Rewise
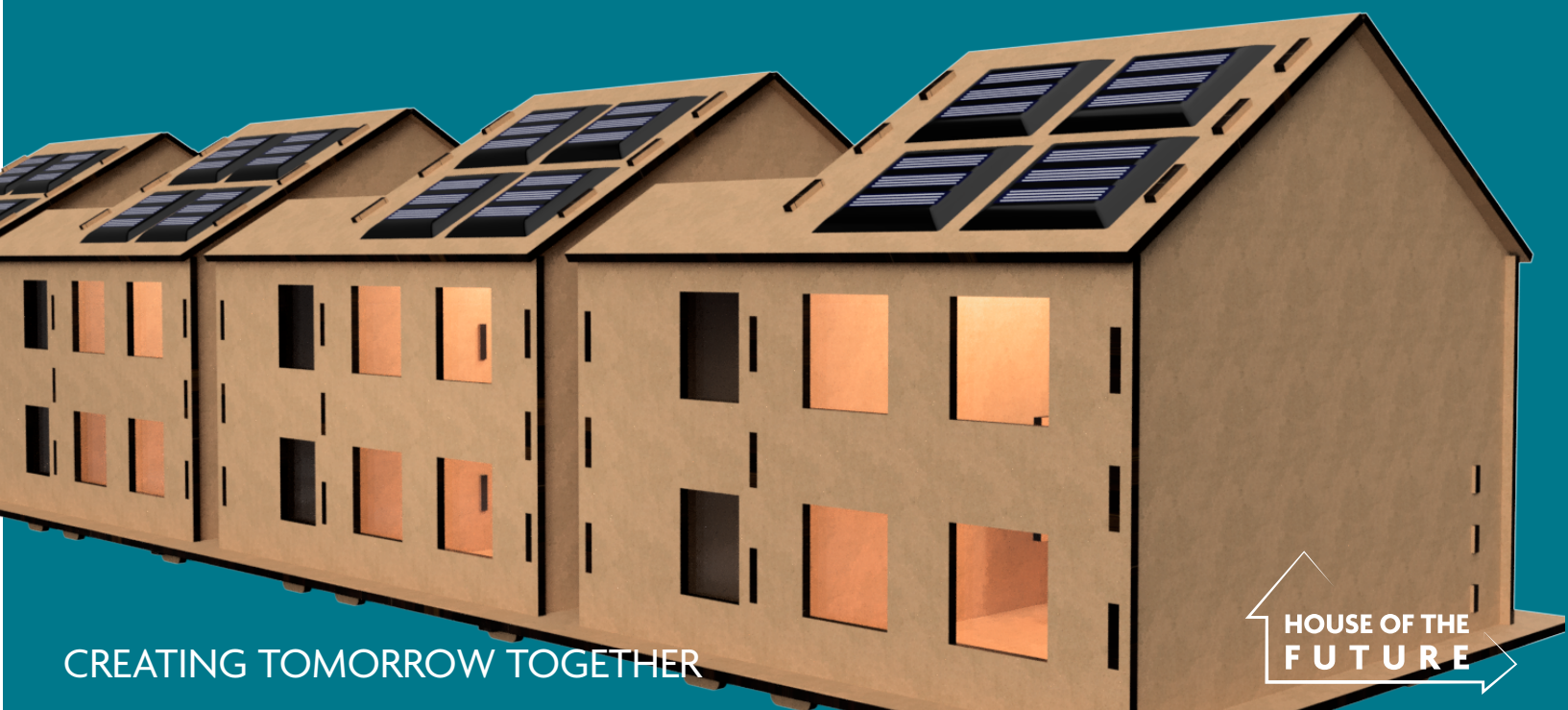
Wates

House of the Future
Workshop Booklet

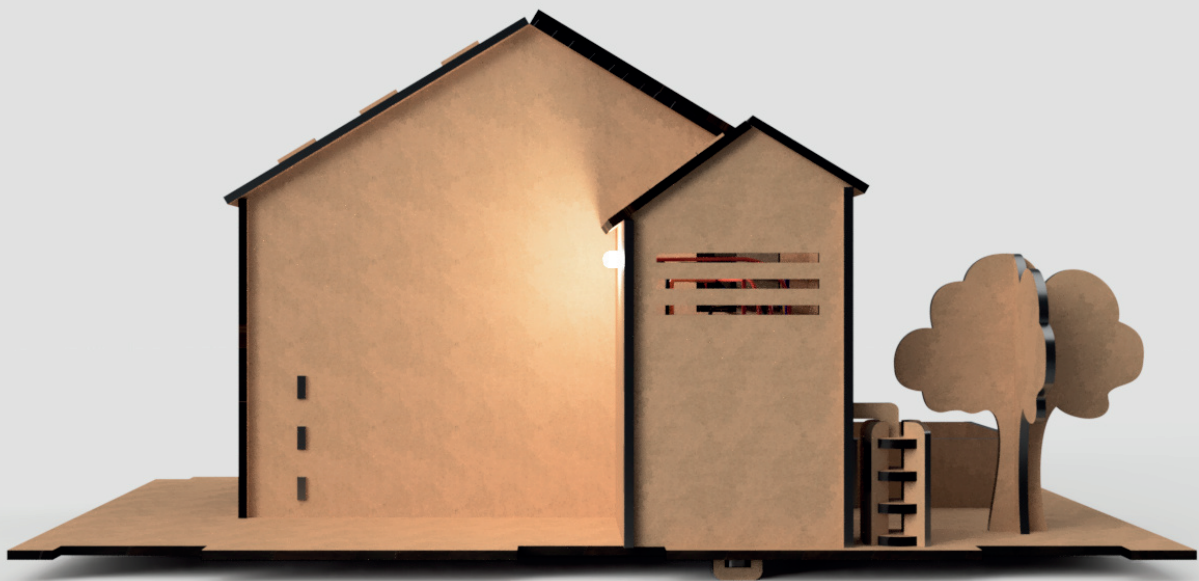CREATING TOMORROW TOGETHER

HOUSE OF THE
FUTURE

WHAT IS HOUSE OF THE FUTURE?

WHAT IS HOUSE OF THE FUTURE?

About Project

Rewise Learning has teamed up with The Wates Group to devise a unique new educational outreach project focusing on developing STEM skills in young people and using STEM subjects to solve critical environmental problems such as climate change, global warming, maintaining biodiversity and achieving NET zero emissions.

About Wates

Wates Residential is one of the UKs leading housing developers. Operating across London and the South, the business works with local authority and housing association partners to build more and better quality homes. This is driven by a shared vision that everyone deserves a great place to live.

