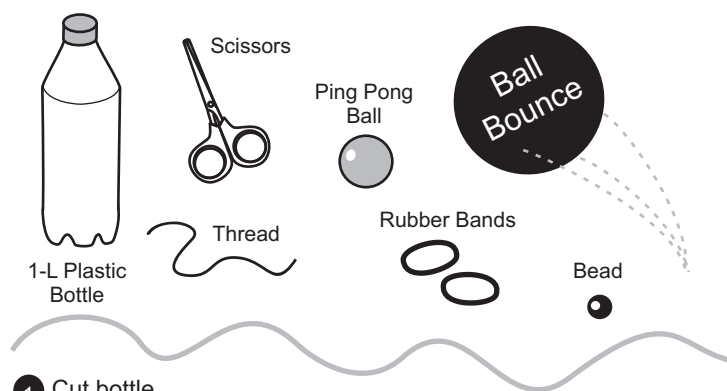


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1 Cut bottle 10-cm from lid. Discard the base.

2 Mark four lines at right angles on rim.

3 Make 1-cm deep cuts on all four lines.

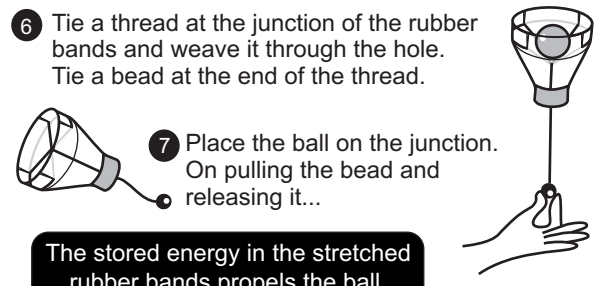
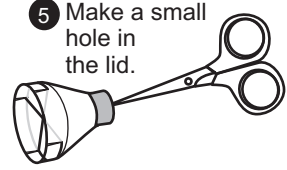
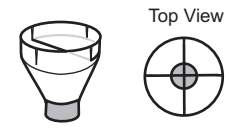
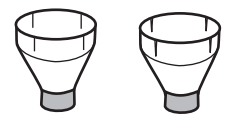
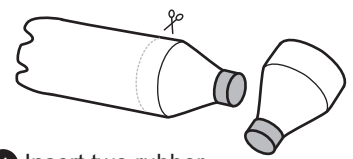
4 Insert two rubber bands in cuts. They will criss-cross in the center.

5 Make a small hole in the lid.

6 Tie a thread at the junction of the rubber bands and weave it through the hole. Tie a bead at the end of the thread.

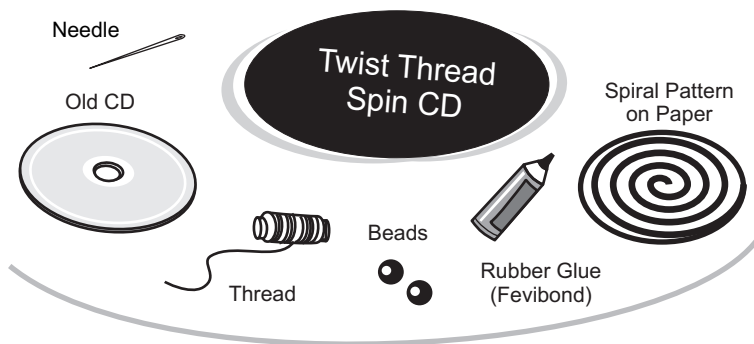
7 Place the ball on the junction. On pulling the bead and releasing it...






The stored energy in the stretched rubber bands propels the ball.



...the ball will jump up 5-meters !!!





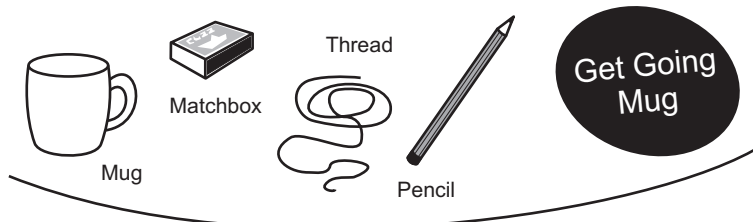
- 1 Make two neat holes near the central hole of an old CD using a hot needle. 
- 2 Stick a spiral pattern on the CD with glue. 
- 3 Weave a 60-cm long thread through the holes. Tie beads on ends. 
- 4 Hang the CD with one hand as shown. 
- 5 On pulling the beads away the CD will spin very fast and the spinning spiral will look glorious! 

*Give CD a twirl with the other hand.*

**Wind and unwind repeatedly.**

CD will spin, twisting the thread.

**The stored energy in the twisted threads spins the CD.**



**Get Going Mug**

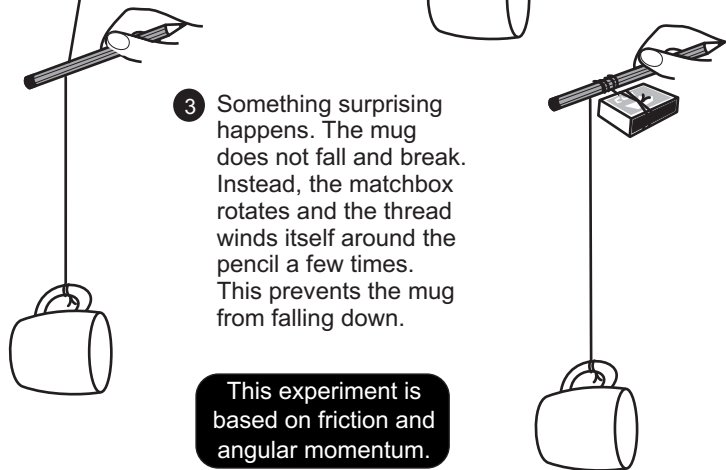


1 Tie a mug and a matchbox to the two ends of a 1.5-m long thread.



2 Place the thread on a pencil such that the mug is suspended. Now take the matchbox below the pencil and release it.

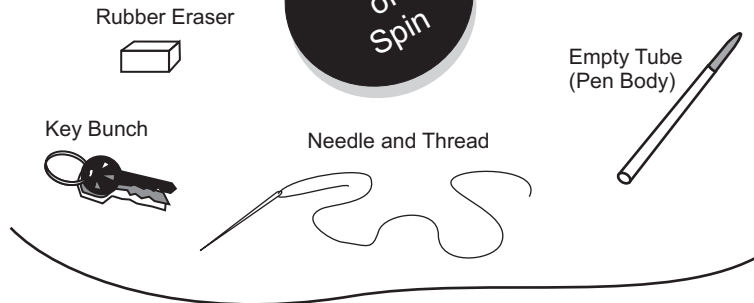
Leave matchbox in this position



3 Something surprising happens. The mug does not fall and break. Instead, the matchbox rotates and the thread winds itself around the pencil a few times. This prevents the mug from falling down.

This experiment is based on friction and angular momentum.

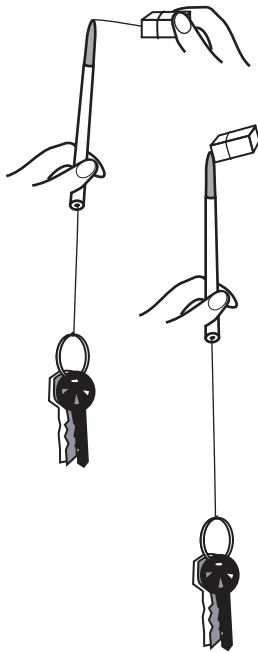
# Power of Spin



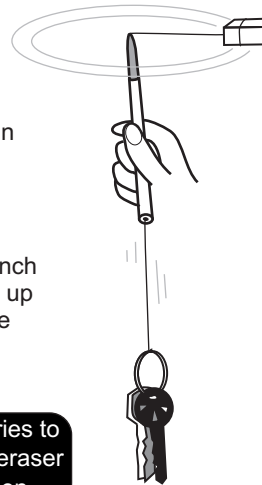
1 Weave a 80-cm long thread through an old pen body.



2 Tie a small weight (eraser) on top and a heavy weight (keys) below.

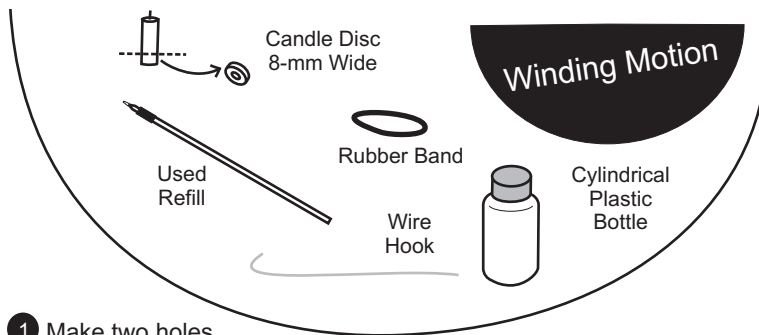


3 Hold the pen in one hand and start spinning the eraser.



The heavy bunch of keys will lift up because of the force of spin!

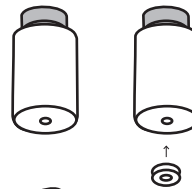
Centrifugal force tries to push the spinning eraser away from the pen.



1 Make two holes in the plastic bottle lid.



2 Make a hole in the base of the bottle. Stick a small piece of candle on the bottle hole.



3 Cut a large rubber band and weave it through the holes of the lid. Tie a knot.

4 Screw lid on the bottle. Pull the rubber band through the base hole with a wire hook.

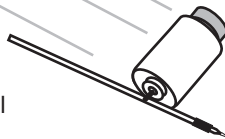


5 Place an old ball pen refill in the rubber band. The candle piece will help in reducing friction.

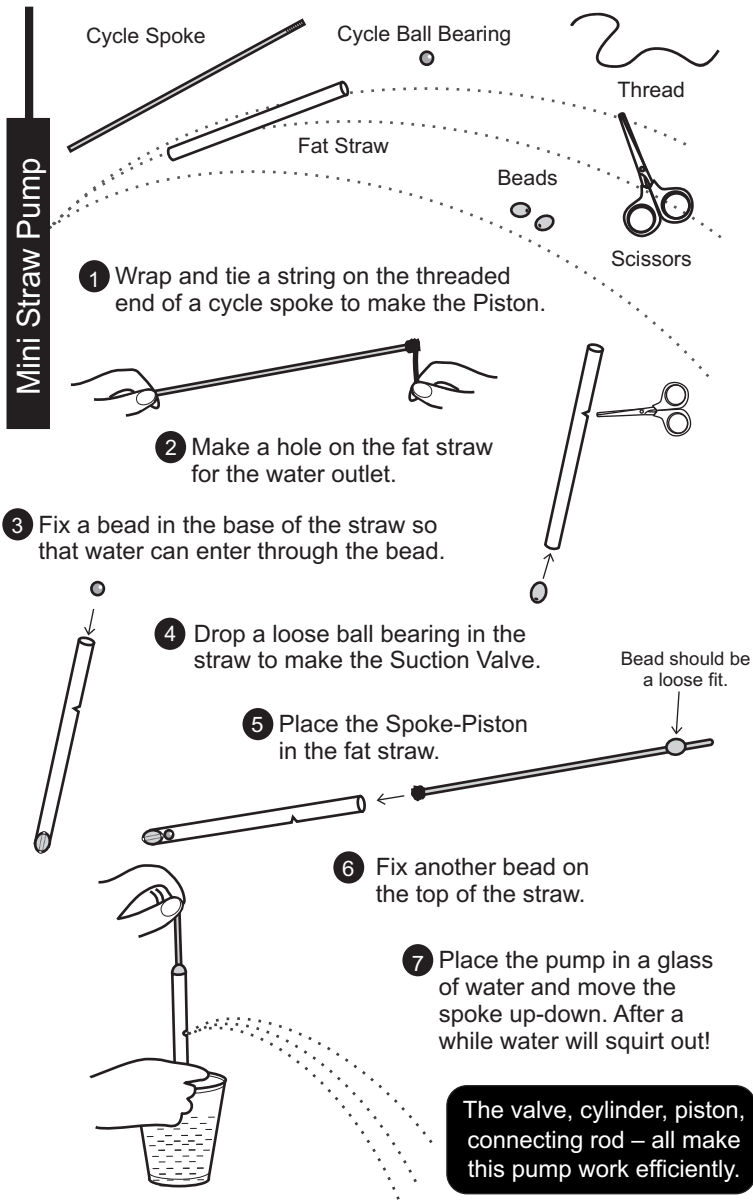
6 Wind the refill to twist the rubber band many times. Then place the bottle on the ground.



The rubber band will unwind and the bottle will move forward!



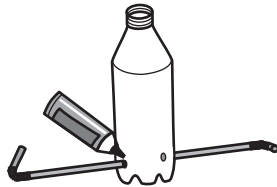
The stored energy in the twisted rubber band propels the bottle forwards.



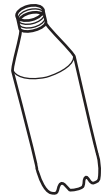
- 1 Make two holes on opposite ends of a plastic bottle near its base.



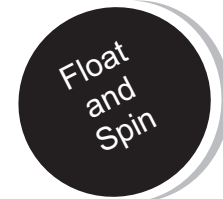
- 2 Insert two bent straws and seal the joints with glue.



Styrofoam Plate



1-L Plastic Bottle



Two Bent Straws

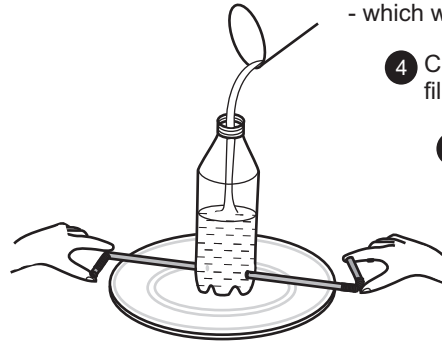


Scissors



Rubber Glue (Fevibond)

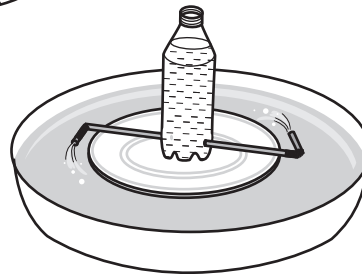
- 3 Stick the bottle right in the middle of a Styrofoam plate - which will act like a boat.



