



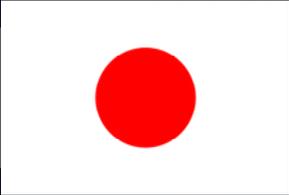
SEEC 2015

EXPERIENCE THE WONDERS OF MIRRORS!

Building a Space Kaleidoscope

WORLD MAP





JAPAN

Hokkaido

Tokyo

Kyushu

Okinawa

TAIWAN

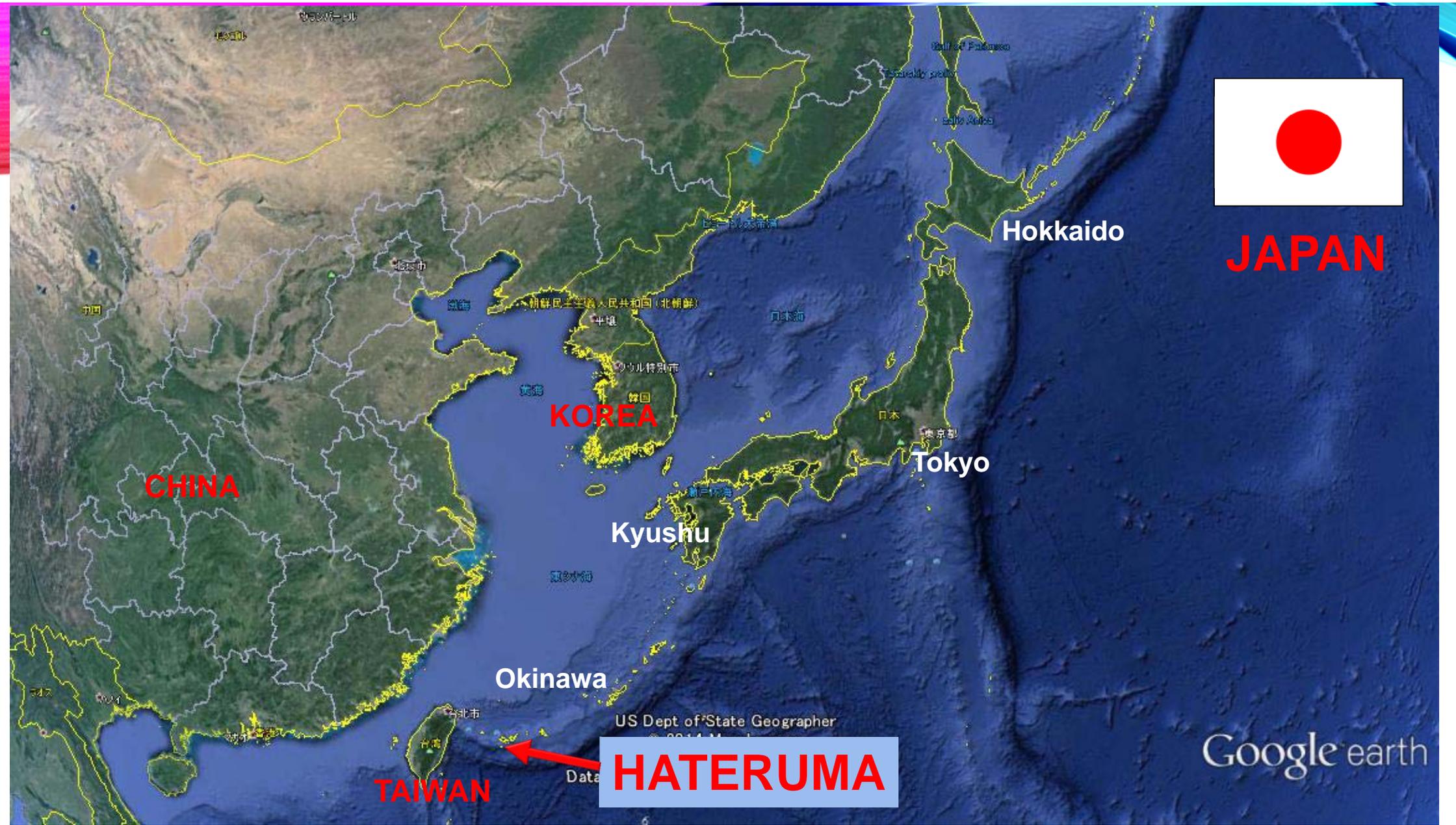
KOREA

CHINA

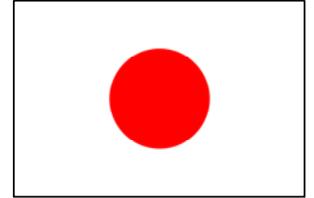
HATERUMA

US Dept of State Geographer

Google earth



HATERUMA



Japan's southernmost
inhabited island

Circumference: approx. 15km

Population: approx. 550 people



SUGARCANE FIELDS

DELICIOUS!



TRADITIONAL CULTURE

The lion dance



DELICIOUS!

The god of HATERUMA
named "MILK"



THE STARRY SKY AND THE LINE OF ORBIT ISS



THE STARRY SKY, OBSERVATION
TOWER AND THE MILKY WAY



KINDERGARTENERS



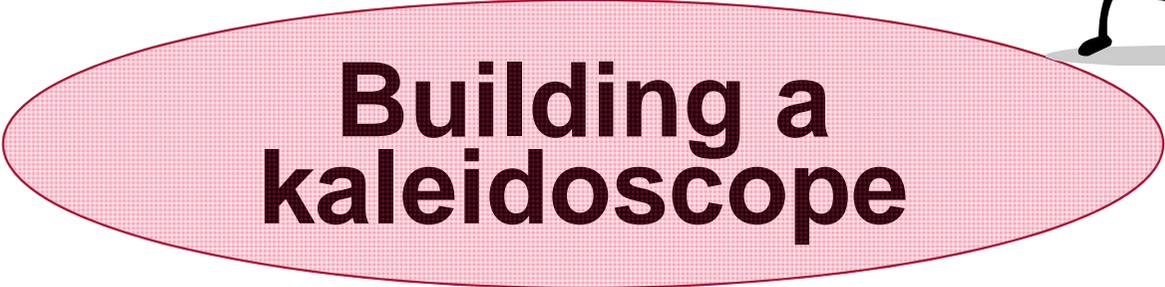
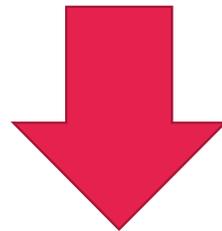
THEME

WE WANT TO COME UP WITH KINDERGARTEN TEACHING MATERIALS BASED ON THE IMAGE OF THE STARRY SKY OF HATERUMA!

