

makeblock



Make anything, make everything.



# NeuronCreative Production and Scientific Lab Manual

-Creative Lab Kit



[www.makeblock.com](http://www.makeblock.com)

@makeblock #makeblock neuron



## Introduction:

The Neuron educational program is designed to use Neuron electronic building blocks (mBlock) as the teaching tools in STEAM education, for students to create fun and interesting works using a variety of materials, and explore simple scientific experiments; in the form of mini-lessons, this educational program inspires teachers to innovatively use the Neuron electronic modules in their teaching, and it can motivate students to be engaged in the activities, learn sensor applications, and improve their programming thinking skills to implement each and every creative idea;

### Contents in this manual:

- Mini-lesson (4 major topics and 21 models)
- Neuron basics Application of teaching ideas and demonstration
- lessons Diagrams for paper
- based models, demo videos, module introduction, software nodes and more

Help teachers and creative lab fans understand the use of Neuron product, provide them with creative inspiration to create more meaningful works or lessons.



**makeblock Curriculum Design Team: Zhang Jilong, Lin Xiasheng, Xiong Qin**

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**JAN, 2018**



## About makeblock :

makeblock Co., Ltd. was founded in 2013. The company's main brand, makeblock, a leading DIY robot-assembly and STEAM educational and learning platform, was created in 2011.

makeblock is a global leader in SETAM education solutions. Makeblock integrates the development and promotion of hardware, software, contents, events and activities, offering STEAM education and entertainment platforms for schools, training institutions and families. The products mainly include easy-to-use programming robot kits, electronic building modules platforms and DIY robot assembly platforms, provide graphical programming APPs and enriched curriculum, which are designed to inspire children's creativity, let children explore their potential, pursue their sense of goodness, beauty and truth, and build a better world. Currently, makeblock products are widely used by schools and families in more than 140 countries and regions.

## Educational Ideas:

“With the development of science and technology, the makeblock education and STEAM education will become more and more important. We hope to build a robot assembly platform to bring together the robot enthusiasts of all ages and make the makeblock education and STEAM education more accessible. Makeblock is aiming to provide the users with the abilities to implement their ideas and we hope more people will turn their ideas into reality. When people are working hard to reach their dreams, they will have endless sense of achievement, which will encourage more people to come up with inventions and creations!” – CEO, Wang Jianjun



## Introduction to Creative Lab:

The exterior design of the Neuron product has won multiple international design awards, such as: Korea's K-Design Award in 2017, Japan's Good Design Award, U.S. IDEA Gold Award, German Red Dot Award, and 2018 CES Design Awards, etc.

The Neuron product also has many wonderful features. The Neuron Creative Lab is a programmable electronic building module created for STEAM education. It has 30 electronic modules with different functions, covering acoustic, optical and dynamic interaction modes; the customized "Neuron APP" can easily create more functions for the electronic building modules to "intelligently" make anything and everything, which also support the drag-and-drop programming (mBlock5) developed by makeblock users to learn programming knowledge.

The Neuron combines electronic technology features and teaching elements. Its exquisite details and playful design can meet the needs of various teaching scenarios and home entertainment and intelligence development. The users of the products are encouraged to integrate things and people around them to creatively make products and implement the creative ideas and make our lives better~



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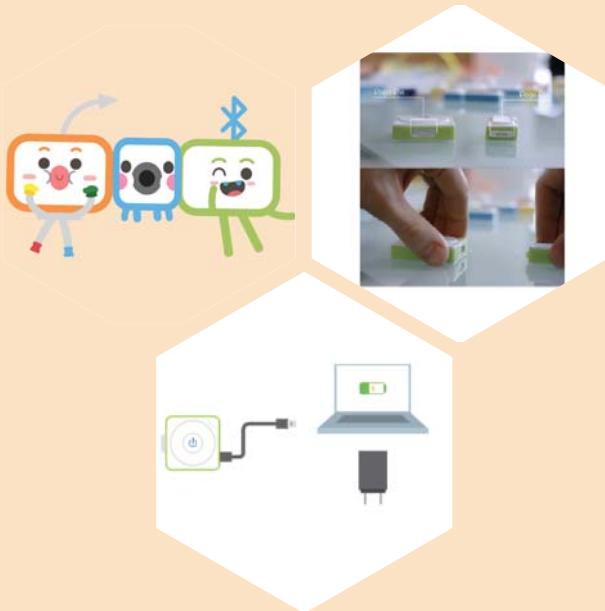
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## I. How to Use Neuron:

Neuron is a smart module-based electronic product. The product has many electronic modules with different functions to help children easily create works according to their own ideas. The electronic modules are easy to use owing to the compact design and magnetic interface. To create simple electronic works, children just need to connect different modules together. It can also be used to create many fun and interesting smart works by combining with the common craft-making materials; for example, small table lamps, strong light alarms, acoustic control lamps, etc.; the product is magnetic, which is convenient for children to show their own works. In addition, children can also use the Neuron APP to add more features for their works to make it better.

### Nine Features

#### Hardware



1.

**PogoPin:** The modules are magnetically connected, easy to assembly and play, and convenient for children to connect different modules together. It can also prevent children from making mistakes in connecting the modules to the wrong sides. It's easy-to-use and durable for 100,000 plays ;

2.

**Sensor:** The Neuron creative lab has many sensors, and the modules can be divided into 3 categories according to their functions, "energy & communication", "input", and "output", which correspond to green, orange and blue colors respectively, and are convenient for the users to identify the modules with different functions. Every Neuron module is equipped with an independent chip with a unique function. The sensors can collect information/values of the surrounding environment and convert the information into easy-to-read digits and other formats.

3.

**Wireless and wired:** Neuron modules support either wireless firmware update (via Bluetooth,WIFI) with iPads and smart phones, or firmware update and charging by connecting it directly to PCs via micro USB cables.

## Software

4.

**Flow-Based Program:** download the Neuron APP onto your iPad or smart phone, and connect via Bluetooth or WIFI. You can now enjoy the online graphical programming. The APP also has built-in features including 10+ model lessons and guide for novice users. It's very easy to start navigating, even for someone who has absolutely no programming experience. More model lessons will be added in Neuron App.

5.

**Visual Program(mBlock5):** Graphical programming software independently developed based on Scratch. It can be downloaded and used by PC users, and more than 2 million users in the world choose mBlock5 as the programming learning tool, which supports windows, macOS, Linux, Chrome OS and other user environments.

6.

**IoT cloud platform:** By using the cloud control node in Neuron APP, the users can share their small works by sending the QR codes or links to friends. In addition, it's also possible to use another device to remotely control the creative works so as to show the ideas remotely.



## Structures

7.

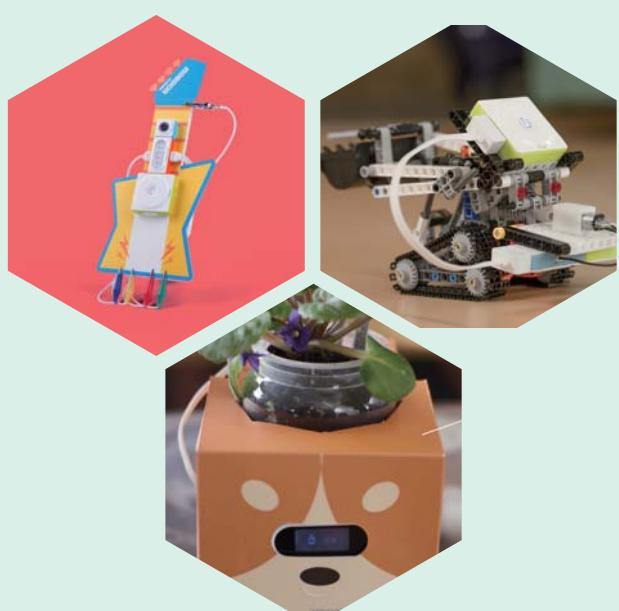
**Paper-based models** (using craft-making materials) : In the neuron lab kit, there are ready-to-use paper-based models corresponding to some lessons. It is also possible to download paper-based models online, or design your own paper-based models. For kids who love craftworks, the neuron electronic building blocks can add intelligence components to the commonly-used craft-making materials, and make the final works more creative;

8.

**Building blocks** (LEGO) :There are several holes on the Neuron magnetic board, adaptive to the LEGO Technical series products, which helps the building block enthusiasts make more creative works; by using the building blocks to make more engineering structures and with the assistance of Neuron's electronic features, your final works will surely have a lot of cool effects.

9.

**Everyday materials:** The plants and fruits that you can see in everyday life can also be combined with neuron modules to achieve fun functions; for example, leaves, bananas, lemons, oranges, etc.



## Three ways to play



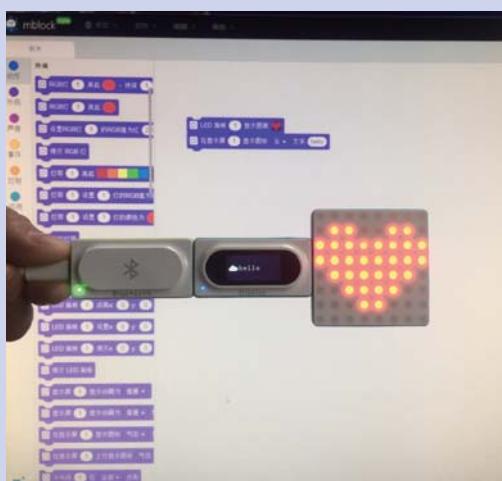
1

**Offline mode:** Each Neuron module has an independent chip and a unique function. It has some default features via factory settings. Therefore, once user opens the package, the product is readily connected to the module to achieve some simple functions, such as "light sensor + power + display = light value of the current environment"; "gyro + power + LED screen = small ball game, etc.;

[For details, please refer to "Module Cards".](#)

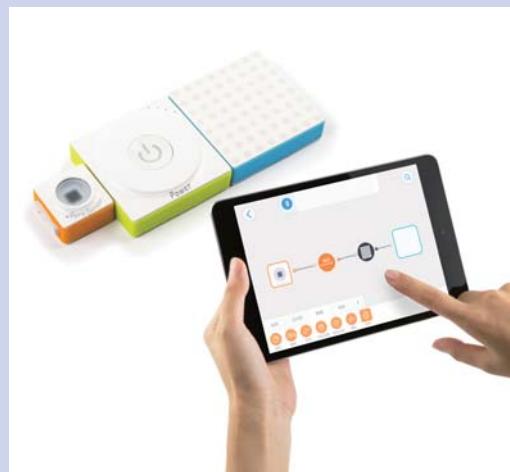
**Online mode(Flow-based):** The online mode graphical programming can be used by anyone as it's very easy to understand. Online programming focuses on developing thinking skills and creativity, other than programming. It lowers the difficulty of programming and reduces the rigid requirements of sequential logic, allowing students to pay more attention to creation of their own works. The online programming has commonly-used nodes, such as "comparison", "digit", "calculation", "otherwise", "and", "or", "switch", etc.; cloud control (IoT) nodes, time nodes, like "delay", "hold", "current time", "sequence", etc.; and advanced nodes, such as "random", "function", "valve" and other advanced programming nodes. It's easy to use, for an example, create a new project --- drag and drop nodes (auxiliary nodes) --- start connection --- enable the function;

[For details, please refer to the "Description of Nodes".](#)



3.

**PC mode (mBlock5):** Visual code programming software; mBlock 5, which is developed on the basis of Scratch 3.0, can be used in drag-and-drop programming and code programming. It allows users to create interesting stories, games, animations and other works, and supports makeblock series products, to facilitate the teaching and learning of programming;  
 Use the Neuron Bluetooth module, USB data connecting cable, and other modules to start programming in mBlock5.



## II. Teaching Modes:

The Neuron product is a smart product designed for STEAM education. It can be used in many teaching areas such as science, technology, art, engineering and other fields. For lessons having different teaching contents, the teaching modes can be slightly adjusted. Teachers can plan their teaching activities and teaching steps according to such teaching modes as problem-based learning, 5E and design thinking teaching modes.

### Creation and Exploration (5E)

In this teaching mode, there are five stages of thinking: engagement, exploration, explanation, elaboration, and evaluation. Students have enough space at each stage to develop their creativity, reasoning ability, and flexibility, etc.



Demonstration lesson for this teaching mode is on page 108.

## Problem-Based Learning

### Problem-Based Learning Process

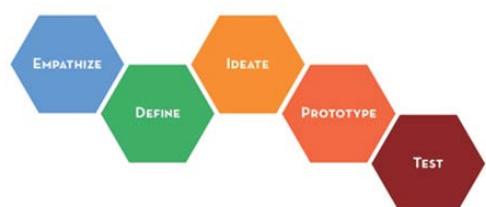


The problem-based learning mode is an active and exploratory learning method that emphasizes the "student-centered" and "problem solving oriented" approach. Under the guidance of the teacher, students start from the question itself, work together through teamwork to explore resources and finally come up with solutions. With this teaching mode, the students can develop the following skills: problem-solving skills; analyzing and summarizing the knowledge points covered in the problems; teamwork ability, including collecting information separately and appreciate diversity; and the ability to obtain and evaluate information.

Demonstration lesson for this teaching mode is on page 110.

## Design Thinking

Design thinking is a methodology to discover problems in life and find solutions from the perspective of socialization. This methodology can cultivate students' sense of social citizenship and abilities to solve social problems from a practical perspective. Design Thinking emphasizes the understanding, focusing, conceiving, and executing processes. In the teaching activities, the process of design thinking is composed of five steps: empathy, requirement defining, ideating, prototype production, and actual testing.



## ➤ Mini-Lesson

### Introduction

The mini-lesson is a lesson plan handbook specifically simplified for teachers and users. Teachers getting the Neuron creative lab kit can start applying it to teaching right away. The Mini-Lesson section includes models of how to create works using Neuron modules (including model introduction, pictures, demo videos, and paper-based model printouts), teaching steps, programming demonstrations, thinking after class, list of materials, and creative work processes, etc. The materials and models provided in the mini-lesson are for teachers' reference, not supposed to be imitated strictly. Our original purpose is to get the teachers and users inspired by the model making processes and lessons, rather than providing complete teaching materials. In addition, the mini-lesson teaching processes are designed to focus on cultivating students' creativity and Tinker (transformation) skills. We hope the teachers can consider these tips in teaching.

In these short lessons, students can:

- Actively learn and understand new knowledge in the context of previously learned concepts
- Learn to think independently and collaborate with others to complete the project
- Participate in the creative making process and apply the skills learned
- Freely discuss ideas with team members and use appropriate tools to record plans
- Share creative achievements with each other

As directors in the activities, teachers can:

- Join the students' group discussions and help students organize their ideas
- Deeply understand the knowledge requirements for the students and summarize the key points of the lessons
- Provide materials for the activities and answer questions
- Set up the classroom to create the student-centered environment

Method to use the mini-lesson: teachers can watch the video (scan the QR code, or click on the website link), and determine if the model is suitable according to the requirements of the lesson. If the model is suitable, the teachers can read the teaching contents, list of materials, programming demonstrations, and work production processes, etc. in details.

**Name of Work: Copycat**

**Difficulty:** Advanced  
**Time:** 30 Minutes

**Lesson Description:**  
 How is this little cat that is very attached to people. It always follows the person in front of it. The cat would follow you everywhere and will imitate every movement of you. It's just like a copycat following every step of the person in front of it.

**Pictures, videos and work description**

**Teaching Procedure**

**Objectives:**  
 For this work, we mainly use ultrasonic sensors and motor drivers.  
 1) Learns functions of ultrasonic sensors and motor drivers  
 2) Learns functions of auxiliary nodes of the motor-drivers software  
 3) Learns software nodes: Functions such as Comparison, Digit, and AND

**Step 1: Inspire**  
 The owner loves the cat, but the cat is not attaching to him. How can we make the cat attach to its owner and follow the owner everywhere?

**Step 2: Thinking**  
 How can we make the cat aware of the owner's movement, and then let it follow its owner? Which modules can let the cat know that its owner is leaving? And which modules can let the car start moving? The ultrasonic sensor can sense the movement of the object in front of them and the motor can drive the wheels.

**Step 3: Program**  
 By using the Neuron APP online programming, set that, within a certain distance, when the person leaves the cat, the ultrasonic sensor will sense the change of distance. When the distance is greater than 20cm, the motor will be triggered to rotate. Then the car will automatically follow the movement of the person.

**Step 4: Make and Tinker**  
 After the program has been achieved, it is time to design the cat's appearance. The ultrasonic sensor has two mounting holes, which can be used as the cat's nose. At the designing stage, two small holes can be drilled.

**Step 5: Test and Share**  
 The work is completed, share your experience and skills, show your work to others, and let more people witness your creativity!

Educational Website: <http://education.makeblock.com/>

Teaching procedures: teaching objectives and key knowledge points. We recommend the following 5 teaching steps: Inspire: Inspire students to think; Thinking: Guide students to analyze the model; program: Programming design; Make and Tinker: Students have enough time to create and transform; Share: Show the final product to others

**Thinking after Class**

➤ **Review on Key Points:**  
 9. Programming for distance sensing of the ultrasonic sensors;  
 10. Use Comparison, Digit and AND nodes.

➤ **Improvement and Optimization:**  
 6. How about adding a buzzer module?

**List of Materials**

Name	Qty.	Unit
Power supply	1	PCS
Bluetooth	1	PCS
Ultrasonic sensor	1	PCS
Dual motor driver	1	PCS
Motor kit	1	Kit
Connection cable 20CM	1	PCS
Magnetic board	4	PCS
Wheel kit	2	Kit

Name	Qty.	Unit
Paper-based cat model	1	Set
Double-sided tape	1	Roll
White paper	1	PCS

Regarding the list of materials required for making models, the teachers and students can replace any materials in the list with the those chosen according to their own creative ideas.

Educational Website: <http://education.makeblock.com/>

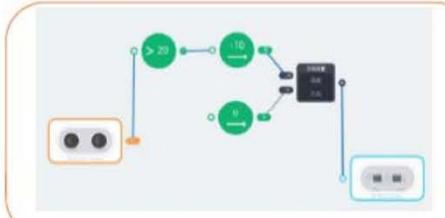
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Model-making diagram: If the teachers and students encounter problems during the model-reproduction process, they can refer to this diagram.

**Neuron – Mini-Lesson**



➤ Demonstration for online programming



- ✓ Descriptions for hardware modules and software nodes can be found in the appendix at the end of the page;
- ✓ For paper-based models of the same design, please find in the appendix at the end of the page-
- ✓ The works with  are under online modes. Download Neuron APP on iPad or smart phone for programming;
- ✓ Download video of the work from official educational website: <http://makeblock.com/>
- ✓ Neuron APP Software version: 1.3.2

Educational Website: <http://education.makeblock.com/>

Model programming diagram: If the teachers and students encounter programming problems during the model-reproduction process, they can refer to this diagram. If the teachers and students wish to change any function of the model, they need re-programming.

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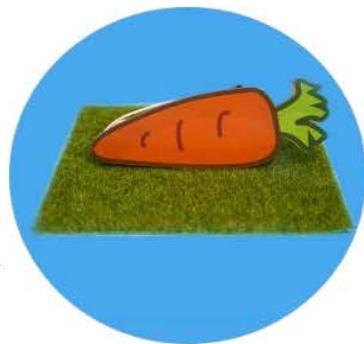
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The works with “” are programmed under **online mode**. As such the Neuron programming APP needs to be downloaded using IPad or smart phone;

The lessons are listed in a sequence based on the level of difficulty (basic, intermediate, advanced) in each category.

# Artist



Pull a Carrot



Rotating Face-Changing



Toy Transformation

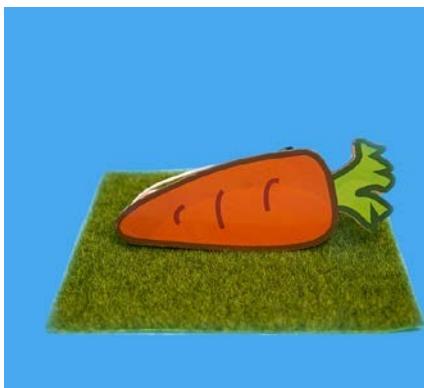


Shy Penguin



Rotating Colorful Light

## Name of Work: Pulling a Carrot



Designer: Lin Xiasheng



Video Link: <http://static.education.makeblock.com/PullupCarrots.mp4>

Difficulty: Basic

Time: 30 Minutes

### Lesson Description:

When the carrot is not pulled out, it remains still, but when it is pulled out, two “NO” signs will appear and shake, as if saying “Don’t pull me out. Don’t pull me out.”



## Teaching Procedure

### Objectives:

This creative work mainly uses gyroscopes and servos.

- 1) When the carrot is in the soil, it is still. At this time, hide the two small hands (“NO” signs) of the carrot by adjusting the angle of the servos.
- 2) When the carrot is pulled out, it will vibrate. When it is vibrating, the servos will rotate quickly.

### Step1: Inspire

By means of anthropomorphic thinking, if the carrot is pulled out of the soil, it may go crazy. If we add small hands (“NO” signs) for the carrot, when it is pulled out of the soil, it will shake its hands.

### Step2: Thinking

What module is used for this work? How can we achieve the functions imagined? What kind of module can feel the vibration, and what kind of module can actually rotate?