- 4 Close both straw ends and fill the bottle with water.

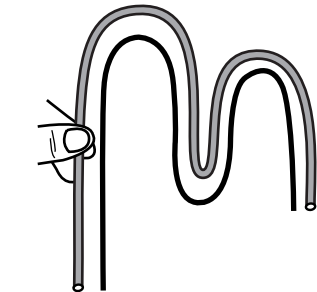
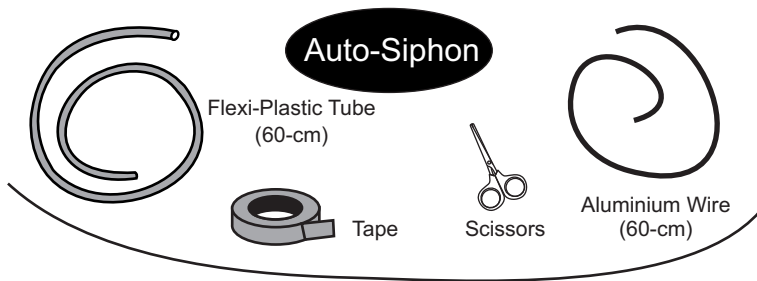
- 5 Gently place the plate with the bottle in a tub of water.

- 6 On opening the straw ends...

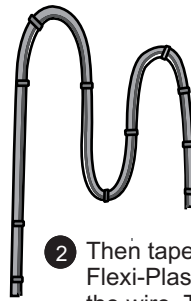


...the model will start spinning!  
This action-reaction toy is based on Newton's Third Law of Motion!

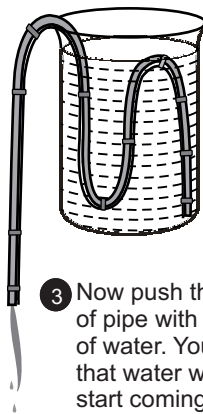
This action-reaction toy is based on Newton's Third Law of Motion.



**1** Bend Aluminium wire in the shape of a double hill - one higher than the other.



**2** Then tape the Flexi-Plastic tube to the wire. The wire will keep the plastic tube in the double hill shape.



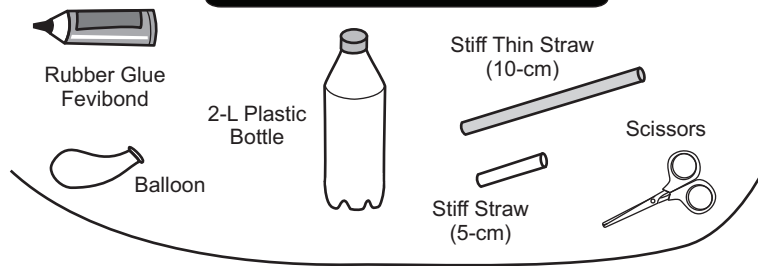
**3** Now push the small end of pipe with a jerk in a jar of water. You will be surprised that water will automatically start coming from the other end.

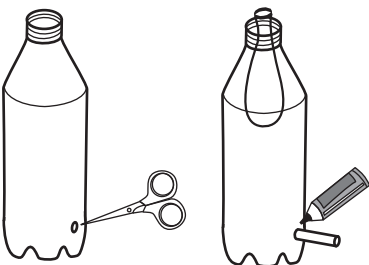
When pushed with a jerk water climbs the high peak and the siphon starts.




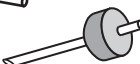
**4** The Auto-siphon will stop only when the water level goes below the lower bend of the tube.

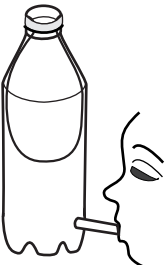
## Balloon Bottle Fountain

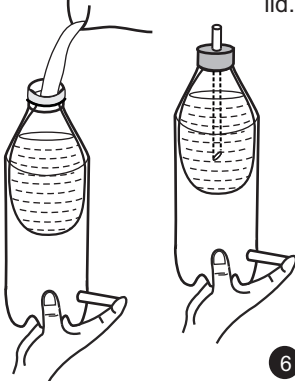


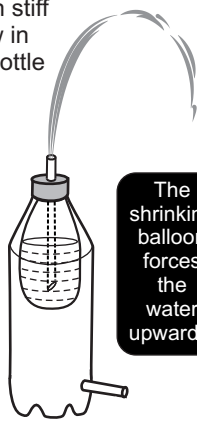
- 

1 Make a small hole near the base of the bottle. Press fit a stiff straw piece. Apply glue to seal joint. Place a balloon on the bottle mouth.
- 

2 For this pull the mouth of the balloon and stretch it tightly on the bottle mouth.
- 

3 Press fit a thin stiff straw in the bottle lid.
- 

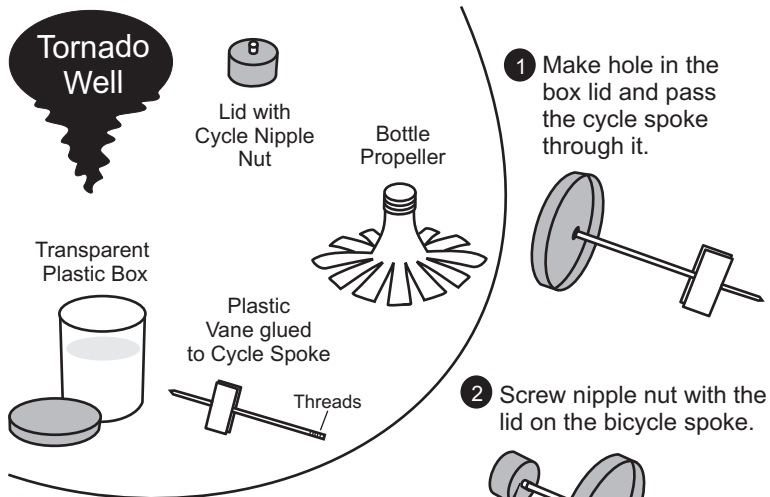
4 Suck out air through the base straw to inflate balloon.
- 

5 Shut the straw end with your finger and fill the inflated balloon with water.
- 

6 Gently screw on the lid with the straw. Then open base straw to see water gush out like a fountain.

The shrinking balloon forces the water upwards.



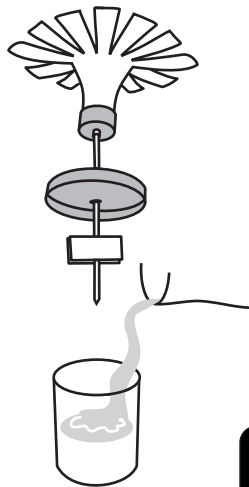


1 Make hole in the box lid and pass the cycle spoke through it.

2 Screw nipple nut with the lid on the bicycle spoke.

3 Twist each propeller petal to make blades. Then screw the propeller to the bottle lid.

Cycle Nipple Nut fixed in the bottle lid hole



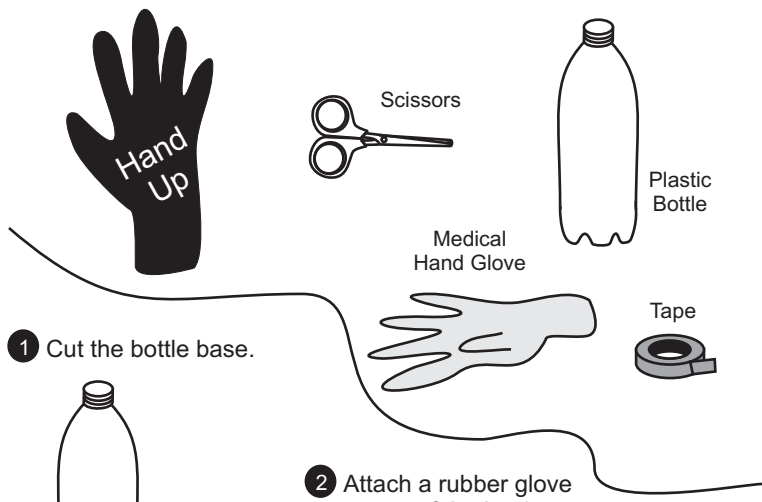
5 Fix the lid along with the spinner on the box. The spinner pivot will rest on the base of the box.

On placing the model under a ceiling fan the spinner will spin fast. Soon, the water will make a parabolic curve.

4 Half fill the box with water.

The spinning vane forms a tornado and sucks water in a parabolic curve.





1 Cut the bottle base.



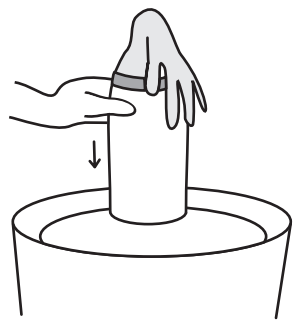
2 Attach a rubber glove on top of the bottle.



3 Fix the joint with tape.



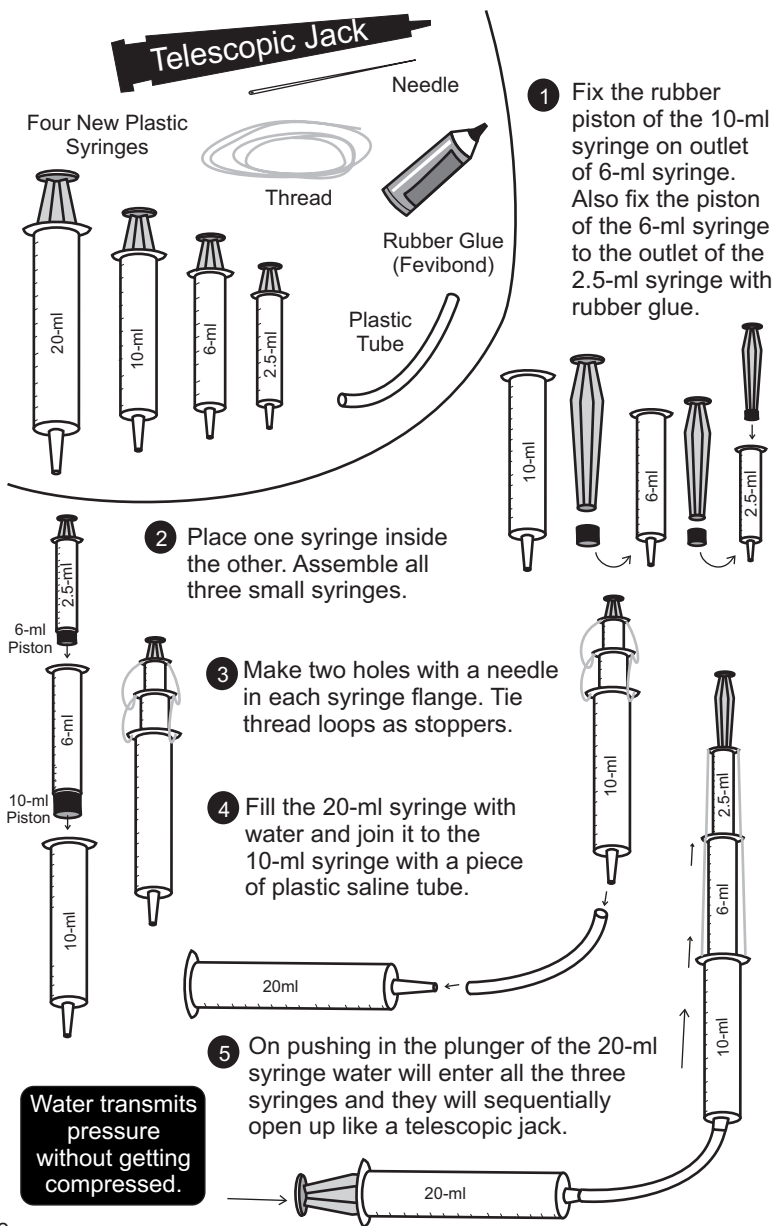
4 Push the bottle without the base in a bucket full of water.

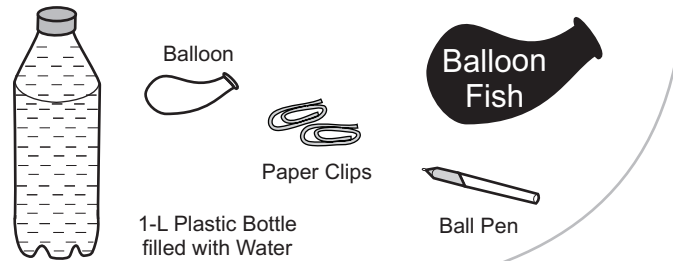


As you push the bottle down the hand will inflate and stand up!!

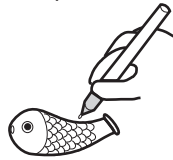


The water entering the bottle displaces air and inflates the rubber glove.

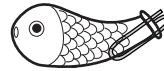




- 1 Draw a fish on the balloon with a ball pen.

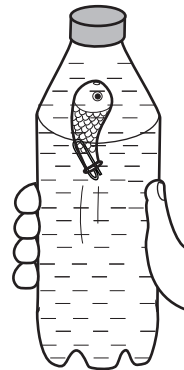
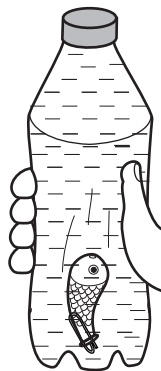
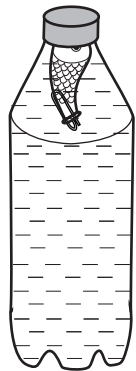


- 2 Insert two paper clips in the balloon to make it heavy. Make sure the mouth of balloon remains open.



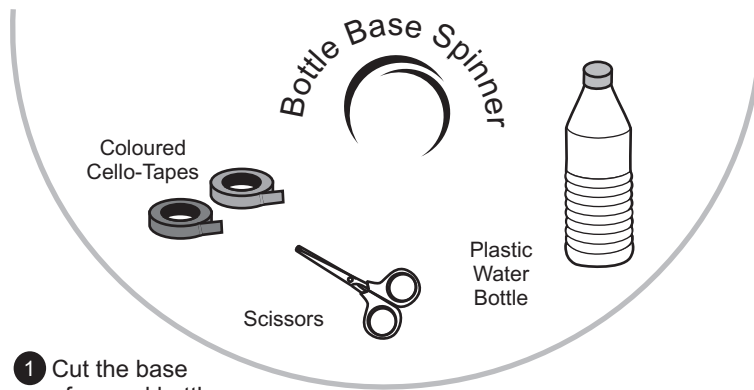
- 3 Place the balloon fish in a bottle full of water. Make sure that the balloon just floats. Then screw on the lid.