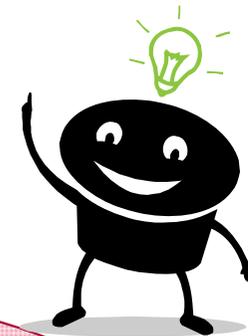


Mirror

KEYWORD



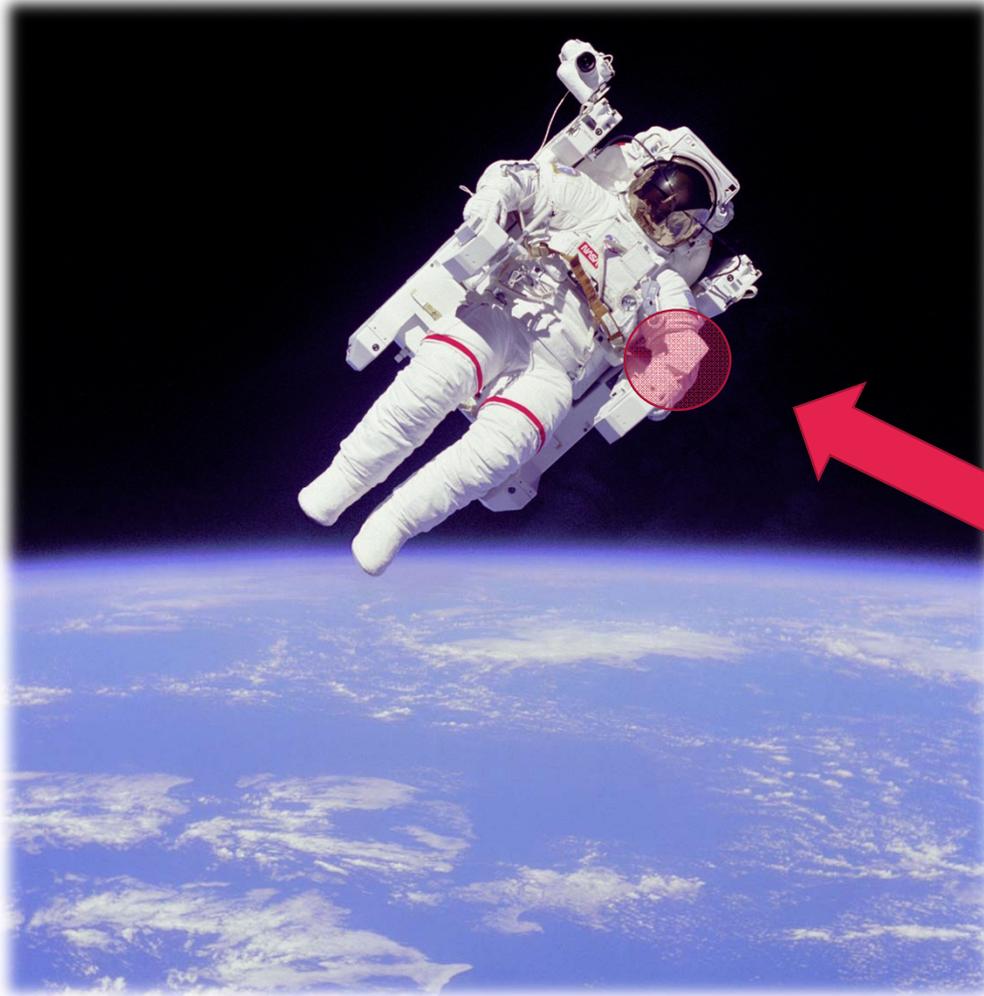
**Building a
kaleidoscope**



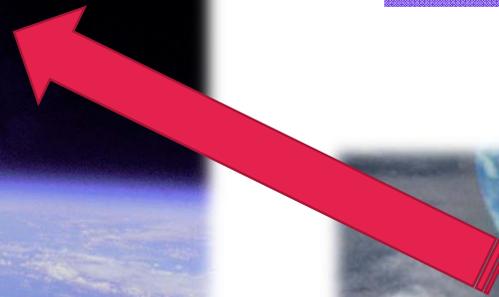
DIFFERENT TYPES OF MIRRORS



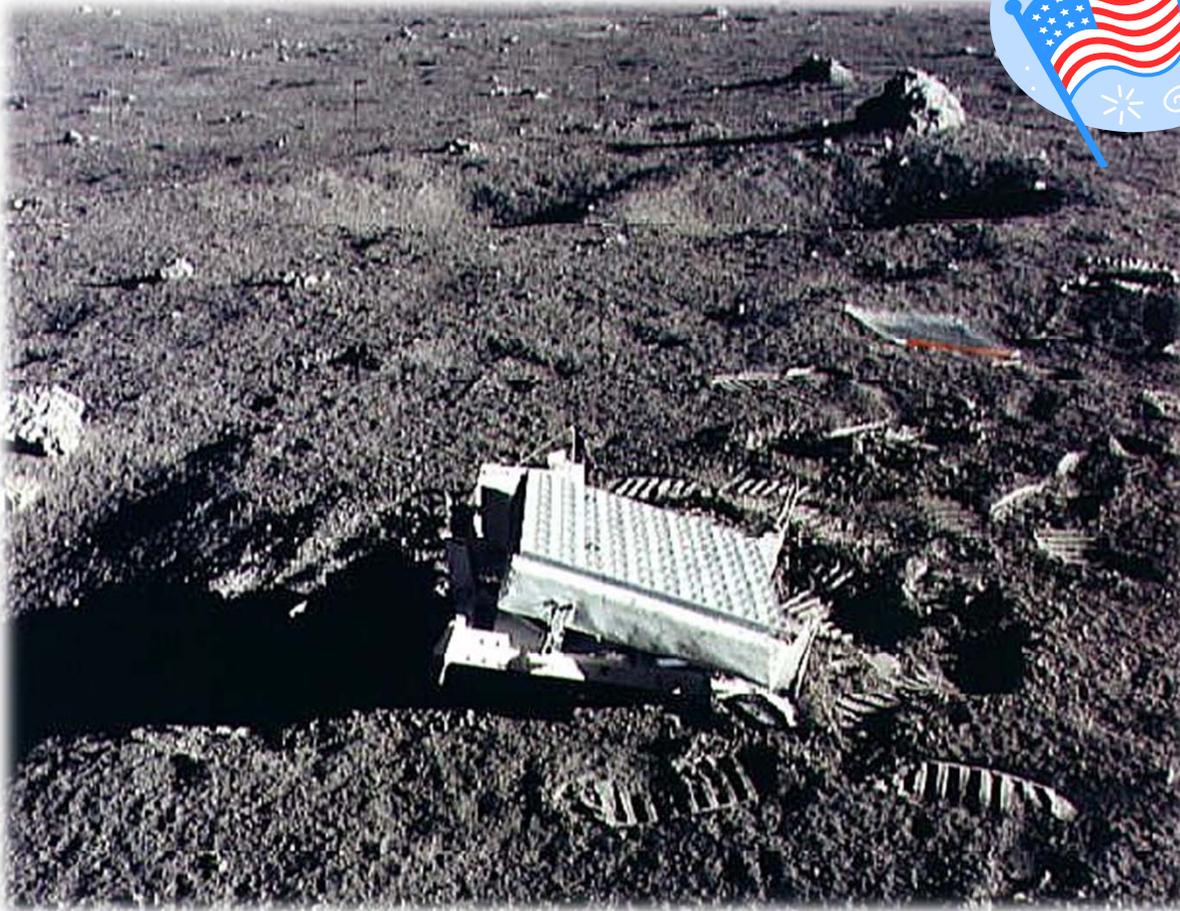
DIFFERENT TYPES OF MIRRORS



SPACE SUIT
MIRROR



DIFFERENT TYPES OF MIRRORS



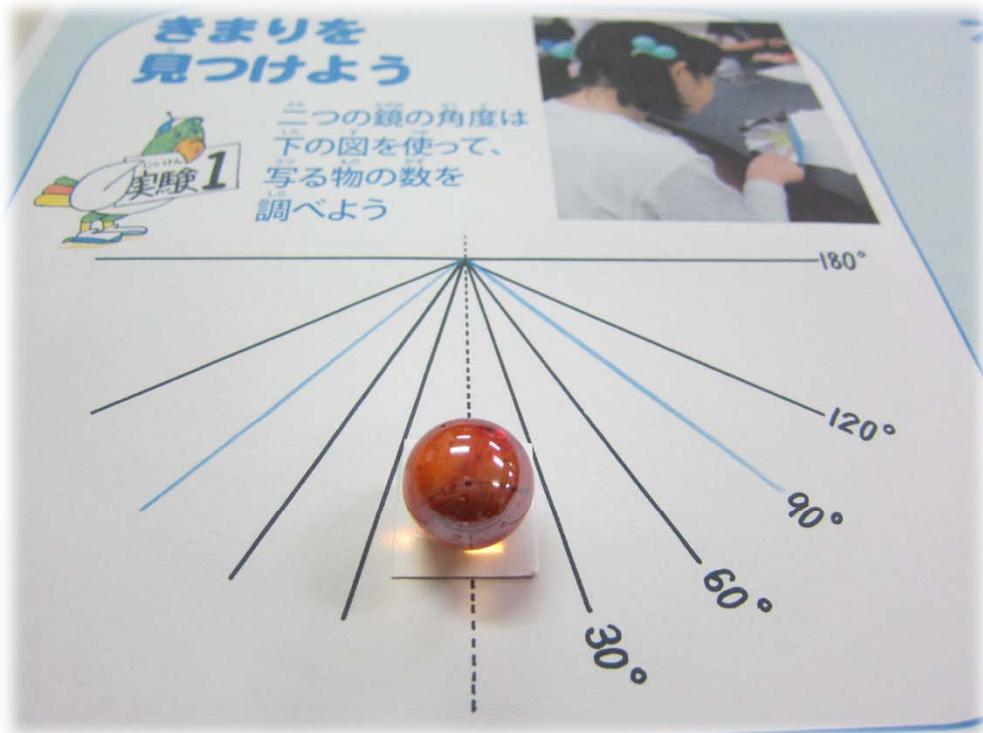
MOON REFLECTOR

Corner cube mirror

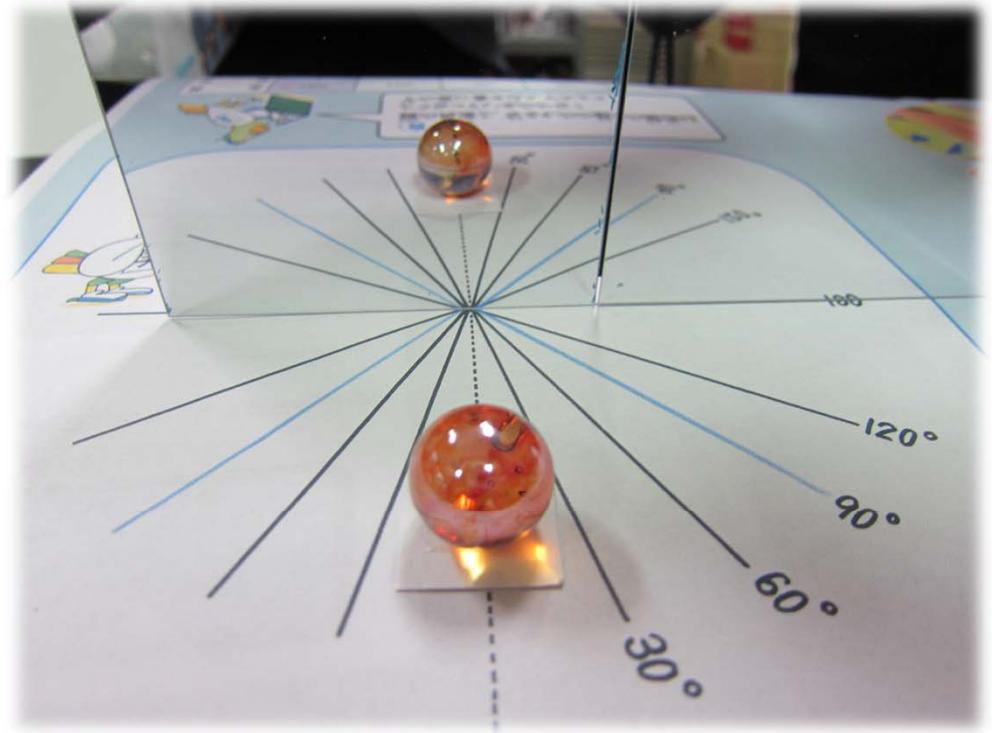