### Step3: Make and Tinker

What materials do we need for this work? The functions of the module need continuous debugging to achieve the best results;

### Step4: Test and Share

The work is completed, share your experience and skills, show your work to others, and let more people witness your creativity!



## Thinking after Class

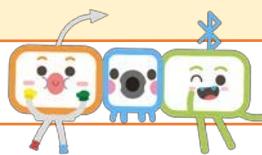
➤ **Review on Key Points:**

1. Servo angle "return to zero" adjustment;
2. Setup angle of servo

➤ **Improvement and Optimization:**

1. How about adding a buzzer module?

## List of Materials



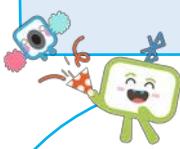
Module List

Name	Qty.	Unit
Power supply	1	PCS
Gyroscope	1	PCS
Dual servo-driver	1	PCS
Servo kit	1	Kit

Material List

Name	Qty.	Unit
Cardboard	1	PCS
Paper-based carrot model	1	PCS
Transparent double-sided tape	1	Roll

## Work Production Procedure



- Work Production Process:



**Work Process**





 **Tips**

- ✓ Descriptions for hardware modules and software nodes can be found in the appendix at the end of the page;
- ✓ For the paper-based models of the same design, please find in the appendix at the end of the page~
- ✓ The works with “http://education.makeblock.com/
- ✓ Neuron APP Software version: 1.3.2

## Name of Work: Rotating Face-Changing

Difficulty: Intermediate

Time: 30 Minutes



Video Link:<http://static.education.makeblock.com/Face-changing.mp4>

### Lesson Description:

Cold poker king or red heart poker king? Pick whichever you want. Control the poker king's eyes by adjusting the angle of the rocker.

## Teaching Procedure



### Objectives:

Rocker and dual-motor driver modules are used for this work.

- 1) Learn the functions of the rocker and dual motor driver
- 2) Connect the rocker to the motor. Control the motor's forward and reverse rotation speed by adjusting axis Y of the rocker (move the lever of the rocker upwards and downwards). When the rocker is pushed upwards, the motor will rotate clockwise; the more the rocker is pushed upwards, the faster the motor rotates. Similarly, when the rocker is pushed downwards, the motor will rotate counterclockwise

### Step1: Inspire

Sichuan Opera face changing has always been a mysterious trick. How do we use these small modules to achieve the effect of Sichuan Opera Face Changing?

### Step2: Thinking

How do they perform Sichuan Opera face changing? Keep rotating different faces can also achieve the effect of face changing.

### Step3: Make and Tinker

What materials do we need for this work? Which modules can give people a sense of "rotation control", and are also interesting (not boring) ?

### Step4: Test and Share

The work is completed, share your experience and skills, show your work to others, and let more people witness your creativity!



### Thinking after Class

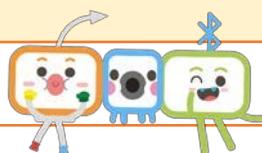
➤ **Review on Key Points:**

3. When the rocker is in offline mode, can only output Y-axis value can be output, while in online the connected mode, both Y-axis and X-axis values can be output;
4. The motor can only control the rotation speed, not the number and angle of rotations;

➤ **Improvement and Optimization:**

2. What else we can do to achieve Sichuan Opera face changing?

### List of Materials



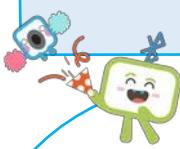
Module List

Name	Qty.	Unit
Power supply	1	PCS
Rocker	1	PCS
Dual motor driver	1	PCS
Motor kit	1	Kit
Magnetic board	4	PCS

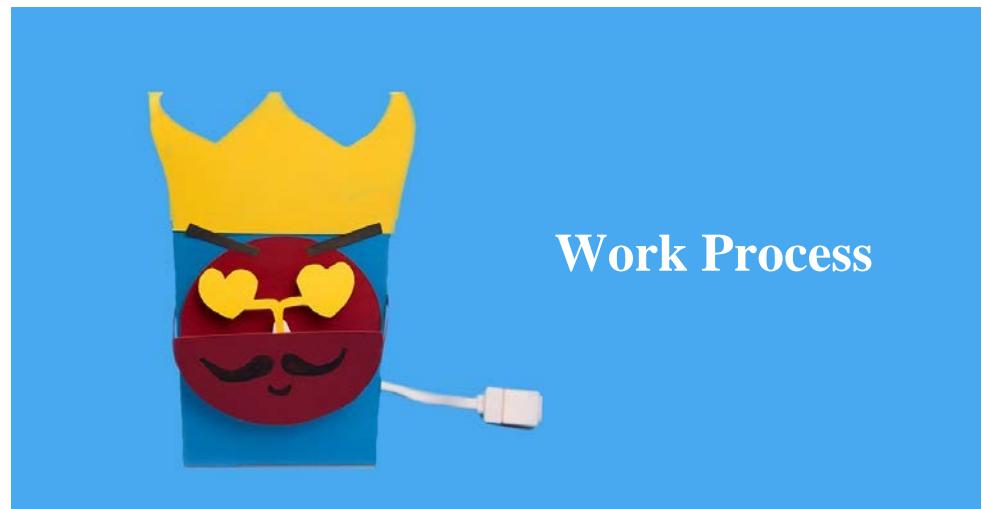
Material List

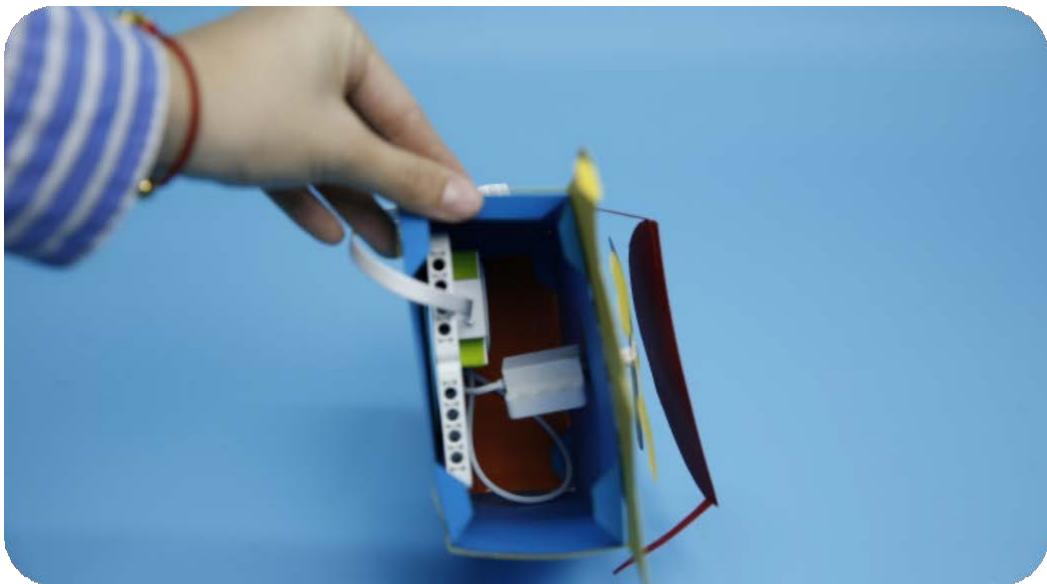
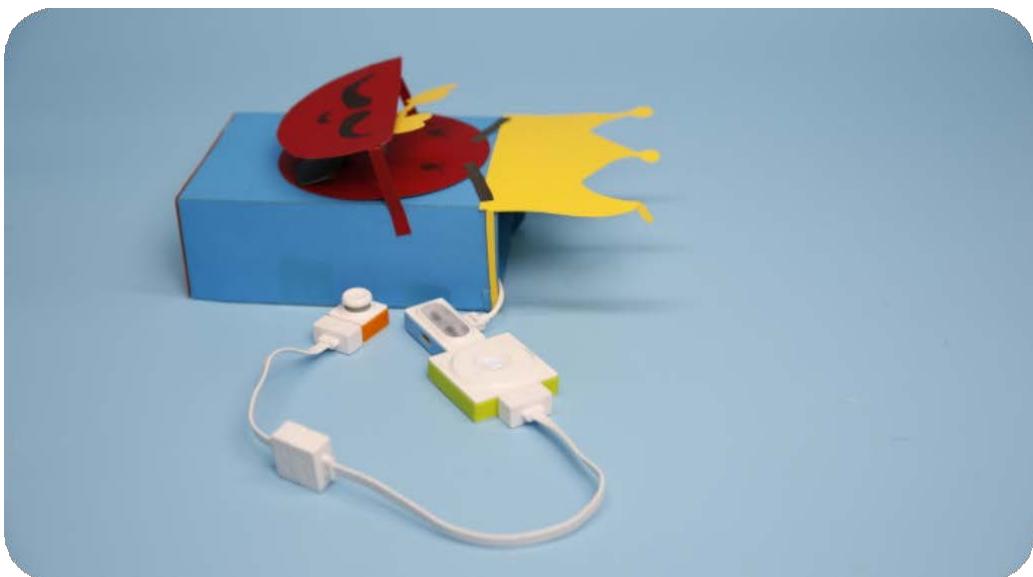
Name	Qty.	Unit
Color cardboard	2	PCS
Glue stick	1	PCS
Double-sided tape	1	Roll
Color marker (black)	1	PCS
Scissors	1	Pair
Art knife	1	PCS

## Work Production Procedure



- Work Production Process:





### Tips

- ✓ Descriptions for hardware modules and software nodes can be found in the appendix at the end of the page;
- ✓ For paper-based models of the same design, please find in the appendix at the end of the page~
- ✓ The works with “⌚” are under online modes. Download Neuron APP on IPad or smart phone for programming;
- ✓ Download video of the work from official educational website: <http://education.makeblock.com/>
- ✓ Neuron APP Software version: 1.3.2

## Name of Work: Rotating Colorful Light



Designer: Xiong Xiong



QR code for video

Video Link: <http://static.education.makeblock.com/ColorfulLights.mp4>

Difficulty: Intermediate

Time: 30 Minutes

### Lesson Description:

Press the button, the beautiful colorful light begins to rotate, and you will be surrounded by the splendid lights. By using the Neuron module, you can easily achieve the desired effects. You should try it ~

## Teaching Procedure



### Objectives:

Use the Neuron electronic modules to create works: 1) Use motor- driven module to control the motor rotation; 2) Use button to start the motor rotation;

### Step1: Inspire

The teacher can play videos or show the finished works to students; let the students observe and think: how to keep the colorful lights rotating? How to keep the light bar on?

### Step2: Thinking

What modules does this work use? Which effects have these modules achieved respectively?

### Step3: Make and Tinker

What materials do we need for this work? The functions of the modules need continuous debugging to achieve the best results;

### Step4: Test and Share

The work is completed, share your experience and skills, show your work to others, and let more people witness your creativity!



## Thinking after Class

### ➤ Review on Key Points:

5. How to use motor modules and LED light bars under offline mode;

### ➤ Improvement and Optimization:

3. Try to add the Bluetooth module and use the Neuron APP to control the color changes, and use the cloud control (IoT) to remotely turn on and off the lights.

## List of Materials



### Module List

Name	Qty.	Unit
Power supply	2	PCS
Bluetooth	1	PCS
Button	1	PCS
Dual DC motor driver	1	PCS
DC motor kit	1	Kit
LED light bar driver	1	PCS
Light bar	1	PCS
Magnetic board	6	PCS
Plug	1	Pack

### Material List

Name	Qty.	Unit
Petal pattern	7	PCS
Plastic bottle	1	PCS
Cardboard (white)	1	PCS
Transparent double-sided tape	2	Roll
Double-sided tape	1	Roll

## Work Production Procedure



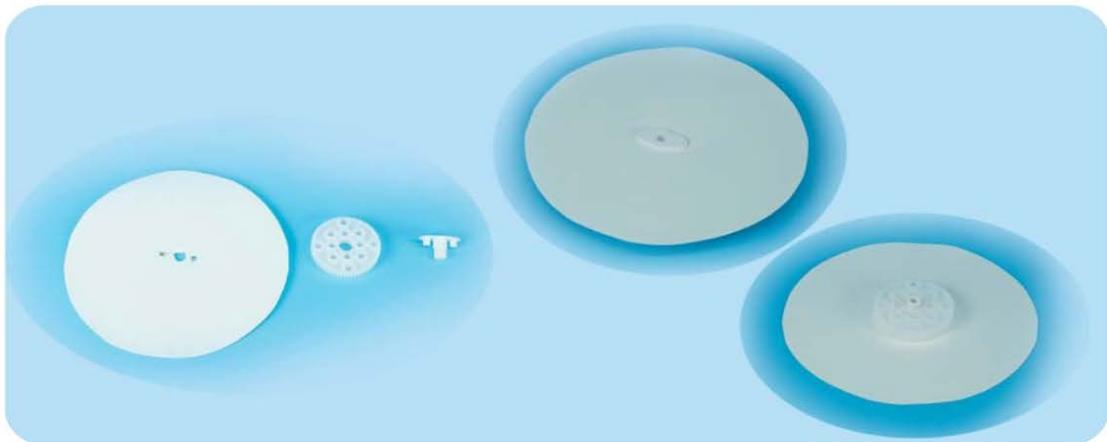
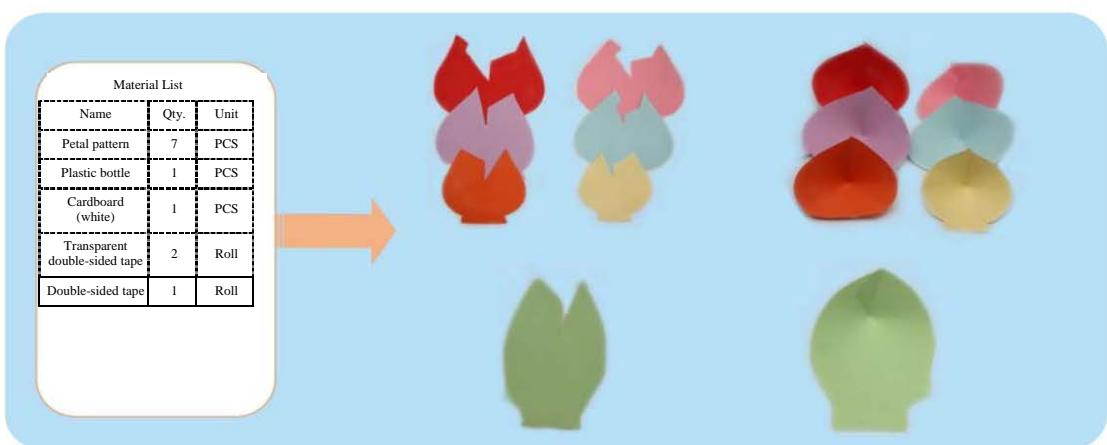
- Work Production Process:



**Work Process**

Module List		
Name	Qty.	Unit
Power supply	2	PCS
Bluetooth	1	PCS
Button	1	PCS
Dual DC motor driver	1	PCS
DC motor kit	1	Kit
LED light bar driver	1	PCS
Light bar	1	PCS
Magnetic board	6	PCS
Plug	1	Pack







### Tips

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- ✓ For paper-based models of the same design, please find in the appendix at the end of the page~
- ✓ The works with “⊕” are under online modes. Download Neuron APP on IPad or smart phone for programming;
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- ✓ Neuron APP Software version: 1.3.2

## Name of Work: Toy Transformation



Designer: Lin Xiasheng



QR code for video

Video Link: <http://static.education.makeblock.com/PuppetsMakeover.mp4>

**Difficulty: Intermediate**

**Time: 30 Minutes**

### Lesson Description:

Use Neuron to make slight modification to your own stuffed toys. You can not only let them know when someone approaches, but also let them start talking.

## Teaching Procedure



### Objectives:

This work mainly uses Wi-Fi, human infrared sensors and speakers.

- 1) Learn how to use Wi-Fi
- 2) Learn the functions of human infrared sensors and speakers
- 3) How to use the speaker's online function

### Step1: Inspire

How to transform your stuffed toys? Let them no longer be "dull" and start interaction with people?

### Step2: Thinking

How to enable them to interact with people? How can they talk?

### Step 3: Programming

Use the Neuron APP for online programming, and try the recording function of the speaker as well as the human infrared sensor.

### Step4: Make and Tinker

How to decorate your toys and Neurons?

### Step5: Test and Share

The work is completed, share your experience and skills, show your work to others, and let more people witness your creativity!



### Thinking after Class:

➤ **Review on Key Points:**

1. How to use Wi-Fi (online and local use)
2. Usage and function of speaker

➤ **Improvement and Optimization:**

4. How about adding a buzzer module?

### List of Materials



Module List

Name	Qty.	Unit
Power supply	1	PCS
Wi-Fi	1	N/A
Human infrared sensor	1	PCS
Speaker	1	PCS
Wi-Fi cable	1	PCS

Material List

Name	Qty.	Unit
Stuffed toy	1	PCS
Transparent double-sided tape	1	Roll

## Work Production Procedure

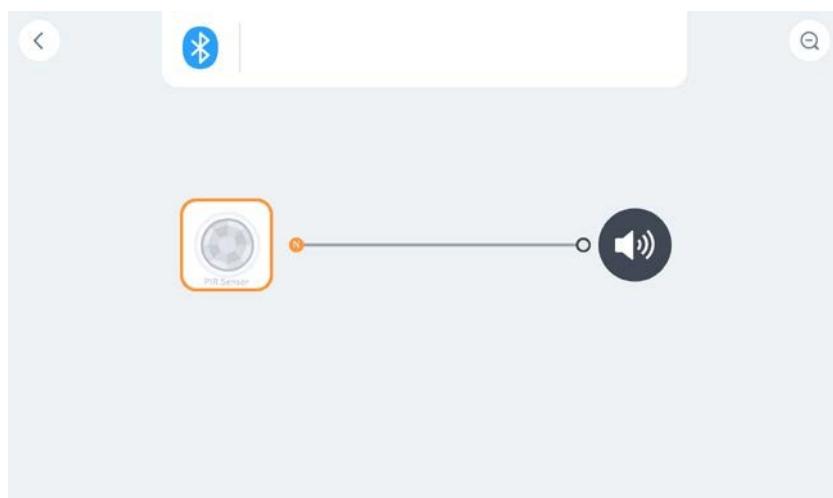


➤ Work Production Process:





➤ Demonstration for online programming



**Tips**

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## Name of Work: Shy Penguin



Designer: Xiong Xiong



QR code for video

Video Link: <http://static.education.makeblock.com/ShyPenguin.mp4>

**Difficulty: Intermediate**

**Time: 30 Minutes**

### Lesson Description:

A penguin lives near an iceberg. Whenever any object (or person) is approaching, it will quietly go hiding. After the object (or person) leaves, it will appear again. By using the Neuron module, you can easily achieve the desired effects. You should try it ~

## Teaching Procedure



### Objectives:

Create works using the Neuron's electronic modules: 1) Use servo module to control the angle of the servo plate; 2) Ultrasonic sensors can sense the distance of any object (or person); Use Neuron APP to achieve the effects of the works: 1) Perform an accurate online adjustment of the angle of the servo to allow the penguin to hide and appear; 2) Compare the digital nodes to adjust the specific distance between the penguin and any object (or person);

### Step1: Inspire

The teacher can play videos or show the finished works to students; let the students observe and try telling a story: What is the penguin doing?

### Step2: Thinking

What modules does this work use? Which effects have these modules achieved respectively?

### Step3: Make and Tinker

What materials do we need for this work? The functions of the modules need continuous debugging to achieve the best results;

### Step 4: Programming

Use the Neuron APP for online programming, and try using comparison, numbers, NOTs, and node maintaining;

### Step5: Test and Share

The work is completed, share your experience and skills, show your work to others, and let more people witness your creativity!



## Thinking after Class

➤ **Review on Key Points:**

6. Servo angle "return to zero" adjustment;
7. Programming for distance sensing of the ultrasonic sensors;
8. Try using comparison, numbers, NOTs, and node maintaining.