- 4 On pressing the bottle from outside a little bit of water will enter the balloon making it heavier. This will make the fish sink to the bottom.



External pressure pushes water in the balloon making it heavy and so it sinks.

On releasing the pressure, the extra water will gush out and the balloon fish will rise up again.



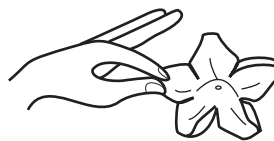
**1** Cut the base of a used bottle using a scissors.

**2** The base will have a star shaped pattern. This top will spin on the raised pip in its center.



**3** Cut a five petal flower along the pattern with a scissors.

**4** Twist each petal to make it into a blade.

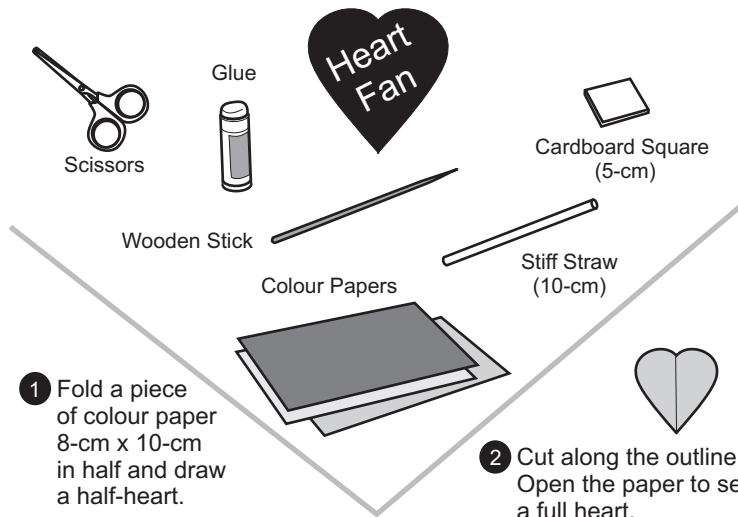


**5** Decorate with colour tapes. Upturn and place the top on a smooth surface and blow on it.

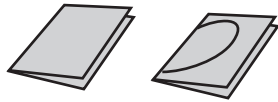


Air will strike the blades and this will spin the top very fast !





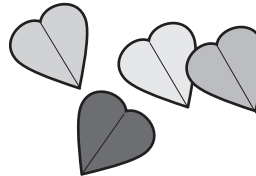
1 Fold a piece of colour paper 8-cm x 10-cm in half and draw a half-heart.



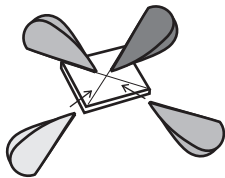
2 Cut along the outline. Open the paper to see a full heart.



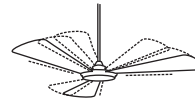
3 Make four such paper hearts.



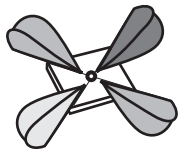
4 Stick only half part of the hearts on a cardboard square. The other halves should stand up like fan blades.



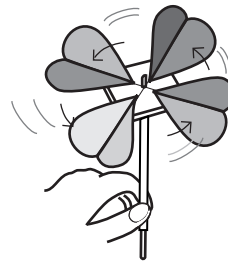
5 Make a hole in the center of the cardboard. Push in a stick through it.



6 Place the stick in a stiff straw and hold it under a ceiling fan to make it spin fast!



Air from the ceiling fan strikes the vanes and spins the fan.



## Bottle Spinner

**Scissors**

**Plastic Water Bottle**

**Old CD**

**Cycle Spoke**

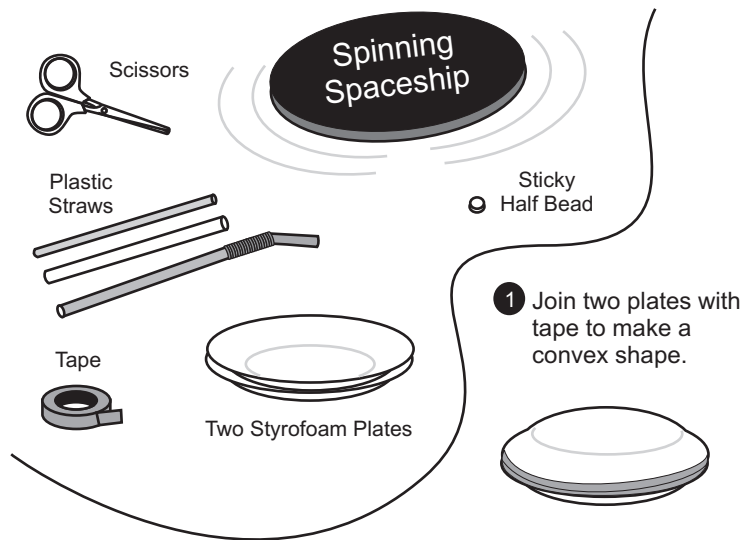
**Rubber Glue (Fevibond)**

**Bead**

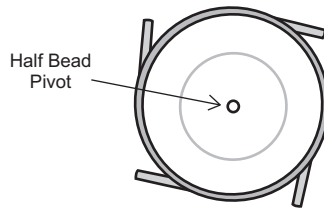
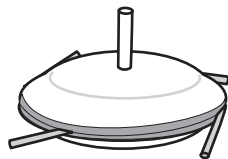
- 1 Mark and cut two slants at 45-degrees on opposite sides of a plastic bottle.
- 2 Cut an old CD in half.
- 3 Insert flat CD edges in the bottle slits. Fix with rubber glue.
- 4 Make holes in the lid and the base of the bottle. Weave a spoke and insert one bead as a stopper.

**Air from the ceiling fan will strike the CD pieces and spin the bottle.**

Hold the bottle under a ceiling fan and see it spin!



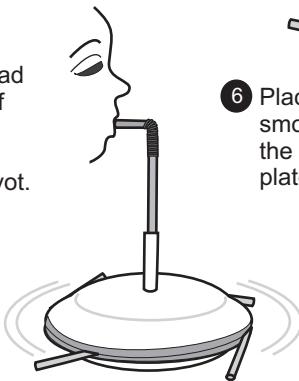
- 2 Make four holes on the joint at ninety-degrees and fix four straw pieces as shown.
- 3 Tight fit a fat straw on the top. It must not touch the base.



- 4 Stick a half-bead in the center of the base. The spaceship will spin on this pivot.

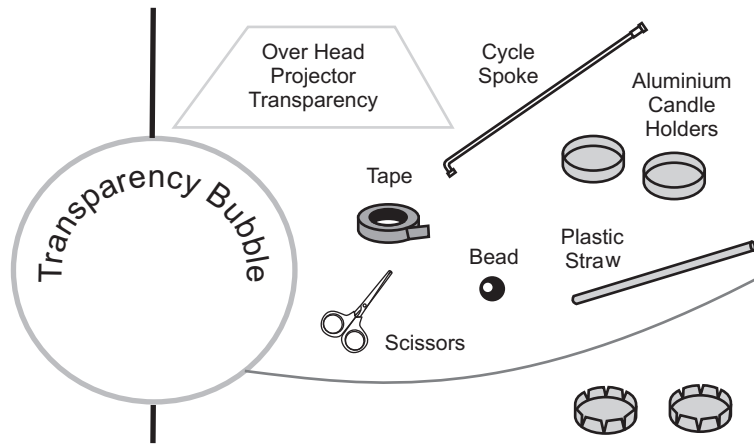
- 6 Place the model on a smooth table. Blow through the bent straw to see the plates spin like a spaceship.

- 5 Insert a loose fitting bent straw in the vertical straw.



The ejecting air from the straw holes will spin the spaceship in the opposite direction.



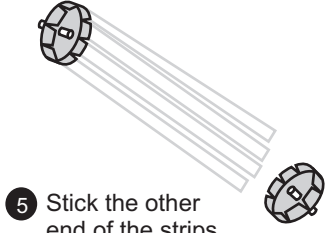


- 1 Cut eight 20-cm x 2-cm strips of transparency.
- 2 Cut eight equally spaced flaps on the rim of each candle holder.



- 3 Make a hole in their base and fix a stiff straw piece in them.

- 4 Stick transparency strips to the flaps on one holder.

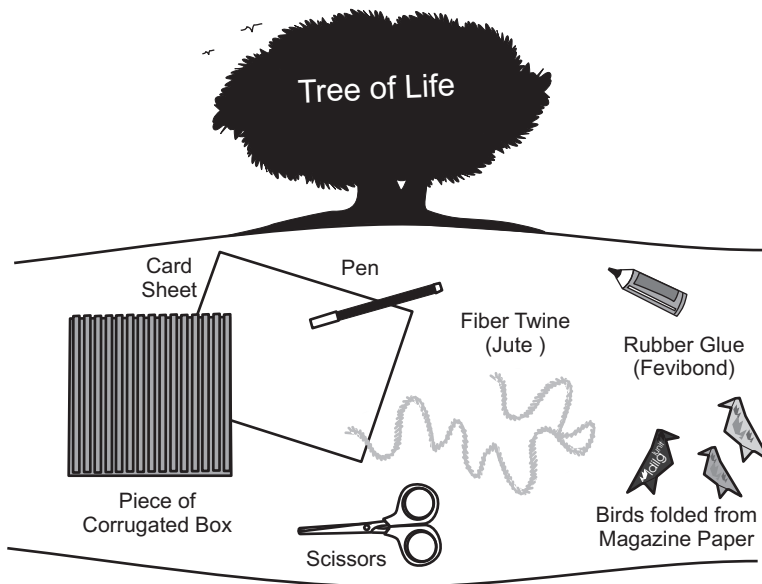


- 5 Stick the other end of the strips to the other holder.

- 6 Pass a cycle spoke through the straw bearings and hold it under a ceiling fan. The spinning model will look like a giant Soap Bubble in motion.

Twist each petal in same direction to make a propeller.

As air strikes the transparency blades it rotates the bubble.

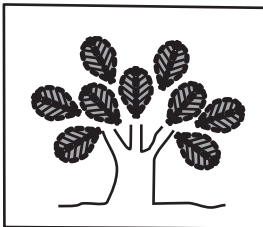


- 1 Remove the top layer of the box to see the corrugations. Draw leaves on the corrugated surface.
- 2 Cut leaves with scissors.
- 3 Cut leaves in half. Join two halves with mirror veins to resemble a real leaf.

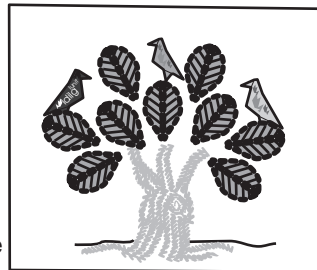


- 4 Draw the outline of a tree on a card sheet.

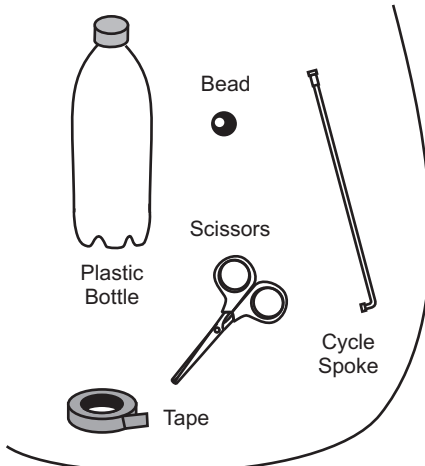
- 5 Stick leaves to make the tree crown.



- 6 Stick twine on the trunk and branches. Glue paper birds to complete the Tree of Life.



## Spinning Spiral

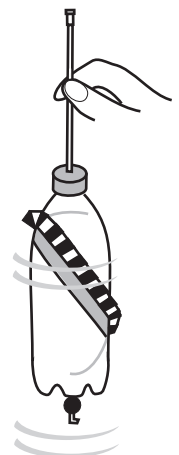


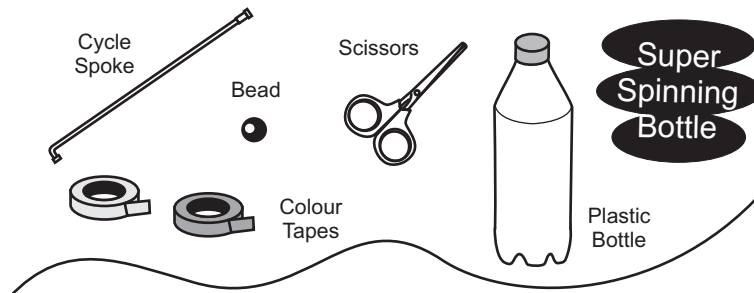
Materials: Plastic Bottle, Bead, Scissors, Cycle Spoke, Tape.

- 1 Draw a spiral on a 250-ml bottle.
- 2 Cut along the spiral.
- 3 Draw another spiral close to the cut.
- 4 Cut small flaps along the entire spiral.
- 5 Lift flaps to make fan blades.
- 6 Tape consecutive flaps to make a continuous spiral. Make holes in the bottle lid and base.
- 7 Place a bead in the spoke to reduce friction. Then weave the spoke through the bottle.

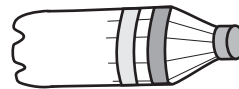
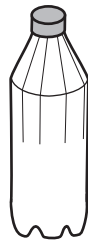
Place the bottle under a ceiling fan and see it spin!

**As air strikes the spiral it rotates the bottle.**

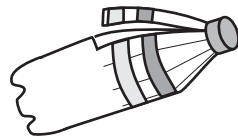




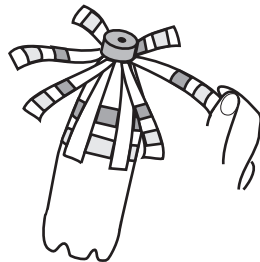
1 Draw 12 lines (6 sectors) on the bottle, half way along its height.