We can precisely measure the distance from the earth to the moon!



EXPERIMENT: LET'S LEARN ABOUT THE PROPERTIES OF MIRRORS!



Place a marble on paper



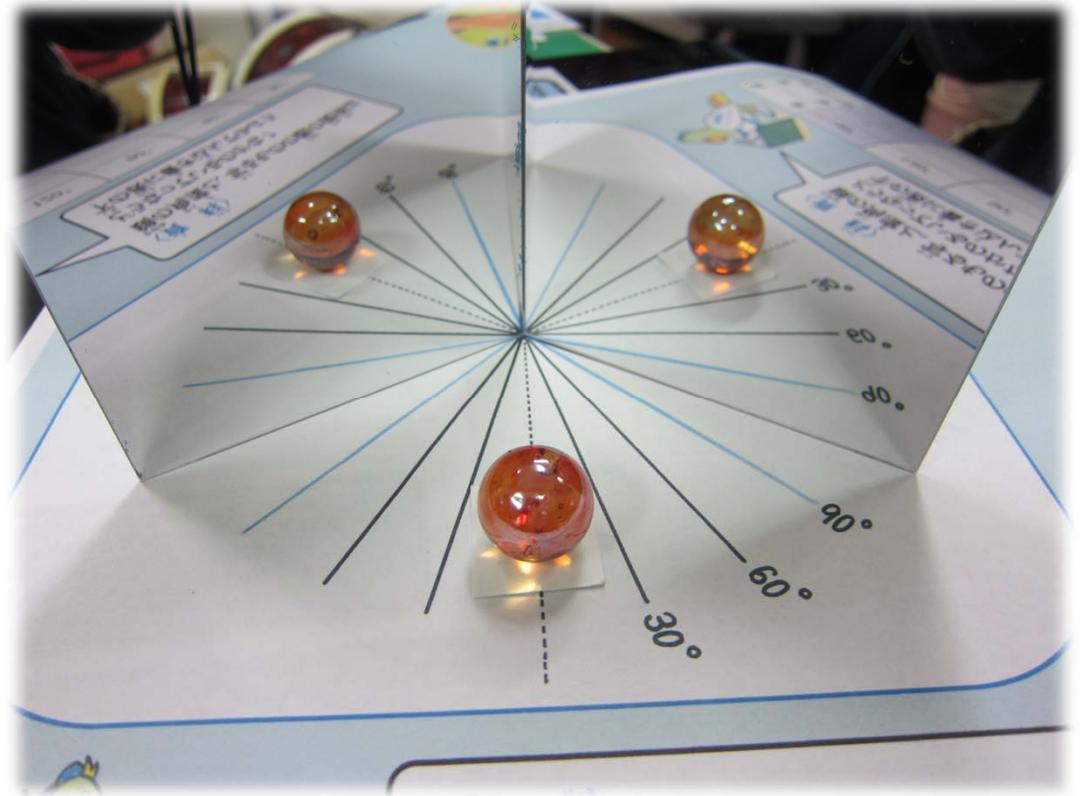
When a mirror is put behind the marble, it reflects and we can see 2 marbles

EXPERIMENT: LET'S LEARN ABOUT THE PROPERTIES OF MIRRORS!

What happens when we change the angle to 120° ?



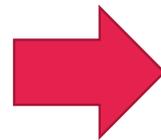
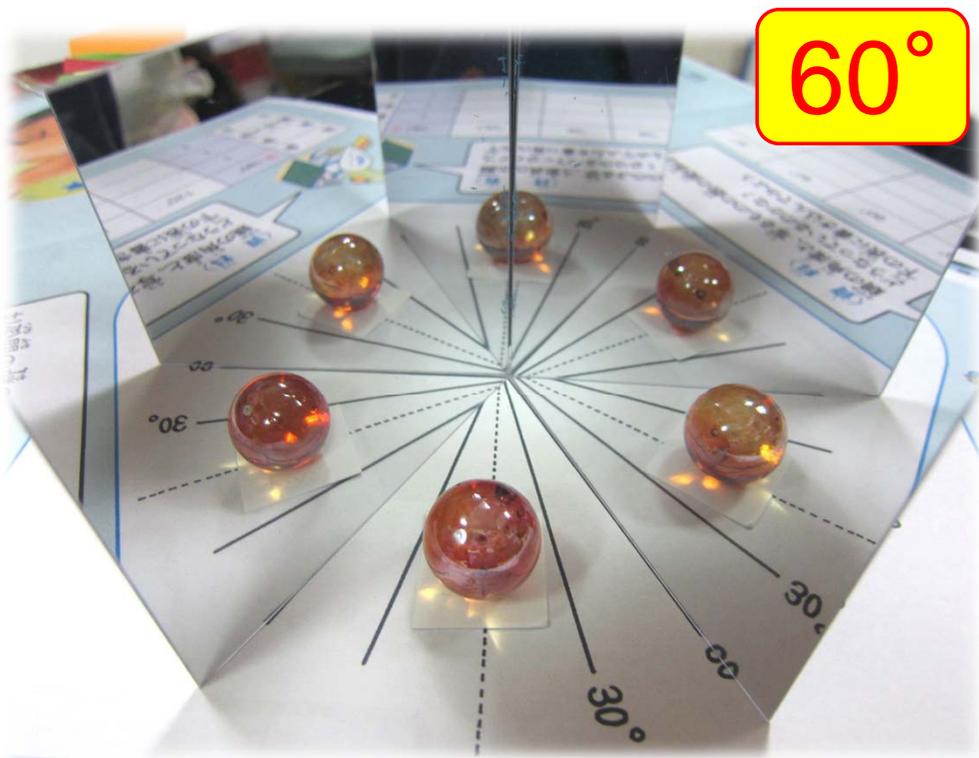
We can now see 3 marbles!