HOUSE OF THE FUTURE FEATURES:
WATES HOUSE VS REWISE MODEL

FEATURES	WATES HOUSE	REWISE MODEL
Solar Panels	≈ Average of 2.6kw per home ≈ Energy is stored in a battery ≈ Stored energy can be used at peak times ≈ Surplus energy can be sold back to the grid ≈ 550kw of power generation across whole development	≈ Solar energy produced will be stored within the power bank ≈ Energy produced can be used to power the model house itself and/or a USB device, such as a mobile phone or tablet
Ground Source Heat Pump	≈ A ground source heat pump is a renewable heating system that extracts low-temperature solar energy stored in the ground or water using buried pipework and compresses this energy into a higher temperature. A ground source heat pump provides a building with 100% of its heating and hot water all year round. ≈ Communal 200 metre borehole to provide hot water and thermal stores	≈ Engraved pipework on the side of the house to show how the heating/plumbing works.
Battery Storage and EV Charger	≈ 5kw Lithium ion battery ≈ Power can be stored from solar panels and the grid, to be used when required ≈ Surplus power can be sold back to the grid ≈ 1mw of storage across the development	≈ 5v power bank ≈ Stored power can be used to charge/power usb devices
Phone App	≈ Every home has a Intelligent Energy System (IES) ≈ Allows residents to control and monitor their energy usage ≈ App can be used to control the thermostat	≈ House of the Future app is used to control the lights, 'heating' and temperature within the model ≈ Red lights are used to imitate the effect of heating systems
Modular Design	≈ Air tight and well insulated ≈ Band A EPC (Energy Performance Rating) ≈ Electric energy elements so the homes are not required to connect with mainline gas. Significantly lowering CO_2 emissions than a standard home ≈ Off-site construction limits disruption to neighbours and roads near the construction site. ≈ Predicted energy bills = £85/month compared to £220/month in a Band C EPC home. ≈ Predicted carbon footprint = 550kgCO_2eq/year compared to 51000kgCO_2eq/year in a Band C EPC home.	≈ Double layered to imitate a cavity for insulation ≈ Removable windows to showcase the heat difference with and without. Highlighting the importance of double-glazing on the Wates House

FEATURE QUIZ

USING THE TABLE ON PREVIOUS PAGE, FIND THE ANSWERS TO THE QUESTIONS BELOW.

1. As a means to combat against climate change, how many KW of renewable energy is Wates producing through solar panels?

_____

2. How can homeowners of the house of the future make money back with their energy?

_____

_____

3. Rising fuel costs: Compared to a standard Band C EPC home, how much money will the Wates house save homeowners in predicted energy bills?

_____

_____

4. Modern methods of construction: Compared to a standard Band C EPC home, the Wates house of the future will reduce the carbon footprint kgC02eq/year by how much?

_____

_____

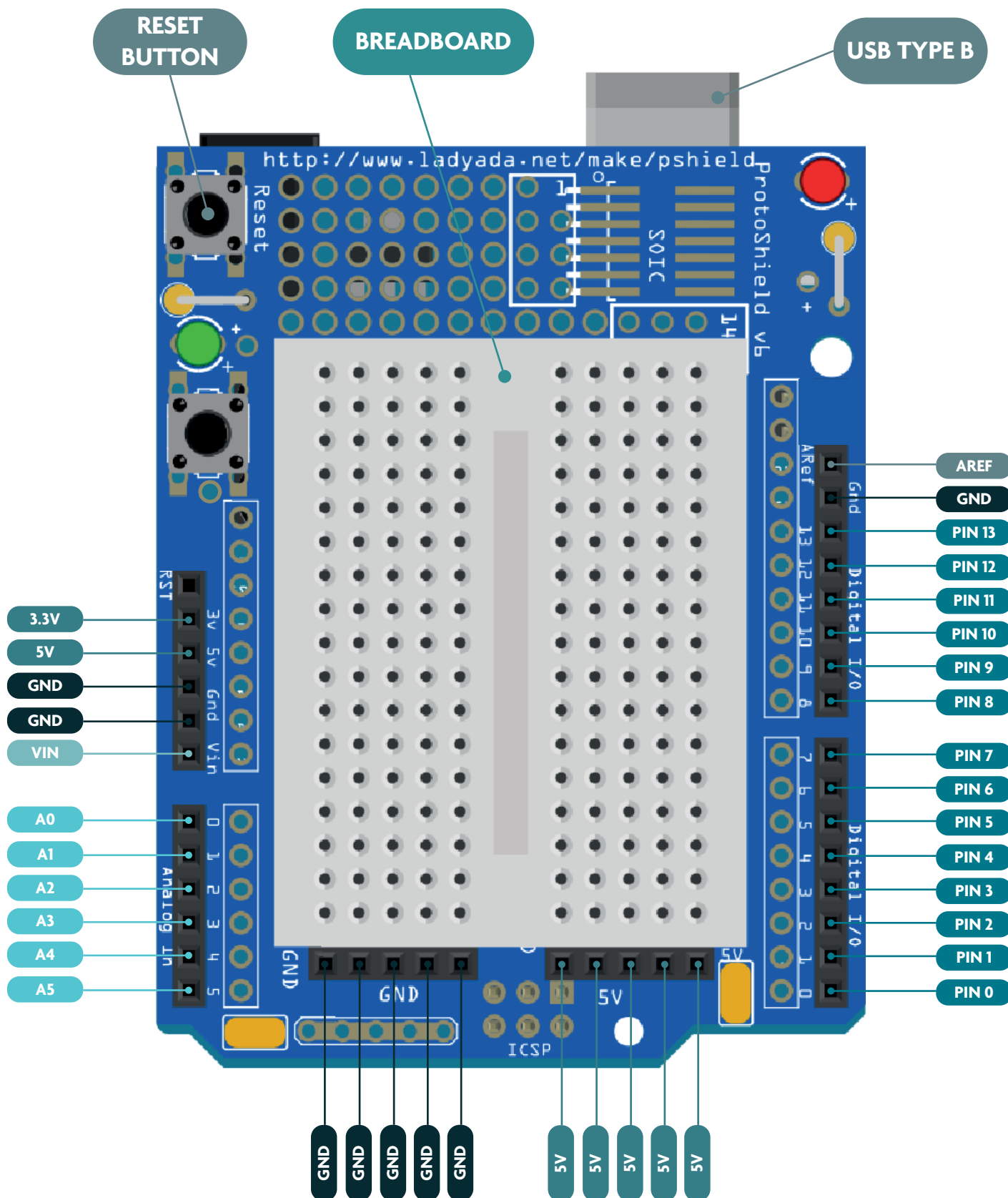**5. List the features of the app for both the Wates house and the Rewise model**

WATES HOUSE

_____

_____

REWISE MODEL

_____

_____

YOUR FUTURISTIC FEATURES

WHAT FEATURES WOULD YOU LIKE TO SEE IN THE HOUSES OF THE FUTURE?