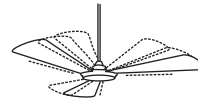
2 Decorate the bottle with colour tapes.



3 Cut on the lines to make six petals.

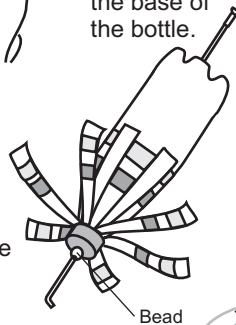


4 Lift the petals and twist them to make fan blades.

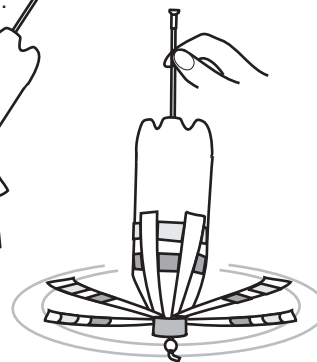


5 Make a hole in the lid and the base of the bottle.

6 Weave a cycle spoke through the holes. Assemble as shown. Hold bottle under the ceiling fan to make it spin.

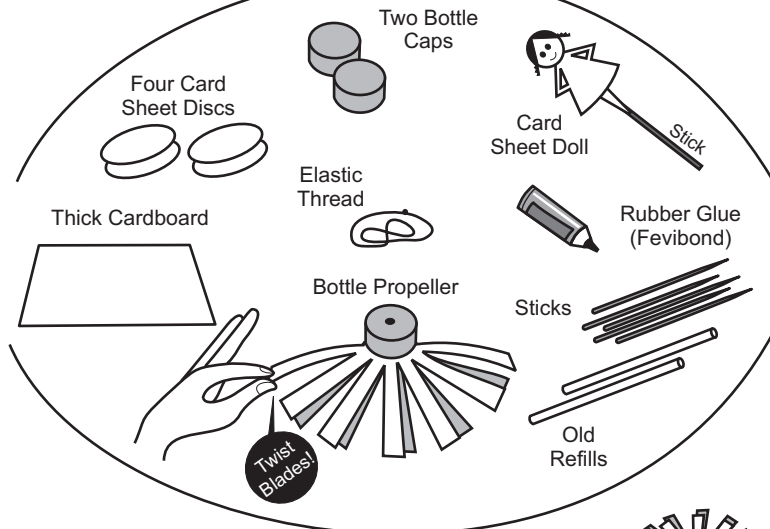


Bead

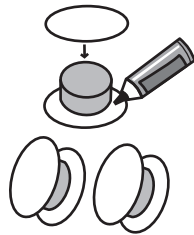


As air strikes the twisted bottle blades it spins the bottle.

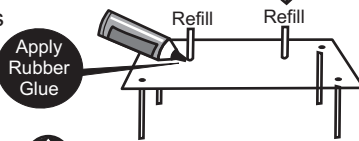
## Rotate Propeller, Spin Doll



1 Make two pulleys using card discs and bottle lids.



2 Insert two ball pen refills as bearings in a thick card base.



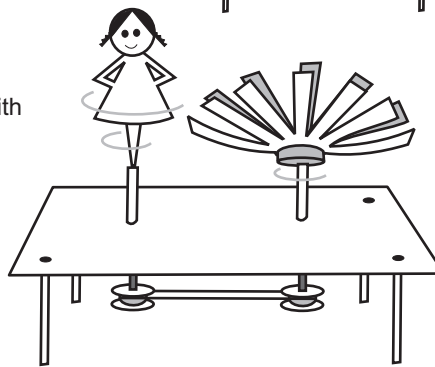
3 Attach a doll and propeller to two separate sticks.

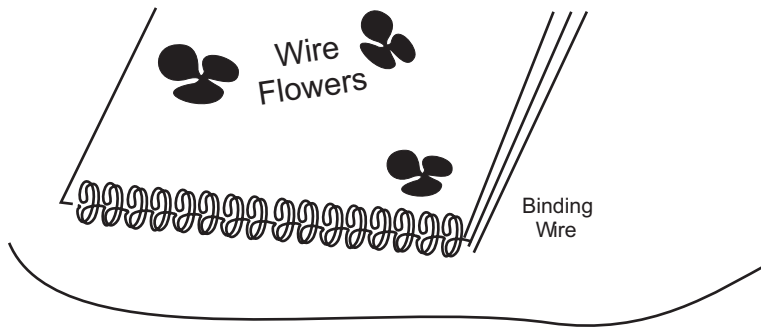


4 Attach pulleys to sticks with the doll and propeller.

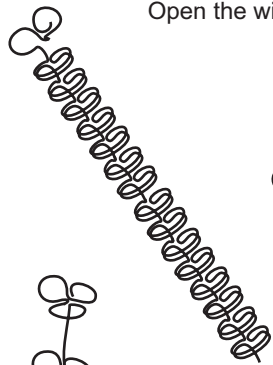
5 Join the two pulleys with an elastic thread.

6 Keep the toy under a ceiling fan. This will spin the propeller and the coupled doll will go round-and-round.

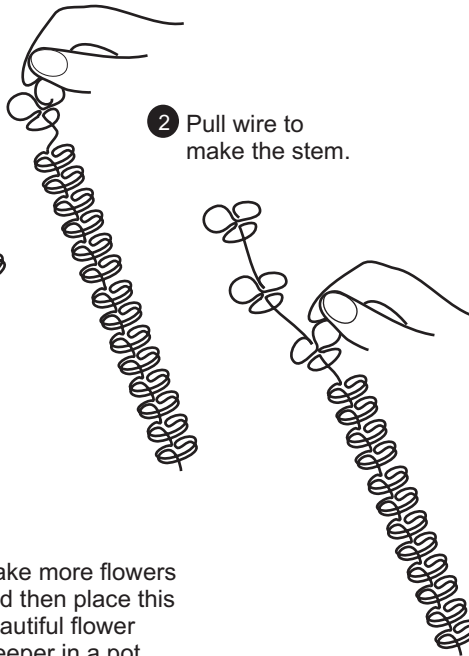




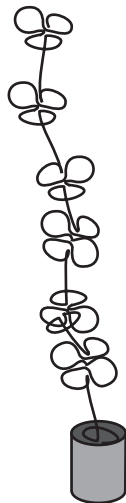
- 1 Salvage Binding Wire from an old book.  
Open the wire circles to make flower petals.



- 2 Pull wire to make the stem.

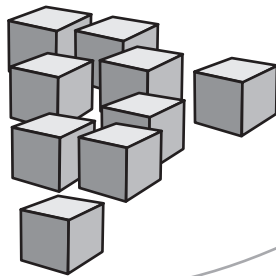


- 3 Make more flowers and then place this beautiful flower creeper in a pot.



# Nine Dancing Cubes

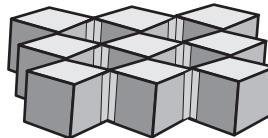
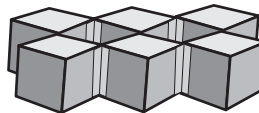
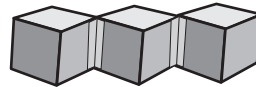
Nine Similar Card Cubes  
(Cut from square boxes)



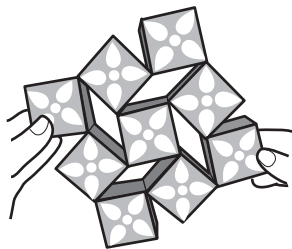
Cello Tape



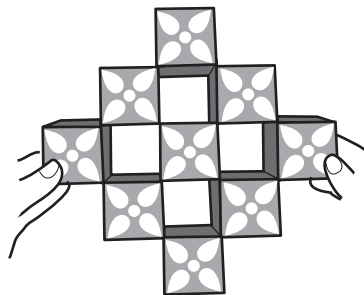
- 1 Tape nine cubes as shown.

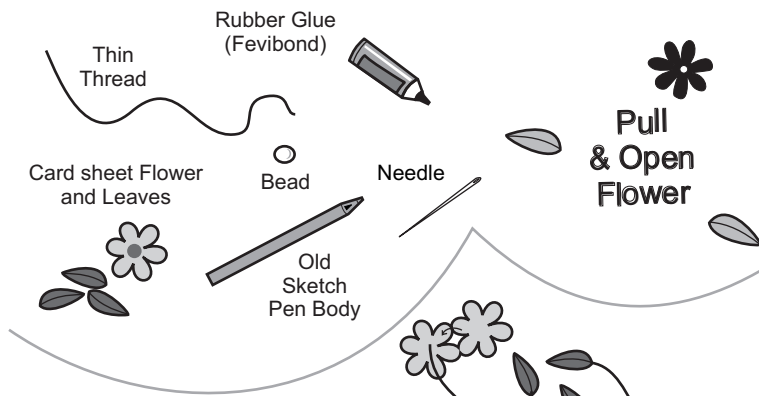


- 2 Hold two diagonally opposite cubes and press them clockwise and anticlockwise. The cubes will dance and make lovely patterns!!



Decorate the Cubes with pictures or patterns to make them look pretty.





1 Sandwich thread between two paper flowers and leaves.

2 Use three holes in the conical part and central hole of a pen body.

3 Pass the flower thread through the main hole and leaf threads through three separate holes in the sketch pen.

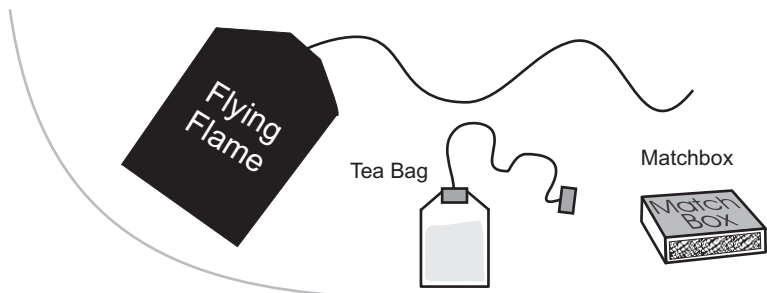
4 Tie the ends of all four threads to a bead.

5 When the thread is loose the flower and leaves appear wilted.

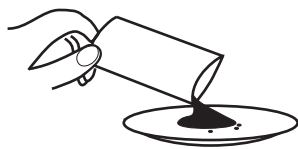
6 On pulling the thread the flower and leaves will stand upright and make a bouquet.



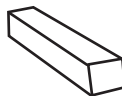




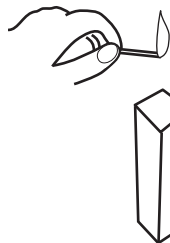
1 Open a tea bag and empty out its contents.



2 Shape the empty tea bag so that it stands vertically on the floor.



3 Set the bag on fire. The burning bag will become light and the trapped hot air inside it will.....

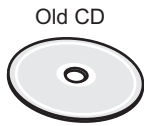


Seek Adult Help

This is a mini hot air balloon. Hot air being lighter it rises up.

...ultimately lift it up magically in the air!

# Convection in Glass



Old CD



Two Glasses



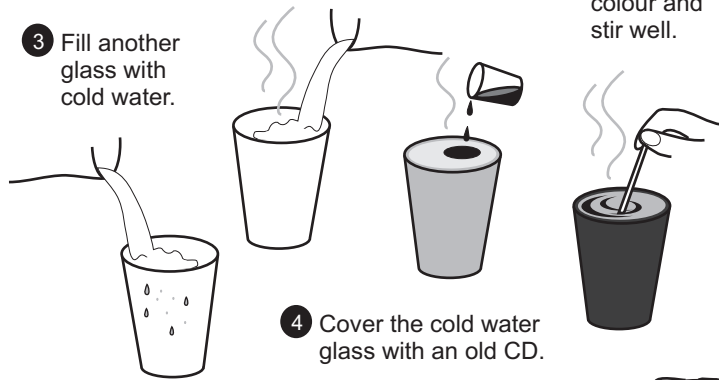
Food Colour

Seek  
Adult  
Help

1 Fill a glass completely with hot water.

2 Add some food colour and stir well.

3 Fill another glass with cold water.



4 Cover the cold water glass with an old CD.

5 Cover the CD hole with your fingers and invert it gently on the coloured water glass.

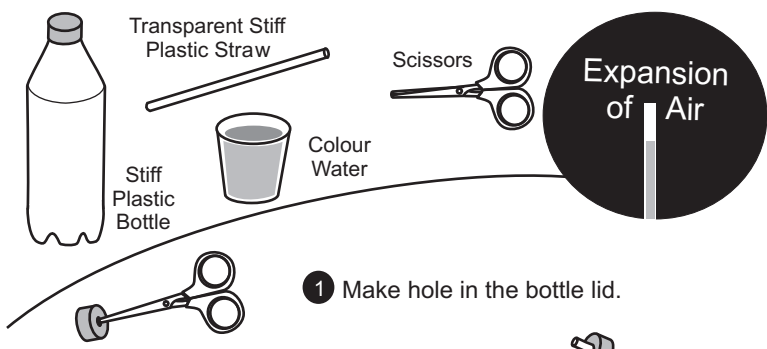


Soon you will see amazing convection currents going up!

Hot water is lighter than cold water, so it rises up.



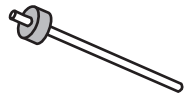
After a while the temperature and colour of water in both glasses will become the same.



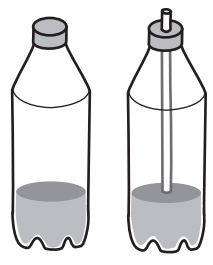
1 Make hole in the bottle lid.



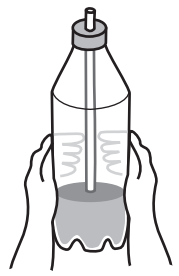
2 Press fit a long transparent stiff straw in the hole.



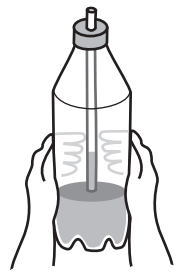
3 Pour some coloured water in the bottle. Screw the lid on the bottle. The straw must dip in the coloured water.