What will happen if we change the angle to 90° , 60° or 30° ?
Let's experiment and find out!

EXPERIMENT: LET'S LEARN ABOUT THE PROPERTIES OF MIRRORS!

When we change the angle...



We can see more marbles!

EXPERIMENT: LET'S LEARN ABOUT THE PROPERTIES OF MIRRORS!

Angle	180°	120°	90°	60°	30°
Number of objects	1	1	1	1	1
Number in the mirror	1	2	3	5	11
Number of Items	2	3	4	6	12

The rule!

$$\text{Angle} \times \text{Total} = 360$$

EXPERIMENT: LET'S LEARN ABOUT THE PROPERTIES OF MIRRORS!

What is this?

=> It's a window.



Windows also become mirrors!

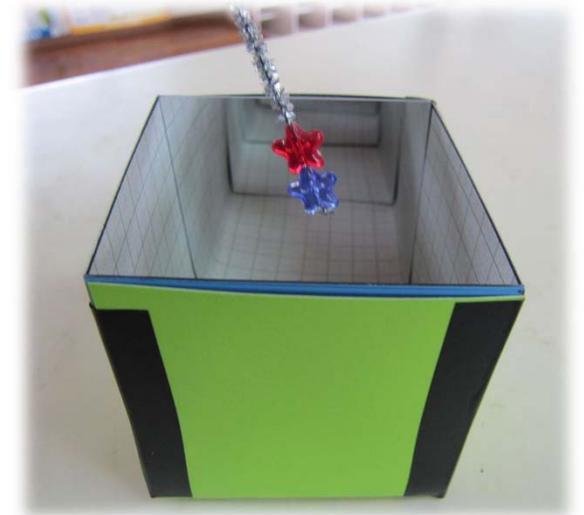


BUILDING A KALEIDOSCOPE USING THE PROPERTIES OF MIRRORS

I TUBE-SHAPED
KALEIDOSCOPE

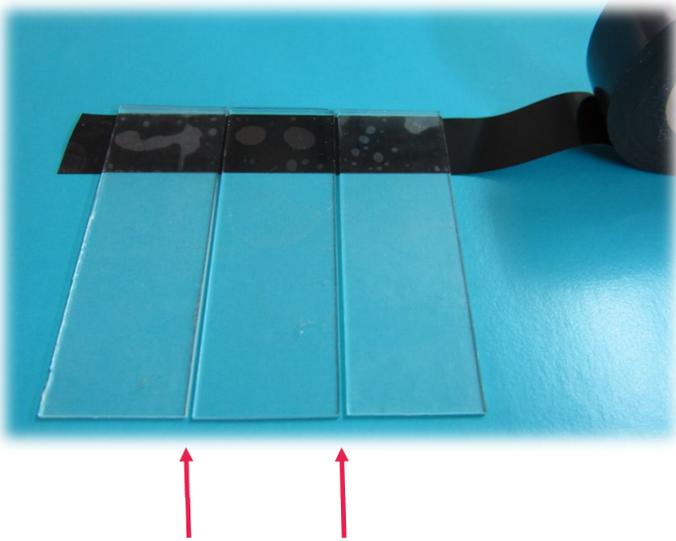


II BOX-SHAPED
KALEIDOSCOPE

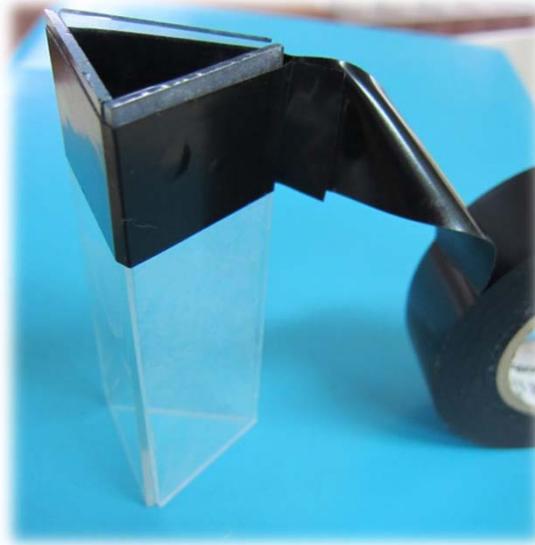


LET'S TRY BUILDING IT I:TUBE-SHAPED KALEIDOSCOPE

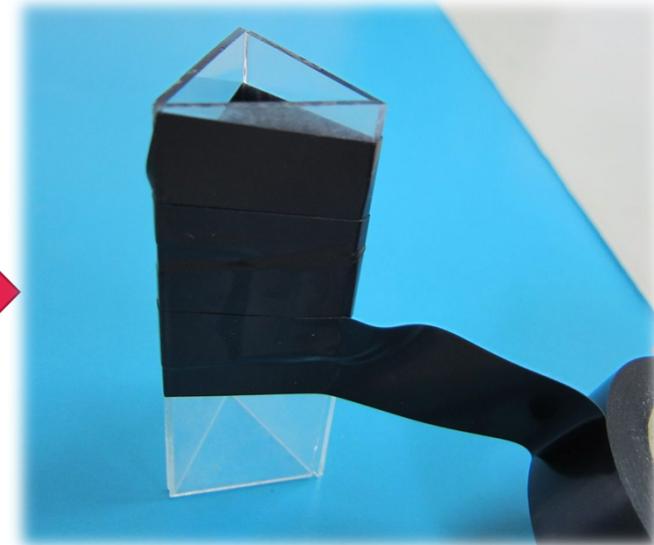
(1) Roll out some black tape and place microscope slides on top.



(2) Connect the 3 slides.



(3) Wrap black tape around the sides.



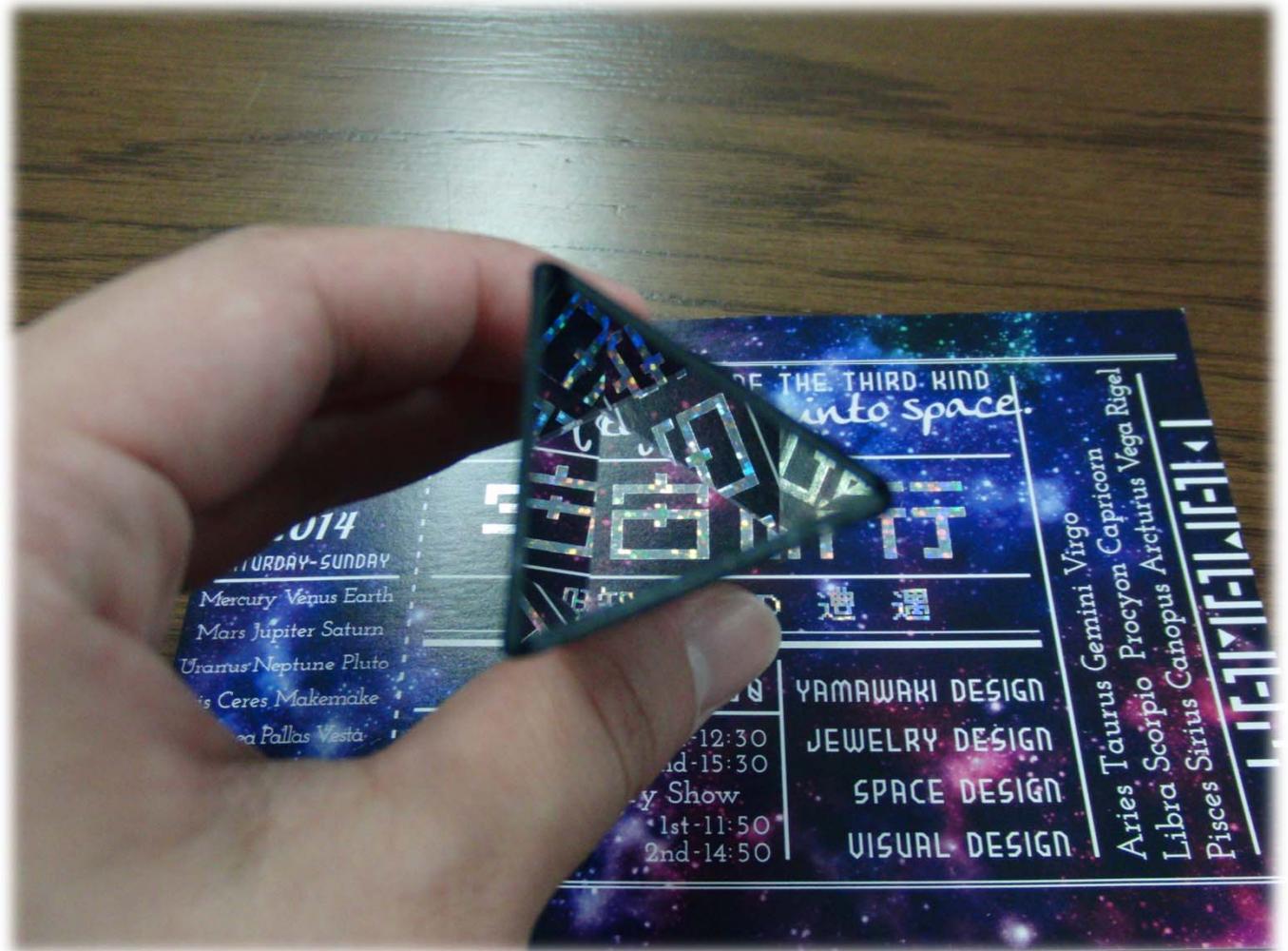
*Leave a gap of about 1mm
between the pieces of glass!