Consider features that could save homeowners money on bills, make certain chores easier, renewable energy, features for hobbies/leisure, ect...

_____

_____

_____

_____

_____

_____

_____

_____

_____

You are free to use the space below to draw some of your ideas for futuristic features

ARDUINO UNO R3 EXPLAINED

RESET BUTTON

BREADBOARD

USB TYPE B

http://www.ladyada.net/make/pshield

ProtoShield vb

SOIC

Reset

AREF
GND
PIN 13
PIN 12
PIN 11
PIN 10
PIN 9
PIN 8

PIN 7
PIN 6
PIN 5
PIN 4
PIN 3
PIN 2
PIN 1
PIN 0

AREF
Grid
Digital I/O
Digital I/O

3.3V
5V
GND
GND
VIN

A0
A1
A2
A3
A4
A5

RST

Analog In

GND

GND

ICSP

5V

GND
GND
GND
GND
GND

5V
5V
5V
5V
5V

GND

3.3V

5V

BREADBOARD

PIN 0- PIN 13

A0- A5

Pins used to output (give) 5 volts of power

Digital Pins that can be programmed to do a certain job

Pins that can be used as an extension cable

Analogue Pins that can be programmed to do a certain job

Pin used to output (give) 3.3 volts of power

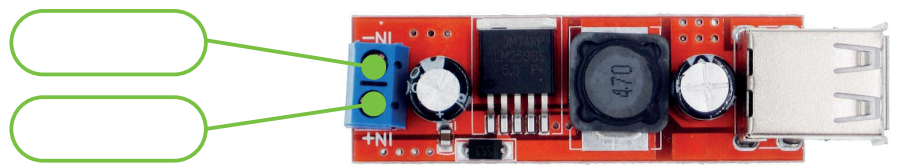Pins that provide a ground charge, can also be labelled as - or G

ARDUINO CHALLENGES

LM2596

LM2596 is a voltage regulator module. It takes voltage from one device (solar panels in our case) and regulates the output to appriopriate voltage level.
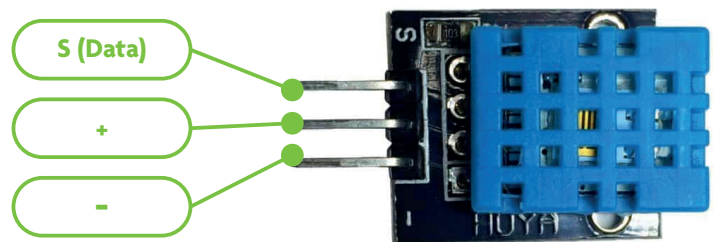
It has 2 screw-in pins.

DHT11

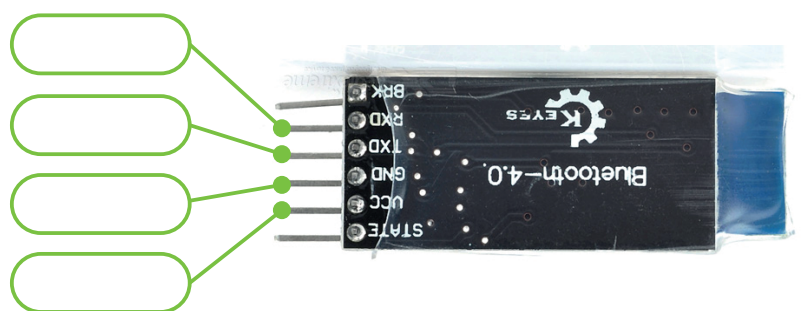DHT11 is a module dedicated to measure air temperature.

DHT11 has 3 pins.

S (Data)

+

-

HM-10

HM-10 is a receiver- transmitter module usually known as Bluetooth module. It sends data from and to Arduino and from and to mobile device in our case.
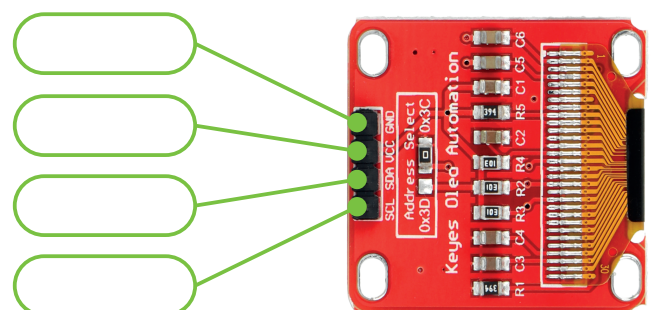
It has 6 pins, but we will only use 4.

OLED Screen

OLED Screen is responsible for displaying our data.The code, which we will write, will allow us to display temperature and voltage gathered from 1 solar panel.

OLED Screen has 4 pins.

CABLES

WITHIN YOUR STEM KITS IDENTIFY AND CATEGORISE TOGETHER THE FOLLOWING TYPES OF CABLES

Male to Female Jumper Cables x 8		Tick the box below if you found them in your kit
Male to Male Jumper Cables x8		Tick the box below if you found them in your kit
White LED cables x3		Tick the box below if you found them in your kit
Red LED cables x2		Tick the box below if you found them in your kit
USB type A to USB type B cable x1		Tick the box below if you found it in your kit

PRACTICE CONNECTIONS

Now that you are familiar with the different components follow the diagram below to connect the OLED to the Arduino Micro-Controller.

You will need to work out which type of jumper cables you need to make the connections.