➤ **Improvement and Optimization:**

5. How about adding a buzzer module?

## List of Materials



Module List

Name	Qty.	Unit
Power supper	1	PCS
Bluetooth	1	PCS
Ultrasonic sensor	1	PCS
Dual servo-drive	1	PCS
Servo kit	1	Kit
Connection cable 20CM	1	PCS
Magnetic board	4	PCS
Plug	1	Pack
Transparent rubber band	1	Pack

Material List

Name	Qty.	Unit
Paper-based model of iceberg	1	PCS
Ice cream stick	2	PCS
White paper cup	1	PCS
Transparent double-sided tape	2	Roll
Double-sided tape	1	Roll
Colored marker (black)	1	PCS
Color cardboard	2	PCS

## Work Production Procedure



- Work Production Process:

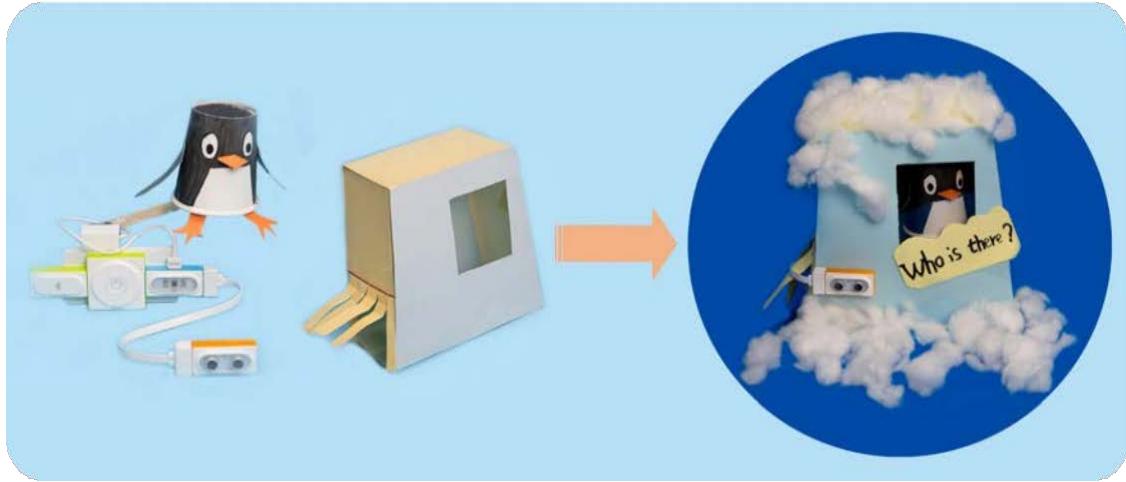
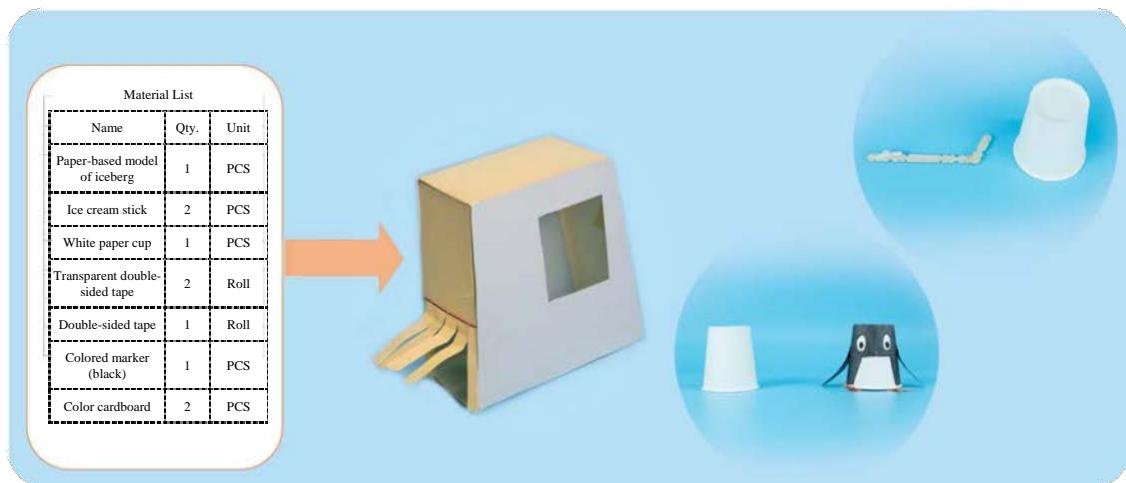


## Work Process

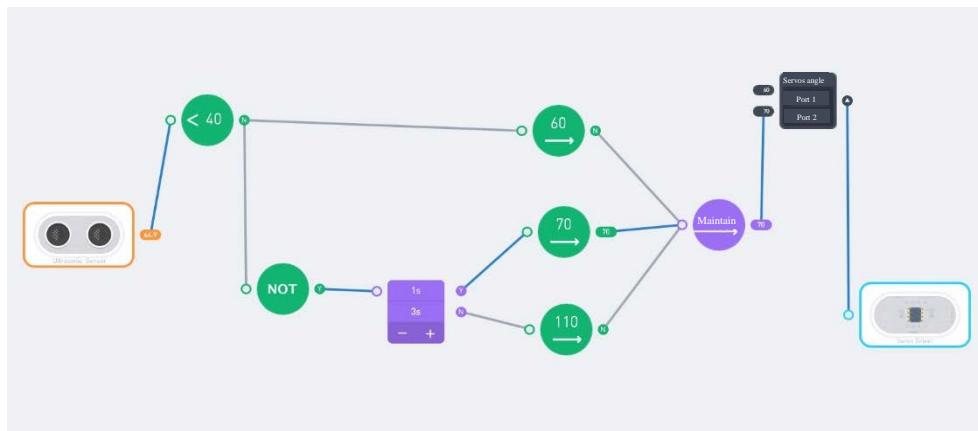
Module List

Name	Qty.	Unit
Power supper	1	PCS
Bluetooth	1	PCS
Ultrasonic sensor	1	PCS
Dual servo-drive	1	PCS
Servo kit	1	Kit
Connection cable 20CM	1	PCS
Magnetic board	4	PCS
Plug	1	Pack
Transparent rubber band	1	Pack

→



➤ Demonstration for online programming



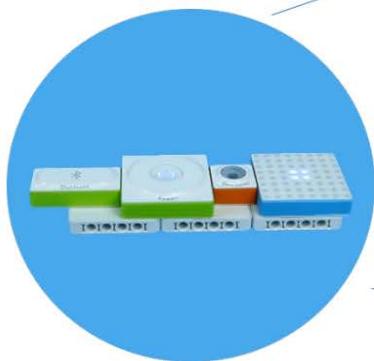
 **Tips**

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- ✓ Neuron APP Software version: 1.3.2

# Engineer



Rocker Toy Car



Level



Smart Watering

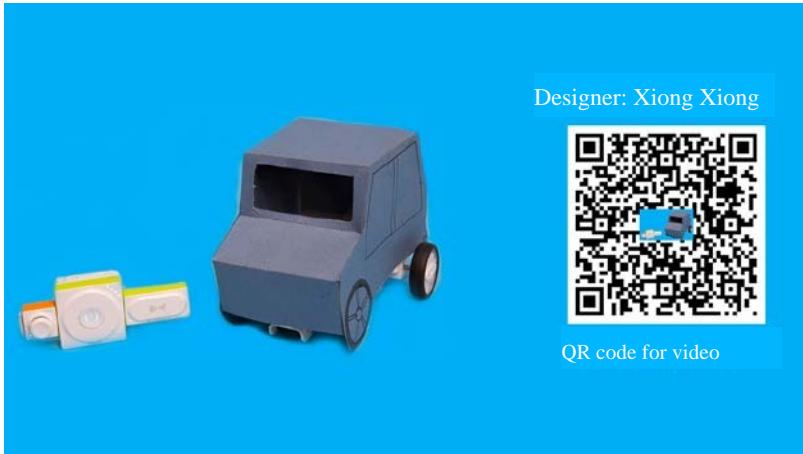


Safe Box



Copycat

## Name of Work: Rocker Toy Car



Designer: Xiong Xiong



QR code for video

Video Link:<http://static.education.makeblock.com/LittleCar.mp4>

**Difficulty: Basic**

**Time: 30 Minutes**

### Lesson Description:

Beep-beep, the car is ready, but how can we remotely control it, and let it start running? By using the Neuron module, you can easily achieve the desired effects. You should try it ~

## Teaching Procedure



### Objectives:

Create works using the Neuron's electronic modules: 1) Use motor module to control the movement of car; 2) Use rocker module to trigger the motor module; 3) The wireless receiving module connects the rocker with the car to control the movement of the car.

### Step1: Inspire

The teacher can play video or show the finished work to students; let the students observe the work and think: can you control this car?

### Step2: Thinking

What modules does this work use? Which effects have these modules achieved respectively?

### Step3: Makeand Tinker

What materials do we need for this work? The functions of the modules need continuous debugging to achieve the best results;

### Step4: Testand Share

The work is completed, share your experience and skills, show your work to others, and let more people witness your creativity!



### Thinking after Class

➤ **Review on Key Points:**

1. Usage of the wireless receiving module.
2. Usage of the rocker module under offline mode.

➤ **Improvement and Optimization:**

1. Connect the Neuron APP to control the direction of the car.

### List of Materials



#### Module List

Name	Qty.	Unit
Power supply	2	PCS
Wireless reception unit	1	Pair
Rocker	1	PCS
Dual DC motor driver	1	PCS
DC motor kit	2	Kit
Magnetic board	4	PC
Plug	1	Pack

#### Material List

Name	Qty.	Unit
Paper-based car model	1	PCS
Double-sided tape	2	Roll
Color marker (black)	1	PCS

## Work Production Procedure



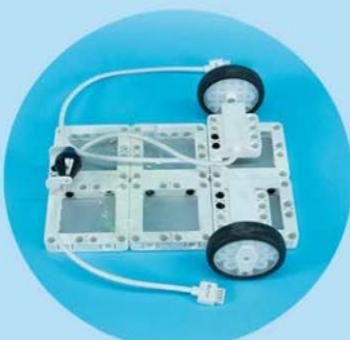
### ➤ Work Production Process:



Module List

Name	Qty.	Unit
Power supply	2	PCS
Wireless reception unit	1	Pair
Rocker	1	PCS
Dual DC motor driver	1	PCS
DC motor kit	2	Kit
Magnetic board	4	PC
Plug	1	Pack

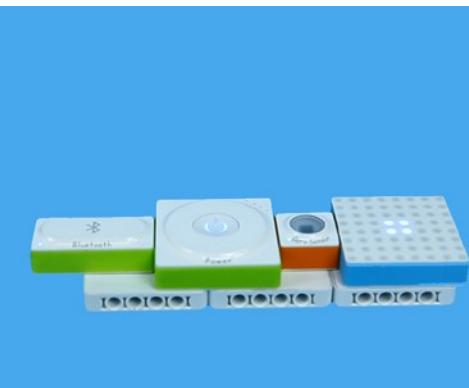
Material List		
Name	Qty.	Unit
Paper-based car model	1	PCS
Double-sided tape	2	Roll
Color marker (black)	1	PCS



### Tips

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- ✓ Neuron APP Software version: 1.3.2

## Name of Work: Level•



Designer: Zhang Jilong



QR code for video

Video Link:<http://static.education.makeblock.com/Gradient.mp4>

**Difficulty:** Basic

**Time:** 30 Minutes

### Lesson Description:

Use gyro sensor to detect tilt, and use the Neuron APP for programming to realize horizontal alignment.

## Teaching Procedure



### Objectives:

1. Know and learn how to use gyroscopes.
2. Make a level.

### Teaching Procedures:

Step 1: Learn “how to measure if an object is horizontal”.

Step 2: The students shall learn by themselves the knowledge required in this lesson, such as Neuron modules and software nodes.

Step 3: Show the finished work and explain the modules and nodes. Provide necessary materials.

Step4: After discussions and observation of the finished work, start making a level.

Step5: Share works with each other.



### Thinking after Class

➤ **Review on Key Points:**

1. Usage of comparison programming languages.

➤ **Improvement and Optimization:**

### List of Materials



Module List

Name	Qty.	Unit
Power supply	1	PCS
Bluetooth module	1	PCS
LED board	1	PCS
Gyro sensor	1	PCS
Magnetic board	3	PCS

Material List

Name	Qty.	Unit
Cardboard	1	PCS

## Work Production Procedure

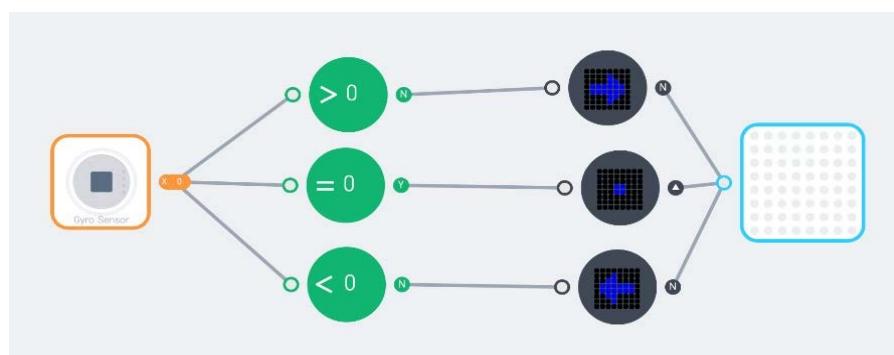


### ➤ Work Production Process:





➤ Demonstration for online programming



**Tips**

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- ✓ Neuron APP Software version: 1.3.2

## Name of Work: Smart Watering



Video Link: <http://static.education.makeblock.com/PlantsGuard.mp4>

**Difficulty: Intermediate**

**Time: 30 Minutes**

### Lesson Description:

Use the soil moisture sensor to monitor plant's humidity, and use the Neuronal APP for programming, so as to start watering when the humidity is too low, and stop watering upon reaching the appropriate humidity.

### Teaching Procedure



#### Objectives:

1. Know and learn how to use soil moisture sensor.
2. Making a smart watering system.

#### Teaching Process:

Step 1: The project "Transform the manual watering system to auto-watering system used in smart farms".

Step2: The students start group discussion.

Step3: Learn the knowledge of Neuron modules and software nodes to be covered in this lesson.

Step4: Show the finished work.

Step5: After discussing and observing the finished work, start making the watering system.

Step6: Share works with each other.



## Thinking after Class

➤ **Review on Key Points:**

1. Usage of comparison programming languages.

➤ **Improvement and Optimization:**

## List of Materials



Module List

Name	Qty.	Unit
power supply	1	PCS
Bluetooth	1	PCS
Dual motor driver	1	PCS
Motor driver kit	1	Kit
Soil moisture sensor	1	PCS
Pump	1	PCS
Magnetic board	3	PCS

Material List

Name	Qty.	Unit
Cardboard	1	PCS

## Work Production Procedure

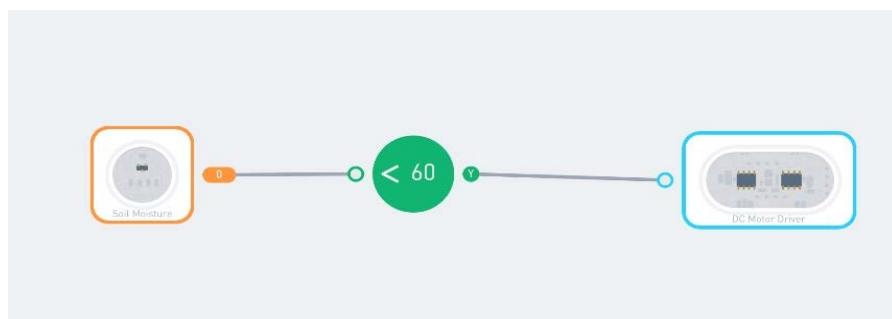


➤ Work Production Process:





➤ Demonstration for online programming



**Tips**

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## Name of Work: Copycat



Video Link:<http://static.education.makeblock.com/CopyCat.mp4>

**Difficulty:** Advanced

**Time:** 30 Minutes

### Lesson Description:

Here is this little cat that is very attached to people. It always follows the person in front of it. The cat would follow you everywhere and will imitate every movement of you. It's just like a copycat following every step of the person in front of it.

## Teaching Procedure



### Objectives:

For this work, we mainly use ultrasonic sensors and motor drivers.

- 1) Learn functions of ultrasonic sensors and motor drivers
- 2) Learn functions of auxiliary nodes of the motor-driven software
- 3) Learn the software nodes: Functions such as Comparison, Digit, and AND

### Step1: Inspire

The owner loves the cat, but the cat is not attaching to him. How can we make the cat attach to its owner and follow the owner everywhere?

### Step2: Thinking

How can we make the cat aware of the owner's movement, and then let it follow its owner? Which modules can let the cat know that its owner is leaving? And which modules can let the cat start moving? The ultrasonic sensors can sense the movement of the object in front of them and the motor can drive the wheels.

### Step3: Programming

By means of Neuron APP online programming, set that: within a certain distance, when the person leaves the cat, the ultrasonic sensor will sense the change of distance. When the distance is greater than 20cm, the motor will be triggered to rotate. Then the cat will automatically follow the movement of the person.

### Step4: Make and Tinker

After the cat's function has been achieved, it is time to design the cat's appearance. The ultrasonic sensor has two protruding holes, which can be used as the cat's nose. At the designing stage, two small holes can be drilled.

### Step5: Test and Share

The work is completed, share your experience and skills, show your work to others, and let more people witness your creativity!



## Thinking after Class

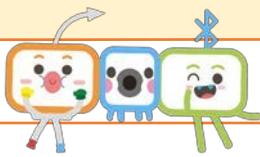
➤ **Review on Key Points:**

9. Programming for distance sensing of the ultrasonic sensors;
10. Use Comparison, Digit and AND nodes.

➤ **Improvement and Optimization:**

6. How about adding a buzzer module?

## List of Materials



Module List

Name	Qty.	Unit
Power supply	1	PCS
Bluetooth	1	PCS
Ultrasonic sensor	1	PCS
Dual motor driver	1	PCS
Motor kit	1	Kit
Connection cable 20CM	1	PCS
Magnetic board	4	PCS
Wheel kit	2	Kit

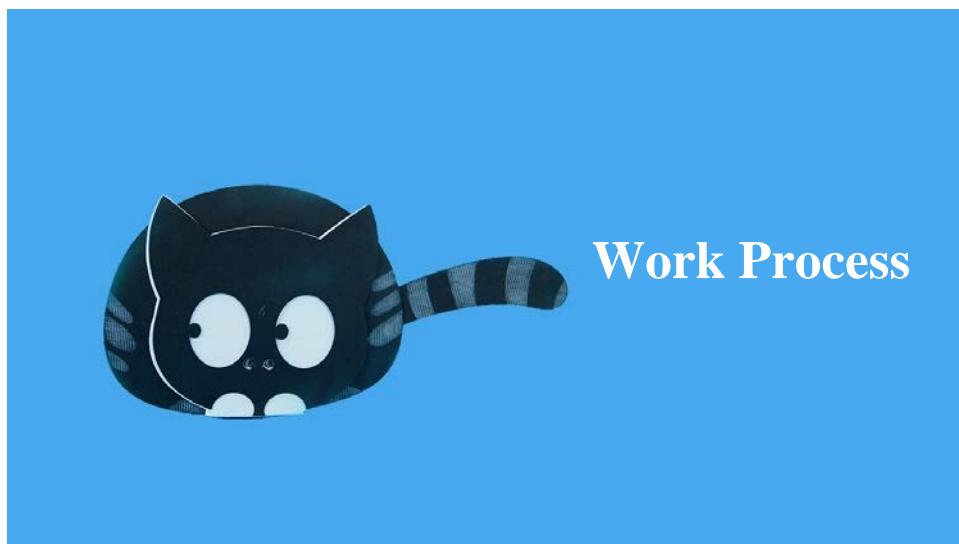
Material List

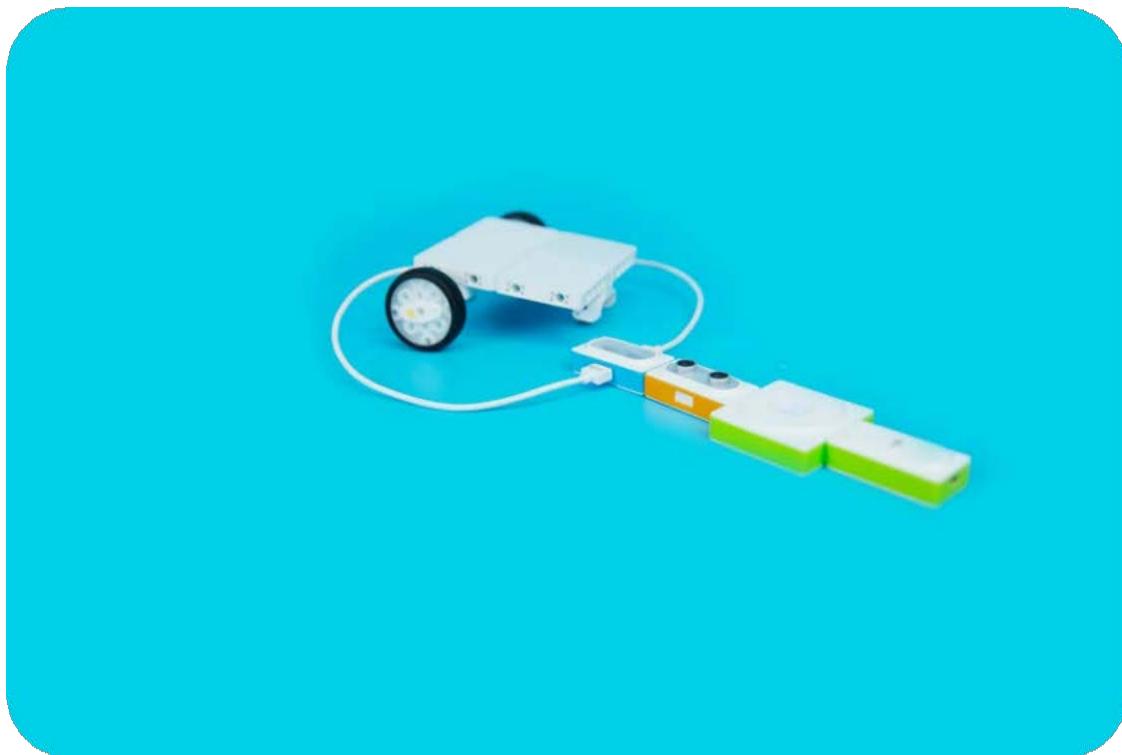
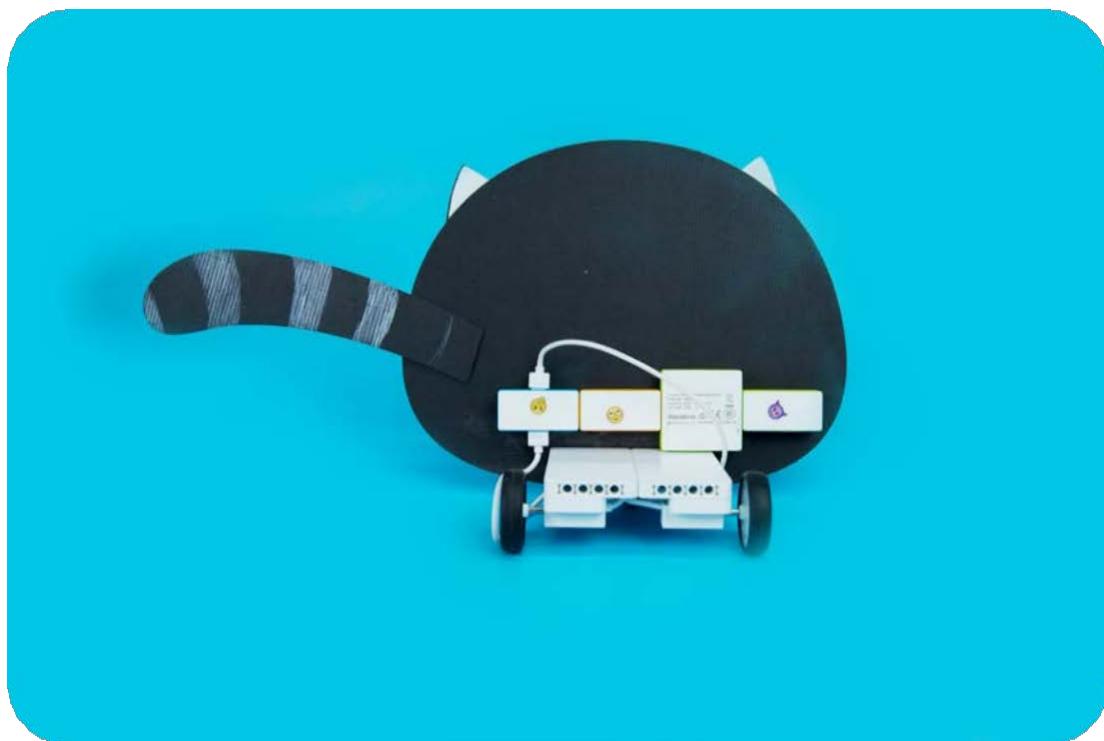
Name	Qty.	Unit
Paper-based cat model	1	Set
Double-sided tape	1	Roll
White paper	1	PCS