LET'S TRY BUILDING IT I:TUBE-SHAPED KALEIDOSCOPE

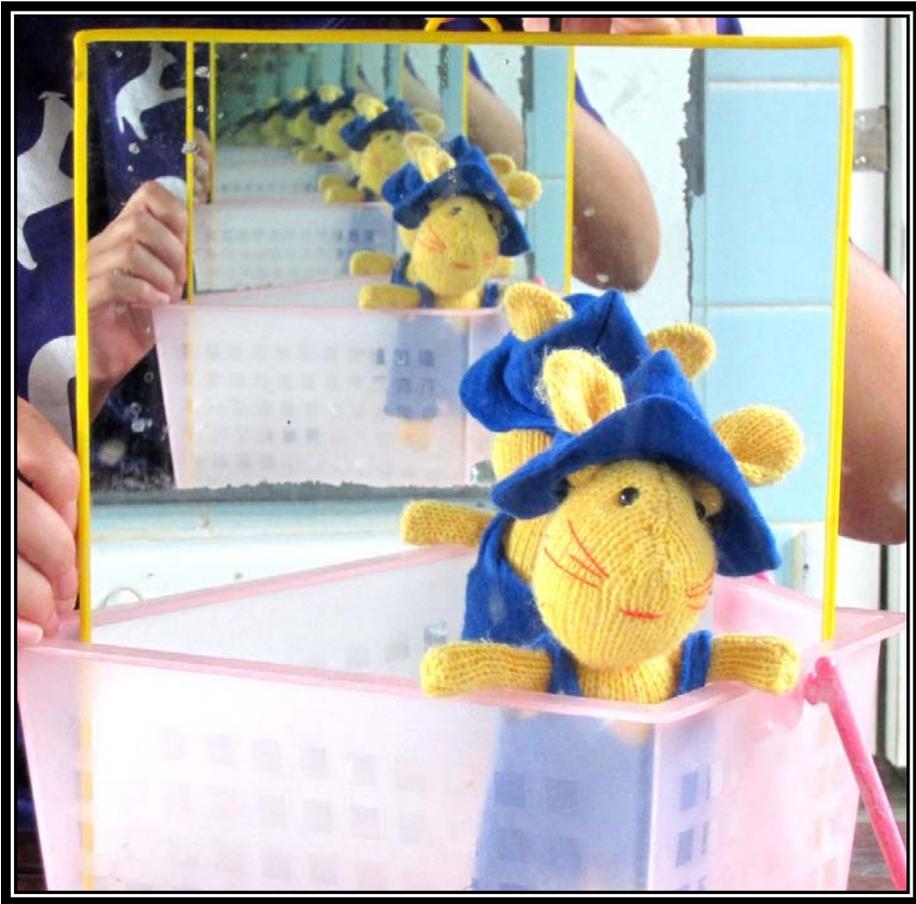
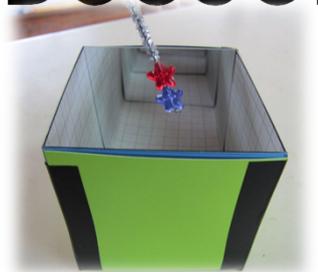
It's finished!



Let's take a look!



LET'S TRY BUILDING IT II: BOX-SHAPED KALEIDOSCOPE



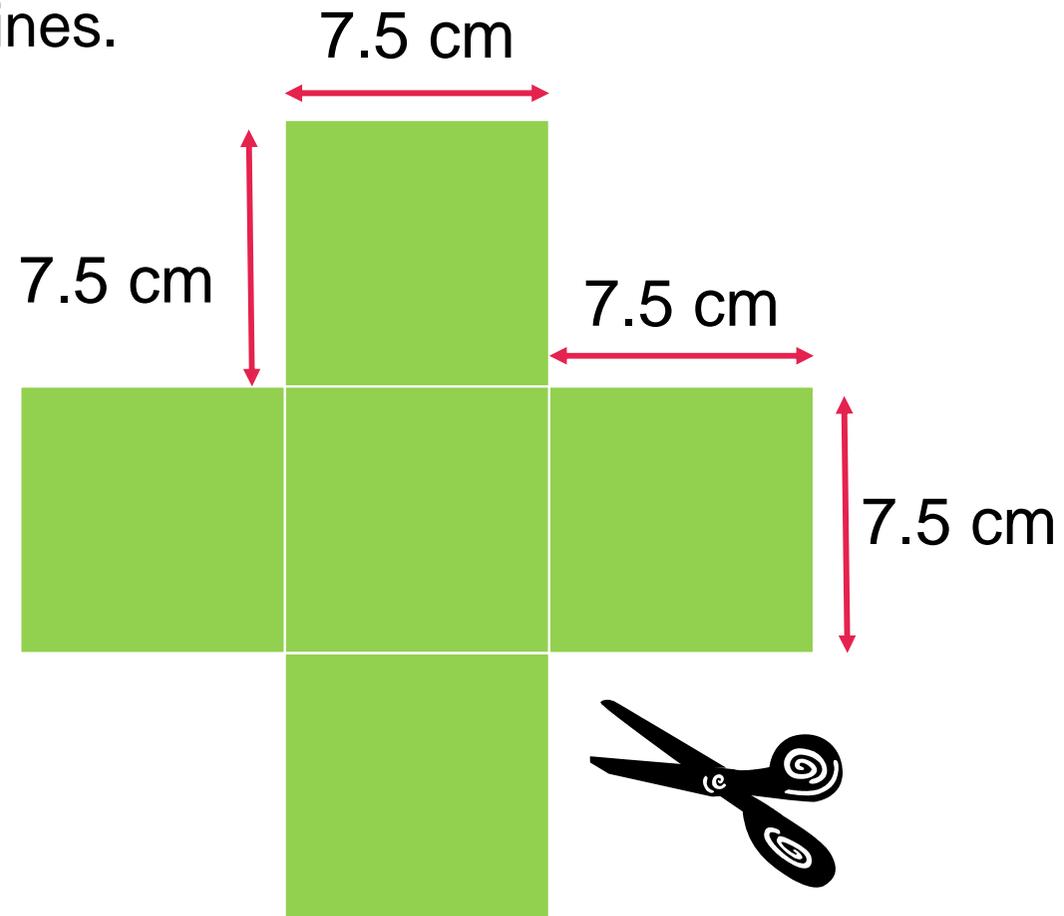
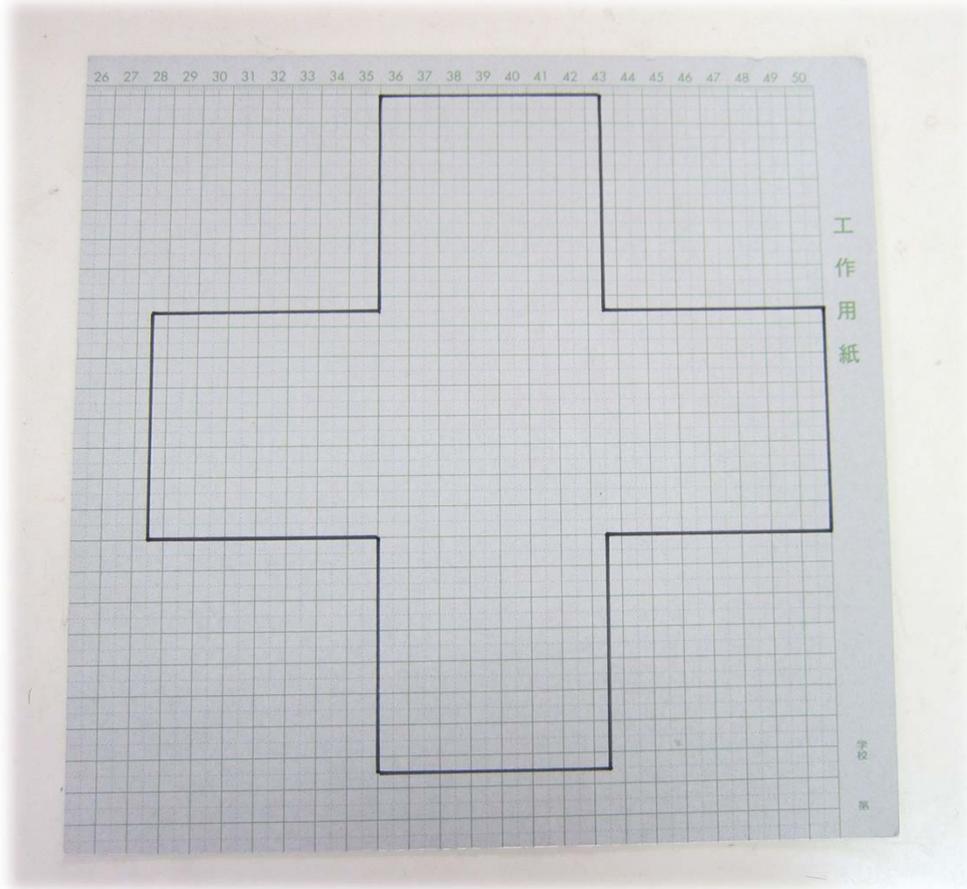
THINGS TO PREPARE:

- ☆ CRAFT PAPER
- ☆ MIRRORS
- ☆ BEADS
- ☆ PIPE CLEANER
- ☆ SCISSORS
- ☆ DOUBLE-SIDED TAPE
- ☆ BLACK TAPE

LET'S TRY BUILDING IT

II: BOX-SHAPED KALEIDOSCOPE

(1) Cut out the craft paper along these lines.

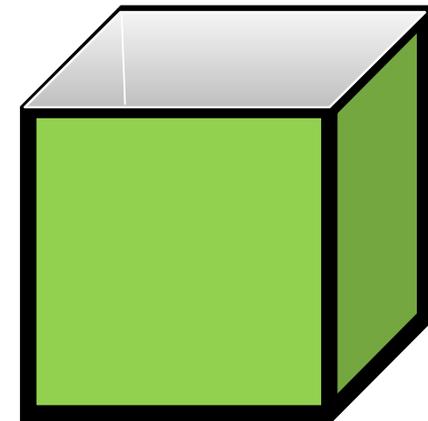
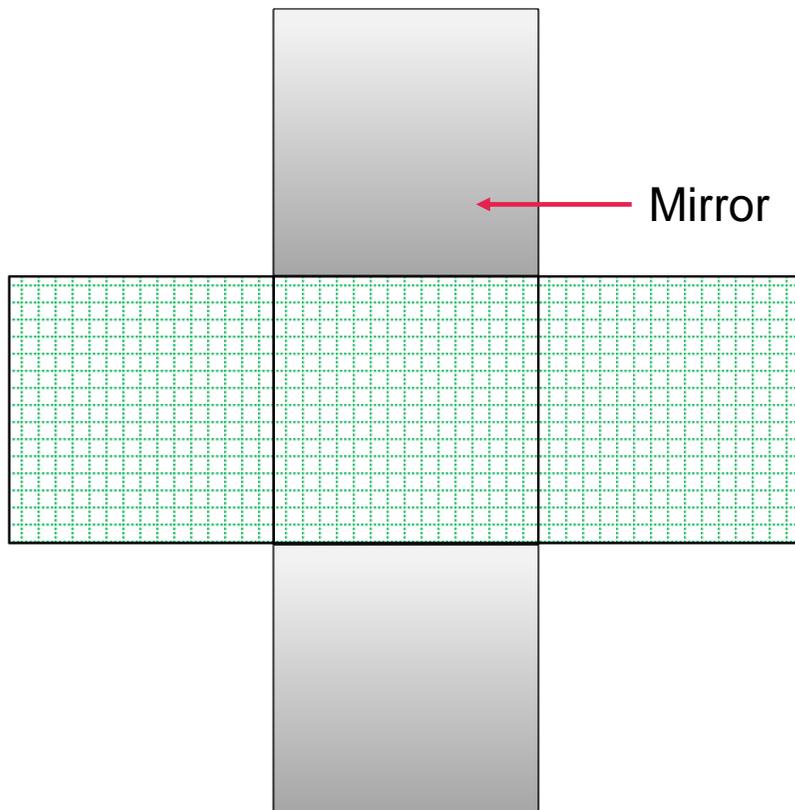


LET'S TRY BUILDING IT

II: BOX-SHAPED KALEIDOSCOPE

(2) Affix mirrors to the top and bottom squares with double-sided tape.

(3) Assemble a box, sticking it together with black tape.



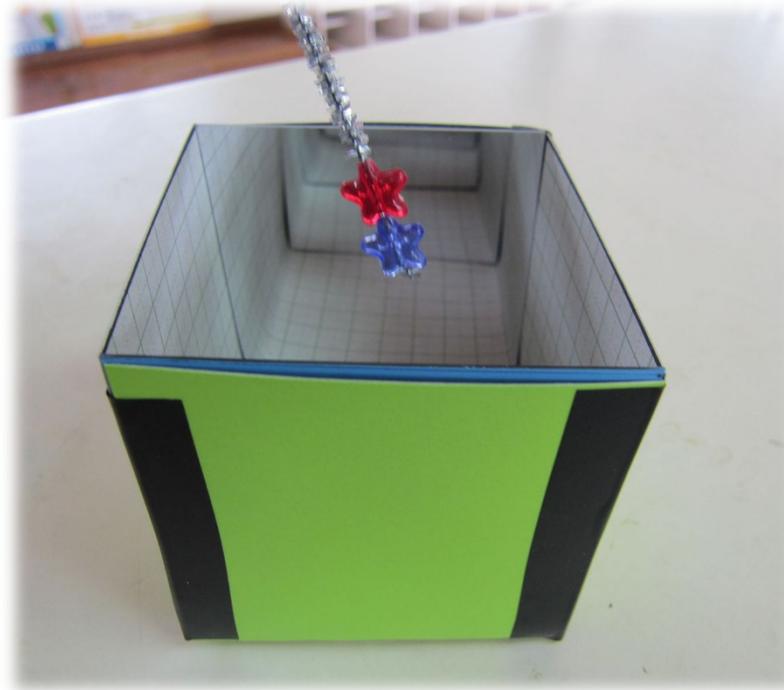
It's finished!

LET'S TRY BUINDING IT II:BOX-SHAPED KALEIDOSCOPE

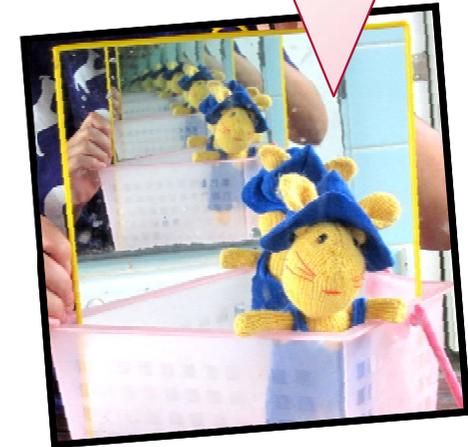
(4) Push two beads along a pipe cleaner.



(5) Dangle the straight wire down inside the box and take a look.