VCC -> 5V

SCK-> A5

SDA-> A4

GND -> GND

0.96 OLED - Arduino

GND -> GND
VCC -> 5V
SDA -> A4
SCK -> A5
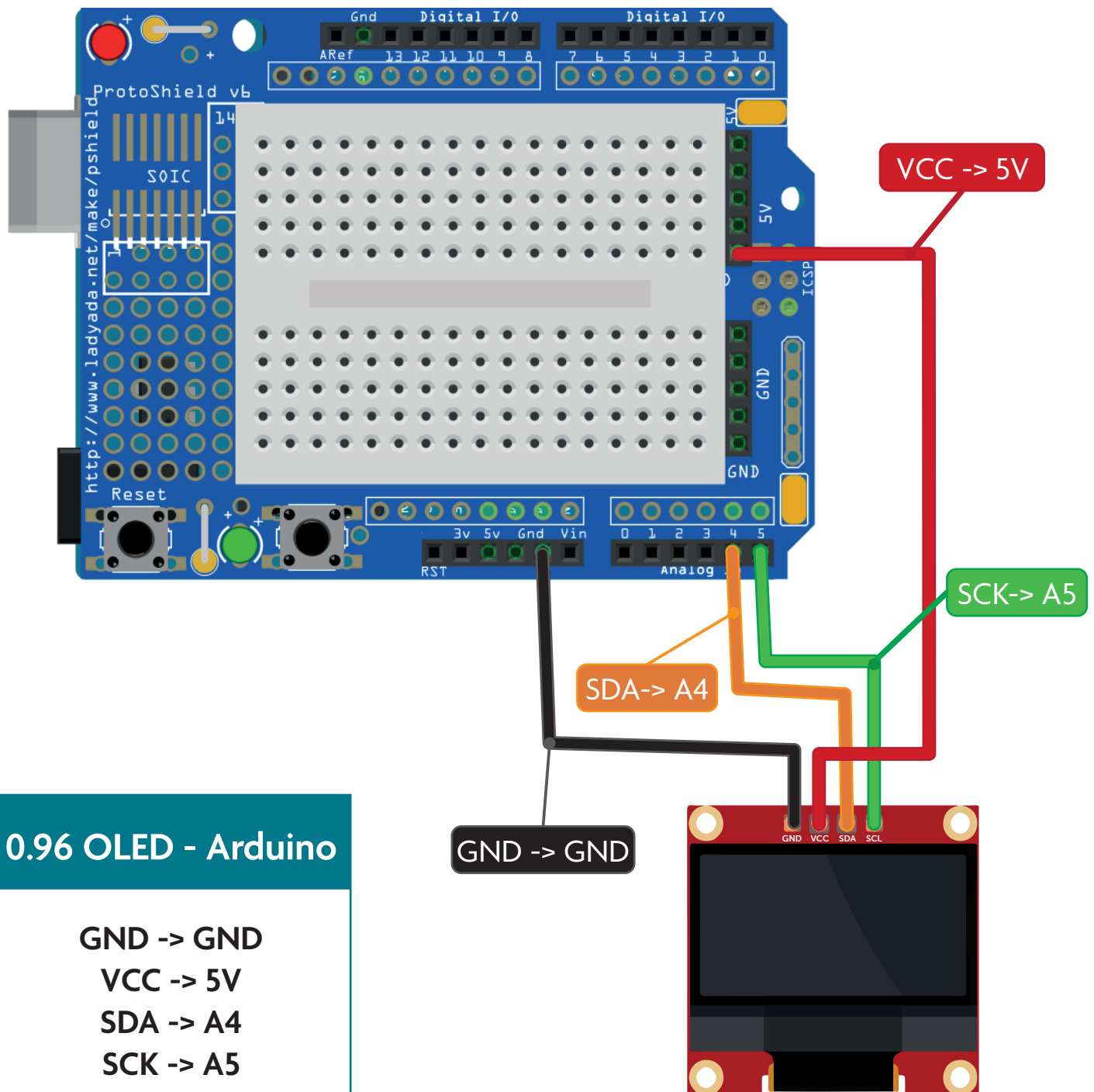
BUILDING THE CIRCUIT

Once you have had a practice connecting the electronics example, you can start connecting all components

Use "Circuit Booklet" as a guide on how to connect your components together.

The "Circuit Booklet" can be found and downloaded from the following website:

www.rewise.co.uk/hof-instructions

Once the circuit is built you will be able to test it by looking at page 11 in this booklet.

You will need to download Arduino software from the following URL (if not downloaded already):

www.arduino.cc/en/software

ARDUINO IDE SOFTWARE

Once the circuit is completed we need to check if it's working correctly.
you need to download House of the Future code from the following website:

www.rewise.co.uk/hof-instructions

Open the code using Arduino software and follow the steps written below.

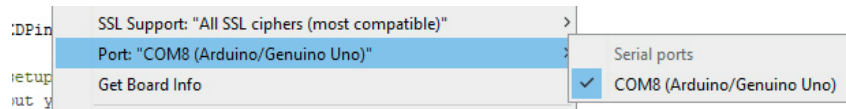**1** — After writing code, you have to verify it, so ensure there are no errors that would prevent the code from running

2 — You need to tell Arduino software whoch microcontroller you are using. Go to Tools -> Port: -> COMx (Arduino/ Genuino Uno)

SSL Support: "All SSL ciphers (most compatible)"
Port: "COM8 (Arduino/Genuino Uno)"
Get Board Info

Serial ports
✓ COM8 (Arduino/Genuino Uno)

3 — After everything is done, you need to upload your code to the microcontroller by pressing the right- pointing arrow

House of the Future
Rewise Learning

10+ Downloads   PEGI 3 ⓘ

You will need to download "House of the Future" app on your mobile phone.
After downloading, turn Bluetooth on your phone, open app, and click "Connect" button.
Choose "HM Soft" device to connect to.

NOTE: Before using the app, please see one of the tutors, because only one house can be tested at the same time.

BUILDING THE HOUSE

Once the circuit has been built and tested you can start building your house.

Use "Instruction Booklet" as a guide on how to build your house.

The "Instruction Booklet" can be found and downloaded from the following website:

www.rewise.co.uk/hof-instructions

DESIGN CHALLENGE

As part of the Wates 125 House of the future project Wates would like you to take part in a competition to design and decorate your House of the future kit.

You can use the space below to come up with concepts for your design, before you decorate your actual House of the future kit.

You will have time within your school art lessons to decorate the house and prizes will be given to the best decorated houses by the Wates team.