## Work Production Procedure



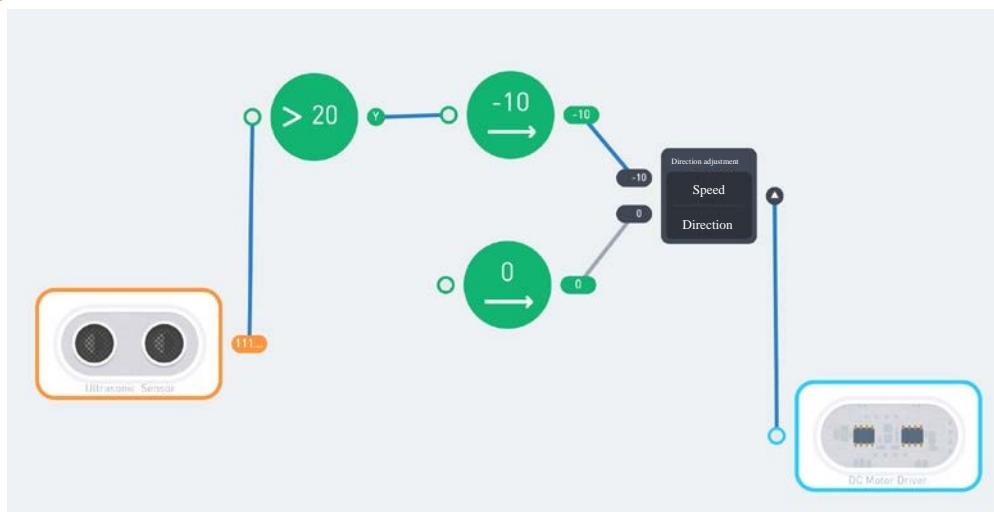
➤ Work Production Process:







➤ Demonstration for online programming



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## Name of Work: Safe Box



Designer: Zhang Jilong



QR code for video

Video Link: <http://static.education.makeblock.com/SafetyBox.mp4>

**Difficulty:** Advanced

**Time:** 30 Minutes

### Lesson Description:

Use the knobs to make a cipher lock and the password is displayed on the display. When the password is correctly entered, the indicator will light up. Now press the button the safe box will be opened.

## Teaching Procedure



### Objectives:

1. Know and learn how to use servo.
2. Understand logics “OR” and “AND”.
3. Make a safe box.

### Teaching Process:

Step 1: Learn "How to protect your property"

Step 2: The students shall learn by themselves the knowledge covered in this lesson, such as Neuron modules and software nodes.

Step 3: Show the finished work and explain the modules and nodes. Provide necessary materials.

Step 4: After discussions and observing the finished work, start making a safe box.

Step 5: Share works with each other.



## Thinking after Class

➤ **Review on Key Points:**

1. Application of servo.
2. Logics “OR” and “AND”.

➤ **Improvement and Optimization:**

## List of Materials



Module List

Name	Qty.	Unit
Power supply	1	PCS
Bluetooth module	1	PCS
Button	1	PCS
Knob	1	PCS
Display	1	PCS
Dual servo-driver	1	PCS
Servo- drive kit	1	Kit
Connection cable 10CM	2	PCS

Material List

Name	Qty.	Unit
Paper-based model	1	PCS
Transparent double-sided tape	1	Roll

## Work Production Procedure

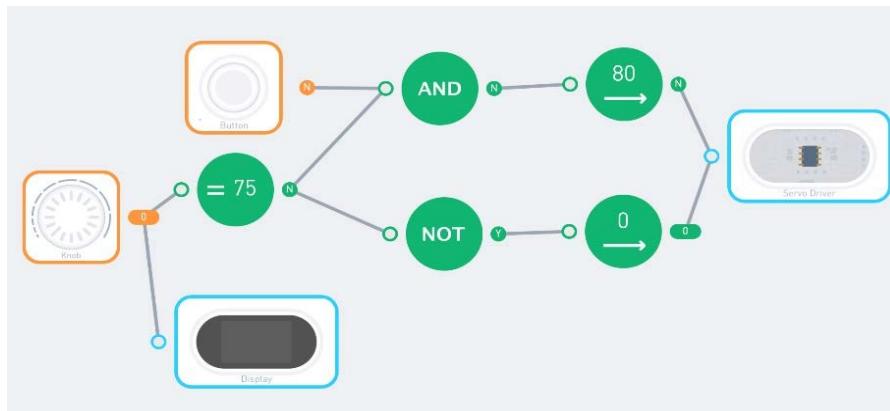


➤ Work Production Process:





➤ Demonstration for online programming



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# Scientist



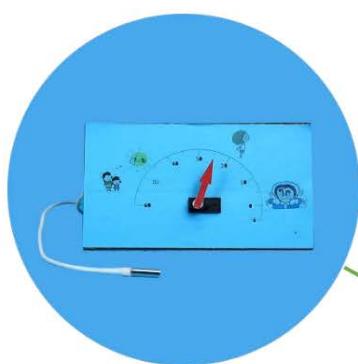
Reflectivity of Different Colors



Exploring the Relationship between Light Energy and Distance



Know Common Conductors and Insulators



Thermometer



Thermal Energy Transmission

## Scientific Experiment: Reflectivity of Different Colors



**Difficulty:** Basic

**Time:** 30 Minutes

### Lesson Description:

Use RGB lamps to create direct light that reaches on the paper. Use the light intensity sensor to measure the intensity of light reflected by the paper. Change the color of paper and observe the measured results.

### Teaching Procedure



#### Objective of Experiment:

1. Investigate the effect of color on the light reflection.
2. Learn how to choose colors in architecture and design.

Question: Which color has great reflectivity? What color has strong light absorption ability?

Experiment process:

Step 1: Collect colored paper made of the same material.

Step 2: The distances between RGB lamp, light intensity sensor and paper should remain unchanged.

Step 3: Wait for the data on the light intensity sensor to become stable, then record the result.

Step 4: Change a paper in different color.

Step 5: Record at least 3 measurement results for each color.



## Thinking after Class

### ➤ Review on Key Points:

1. Which color can reflect light with the greatest reflectivity?
2. Which fields in our lives does the rule apply to?

### ➤ Improvement and Optimization:

How can we use this principle?

## List of Materials



### Module List

Name	Qty.	Unit
Power supply	1	PCS
Light sensor	1	PCS
RGB lamp	1	PCS
Display	1	PCS
Knob	1	PCS
Connection cable 10CM	1	PCS
Magnetic board	4	PCS

### Material List

Name	Qty.	Unit
Worksheet	1	PCS

## Data



Color	Reflectance				Average
White					
Blue					
Green					
Red					
Yellow					
Black					



### Tips

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**Scientific Experiment:**  
**Explore the Relationship between Light Intensity and Distance**



**Difficulty: Basic:**

**Time: 30 Minutes**

**Lesson Description:**

Use the Neuron's light sensor module along with the display module to make a simple instrument for detecting light intensity. Use this instrument to measure the light intensity at different distances to conclude the relationship between light energy and distance.

**Teaching Procedure**



**Objectives:**

1. Explore relationship between light intensity and distance.
2. Learn the control variable method in scientific experiments

**Experiment Process:**

Step 1: Place the measuring tape on the table for 50 cm.

Step 2: Set up the measuring instrument on the starting point of the tape (0 cm) .

Step 3: Put the flashlight at 10cm on the tape. Ensure that the height of the flashlight is the same as that of the measuring instrument.

Step 4: Record the result when the displayed result of the instrument becomes stable.

Step 5: Move the flashlight backward by 10 cm and record the result.

Step 6: Repeat Step 4 and Step 5.

Step 7: When the flashlight is moved to 30 cm, record the result and return the flashlight to 10 cm on the tape.

Step 8: Repeat this experiment 3 times to get the average value of the results.

**Conclusion:**

The intensity of flashlight decreases as the distance from a light source increases.



### Thinking after Class

➤ **Review on Key Points:**

1. Why should we repeat the experiment more than 3 times?
2. Is there a relationship between the energy of light and the distance?

➤ **Improvement and Optimization:**

Try to find the current rule of light decay

### List of Materials



#### Module List

Name	Qty.	Unit
Power supply	1	PCS
Light sensor module	1	PCS
Display	1	PCS
Magnetic board	4	PCS

#### Material List

Name	Qty.	Unit
Measuring tape	1	Roll
Worksheet	1	PCS

## Data



Distance (CM)	Light Intensity					Average
10						
20						
30						



### Tips

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## Scientific Experiment: Know Common Conductors and Insulators



**Difficulty:** Basic

**Time:** 30 Minutes

### Lesson Description:

With the feature of a touch switch, make an instrument to determine whether an object is a conductor. Use the instrument to do an exploratory experiment, with the objective to let students learn the conductive properties of household materials.

### Teaching Process



#### Objectives:

Identify the conductive household materials

Question: How do I make the touch switch work (forming a loop) ? Give examples of conductors and insulators.

#### Experiment Process:

Step 1: Find at least 10 commonly used materials (such as toothpicks, fruits, soda cans, white paper) .

Step 2: Based on the materials found, provide your assumptions as to which ones are conductors and which ones are not.

Step 3: Test the materials one by one, and record the results.



## Thinking after Class

➤ **Review on Key Points:**

1. What is a loop?
2. What are conductors and insulators?

➤ **Improvement and Optimization:**

Explore new question: Can the electrical conductivity of objects be changed?

## List of Materials



Module List

Name	Qty.	Unit
Power supply	1	PCS
Touch switch	1	PCS
Display	1	PCS

Material List

Name	Qty.	Unit
Worksheet	1	PCS

## Data



Material	Conductor	Insulator



### Tips

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- ✓ Neuron APP Software version: 1.3.2

## Scientific Experiment: Thermal Energy Transmission



**Difficulty: Basic**

**Time: 30 Minutes**

### Lesson Description:

Use the temperature sensor to detect temperature changes of objects, and record the rules.

### Teaching Procedure



#### Objectives:

Explore the thermal conductivity of different materials.

#### Experiment Process:

- Step 1: Collect at least 3 kinds of objects of the same size but of different materials (such as wooden chopsticks, plastic chopsticks, and iron chopsticks).
- Step 2: Attach the temperature sensor on each object. Make sure that the temperature sensor is attached to the same position on each object.
- Step 3: Prepare 3 cups of the same size and pour the same amount of hot tap water into each cup.
- Step 4: Turn on the timer and record the temperature sensor's results once every 3 minutes.
- Step 5: Record 3 sets of results



## Thinking after Class

➤ **Review on Key Points:**

- 1 Which household material has the best thermal conductivity?
2. Which fields in our lives does the rule apply to?

➤ **Improvement and Optimization:**  
 How can we use this principle?

## List of Materials



Module List

Name	Qty.	Unit
Power supply	1	PCS
Temperature sensor	1	PCS
Display	1	PCS

Material List

Name	Qty.	Unit
Worksheet	1	PCS
Disposable cup	Several	PCS
Iron chopsticks	1	PCS
Plastic chopsticks	1	PCS
Wood chopsticks	1	PCS
Transparent adhesive tape	1	Roll

## Data



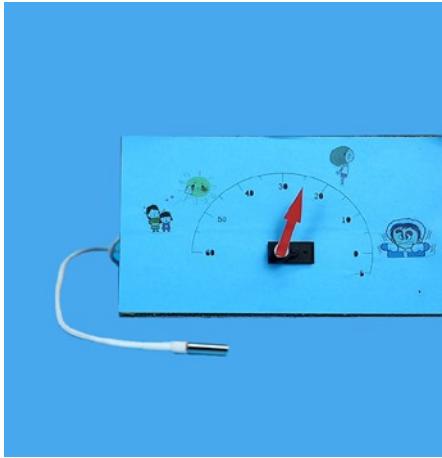
Material	Time		
	3min	6min	9min
Iron			
Plastic			
Wood			



### Tips

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## Name of Work: Thermometer



Designer: Zhang Jilong



QR code for video

Video Link: <http://static.education.makeblock.com/Thermometer.mp4>

**Difficulty:** Intermediate

**Time:** 30 Minutes

### Lesson Description:

Use the temperature and humidity sensors to detect the temperature and humidity in the surrounding environment. Use the neuron APP programming feature to “map” the data into degrees which will be displayed on servo.

## Teaching Procedure



### Objectives:

1. Know and learn how to use the temperature and humidity sensor module to explore the surrounding environment.
2. Understand the "Mapping" node.
3. Make a thermometer.

### Teaching Process:

Step 1: Start the lesson by telling a story (or a model) related to temperature.

Step 2: In the exploration stage, the students learn the knowledge covered in this lesson by self-study, such as Neuron modules and software nodes.

Step 3: Changes the external factors to cause temperature and humidity changes, which will let the students experience the natural changes. (For example, hold the sensor tightly and blow into the sensor)

Step 4: Show finished work to the students. Then provide them with necessary materials.

Step 5: After observing the sample finished work, the students start to make their own works.

Step 6: Share works with each other.



### Thinking after Class

➤ **Review on Key Points:**

1. Know and learn how to use the temperature and humidity sensor module to explore the nature environment.
2. Understand the "Mapping" node.

➤ **Improvement and Optimization:**

Try adding other sensors to make the thermometer smarter. For example, add RGB lamp or buzzer to realize reminding function.

### List of Materials



Module List

Name	Qty.	Unit
Power supply	1	PCS
Bluetooth module	1	PCS
Temperature and humidity sensor	1	PCS
Dual servo-driver	1	PCS
Servo kit	1	Kit
Magnetic cable (10cm)	1	PCS

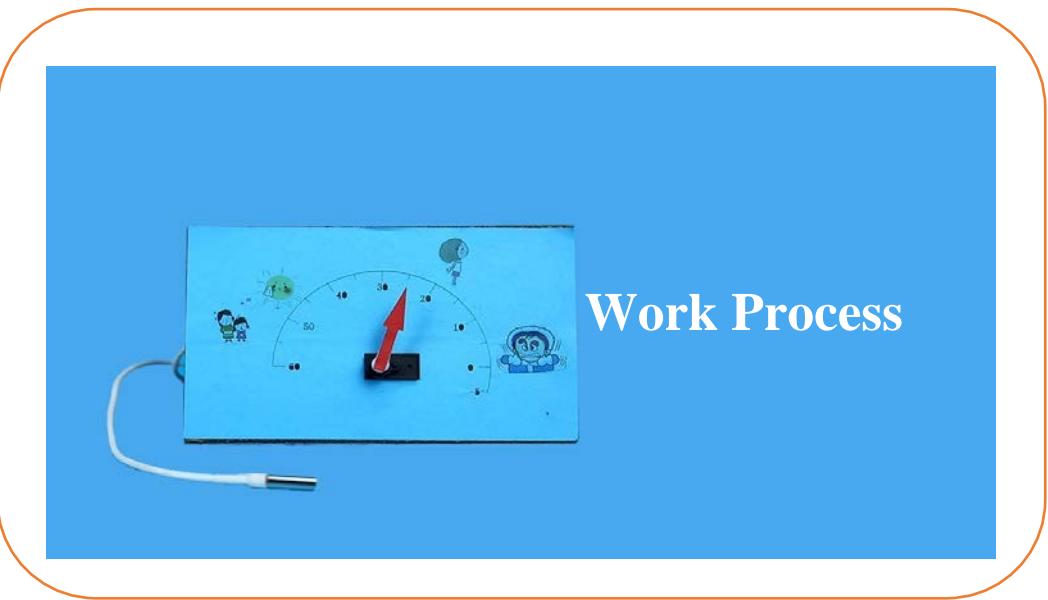
Material List

Name	Qty.	Unit
Cardboard	1	PCS

## Work Production Procedure

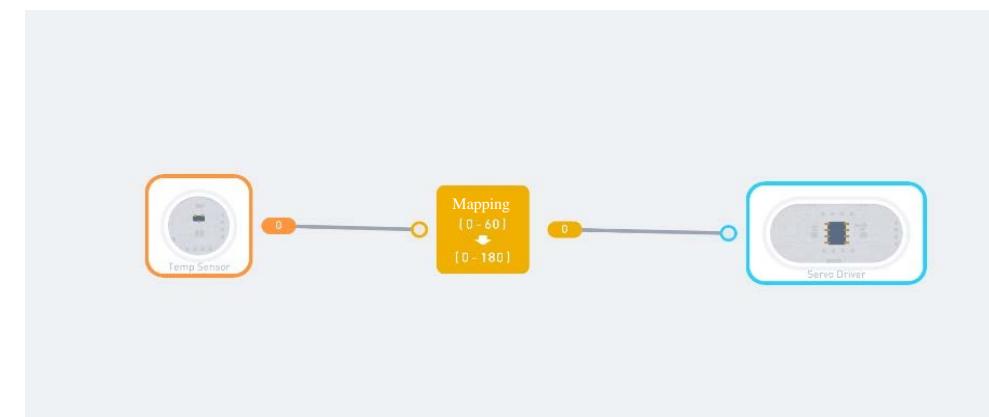


➤ Work Production Process:





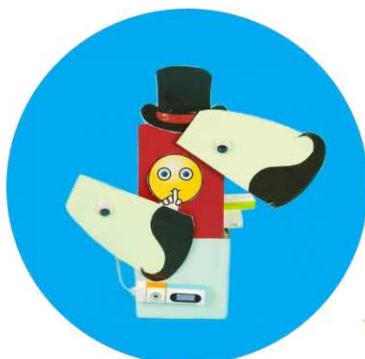
➤ Demonstration for online programming



**Tips**

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- ✓ Neuron APP Software version: 1.3.2

# Maker's Home



“Quiet Zone” Reminder



Energy-Saving Light



Visual Door Remote  
Control System



Auto-adjustable  
Clothes Drying Rack



Plant Guard



Smart Pill Box

## Name of Work: Energy- Saving Light



Designer: Lin Xiasheng



扫一扫，看视频

QR code for video

Video Link: <http://static.education.makeblock.com/EnergysavingLamp.mp4>

**Difficulty:** Basic

**Time:** 30 Minutes

### Lesson Description:

When the night falls, the lights will be lit up in the house, giving family the warmth of home. When the daylight comes, the light will automatically turn off, saving electric energy.

### Teaching Procedure



#### Objectives:

The main modules used in this work include the light sensor and the LED driver.

- 1) Know and learn functions of the light sensor and LED driver
- 2) Learn the online functions of the light sensor
- 3) Master the knowledge of software node: comparison

#### Step1: Inspire

We often see these scenarios. When night is falling, a lot of road lamps, signs and household appliances will automatically be turned on; when the daylight comes, the lights will be automatically turned off. How does this happen? We can also install these kinds of lights in our home, which are beautiful and energy saving.