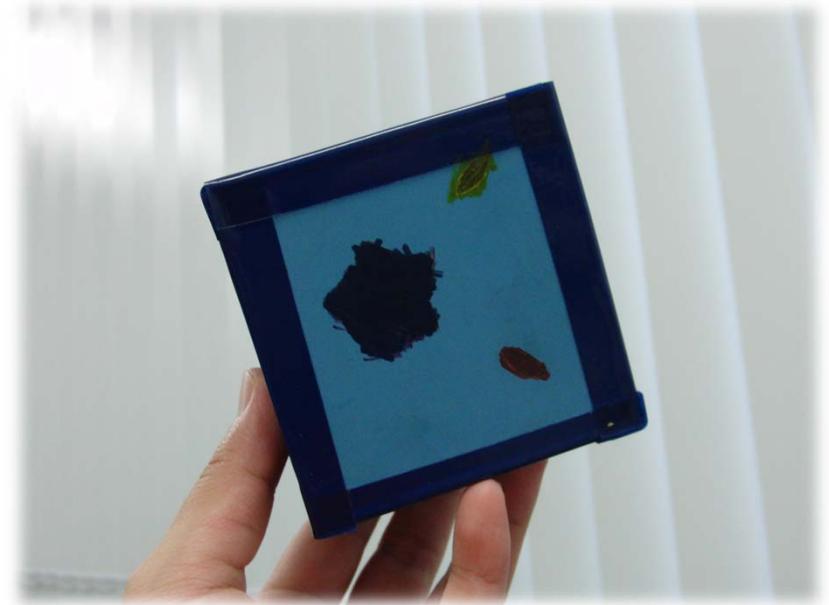
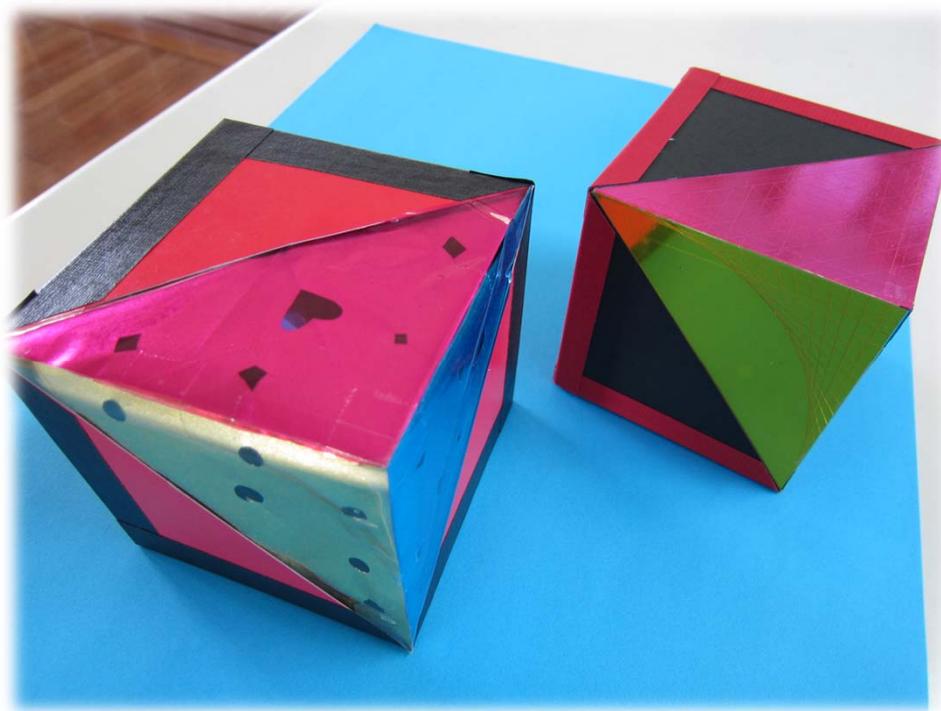


**What did it
look like?**

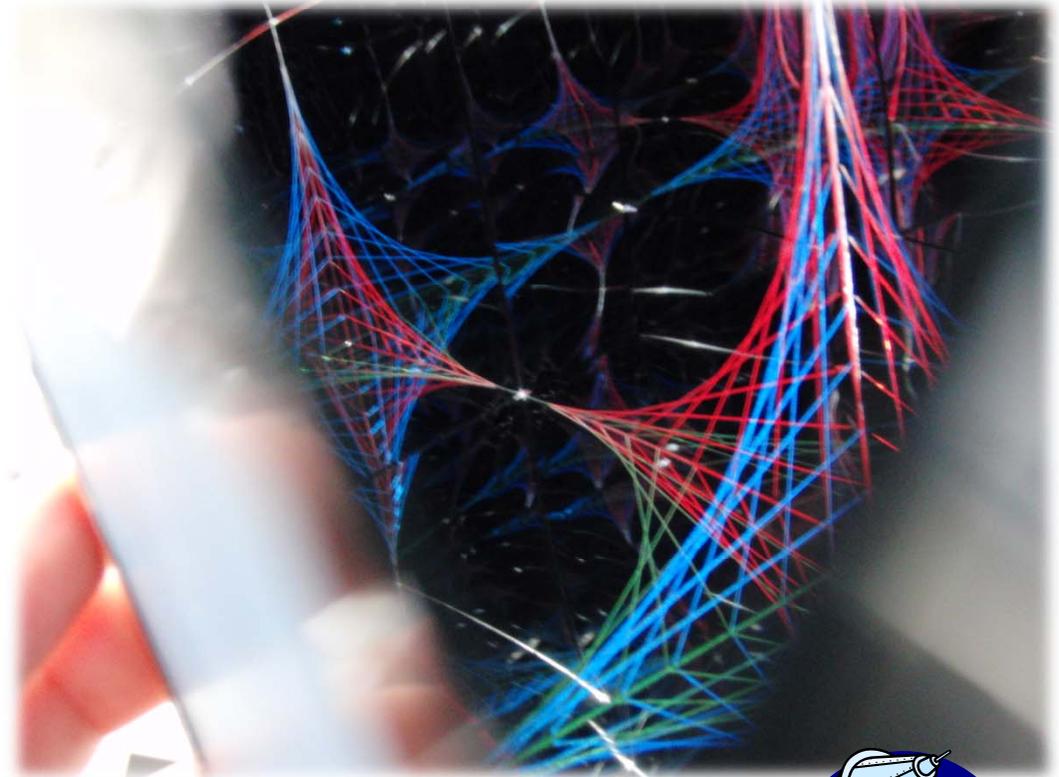
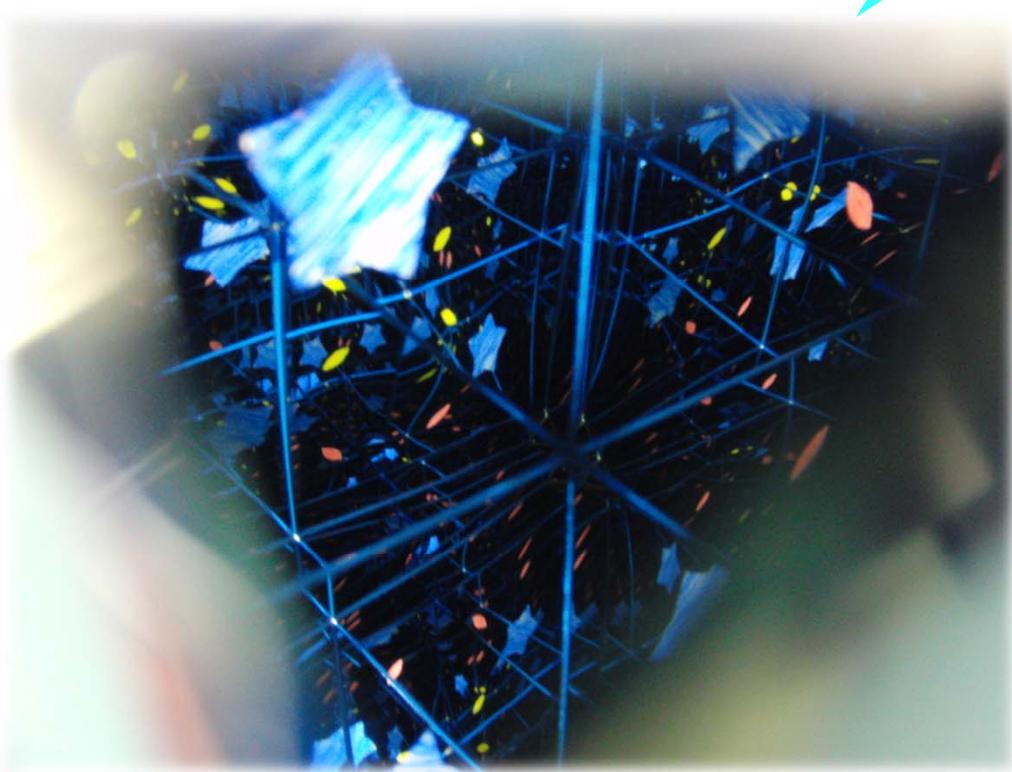


PRACTICAL USES

THE PROPERTIES OF MIRRORS CAN BE USED TO MAKE DIFFERENT TYPES OF KALEIDOSCOPES!