USE THE NEXT PAGES TO DESIGN THE DIFFERENT ANGLES OF THE HOUSE.
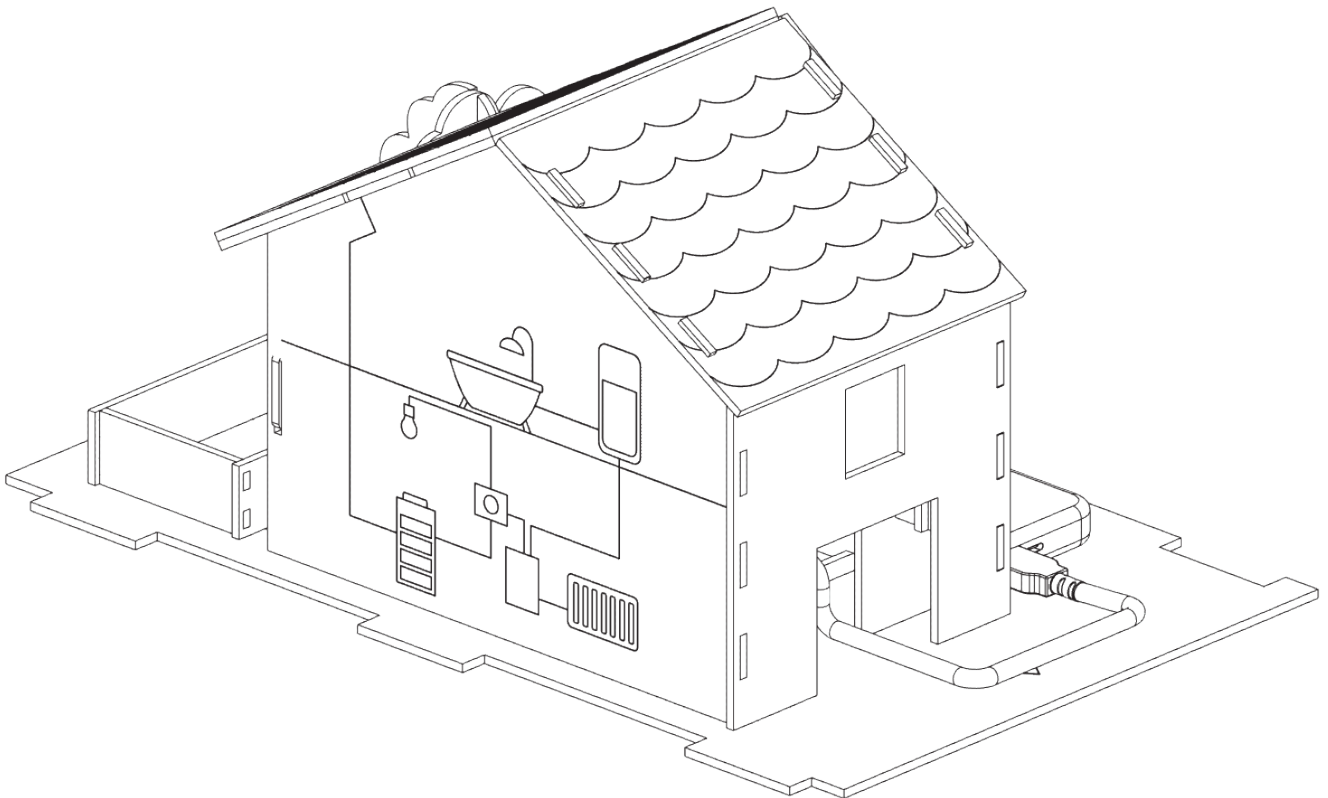