#### Step2: Thinking

What can we do to enable the light to distinguish nighttime and daytime. And how can we let the light off in the night and on at daytime? Which module can realize this kind of effect?

#### Step3: Programming

By means of Neuron APP's online programming, we can let the lights off at daytime and on at nighttime according to the various values obtained from the light sensor;

#### Step 4: Make and Tinker

After the function is achieved, we will begin to make various small works, such as energy-saving desk lamps, signs, and home appliances models!

#### Step5: Test and Share

The work is completed, share your experience and skills, show your work to others, and let more people witness your creativity!



### Thinking after Class

➤ **Review on Key Points:**

11. Functions of the light sensor
12. Use of software nodes

### List of Materials



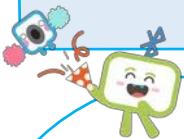
Module List

Name	Qty	Unit
Power supply	1	PCS
Bluetooth	1	PCS
Light sensor	1	PCS
LED driver	1	PCS
LED	1	Pack
Connection cable 10CM	1	PCS

Material List

Name	Qty.	Unit
Paper-based house model	1	Set
Double-sided tape	1	Roll

## Work Production Procedure

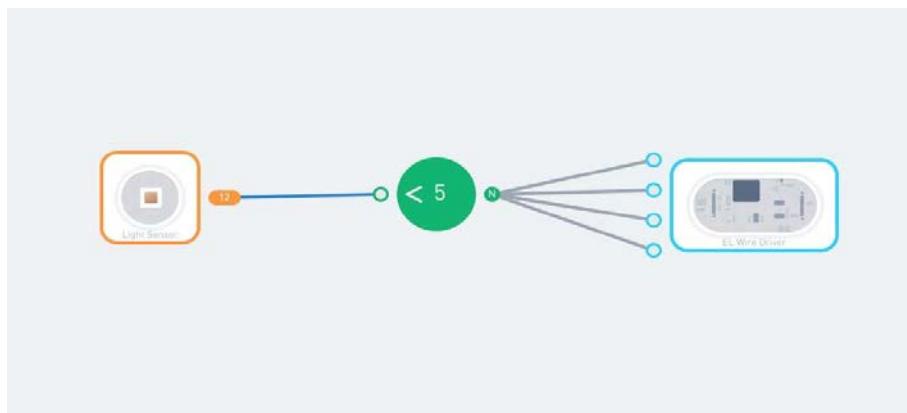


➤ Work Production Process:





➤ Demonstration for online programming



**Tips**

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- ✓ Neuron APP Software version: 1.3.2

## Name of Work: “Quiet Zone” Reminder

Difficulty: Intermediate

Time: 30 Minutes



Designer: Xiong Xiong



QR code for video

Viedo link:<http://static.education.makeblock.com/SilenceKeeper.mp4>

### Lesson Description:

When you are reading a book in the library, someone is talking very loudly. Sometimes it is not polite to remind the person directly. Now you can use this “quiet zone” reminder to remind that person~

By using the Neuron module, you can easily achieve the desired effects. You should try it ~

### Teaching Procedure



#### Objectives:

Create works using the Neuron's electronic modules: 1) Sound sensor, which can activate the servo when a large volume is sensed; 2) Servo, which can control the opening and closing angles; 3) Display, which can show the volume of voice;

Use Neuron APP to achieve the function of the works: 1) online adjustment of the servo angle accurately, so that the 2 displays can rotate at the same speed; 2) using the comparison and digit nodes to setup, so that if the volume of sound is greater than a certain value, the “quiet zone” reminding sign will be lit up;

#### Step1: Inspire

The teacher can play video or show the sample finished work to the students; let the students observe the work and think: in what everyday life scenarios can we use the “quiet zone” reminder.

#### Step2: Thinking

What modules does this work use? Which effects have these modules achieved respectively? What are the difficulties in using double- servos?

#### Step3: Make and Tinker

What materials do we need for this work? The functions of the modules need continuous debugging to achieve the best results;

#### Step 4: Programming

Use the Neuron APP for online programming, try the nodes such as comparison, digit and others;

#### Step5: Test and Share

The work is completed, share your experience and skills, show your work to others, and let more people witness your creativity!



## Thinking after Class

➤ **Review on Key Points:**

1. Adjust the angle and direction of double-servo;
2. Method to Use comparison and numbers digit nodes.

➤ **Improvement and Optimization:**

1. How about adding an LED module?

## List of Materials



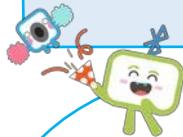
Module List

Name	Qty.	Unit
power supply	1	PCS
Bluetooth	1	PCS
Sound sensor	1	PCS
Dual servo driver	1	PCS
Servo kit	2	Kit
Connection cable 20CM	1	PCS
Magnetic board	3	PCS
Plug	1	Pack

Material List

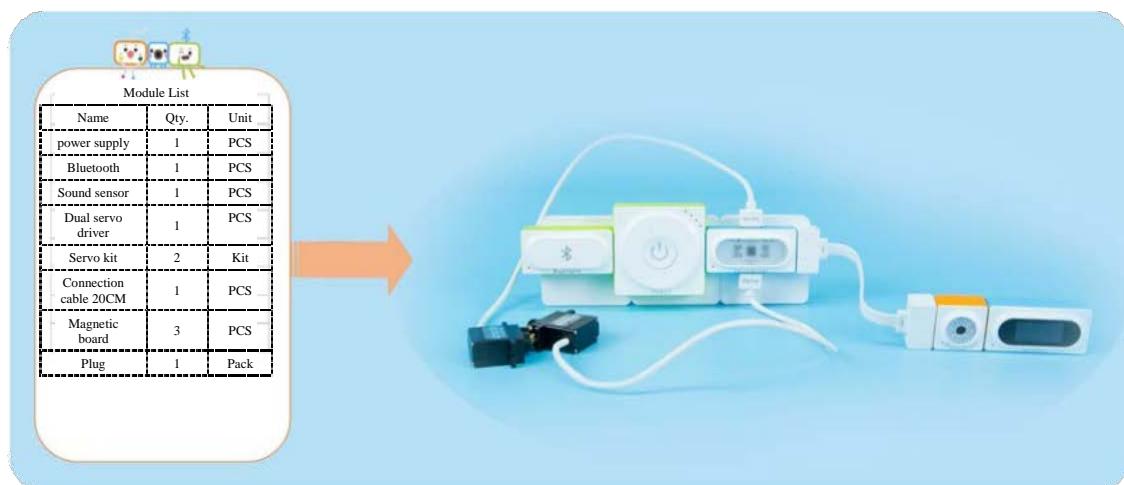
Name	Qty.	Unit
Paper-based box model	1	PCS
Ice cream stick	2	PCS
Color cardboard	3	PCS
Transparent double-sided tape	2	Roll
Double-sided tape	1	Roll

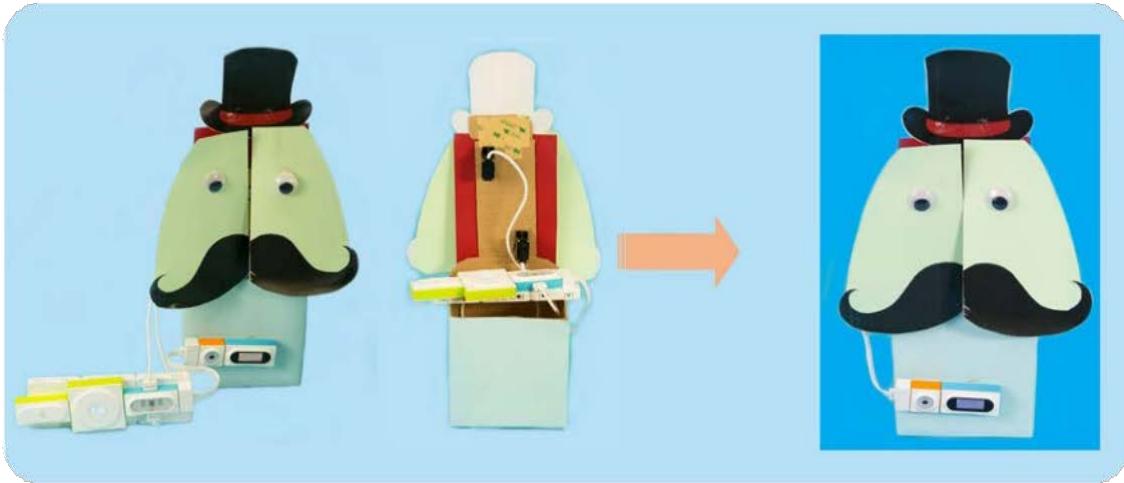
## Work Production Procedure



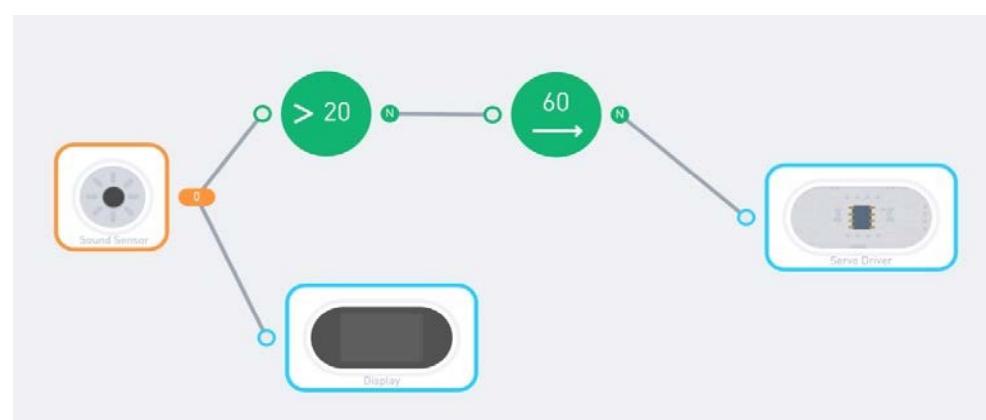
### ➤ Work Production Process:

## Work Process





➤ Demonstration for online programming



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- ✓ Neuron APP Software version: 1.3.2

## Name of Work: Auto-adjustable Clothes Drying Rack



Designer: Xiong Xiong



QR code for video

Video Link:<http://static.education.makeblock.com/ClothesHanger.mp4>

**Difficulty: Intermediate**

**Time: 30 Minutes**

### Lesson Description:

It's raining, but the clothes are still hanging on the drying rack. And there is no one at home to bring the clothes home. You can make an automatic drying rack. By using the Neuron module, you can easily achieve the desired effects. You should try it ~

## Teaching Process



### Contents:

Create works using the Neuron's electronic modules: 1) Use servo module to control the rotating angle of the servo; 2) temperature and humidity sensor can sense the humidity in the environment;

Use Neuron APP to achieve the effects of the works: 1) Perform an accurate online adjustment of the angle of the servo to allow the consistency of the rotating angles for 2 servos; 2) the comparison, digit and NOT nodes can let the automatic drying rack to collect the clothes if the humidity is greater than a certain value, and put the clothes on the rack if the humidity is lower than this value;

#### Step1: Inspire

The teacher can play videos or show the sample finished works to the students; the students observe the work and focus on learning the angles and installation directions for the double servos?

#### Step2: Thinking

What modules does this work use? Which effects have these modules achieved respectively?

#### Step3: Make and Tinker

What materials do we need for this work? The functions of the modules need continuous debugging to achieve the best results;

#### Step 4: Programming

Use the Neuron APP for online programming, try the functions such as comparison, digit, NOT and other nodes;

#### Step5: Test and Share

The work is completed, share your experience and skills, show your work to others, and let more people witness your creativity!



## Thinking after Class

➤ **Review on Key Points:**

1. Adjusting the angle and direction of double-servo; programming for distance sensing of the ultrasonic sensors;
2. Use of Comparison, Digit, NOT and other nodes.

➤ **Improvement and Optimization:**

1. Use the cloud control (IoT) to remotely control the rack.

## List of Materials



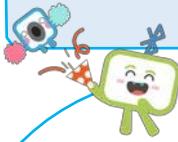
Module List

Name	Qty.	Unit
Power supply	1	PCS
Bluetooth	1	PCS
Temperature and humidity sensor	1	PCS
Dual servo driver	1	PCS
Servo kit	2	Kit
Connection cable 20CM	1	PCS
Magnetic board	8	PCS
Plug	1	Pack
Transparent rubber band	1	Pack

Material List

Name	Qty.	Unit
Paper-based house model	1	PCS
Paper-based balcony model	1	PCS
Ice cream stick	2	PCS
Transparent wire	1	PCS
Transparent double-sided tape	2	Roll
Double-sided tape	1	Roll
Color cardboard	3	PCS

## Work Production Procedure

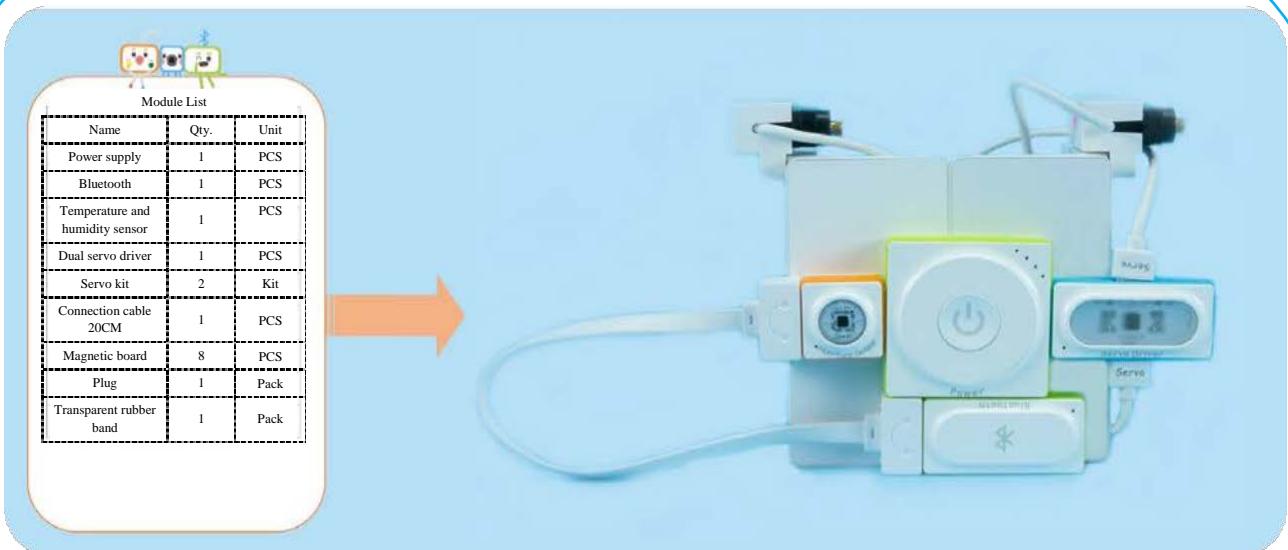


➤ Work Production Process:

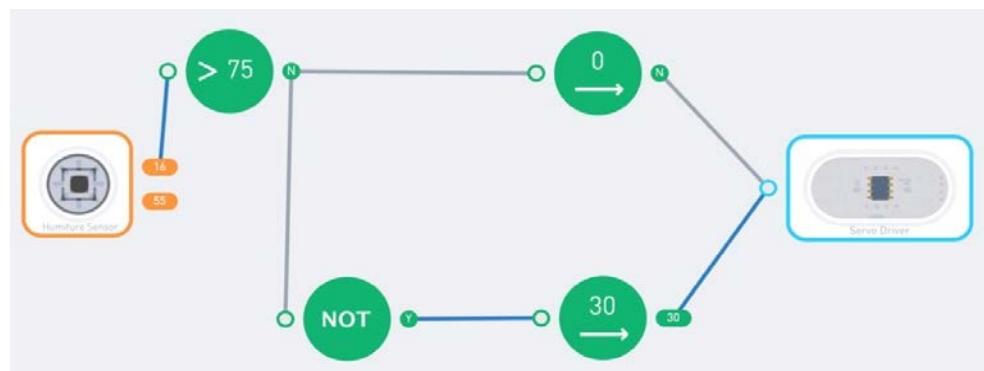


Material List		
Name	Qty.	Unit
Paper-based house model	1	PCS
Paper-based balcony model	1	PCS
Ice cream stick	2	PCS
Transparent wire	1	PCS
Transparent double-sided tape	2	Roll
Double-sided tape	1	Roll
Color cardboard	3	PCS





➤ Demonstration for online programming



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## Name of Work: Smart Pill Box



Designer: Lin Xiasheng



QR code for video

Video Link: <http://static.education.makeblock.com/SmartPillBox.mp4>

Difficulty: Intermediate

Time: 30 Minutes

### Lesson Description:

Grandma/Grandpa often forgets to take medicine on time. What should I do? The smart pill box reminds you to take medicine at scheduled time. It can help grandpa and grandma to remember taking medicines on time.



## Teaching Process

### Objectives:

The main modules used in this work include the light sensor and the buzzer.

- 1) Learn the functions of the light sensor and buzzer.
- 2) Learn the functions of software nodes, such as time, digit, comparison and “AND”, etc.

### Step1: Inspire

Grandma/Grandpa often forgets to take medicine on time. How should I remind them to take medicine? If the pill box can automatically remind them to take medicine, that will be terrific.

### Step2: Thinking

First of all, I need a timer and a small alarm that can remind me at scheduled time. Second, when grandma/grandpa opens the pill box and takes the medicine, the alarm would automatically stop. In this way, it won't bother grandma/grandpa too much.

### Step3: Programming

Which modules can help me achieve these functions? The software can help me achieve the timing function. The buzzer can act as a small alarm. But how does the pill box know whether grandma/grandpa has opened the pill box and taken the medicine? The light sensor can sense when the pill box is opened (because the light will reach inside the box).

### Step4: Make and Tinker

How should I design the pill box? How should I put the modules in the pill box and make it sense the light and make sounds? (Double-layer structure)

### Step4: Test and Share

The work is completed, share your experience and skills, show your work to others, and let more people witness your creativity!



## Thinking after Class

➤ **Review on Key Points:**

13. Functions of software nodes
14. Functional logic: When it's time to take medicine but the pill box hasn't been opened, grandma/grandpa should be reminded of taking medicine. When the pillbox is opened, stop reminding.

➤ **Improvement and Optimization:**

1. Add an LED panel, so as to show some reminders on it.

## List of Materials



Module List

Name	Qty.	Unit
Power supply	1	PCS
Bluetooth	1	PCS
Light sensor	1	PCS
Buzzer	1	PCS
Connection cable 10cm	1	PCS

Material List

Name	Qty.	Unit
Paper-based pill box model	1	PCS
Scissors	1	Pair
Double-sided tape	1	Roll

## Work Production Procedure



➤ Work Production Process:



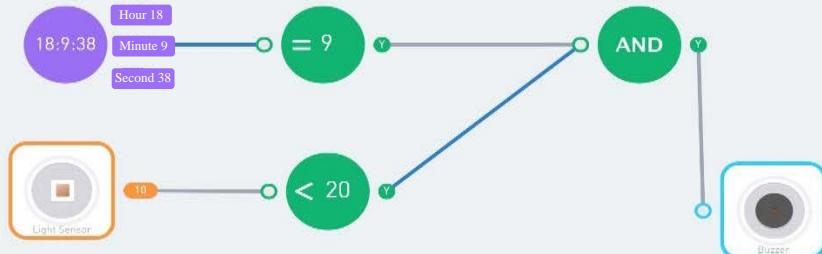
**Work Process**







➤ Demonstration for online programming



### Tips

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- ✓ Neuron APP Software version: 1.3.2

## Name of Work: Plant Guard



Designer: Zhang Jilong



QR code for video

Difficulty: Intermediate

Time: 30 Minutes

### Lesson Description:

Make use of the conductivity of the touch switch and use the Neuron APP programming function to make an alarm system. When the system is triggered, the buzzer makes alarming sounds and the LED flashes.

Video Link: <http://static.education.makeblock.com/VisualizedDoorbellSystem.mp4>

## Teaching Procedure



### Objectives:

1. Know and learn how to use touch switch.
2. Make an alarm system.

### Teaching Process:

Step 1: Exploring "How to Protect Plants from being Destroyed by Little Animals"

Step 2: Through self-study, the students learn the knowledge covered in this lesson, such as Neuron modules and software nodes.

Step 3: Show the sample finished work and explain the modules and nodes. Provide necessary materials.

Step 5: After discussions and observing the sample finished work, start making an alarm system.

Step 6: Share works with each other.



## Thinking after Class

➤ **Review on Key Points:**

1. The use and principle of touch switch.
2. Alarm system

➤ **Improvement and Optimization:**

Can you make an anti-theft system for your own room?