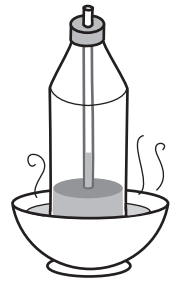
4 Rub your palms briskly to make them warm. Then gently place them on the bottle. DO NOT PRESS.



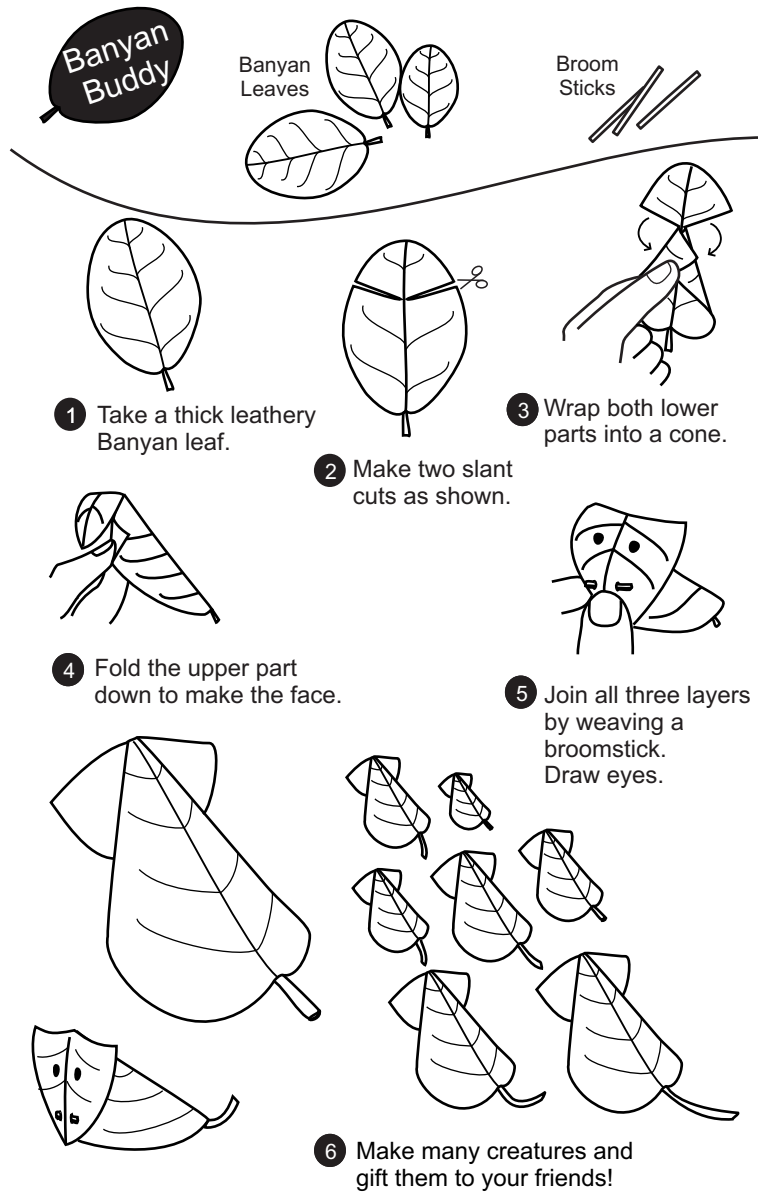
5 The air inside the bottle will warm and expand. This will put pressure and push water up the straw.

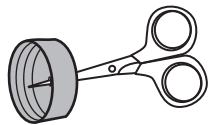
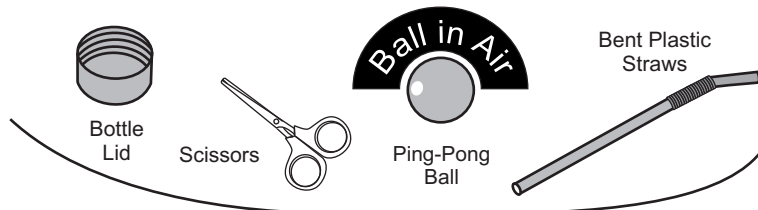


6 Instead of cupping the bottle with your warm hands you could place it in a bowl of warm water. The warm air will again push the water up the straw.

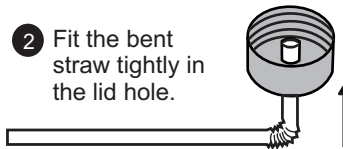


Warm air in the bottle expands and pushes the color water in the straw.

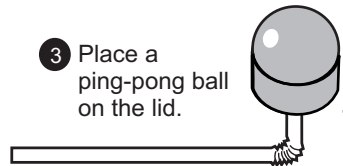




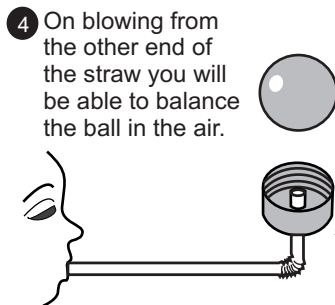
1 Make a neat hole in the lid by rotating the scissors. The bent straw must fit tightly in the hole.



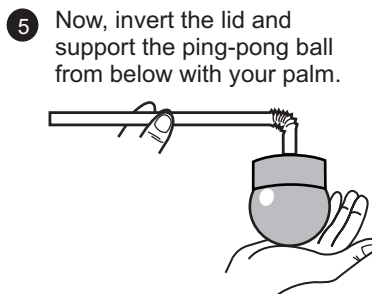
2 Fit the bent straw tightly in the lid hole.



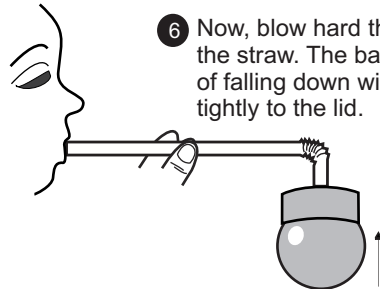
3 Place a ping-pong ball on the lid.



4 On blowing from the other end of the straw you will be able to balance the ball in the air.

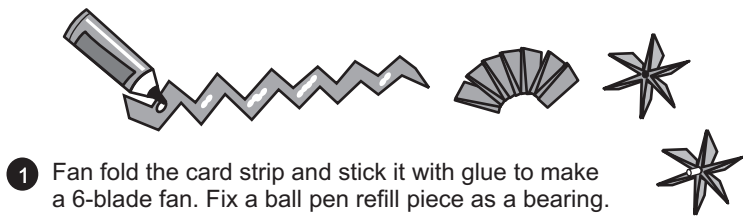
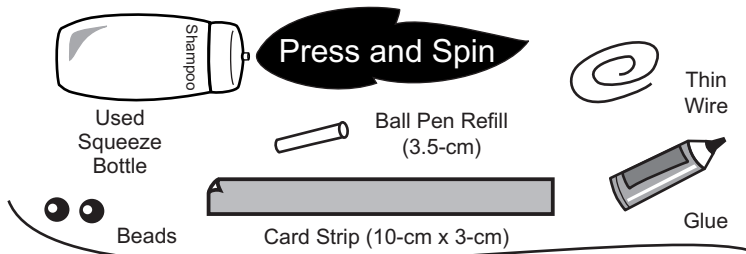


5 Now, invert the lid and support the ping-pong ball from below with your palm.

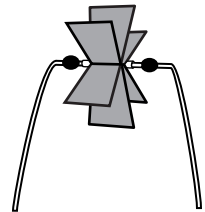


6 Now, blow hard through the straw. The ball, instead of falling down will stick tightly to the lid.

Air gushing out at high speed creates low pressure because of which the ping-pong ball sticks to the lid.



1 Fan fold the card strip and stick it with glue to make a 6-blade fan. Fix a ball pen refill piece as a bearing.



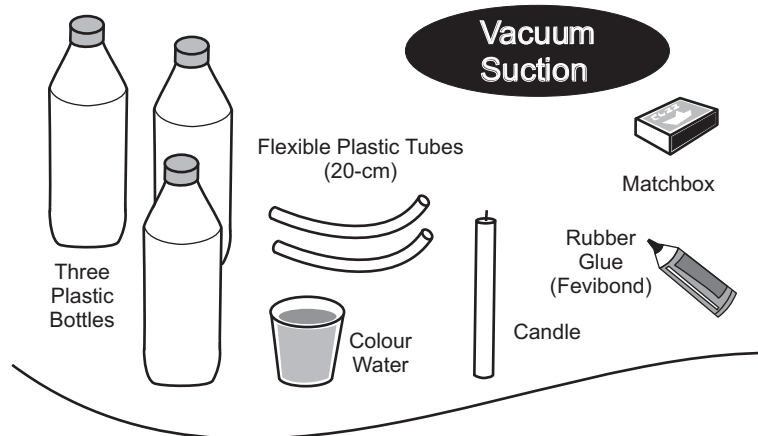
2 Weave the wire through the refill. Place two beads on the ends as stoppers. Bend the wire in a U shape.



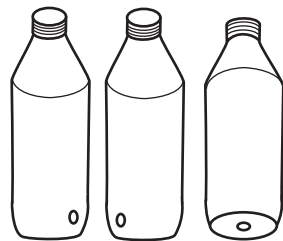
3 Tape the ends of the wire on a used shampoo bottle. The fan must be right on top of the nozzle.



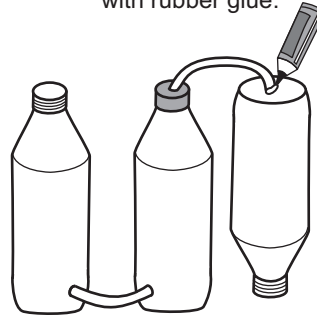
4 On squeezing and releasing the bottle air will gush out and the fan will spin very fast.



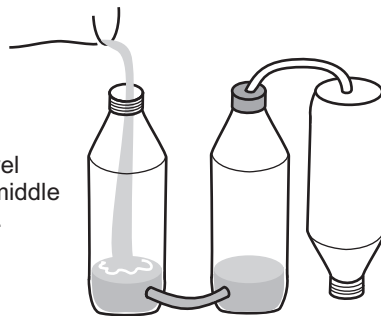
**1** Make three holes in the bottles as shown. Also make a hole in one lid.



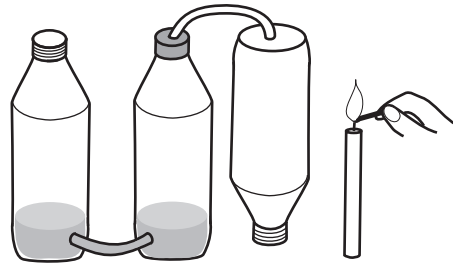
**2** Join the bottles with two short plastic tubes as shown. Seal all joints with rubber glue.



**3** Pour colour water in the left bottle. The level of water in the left and middle bottles will be the same.



4 Then light a candle.



5 Carefully invert the right hand bottle on the burning candle. Keep the bottle pressed down.

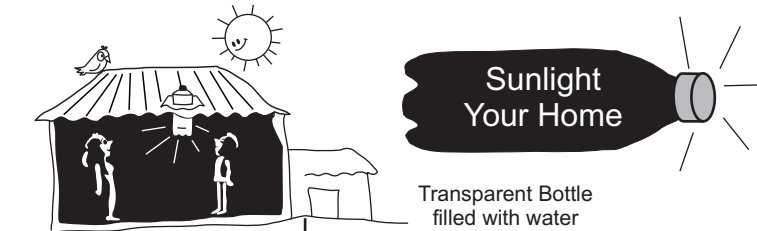


Seek  
Adult  
Help

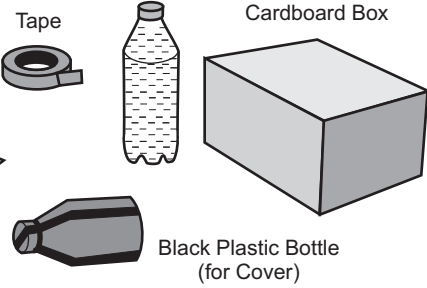
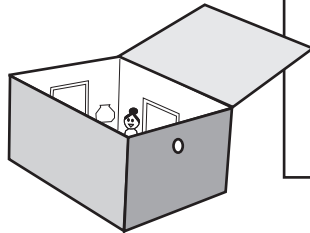
6 After a while the candle will consume all the oxygen in the bottle and will extinguish. A partial vacuum will be created and some water will be sucked into the middle bottle. The level of water in the middle bottle will rise.

The burning candle consumes oxygen and causes a partial vacuum which sucks in water.

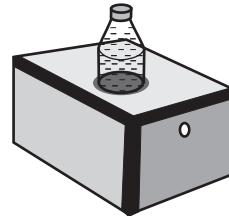




- 1 Stick pictures inside the cardboard box to make a Doll House.



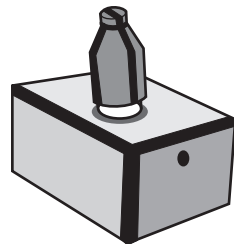
- 2 Seal all the joints with tape. Make a peep hole on one side. Make another hole on top to suspend a water bottle.



- 3 Suspend a transparent bottle filled with water in the box. Half bottle will be out and half will be inside the box.