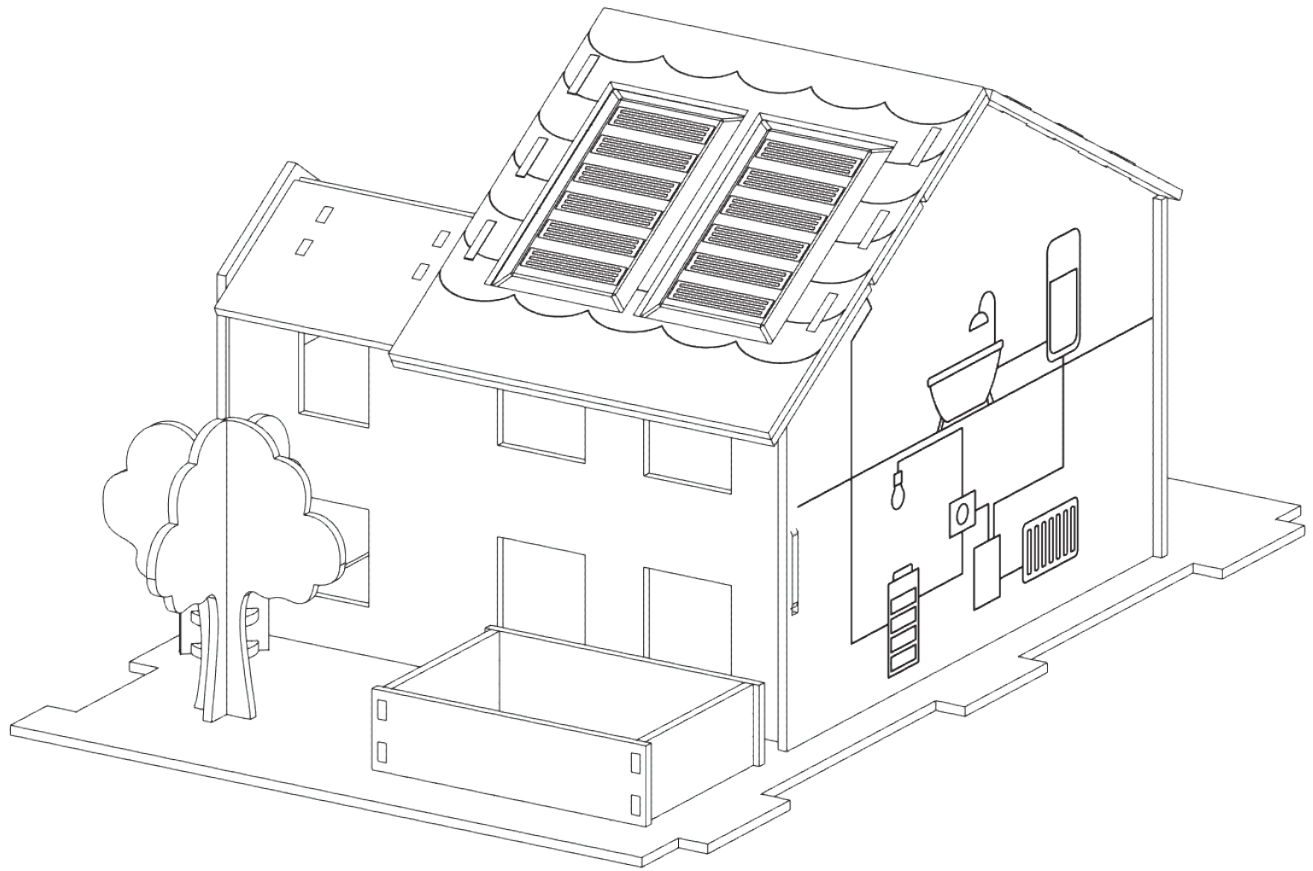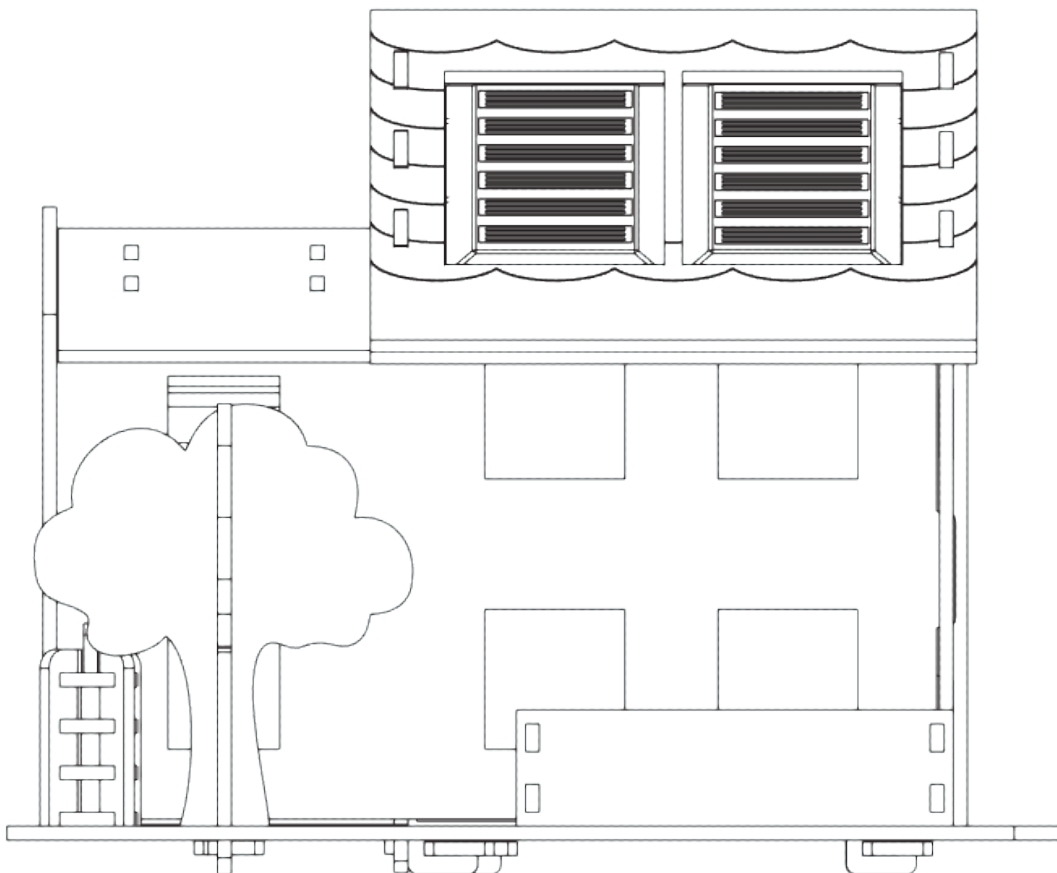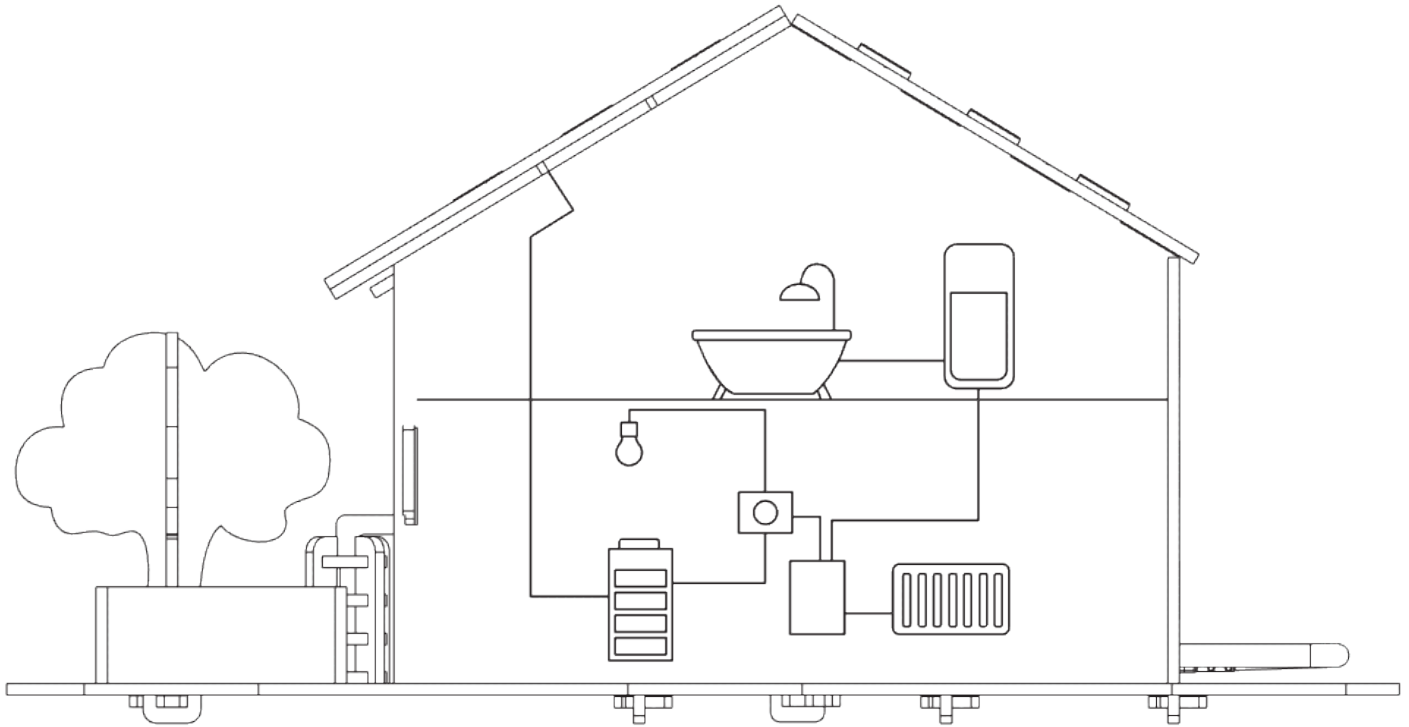
DESIGN
CHALLENGE