## List of Materials



Module List

Name	Qty.	Unit
Power supply	1	PCS
Bluetooth module	1	PCS
Touch switch (four control buttons)	1	PCS
RGB light	1	PCS
Buzzer	1	PCS

Material List

Name	Qty.	Unit
Cardboard	1	PCS
Scissors	1	Pair

## Work Production Procedure

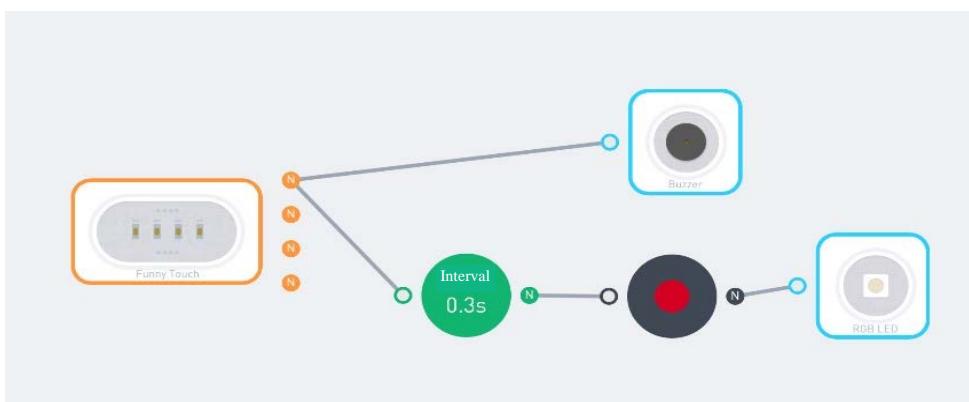


➤ Work Production Process:





➤ Demonstration for online programming



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## Name of Work: Visual Door Remote Control System✿

**Difficulty:** Advanced

**Time:** 30 Minutes



Video Link: <http://education.makeblock.com/zh-hans/resource/neuron-kskmx/>

### Lesson Description:

The doorbell is ringing. Who's this? Do you want to open the door? Use remote identification to see who the visitor is, and then decide whether you want to open the door (remotely) or not. By using the Neuron module, you can easily achieve the desired effects. You should try it ~

### Teaching Procedure



#### Contents:

Create works using the Neuron's electronic modules: 1) The gyro senses whether someone is knocking on the door outside; 2) The servo module controls the angle of the servo plate; 3) The camera can take photos and transfer photos in real time; 4) WIFI connects home network to the camera module.

Use Neuron APP to achieve the functions of the work: 1) online adjustment of the servo angle accurately, so that the doors can be opened and closed smoothly; 2) IoT to remotely control the door opening; 3) Customize the time interval to take photos;

#### Step1: Inspire

The teacher can play videos or show the sample finished works to the students; the students observe the sample and think: imagine the convenience that the smart home system can bring to our lives~

#### Step2: Thinking

What modules does this work use? Which effects have these modules achieved respectively?

#### Step3: Make and Tinker

What materials do we need for this work? The functions of the modules need continuous debugging to achieve the best results;

#### Step 4: Programming

Use the Neuron APP for online programming; try using nodes, such as IoT and others;

#### Step5: Test and Share

The work is completed, share your experience and skills, show your work to others, and let more people witness your creativity!



### Thinking after Class

➤ **Review on Key Points:**

1. Use of WIFI and camera module;
2. Use for IoT.

➤ **Improvement and Optimization:**

1. How about adding a buzzer module?

### List of Materials



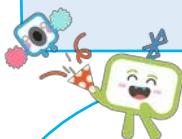
Module List

Name	Qty.	Unit
Power supply	1	PCS
WIFI	1	PCS
Camera	1	PCS
Gyroscope	1	PCS
Dual servo-driver	1	PCS
Servo kit	1	Kit
Connection cable 20CM	1	PCS
USB cable	1	PCS
Magnetic board	5	PCS
Plug	1	Pack

Material List

Name	Qty.	Unit
House-based model of house	1	PCS
Ice cream stick	1	PCS
Transparent double-sided tape	2	Roll
Double-sided tape	1	Roll
Colored marker (black)	1	PCS
Color cardboard	1	PCS

## Work Production Procedure



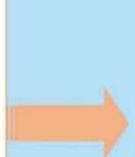
### ➤ Work Production Process:

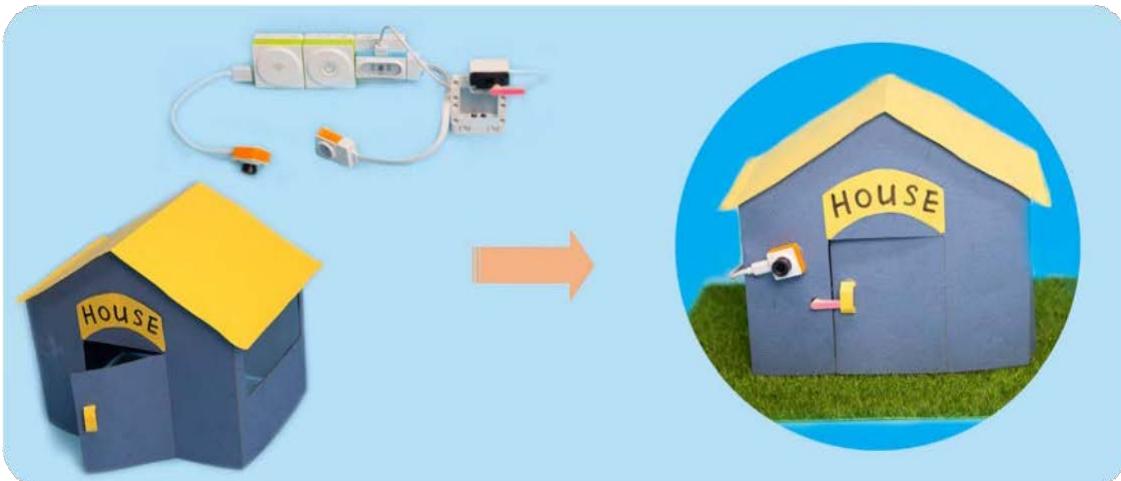


**Work Process**

Module List

Name	Qty.	Unit
Power supply	1	PCS
WIFI	1	PCS
Camera	1	PCS
Gyroscope	1	PCS
Dual servo-driver	1	PCS
Servo kit	1	Kit
Connection cable 20CM	1	PCS
USB cable	1	PCS
Magnetic board	5	PCS
Plug	1	Pack





➤ Demonstration for online programming



**Tips**

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- ✓ Neuron APP Software version: 1.3.2

## Glowing and Sounding Cottage

Teacher:	Grade: 4	Time: 1 Hour:
<b>Unit Title:</b> Glowing and sounding cottage	<b>Essential Standards:</b>  <b>4-PS3-2.</b> Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.  <b>4-PS3-4.</b> Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.	
<b>Objectives:</b> After this lesson, the students will know how to use Neuron modules; understand the working principle of human infrared sensors, LED drivers and other modules; learn to collaboratively work with others; and be able to use Neuron modules to make their own works.		
<b>Student Group:</b> Group work, pair work		
Materials/Resources		Essential Vocabulary
<b>Teacher:</b> Neuron, materials, PPT, worksheets	<b>Student:</b> Neuron, materials	Electricity, light energy, sound energy, human Infrared sensors, remote control, programming, and cooperative learning
<b>Learning Experience</b>		
Inquiry Based Learning:  <input type="checkbox"/> Use of the 5 E Lesson format Learner-centered instruction <input type="checkbox"/> Use of scientific investigation, problem Solving or engineering design <input type="checkbox"/> Hands on- minds on instructional strategies <input type="checkbox"/> Use of Process skills in context-predict, observe, measure, classify, infer, communicate	<p><b>Engage: Activating Strategy/Hook (Observation)</b></p> <ul style="list-style-type: none"> <li>The teacher introduces the Christmas stories; wait for the Christmas gifts from Neuron and think how to decorate the Christmas cottage.</li> <li>The teacher show the students the Christmas cottage made by him (a smart cottage that can sense lights and have a doorbell.)</li> <li>The students have 3 minutes to take a close look at the smart cottage, as well as all Neuron modules used, etc.</li> <li>The students observe and explore the function of each neuron module</li> <li>The teacher will explain the function of each neuron module in detail</li> </ul> <p><b>Explore: Learning Experiences (Thinking)</b></p> <ul style="list-style-type: none"> <li>The teacher distributes Form 1 and explains what needs to be filled up</li> <li>The students work in pairs to design a structure to achieve all functions of the Neuron. At this time, the teacher needs to guide the students regarding how to learn collaboratively and share work duties. (For example: one person acts as a structure builder and the other a tester)</li> </ul>	

<input type="checkbox"/> Peer Discussion–scientific arguments and explanations <input type="checkbox"/> Use appropriate tools accurately <input type="checkbox"/> Focus on detail-precision & accuracy in observations and measurements <input type="checkbox"/> Use of collaboration for learning	<ul style="list-style-type: none"> <li>The students have 8 minutes to build the structure according to their design (remind the students to consider time spent and materials to be used during the design process)</li> <li>The students have 2 minutes to report to the teacher regarding their final design (according to Form 1)</li> </ul>	
	<p><b>Explain: Learning Experiences</b> (Actual practice + immediate direction)</p> <ul style="list-style-type: none"> <li>The students have 30 minutes to build the structure according to their design</li> <li>The students should report any problem immediately</li> <li>The teacher will walk around the classroom and provide help and guidance as required</li> </ul>	
	<p><b>Elaborate: Extending &amp; Defining</b> (Communication and share)</p> <ul style="list-style-type: none"> <li>The teacher distributes Form 2. The students have 3 minutes to report their works based on the four key points</li> <li>The students have 5 minutes to show their works</li> </ul>	
	<p><b>Evaluate: Summarizing Strategy</b> (Summary)</p> <ul style="list-style-type: none"> <li>The students conduct self-evaluation (allow the students to evaluate their own works and the entire process, from personal perspective and team perspective.)</li> <li>The teacher evaluates according to the process and results (there is a corresponding evaluation form)</li> <li>Review what learned</li> </ul>	
<b>Differentiation Strategies</b>		
<b>Extension</b>	<b>Intervention</b>	<b>Language Development</b>
Adding programming contents	Simplify the structure	The names of the Neuron modules
<b>Assessment(s) :</b>		
<b>Teacher Reflection:</b>		

## Explore the impact of different materials on sound emissions

### Lesson Description:

With the knowledge of the topic and under teacher's guidance:Explore the sounds around you; Use NEURON sensor to obtain test results; Learn to record statistic data in tables, and analyze the data and make conclusion;

### Objectives:

Level: Elementary School (10-12 Years Old)

Difficulty: Intermediate

Time: 50 Minutes

### List of Materials:

- ✓ NEURON Modules
  - ♦Power 2PCS
  - ♦Knob
  - ♦Button
  - ♦Sound Sensor
  - ♦Buzzer
  - ♦Display
- ✓ Files
  - ♦Teacher guide PPT
  - ♦Test tool model
  - ♦Student worksheet
- ✓ Attachments and files
  - ♦Computers
  - ♦Sound files
  - ♦Product videos

### Teaching Process:

#### STEP 1: Preparation (3 mins)

1. Teacher's self-introduction, getting to know each other, and be familiar with the environment;  
*The teacher and the students getting to know each other;*
2. Classroom Rules;  
*Such as: raising hands to answer questions, friendly sharing materials, etc;*

#### STEP 2: Lesson Description (10 mins)

1. Have you been listening to the sounds around you?  
*Have we been paying attention to various sounds around us? Listen carefully to the sounds surrounding us;*
2. Guess what you've heard (play audio);
  - 1) Distribute worksheets
  - 2) Play audio for various sounds
3. Objectives: Explore the impact of different materials on sound reflection;

#### STEP3: Learning (10 mins)

1. Provide directions via scenarios, introducing the students into the lesson;  
*When we shout in an empty room we can hear the echo, but if the room is filled with furniture we couldn't hear any echo. Why?*
2. Learn the offline mode of NEURON;
  - 1) Distribute Knob, Buzzer, Power (2 PCS);
  - 2) Learn to make the Buzzer sound as shown in the PPT;
  - 3) Provide Sound Sensor and display, and learn how to use them

*The teachers can refer to the guidance PPT*

**STEP 4:** Exploration (10 mins)

1. Raising Questions;

*Do materials have any effect on the echo? What material has a greater impact on the echo?*

*The teachers can refer to the guidance PPT*

2. Making Assumptions;

*Based on existing materials, make assumptions about the degree of influence of the materials on sound reflection*

*The teachers can refer to the guidance PPT*

3. Making Plans;

*Use the tools provided by the teachers to make plans.*

4. Recording Data;

*Record the actual data measured.*

5. Processing Information and Reach Conclusions

*Perform group discussion and reach conclusion regarding the data measured.*

**STEP 5:** Share (5 mins)

1. What conclusions have you reached from the experiments?
2. What fun features have you found in this lesson?
3. Can you repeat these experiments using the materials of this lesson?

**STEP 6:** Finishing (2 mins)

1. Organize the modules
2. Clean up desks

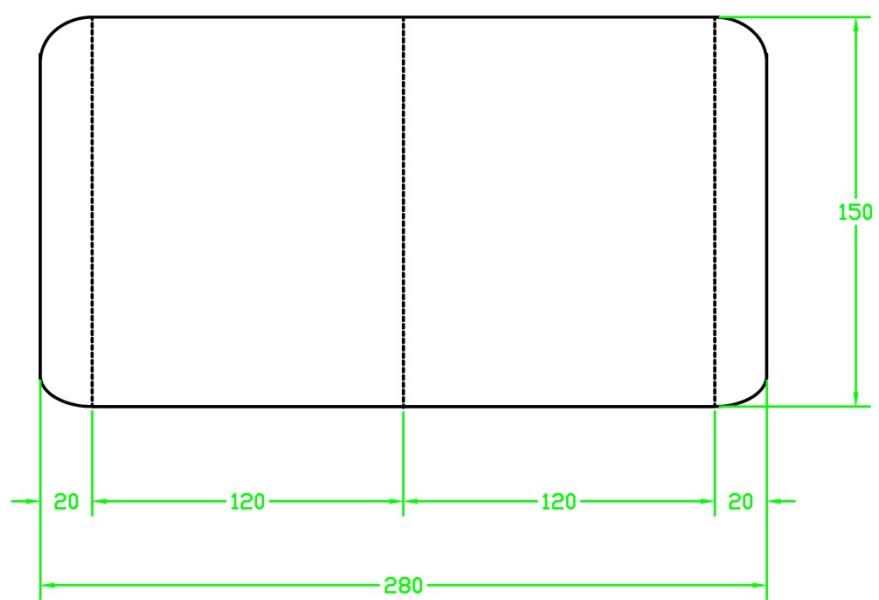
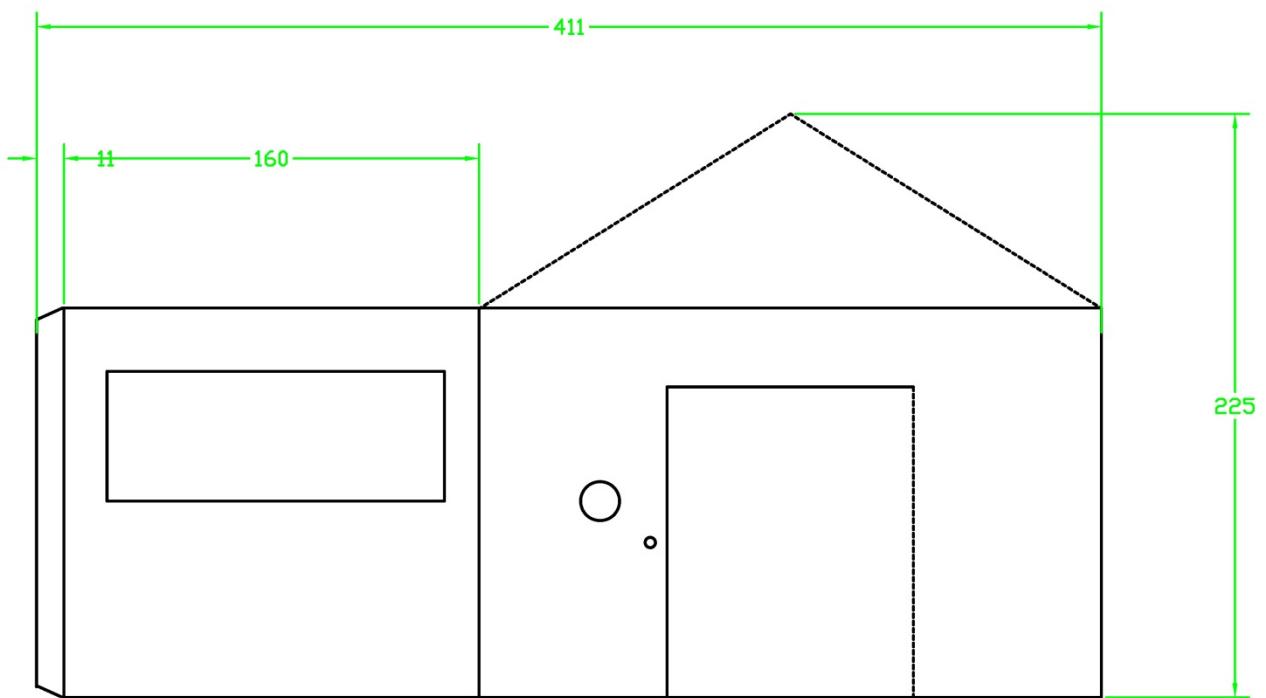
## V. Patterns of Paper-Based Models:

The followings are the paper-based models for your reference: If 1:1 originally sized paper-based models are required, please download from website <http://education.makeblock.com/>

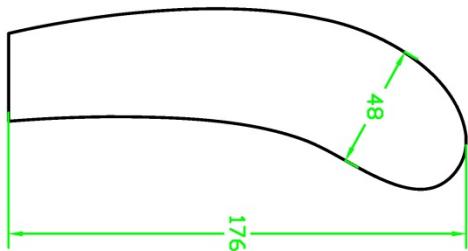
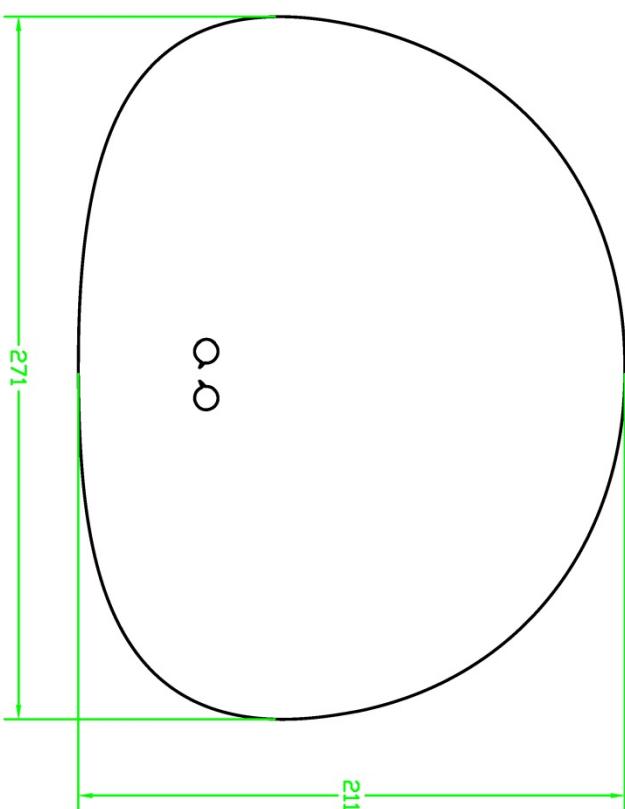
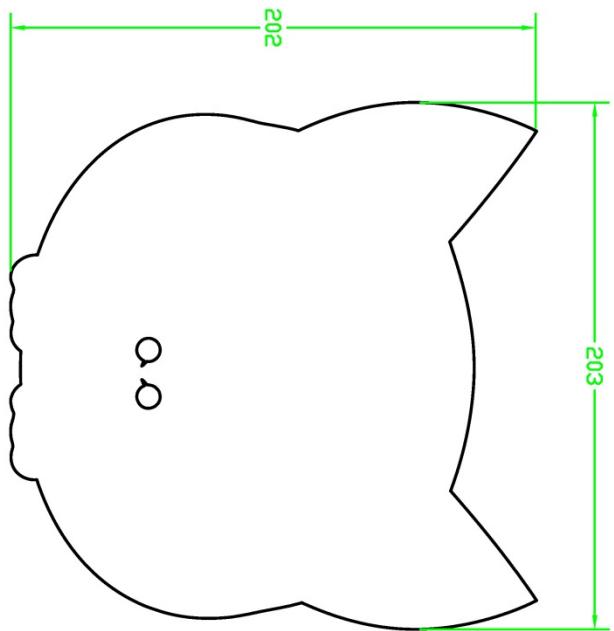
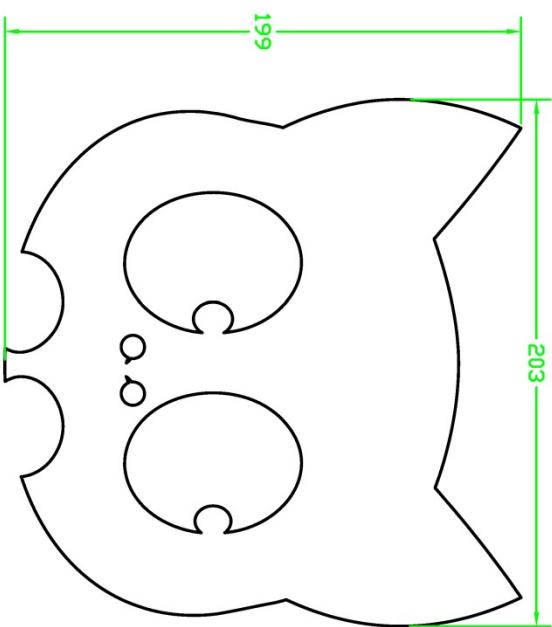
### Existing Paper-Based Models:

- House
- Copycat
- Carrot
- Rotating Face-Changing
- Pill Box
- Safe Box
- Smart Watering
- Plant Guard
- Thermometer
- Quite Zone Reminding Sign
- Penguin & Iceberg
- Toy Car
- Auto-Adjustable Clothes Drying Rack

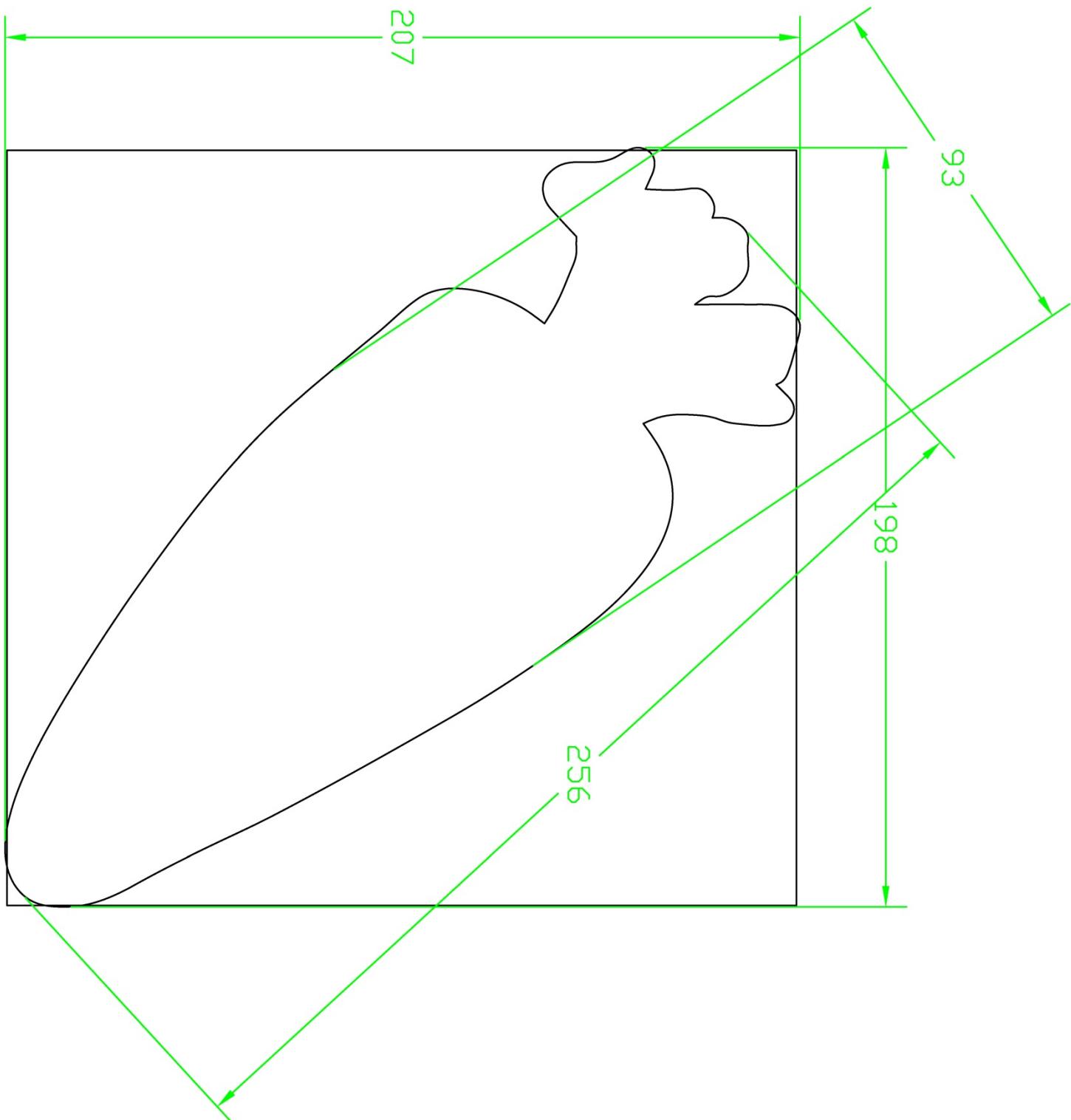
# House



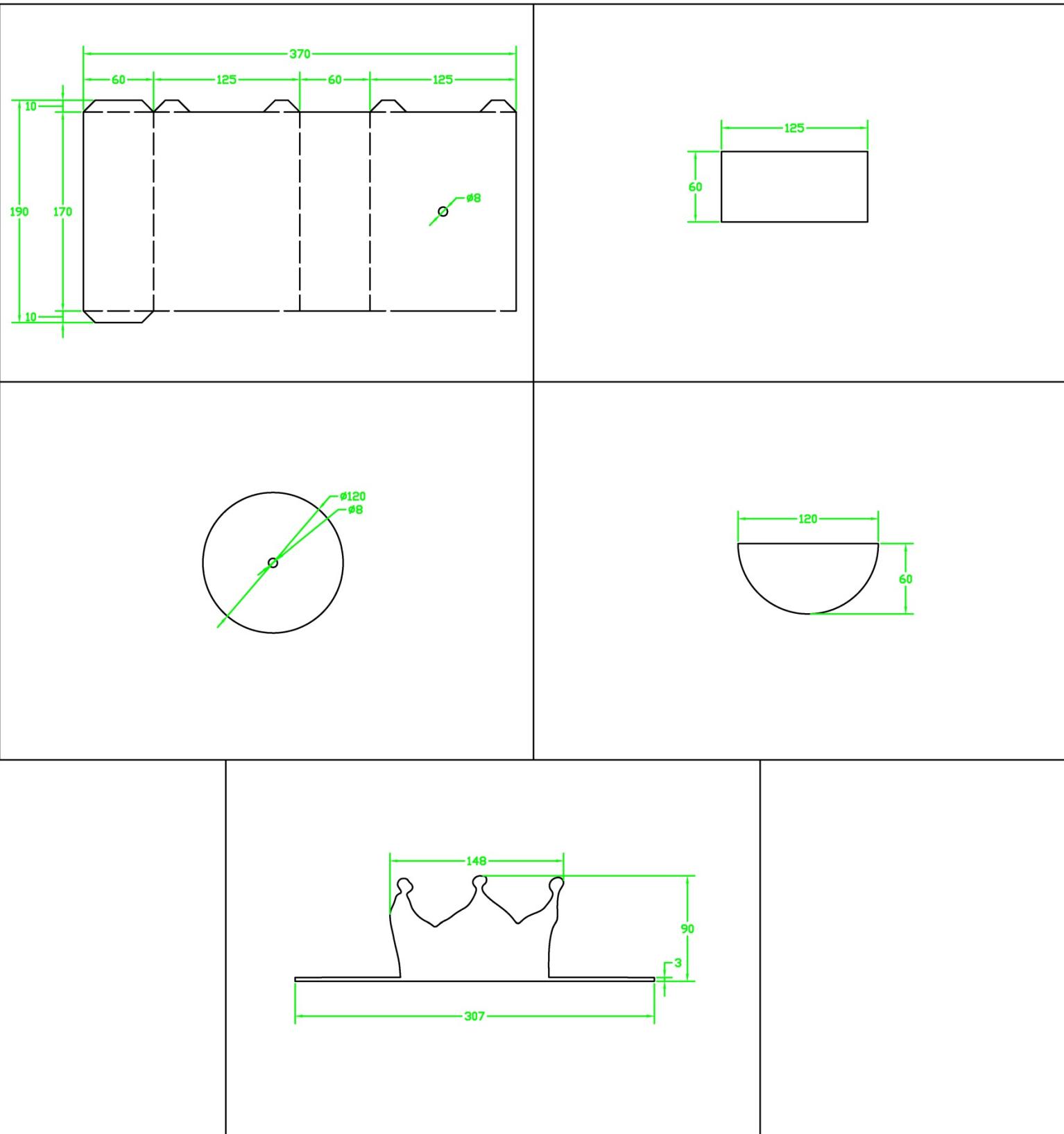
Copycat



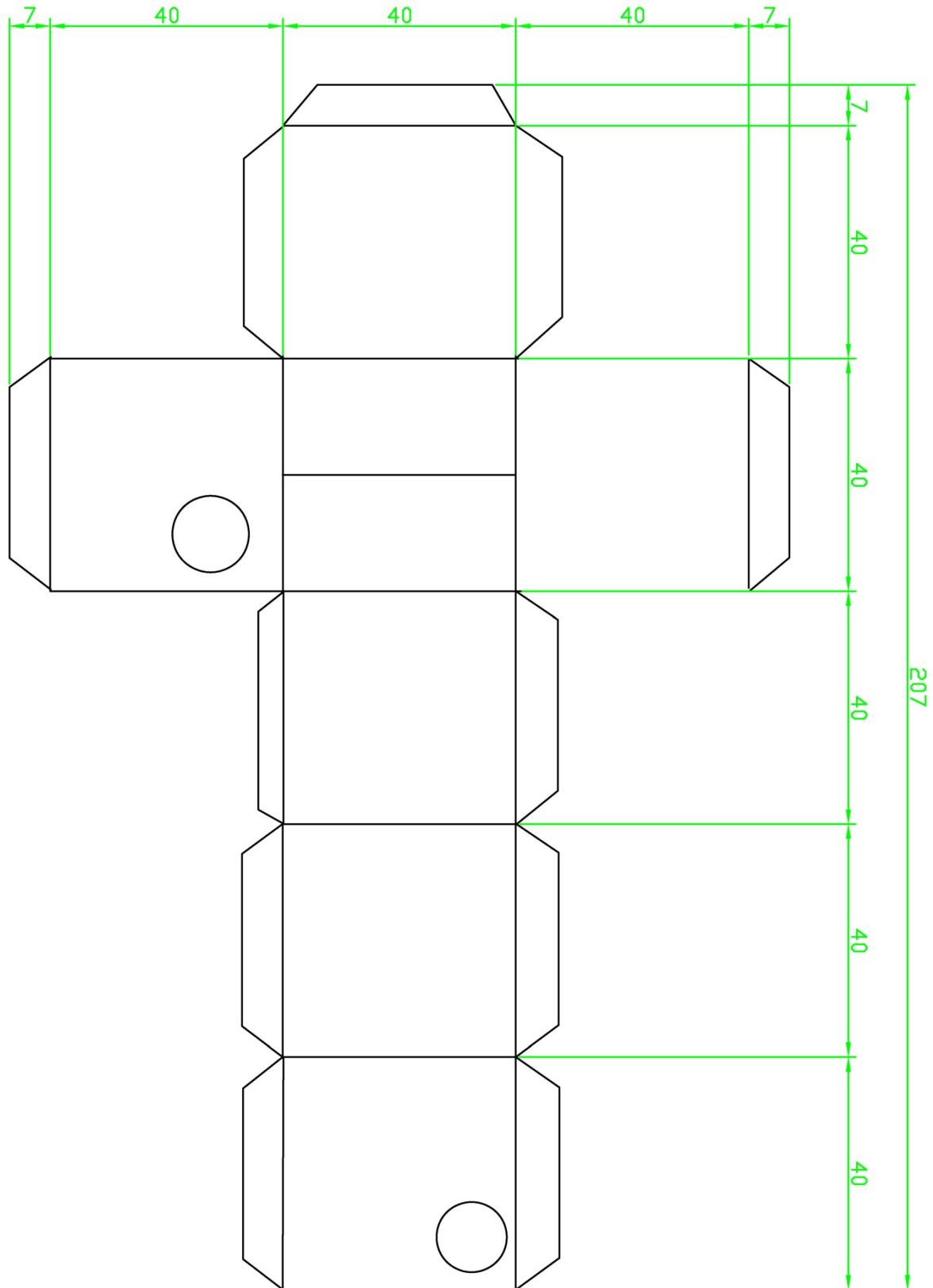
# Carrot



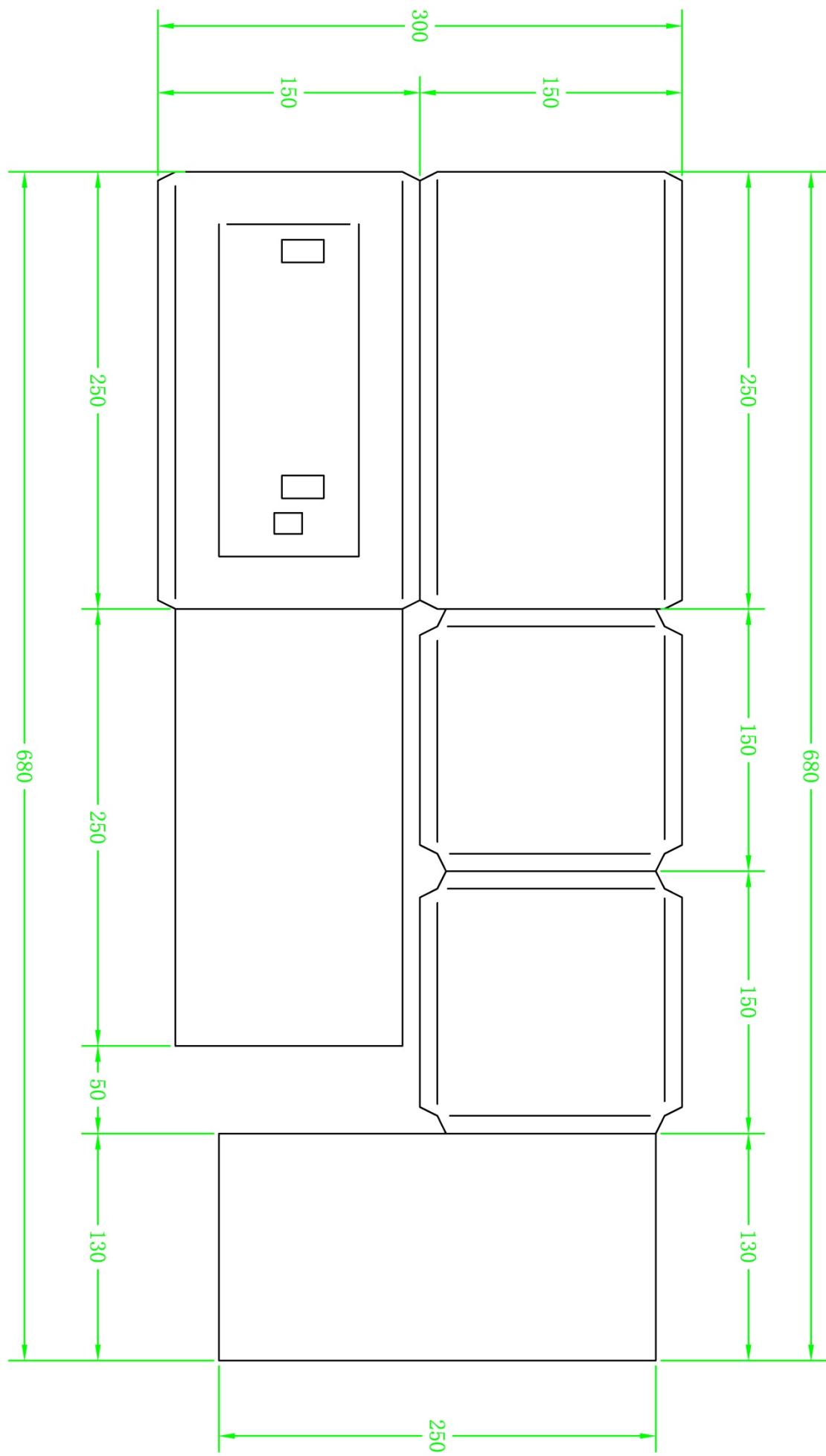
## Rotating Face-Changing



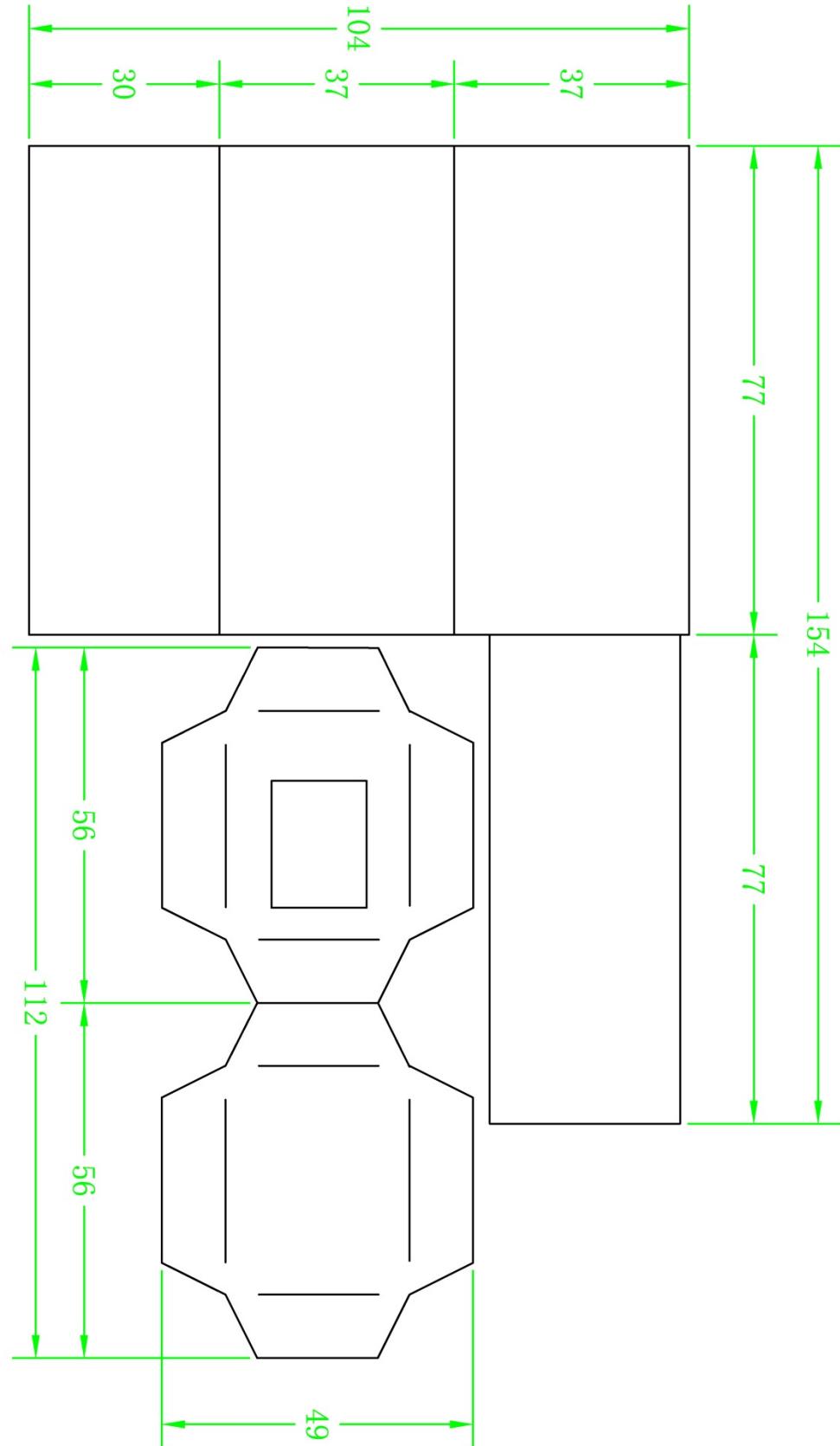
# Pill Box



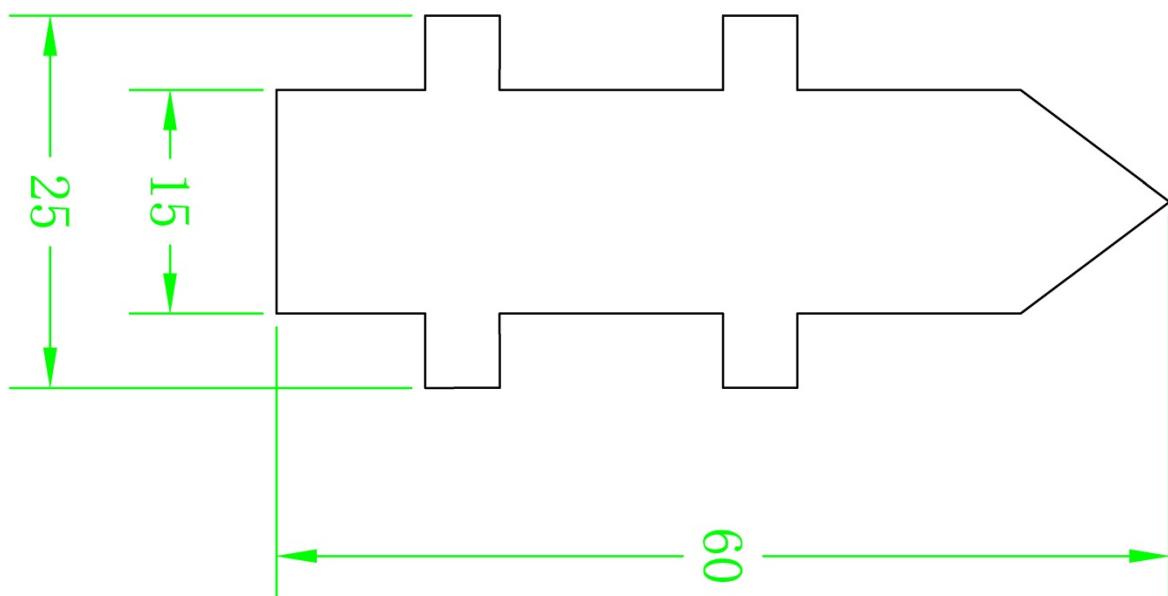