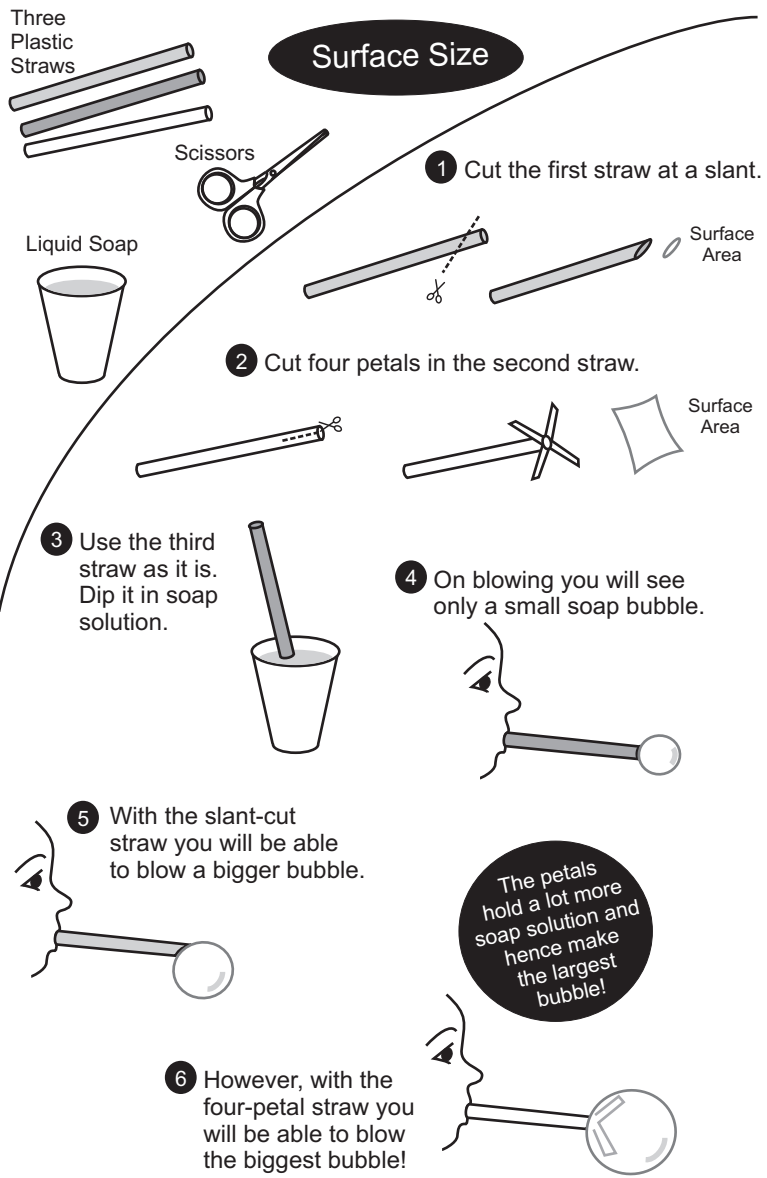
- 5 Cut a bottle in half and cover it with black paper.

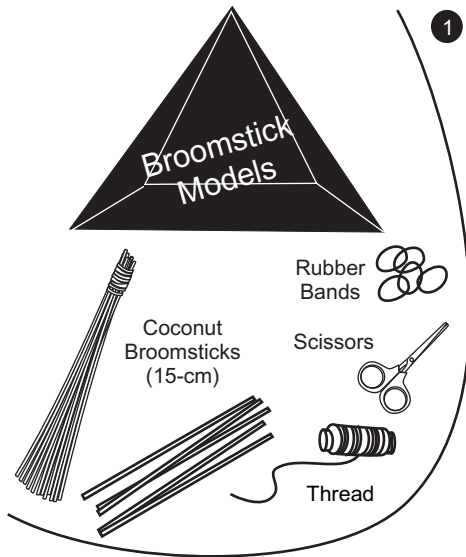
- 4 Go out in the Sun. View through the peep hole. You will see the Doll's House brightly lit.



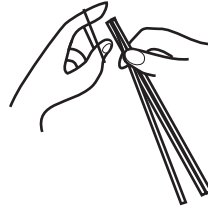
Sunlight refracted by the water bottle lights up the dark box.

- 6 Camouflage the water bottle with the covered bottle. It will be pitch dark inside. Lift the cover to see bright light inside the box.

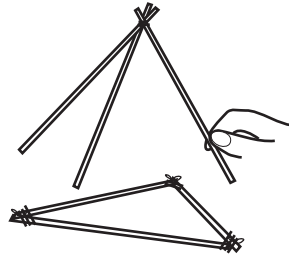




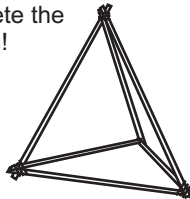
1 To make a Tetrahedron you will need six broomsticks and four rubber bands. Take three sticks and join them with a rubber band.



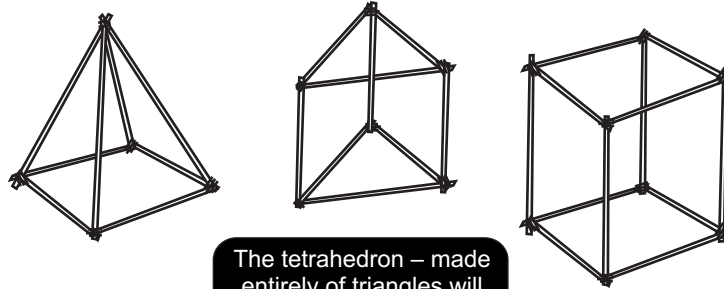
2 Make a triangle with three more sticks. Join each end of the tripod to one vertex of the triangle...



3 ... to complete the Tetrahedron!

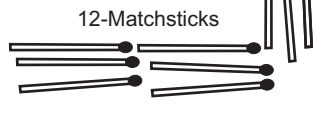


Make different shapes - Pyramids, Cubes, Prisms etc. The rubber bands decay after a while. For permanent joints tie all the junctions with thread. This is a very low-cost way of making 3-D models.

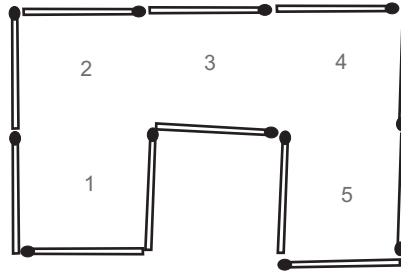


The tetrahedron – made entirely of triangles will be the strongest structure.

# Matchstick Maths



1 This shape made with 12-matchsticks has an area of five squares.

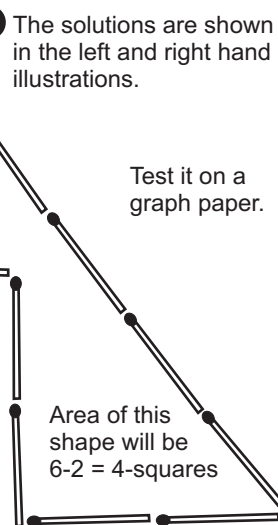
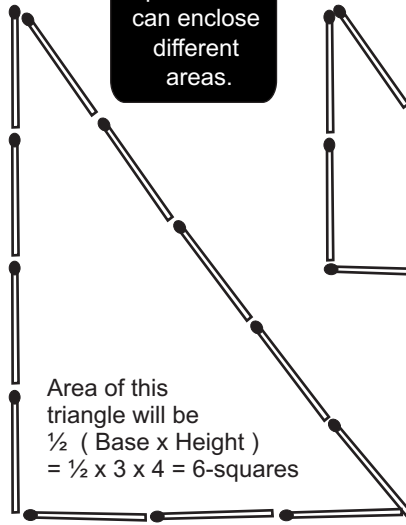


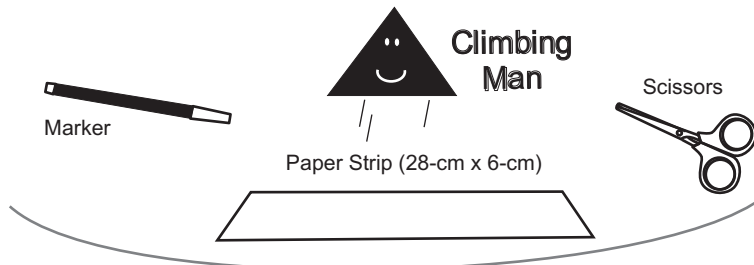
2 Now arrange the same 12-matchsticks to enclose an area of six and four squares.

The same perimeter can enclose different areas.

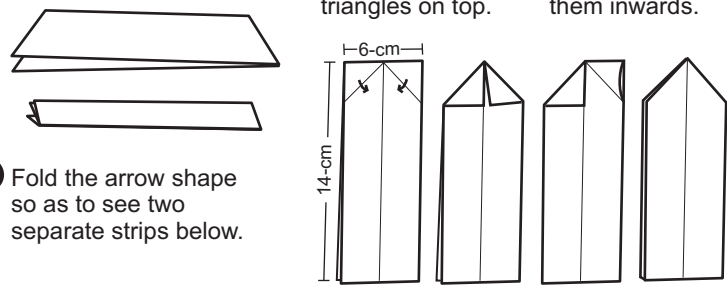
3 The solutions are shown in the left and right hand illustrations.

Test it on a graph paper.

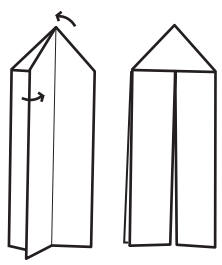




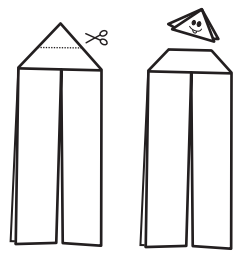
- 1 Fold strip in half and then in a quarter.
- 2 Open strip and fold two small triangles on top.
- 3 Open triangles and then squish them inwards.



- 4 Fold the arrow shape so as to see two separate strips below.

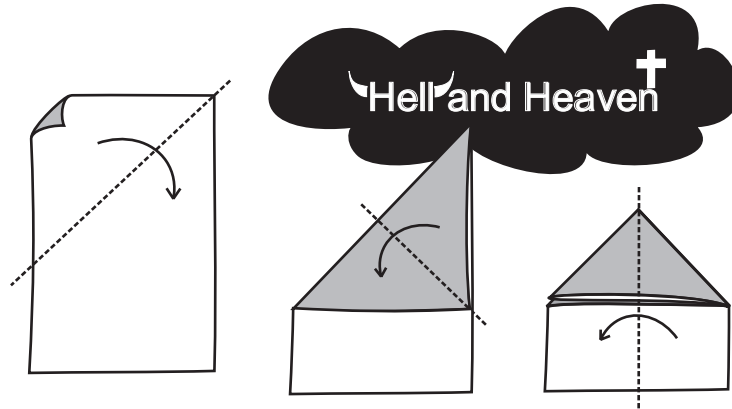


- 5 Cut the top of the triangle.
- 6 Draw a smiley face on the triangle.
- 7 Tuck the smiley between the two strips.



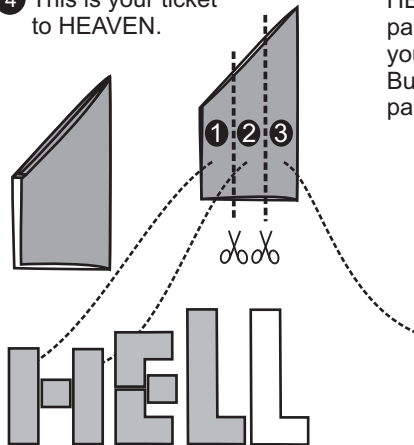
- 8 On moving the strips up-down the smiley will climb up and get ejected!!

The triangle climbs up because of the friction between the papers.

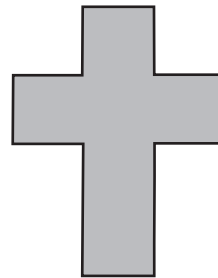


- 1 Take half A-4 sheet. (21-cm x 15-cm)  
Fold top left corner to make a triangle.
- 2 Fold top triangle in half.
- 3 Fold model in half from right to left.

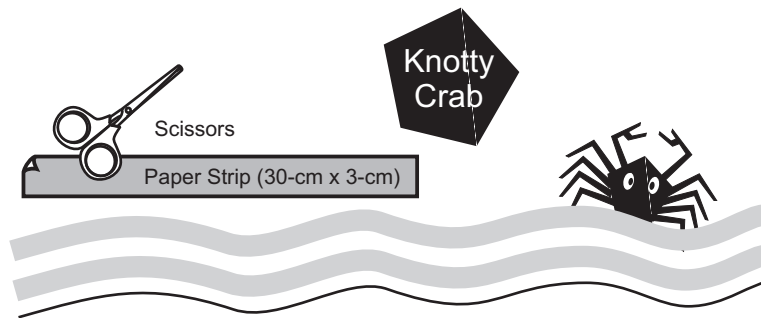
- 4 This is your ticket to HEAVEN.



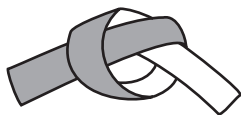
- 5 Who doesn't want to go to HEAVEN? A greedy person wants part of your ticket. Being generous you cut part 1 and give it to him. But he wants more. So, you cut part 2 and give that too.



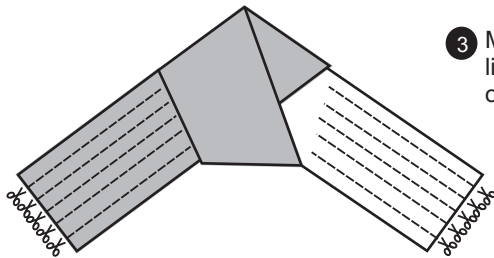
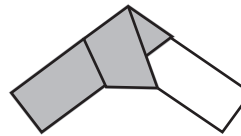
- 6 Armed with parts 1 and 2 the greedy man tries to enter heaven. The guard assembles parts 1 and 2 and makes the word HELL. "Your place is in HELL," the guard tells him. "Go to HELL".
- 7 Having given away part 1 & 2, you are only left with part 3. The guard unfolds a CROSS in part 3 and allows you to enter HEAVEN !



- 1 Tie a knot in a strip of paper 30-cm long and 3-cm wide.

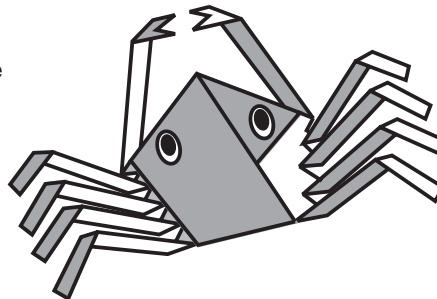


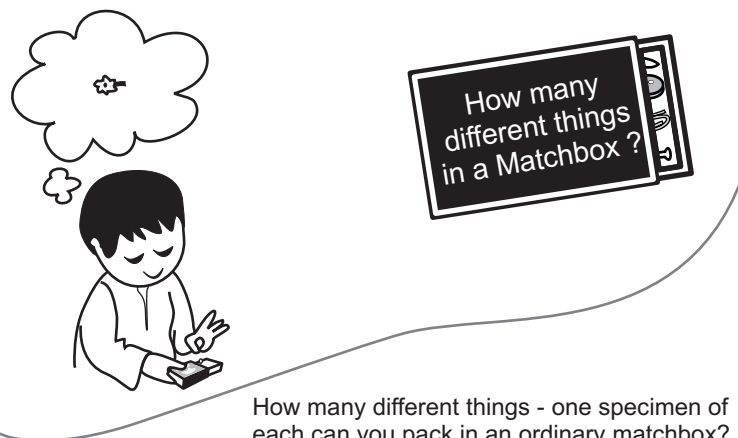
- 2 On pulling both ends and tightening the strip you will see a regular pentagon in the middle.