FLOOR PLAN

Wates
125 YEARS
WATES GROUP CELEBRATES
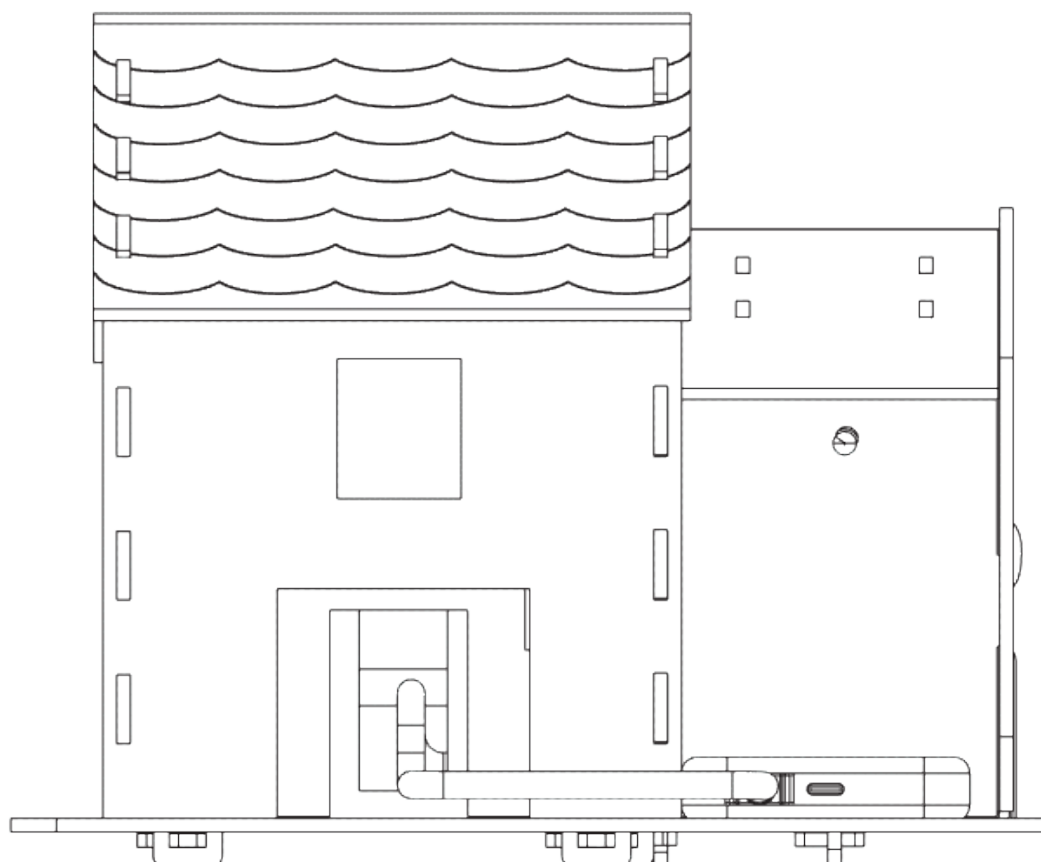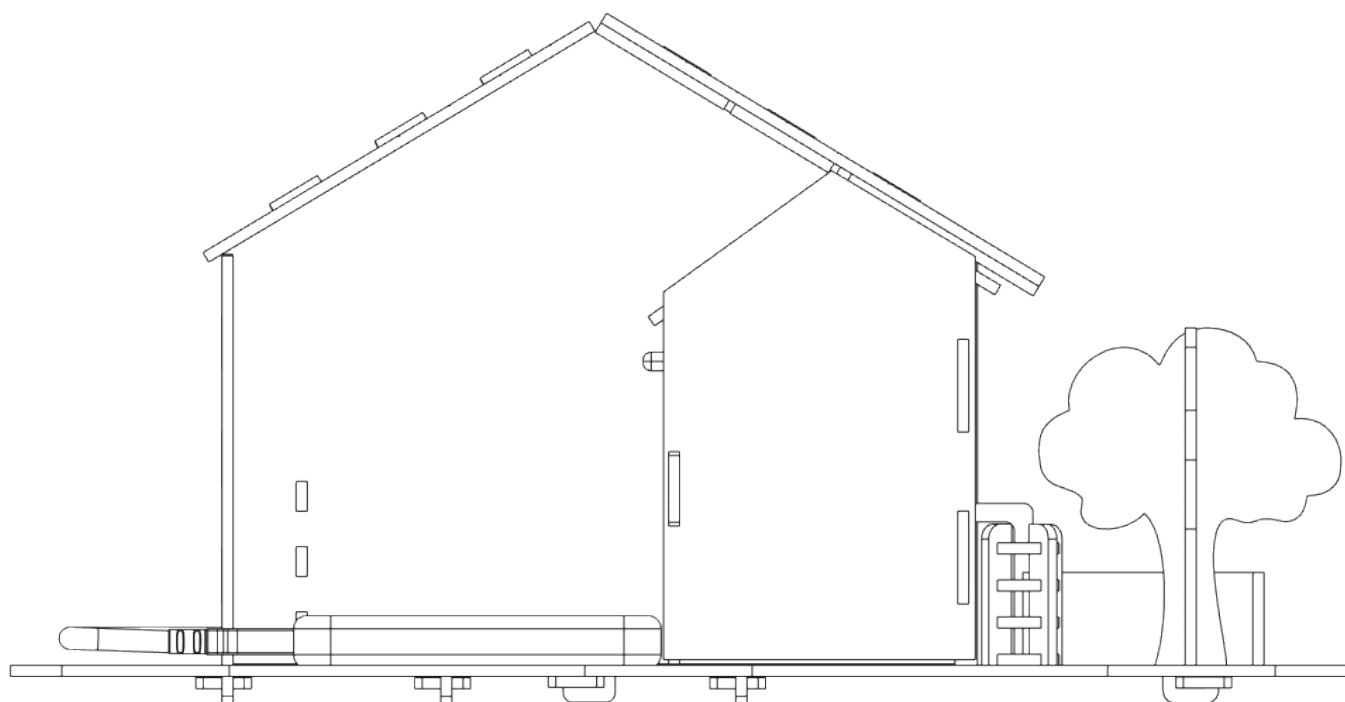
USING THE DIAGRAMS BELOW FILL IN THE FLOOR PLANS WITH HOW YOU WOULD DESIGN THE INSIDE OF THE HOUSE WITH FURNITURE AND ACCESSORIES.