# Safe Box



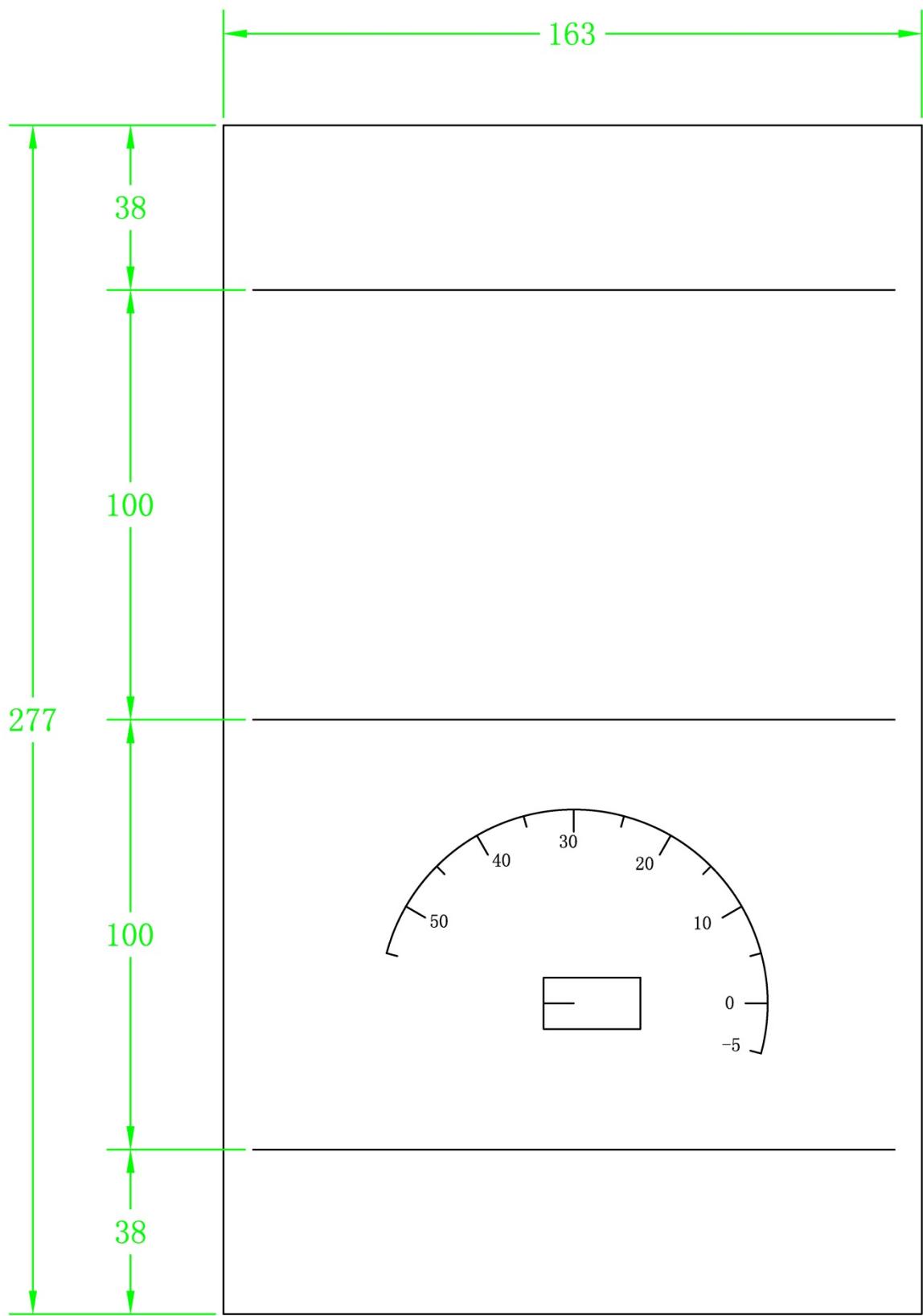
# Smart Watering



# Plant Guard

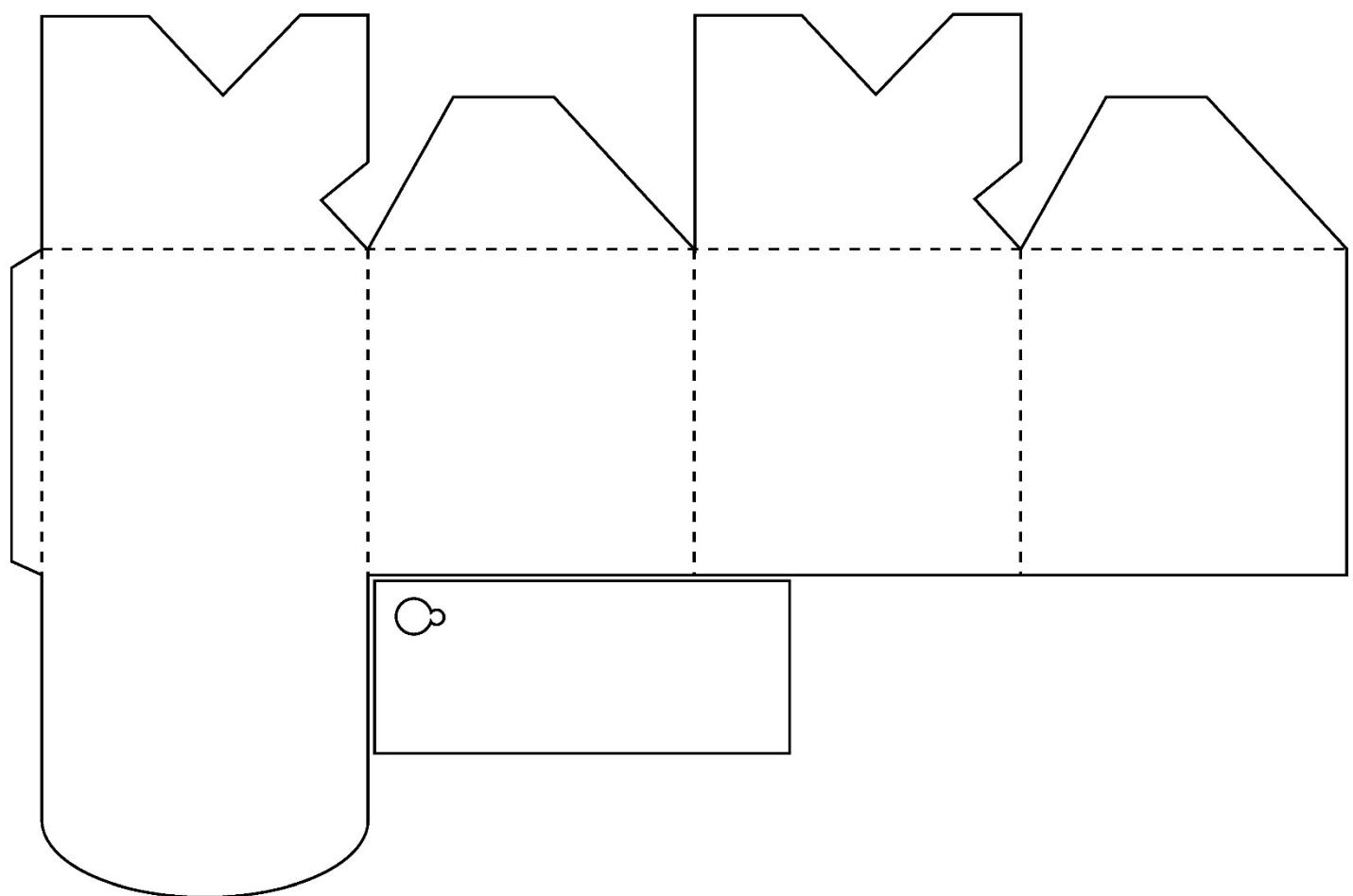


# Thermometer



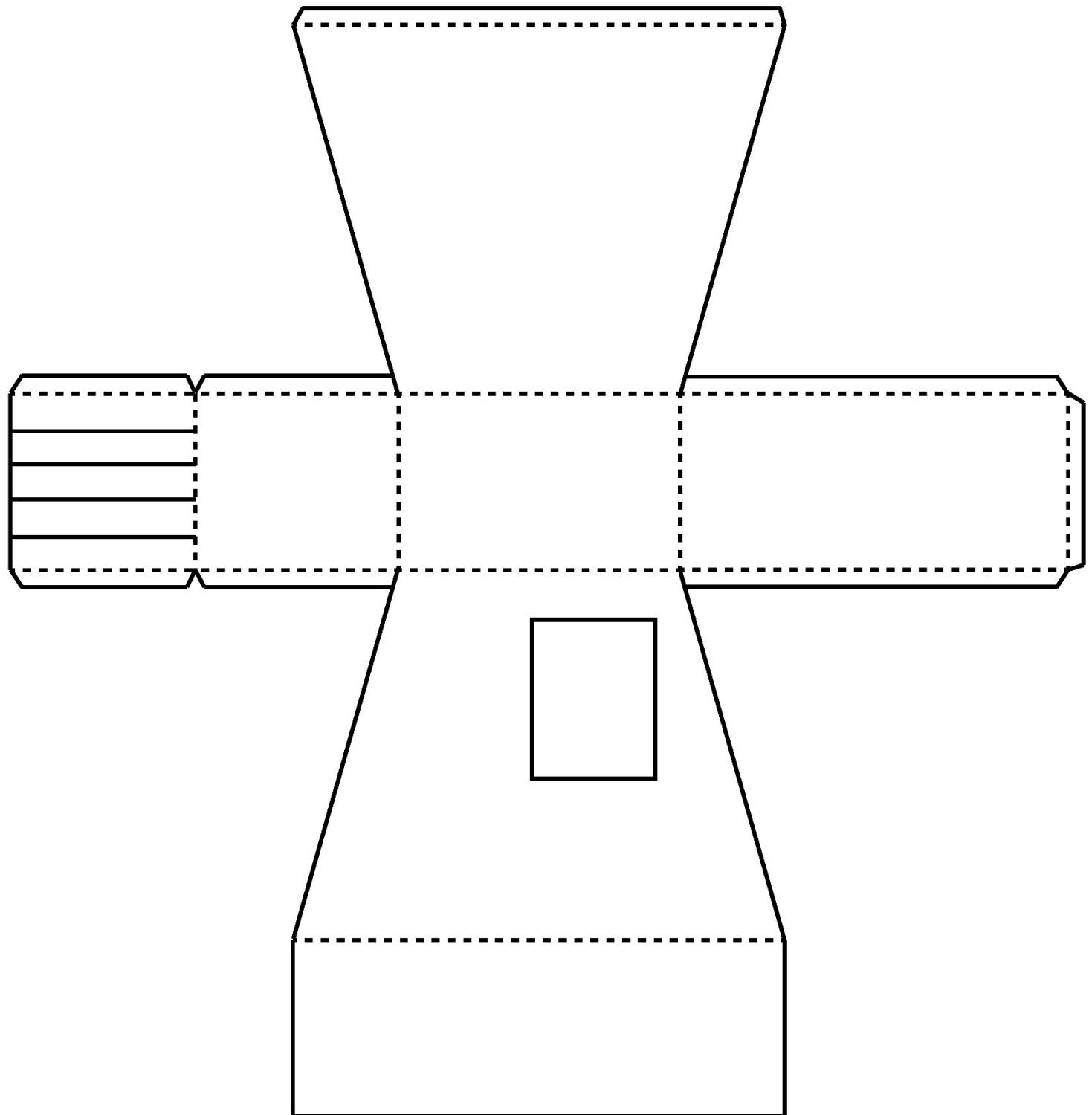
Reminder

Size: 450\*298mm



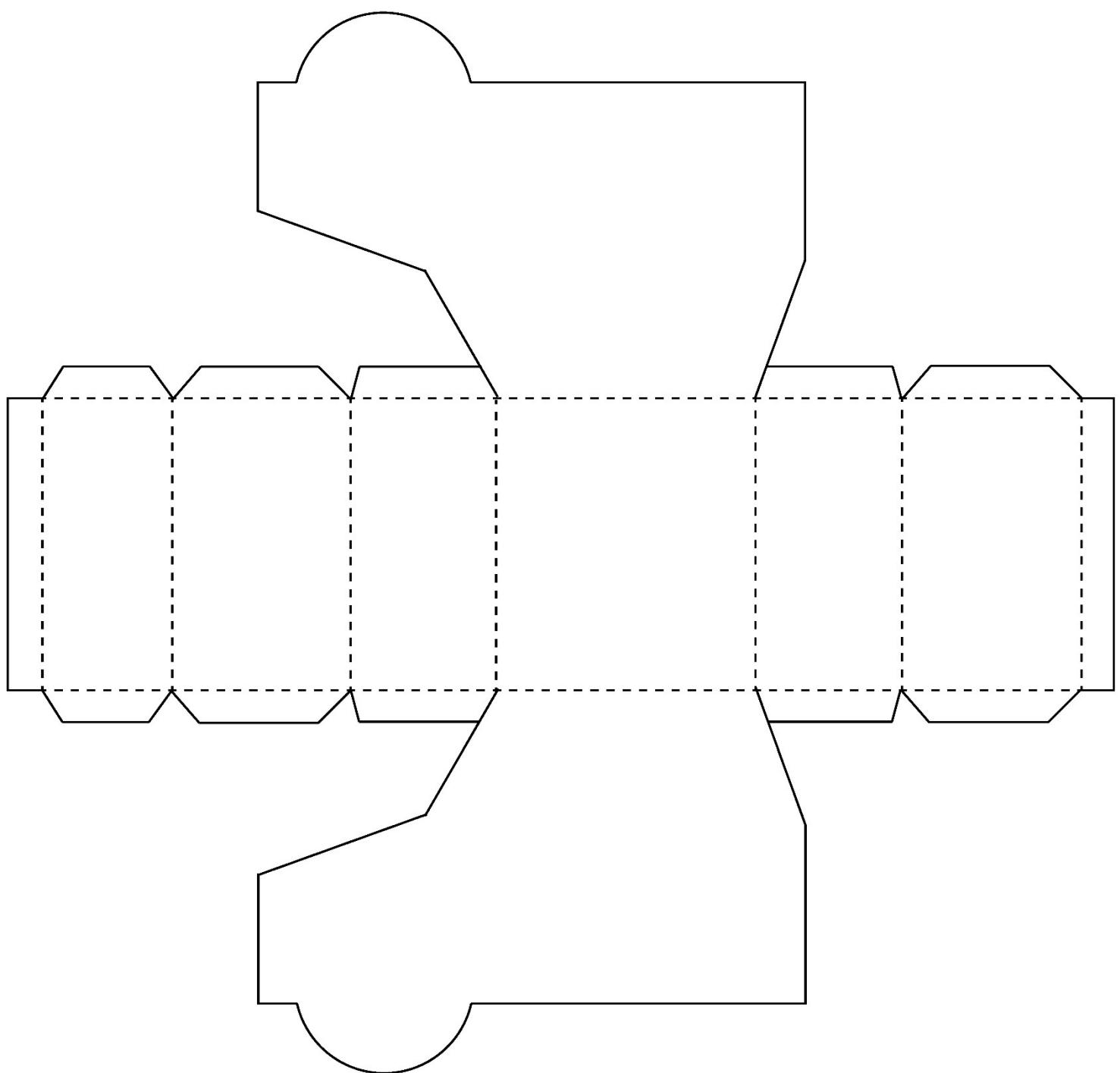
Penguin & Iceberg

Size: 609\*629mm



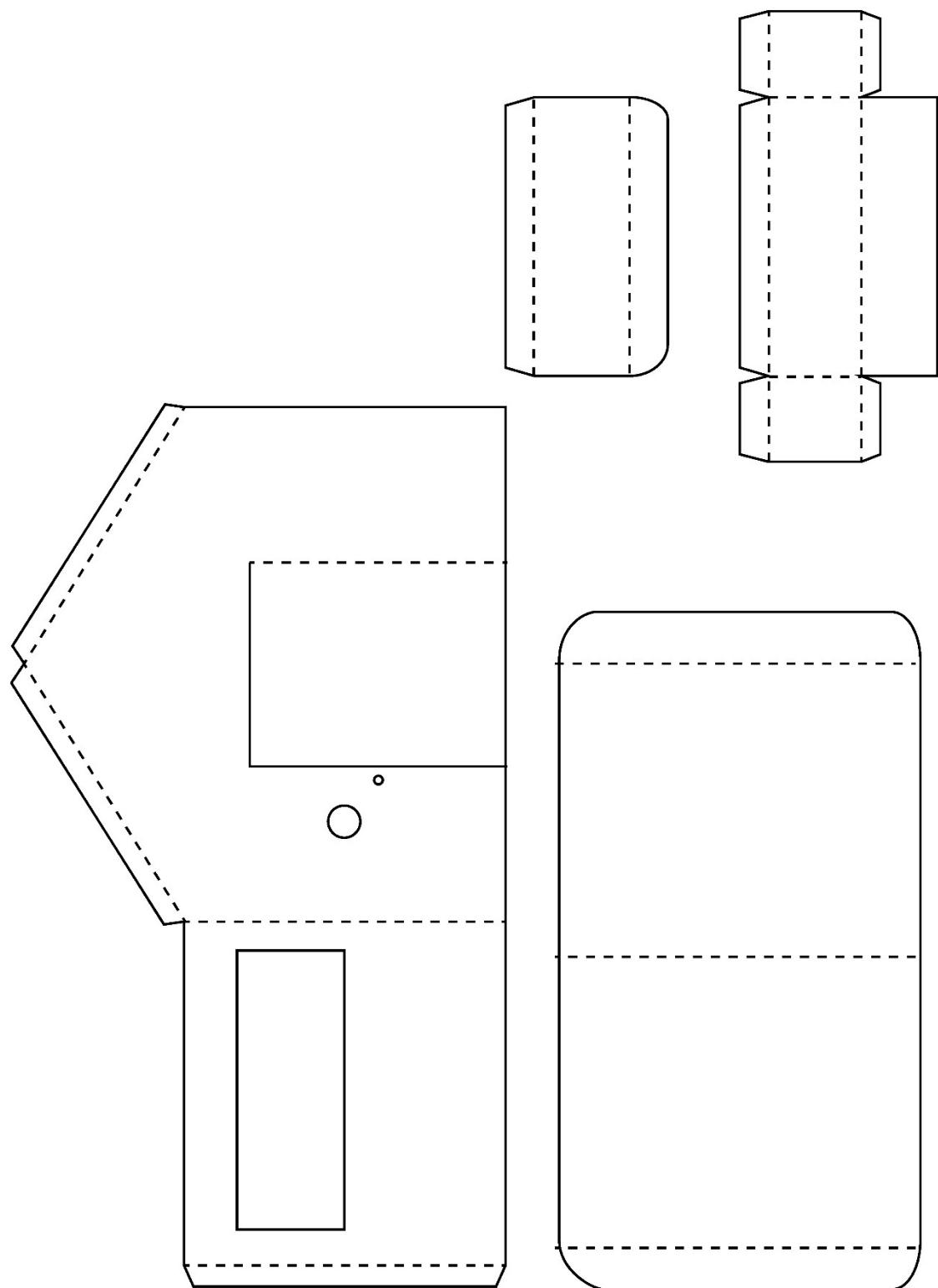
# Toy Car

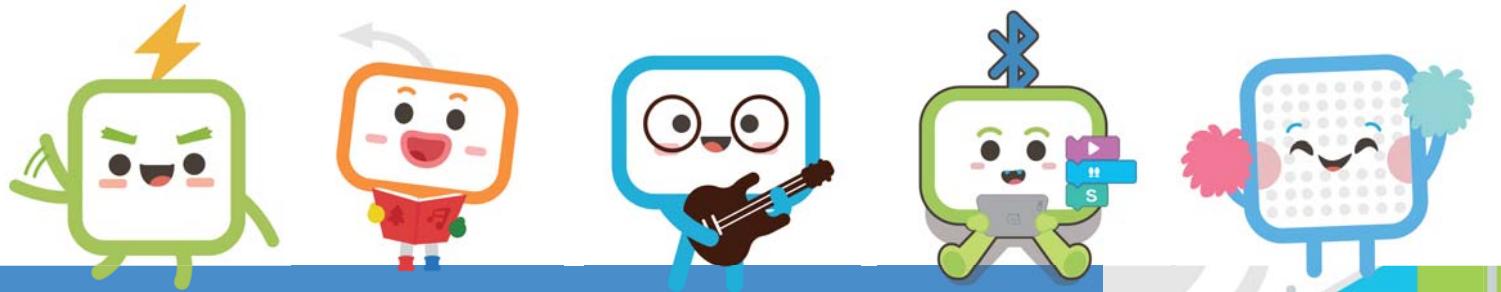
Size: 341\*327mm



# House and Balcony

Size: 595.5\*431.5mm





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