- 3 Mark and cut five parallel lines on both strips jutting out from the pentagon.

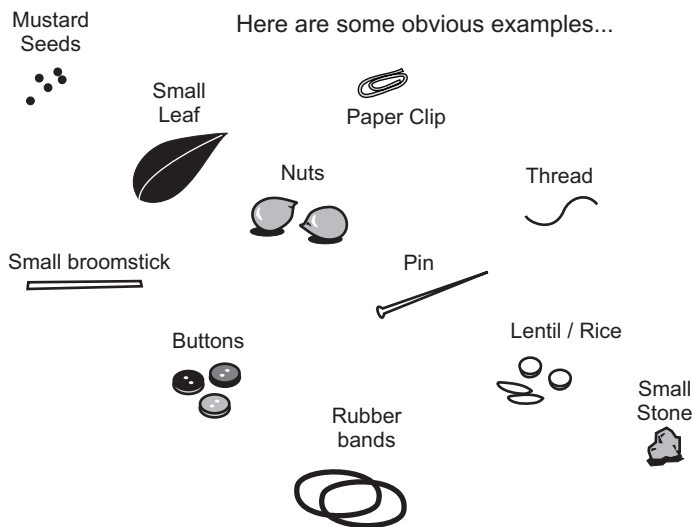
- 4 Fold the top strips to make two jaws. Fold and shape lower strips to make the legs and feet of the crab. Finally draw two eyes and then admire your KNOTTY CRAB!





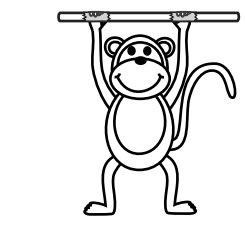
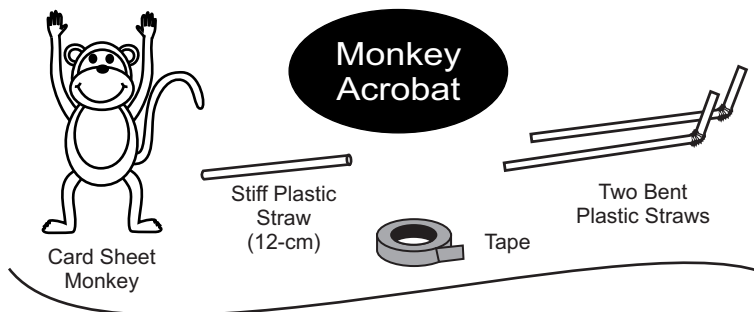
How many different things - one specimen of each can you pack in an ordinary matchbox? For this you will have to look for the littlest and tiniest things around you.

Here are some obvious examples...

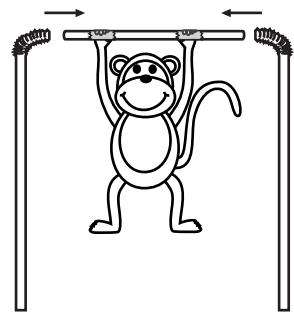


In 1980, the Vikram Sarabhai Community Science Center, Ahmedabad, India organized a competition for children - How many different things, one of each can you pack in a matchbox? One child packed more than 250 things in one single matchbox! The word Nano had not been invented then. Today's children will easily surpass that record. This is still a great science activity for school children.

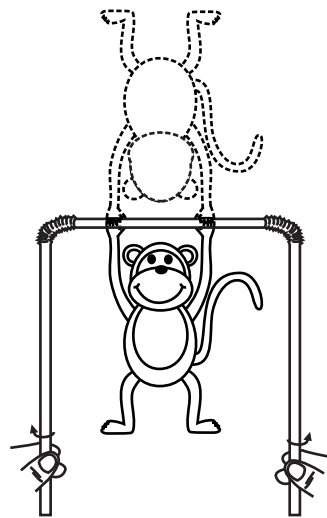




1 Stick the hands of the monkey with tape to the stiff straw.

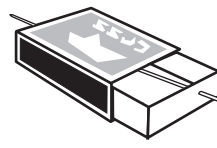
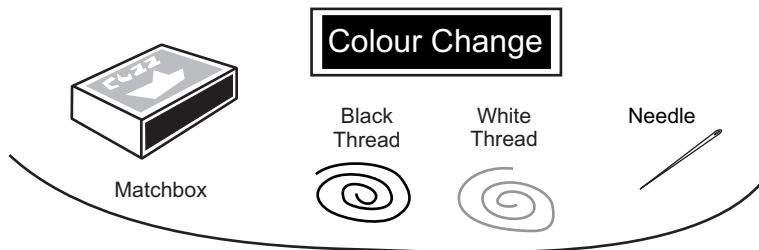


2 Cut the short ends of the bent straws. Keep the springy part intact. Insert both the ends of the stiff straw in the springy ends of the vertical straws.

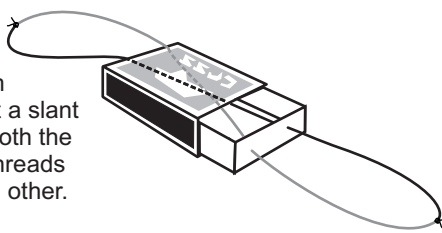


3 Hold the vertical straws with both hands and gently twirl them to make the monkey go around in circles.

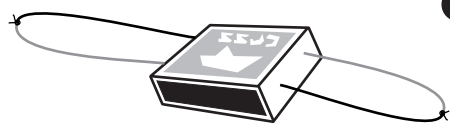
The twirling vertical straws transmit the rotation to the monkey acrobat.



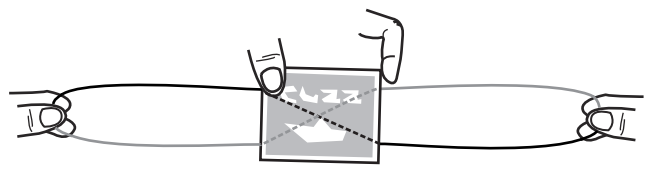
**1** Weave 60-cm long WHITE thread at a slant through the drawer of a matchbox.



**2** Weave another 60-cm long BLACK thread at a slant through the drawer. Both the WHITE and BLACK threads must criss-cross each other.

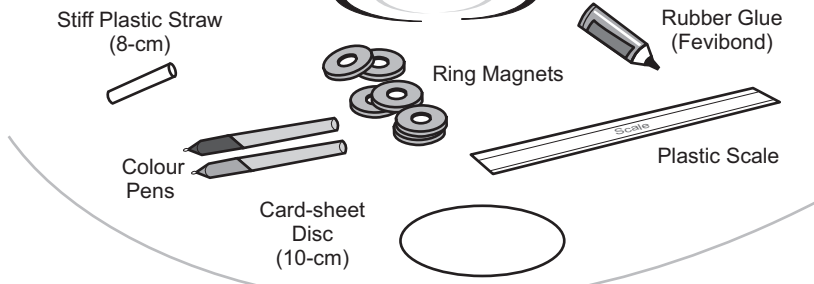


**3** Tie knots on both ends to join the threads. Cover the drawer with the outer shell of the matchbox.



**4** Hold the two loops of thread as shown. The matchbox will be in the middle. Ask a friend to move the matchbox from left to right. Magically, the colours of the threads will interchange. White will become black and black will become white.

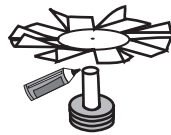
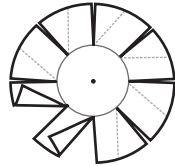
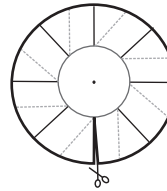
## Magnetic Rotation



- 1 Tight fit a piece of straw in three ring magnets.



- 2 Draw this pattern on a 10-cm card sheet disc as shown. Cut along the bold lines.

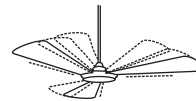


- 4 Stick top of the straw to the spinner.

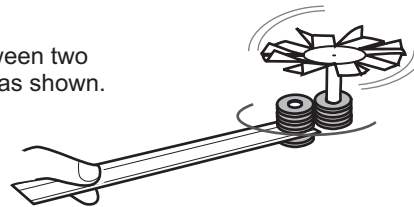
- 3 Fold on the dotted lines to make fan blades.



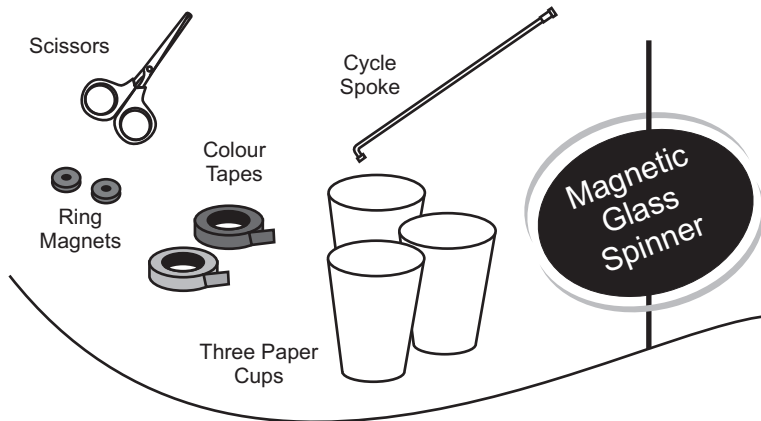
The fan breeze makes the propeller spin and go round-and-round.



- 5 Sandwich a plastic scale between two layers of magnets. Assemble as shown.



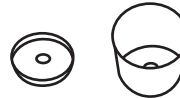
Hold the assembly under a ceiling fan. The card spinner will spin and also rotate round-and-round the magnets on the scale.



1 Cut the cups as shown in quarter, half and three-fourths.



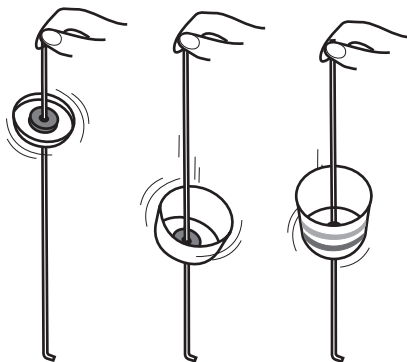
2 Make a hole in center of the base and decorate the cut cups with colour tapes.



3 Fix two ring magnets on the hole. One above and the other from below.



4 Place the cup with the magnets in a cycle spoke. Hold the spoke loosely on top.

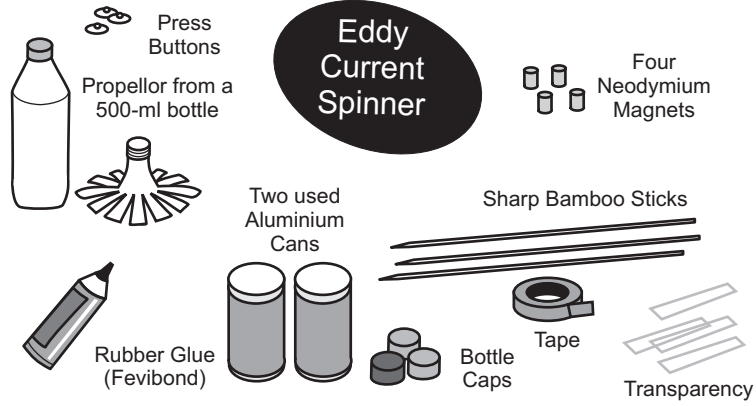


5 Give the cup a gentle twirl. The cup will keep spinning and slowly come down.

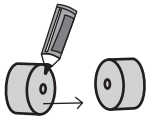
6 Repeat the experiment with the other two cups. You will find that the bigger the cup, the slower it will spin.

The ring magnets are mounted off-center on the spoke. They stick to the magnet and slowly spin down.

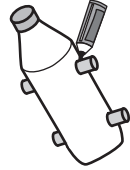
# Eddy Current Spinner



**1** Make holes in two bottle caps and stick them back-to-back.



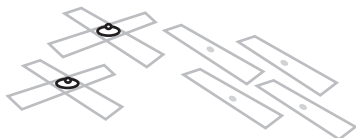
**2** Stick four Neodymium magnets on a 500-ml plastic bottle as shown.



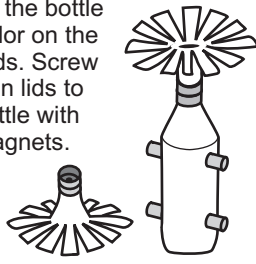
**3** Fix half the press button - only the pip part in the lid hole.



**5** Cut four 1-cm x 6-cm transparency strips. Stick them into two crosses. Make holes and stick half a press button in their centers. The pip must be on the top.

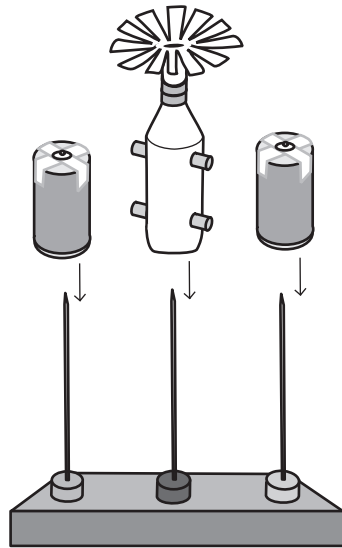


**4** Screw the bottle propellor on the twin-lids. Screw the twin lids to the bottle with the magnets.



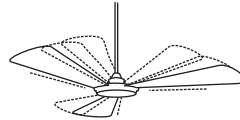
**6** Cut the tops of two aluminium cans. Tape the crosses on top of the cans. Make a large hole in the center in the base of each can.