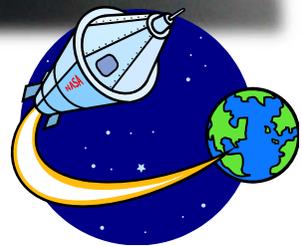
LOOK INTO THESE
MYSTERIOUS WORLDS!



WOW!



IT'S LIKE SPACE!



THANK YOU FOR LISTENING!



Slide 1	<p>Hello, everyone.</p> <p>My name is Kae Ichihashi and I have come from the Okinawa Prefecture in Japan.</p> <p>I currently work at Hateruma Kindergarten.</p> <p>I would now like to talk on the theme of “Experience the Wonders of Mirrors! Building a Space Kaleidoscope.”</p>
Slide 2	<p>To begin, I would like to tell you about Hateruma, the island where I live.</p> <p>This is a world map. Now I get close to see this part.</p>
Slide 3	<p>Where exactly is Hateruma?</p> <p>The answer is... here.</p> <p>Hateruma is Japan’s southernmost inhabited island. It is located in a remote place just 220 km from Taiwan and approximately 2,000 km away from Tokyo.</p>
Slide 4	<p>Hateruma is a peaceful island surrounded by a beautiful coral reef. The island has a circumference of about 15km and has a population of approximately 550 people. Okinawa has a custom of eating goats, and there are many goats raised on Hateruma.</p>
Slide 5	<p>The key industry is agriculture, and the cultivation of sugarcane is prosperous.</p>
Slide 6	<p>There is a traditional culture on this island. This is a picture of the lion dance. This event is held in the biggest festival called “MUSHAMA”. When children are bitten by this lion, they will grow up strong and healthy.</p>
Slide 7	<p>Since there is little artificial light, stars cover the entire sky on nights when there is no moonlight.</p> <p>The sky above Hateruma is hardly affected by jet streams, and there is little flickering of the stars, so it is a near-perfect environment for astronomical observation.</p>
Slide 8	<p>Of the 88 constellations, 84 can be observed throughout the year, with the Southern Cross visible from December to June and the Milky Way visible year-round.</p> <p>In recent years, Hateruma has been called “the island that is closest to space,” and it has attracted tourists not only from Japan but also from other countries.</p>
Slide 9	<p>The children of Hateruma Kindergarten are growing up with great energy in this wonderful environment. This photo was taken on a trip to a nearby beach. This year, there are 15 kindergarteners. Some of the children want to become pilots or work on space stations in the future.</p>

Slide 10	<p>When deciding on the theme of this presentation, I felt that I wanted to come up with kindergarten teaching materials based on the image of the starry sky of Hateruma.</p> <p>That's what led me to think of building a kaleidoscope.</p> <p>In order to build a kaleidoscope, we first need to learn about mirrors. That is the keyword of this presentation.</p> <p>I would now like us to experience together the wonders of mirrors.</p>
Slide 11	<p>In everyday life, we use various types of mirrors.</p> <p>For example, mirrors on the roads, in bathrooms, and in cars...</p> <p>But how about this mirror? Where is it?</p>
Slide 12	<p>That's right.</p> <p>This is a mirror attached to a space suit.</p> <p>Space suits feature switches for temperature control and other functions, but since it is impossible for an astronaut to move his or her head to see parts of the space suit, these switches are operated by looking into this mirror. Now, what is this?</p>
Slide 13	<p>This is a moon reflector, which uses something called a corner cube mirror that is constructed with three mirrors placed at right-angles. It was carried to the moon by the Apollo spacecraft. Laser beams are reflected onto this in order to measure the distance to earth. This mirror has made it possible to measure the distance between earth and the moon in units of centimeters.</p> <p>So mirrors are even being used in space.</p>
Slide 14	<p>But what are the properties of mirrors?</p> <p>Let's carry out an experiment using mirrors.</p> <p>Please get this paper ready.</p> <p>Place a marble on top of the paper.</p> <p>Then, when you place a mirror behind the marble, it will reflect and you will be able to see two marbles. Has everyone been able to see this?</p>
Slide 15	<p>OK, next, let's try applying angles using two mirrors.</p> <p>Please try placing the two mirrors along the line showing 120 degrees.</p> <p>What can you see?</p> <p>That's right. There are now three marbles visible.</p> <p>Now how about if we change the angle to 90, 60 or 30 degrees? Let's try this out as an experiment.</p>
Slide 16	<p>When we change the angle, this is the result.</p> <p>Let's record on paper the number of items appearing in the mirror.</p> <p>You should be able to notice a common rule.</p>

Slide 17	<p>The results of the experiment look like this.</p> <p>Did everyone notice the rule?</p> <p>The angle when multiplied by the number of marbles always equals 360.</p> <p>This is very interesting, isn't it?</p>
Slide 18	<p>Let's look at one other property of mirrors.</p> <p>What is this?</p> <p>Yes, it's a window.</p> <p>However, the scenery in front of the window is reflected in this glass part.</p> <p>That's right: it's the same as a mirror.</p> <p>Windows also become mirrors when the inside is dark and outside is light.</p> <p>Using this mirror-like property, let's try building an actual kaleidoscope.</p>
Slide 19	<p>Today, I would like us all to build together two types of kaleidoscopes.</p> <p>The first is a tube-shaped kaleidoscope, and the second is a box-shaped kaleidoscope.</p>
Slide 20	<p>Let's get straight into building our tube-type kaleidoscope.</p> <p>Please get ready the three microscope slides, black vinyl tape and scissors.</p> <p>Roll out the black tape, then arrange and affix three microscope slides on top of the tape.</p> <p>Please leave a gap of about 1mm between the pieces of glass.</p> <p>Now cut the tape and make a triangle shape with the glass.</p> <p>Next, wrap the sides with tape. It's okay if there is a little bit of glass showing at the top or bottom.</p>
Slide 21	<p>This is now finished.</p> <p>Please take a look inside.</p> <p>How does it look? If you place a shiny sheet of paper or a similar item at the end of the tube, it should look very pretty.</p> <p>OK, let's move on to our next production.</p>
Slide 22	<p>Next, let's try building a box-shaped kaleidoscope.</p> <p>In the experiment we just did with the marbles, we saw that number of marbles increased as the angle of the two mirrors became smaller.</p> <p>When the angle is placed substantially close to zero – in other words, when the mirrors are facing each other in parallel – you will be able to see an infinitely continuing corridor like this.</p> <p>The box-shaped kaleidoscope produces this state inside a box.</p> <p>Please get ready the materials and tools that we are going to need.</p>
Slide 23	<p>First, please cut out the craft paper along the lines.</p>

Slide 24	<p>Next, affix mirrors to the top and bottom squares with double-sided tape.</p> <p>Assemble a box, sticking it together with black tape.</p> <p>The box is now finished.</p>
Slide 25	<p>Push two beads along the pipe cleaner.</p> <p>Dangle the pipe cleaner down inside the box and take a look.</p> <p>How does it look? Can you see what looks like an endlessly continuing corridor?</p>
Slide 26	<p>Like this, the properties of mirrors can be used to make different types of kaleidoscopes.</p> <p>As an example of practical use, I have brought along today a box-shaped kaleidoscope that uses six mirrors.</p> <p>Please have a look through it.</p>
Slide 27	<p>Inside, it looks like this.</p> <p>Don't you think it looks like space?</p> <p>As souvenirs, I will give out space kaleidoscope building kits to the teachers in attendance today, so please try building them at home.</p> <p>Please follow the instructions that are provided inside the kits.</p> <p>Finally, I am happy to take any questions. Is there anything you would like to ask?</p>
Slide 28	<p>This brings my presentation to an end.</p> <p>Thank you for listening carefully.</p>
Extra	<p>To close, I will play the Okinawan instrument known as the "sanshin."</p> <p>Please listen!</p>