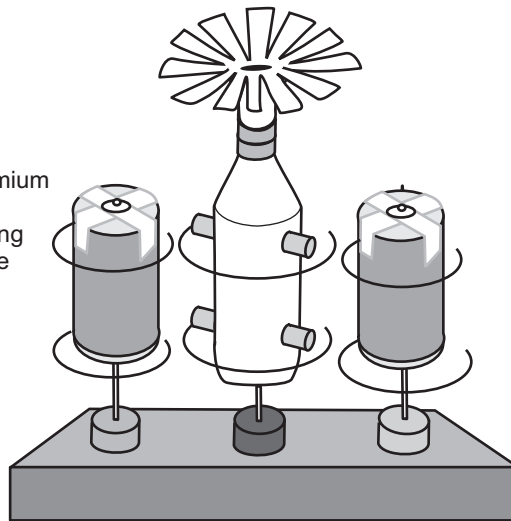


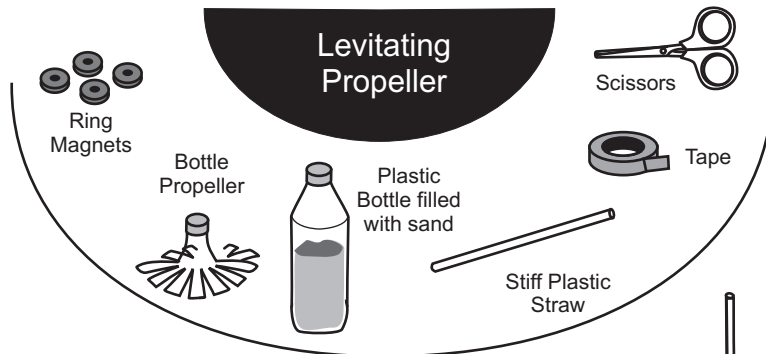
- 7 Fix three sharp bamboo sticks (skewers) on three bottle caps. Stick the caps on a wooden block. Perch the bottle with the magnets on the middle stick and the aluminium cans on the two end sticks. The tip of the sticks must perch on the press buttons. Then place the model under a ceiling fan.

Spinning magnets produce Eddy currents in the aluminum cans. These current produces a magnetic force which interacts with the strong neodymium magnets making the aluminum cans spin.

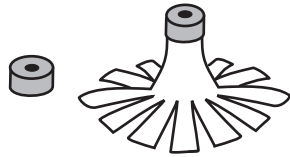


- 8 The breeze from the ceiling fan will spin the propeller and the bottle. The strong neodymium magnets will also spin. These spinning magnets will create eddy currents in the aluminium cans and they will start spinning too!





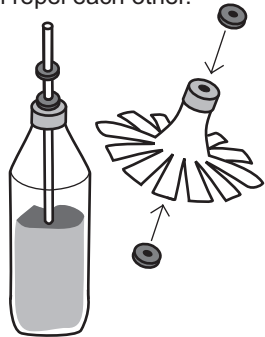
- 1 Make a propeller from a 500-ml plastic bottle. Make a hole in the bottle lid.



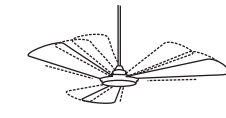
- 2 Screw the lid with the hole on a bottle half filled with sand. Press fit a stiff straw in the lid. Embed the straw in the sand to make it stand erect.



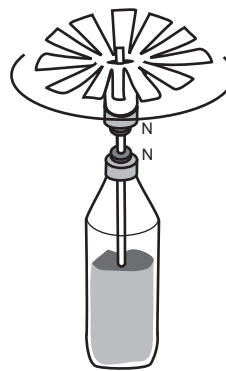
- 3 Place a few ring magnets in the straw. Similar poles will repel each other.



- 4 Place two magnets each inside and outside the propellor lid. These magnets will automatically stick to each other.

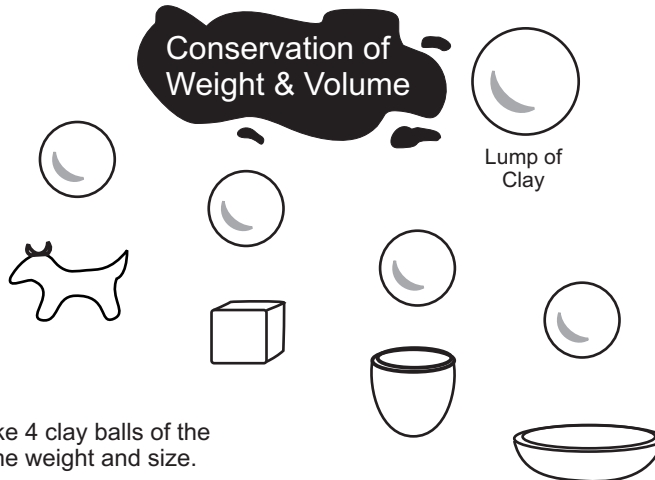


Like poles repel and this levitates the bottle fan. The ceiling fan makes it spin.



- 5 Place the propeller on the stiff straw. The magnets in the straw and the propeller should repel each other. This will make the propeller levitate. On placing it under a ceiling fan the propeller will spin very fast!

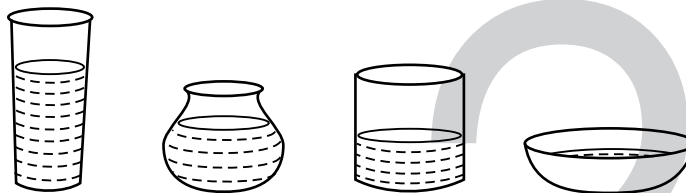
## Conservation of Weight & Volume



1 Make 4 clay balls of the same weight and size.

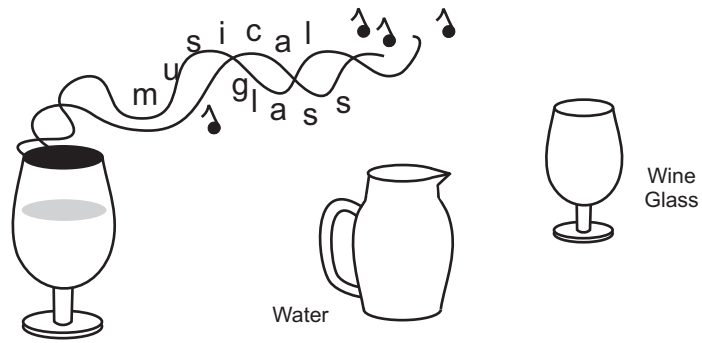
2 Then transform each ball into a different shape - animal, cube, cup and a saucer.

Ask your friend, "Which shape is heavier?"  
Each shape was made from a similar ball.  
So how can they have different weights?



Fill same amount of water (one cupful)  
in four vessels of different shapes.  
Each will have a different water level.  
Which vessel contains more water?





- 1 Rub your wet finger on the rim of a wine glass. You will hear a musical note.



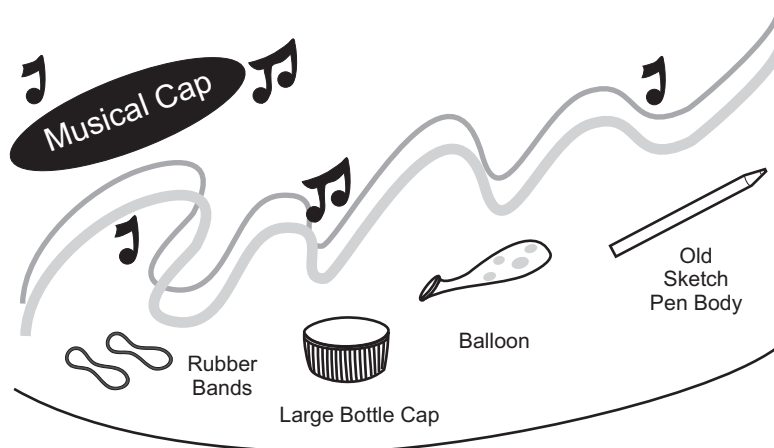
- 2 Then fill the wine glass half with water. On rubbing the rim the note will change.



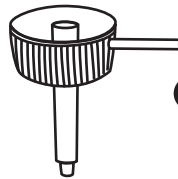
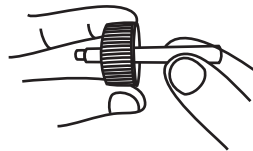
- 3 Keep adding more water and try again.

As you add more water the musical note will get less shriller. The musical note is produced by the vibrating water in the wine glass.

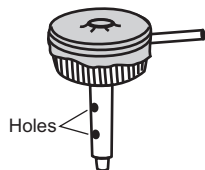




- 1 Make a 8-mm hole in the bottle lid with a scissors. Press fit a 8-cm long old sketch pen piece in the hole.



- 2 Make another small hole in the rim of the lid. Press fit a 5-cm long ball pen refill in this hole.

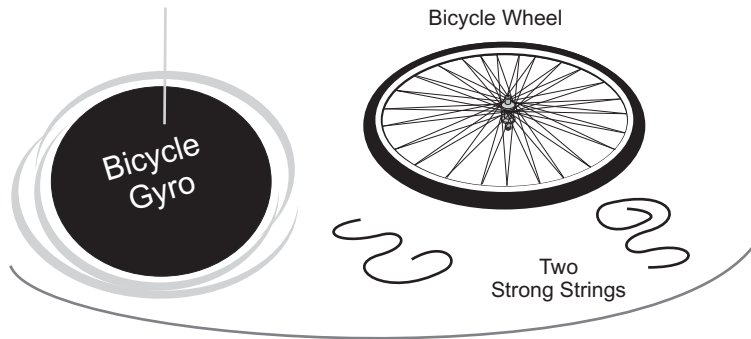


- 3 Stretch a torn balloon on the lid. Place rubber bands to keep it stretched.

- 4 Push the sketch pen so that it just touches the balloon. On blowing through the refill you will hear a sound. Open and close the holes to hear different musical notes.

On blowing, the stretched balloon vibrates producing melodious notes.

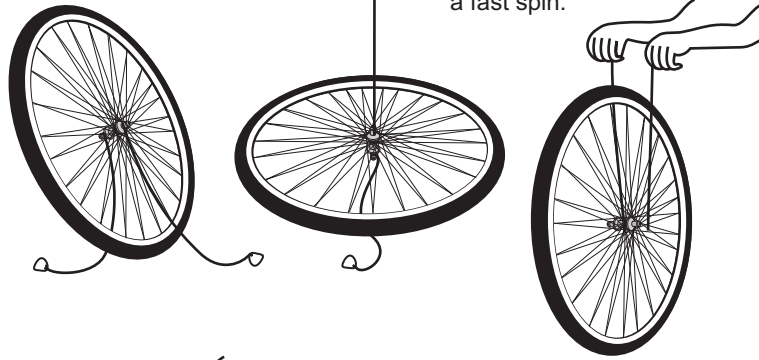




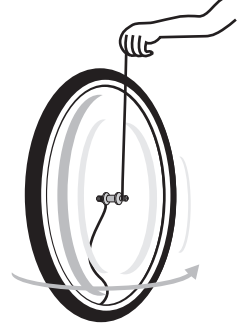
1 Tie two strong strings 80-cm long on both ends of the axle of a cycle wheel. Tie knots on their ends.

2 On hanging the wheel by one string it will lie horizontal.

3 Hold both strings and give the wheel a fast spin.

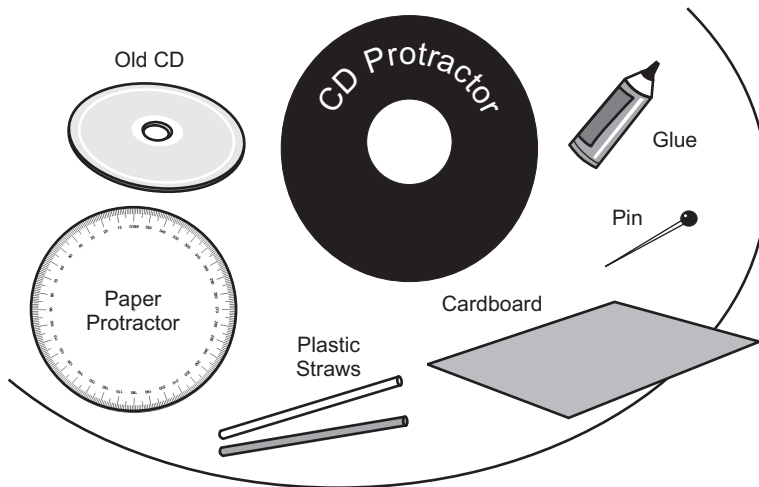


4 Once the wheel starts spinning drop the left hand string. The wheel will not fall down! Instead, while spinning it will start rotating in the clockwise direction.



However, if you drop the right hand string while the wheel is spinning then it will rotate slowly in the anti-clockwise direction.

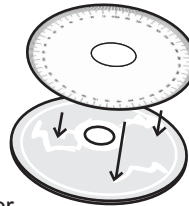
**The spinning wheel does not fall because of gyroscopic action. Instead, it slowly turns around.**



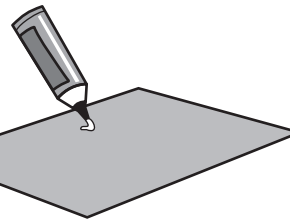
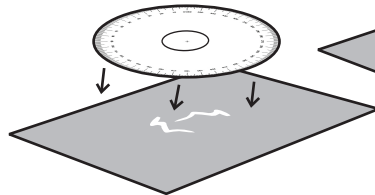
- 1 Apply rubber glue on top of an old CD.



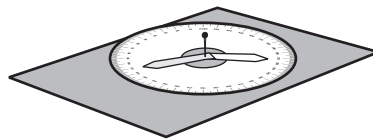
- 2 Stick the printout of a paper protractor on this CD. The protractor will indicate angles from 0 to 360-degrees.




- 3 Apply glue on a thick cardboard and stick the CD protractor on it.



- 4 Cut points in two short straws. Pivot them in the center of the protractor with a paper pin. Use these straw pointers to measure angles.





Science is not hardware - burettes, pipettes and test tubes. Instead, science is way of critically looking at the world around us. Children can do amazing science experiments using simple stuff available at home - old plastic bottles, paper cups, straws, leaves etc. This simple handbooks documents over 50 science experiments which children can do using ordinary stuff and tools easily available at home.