BRANDING
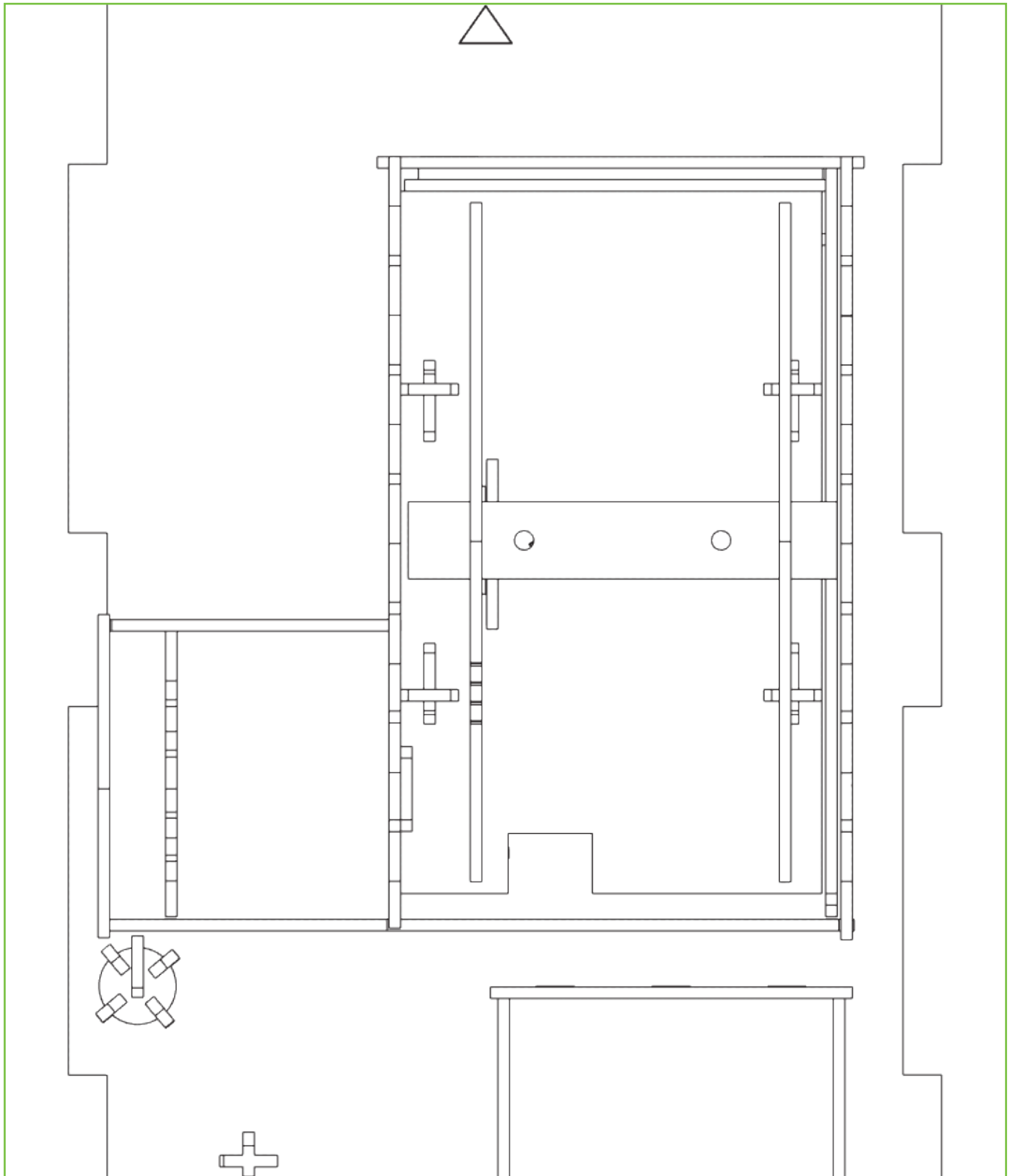
Now that you have built the House of the future, we would like you to think about how we can encourage others to live in houses of the future.

- We would like you to create a marketing plan for your very own house of the future company.
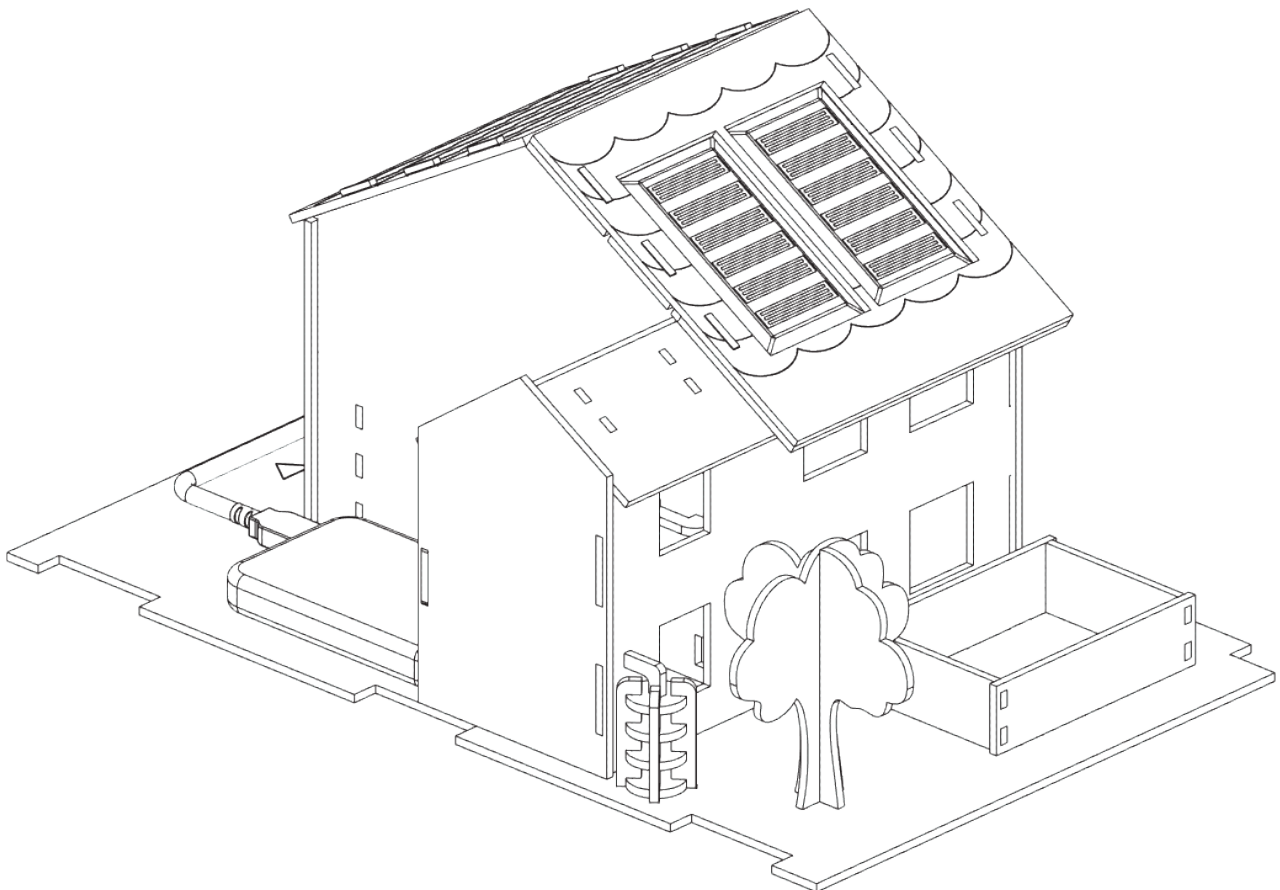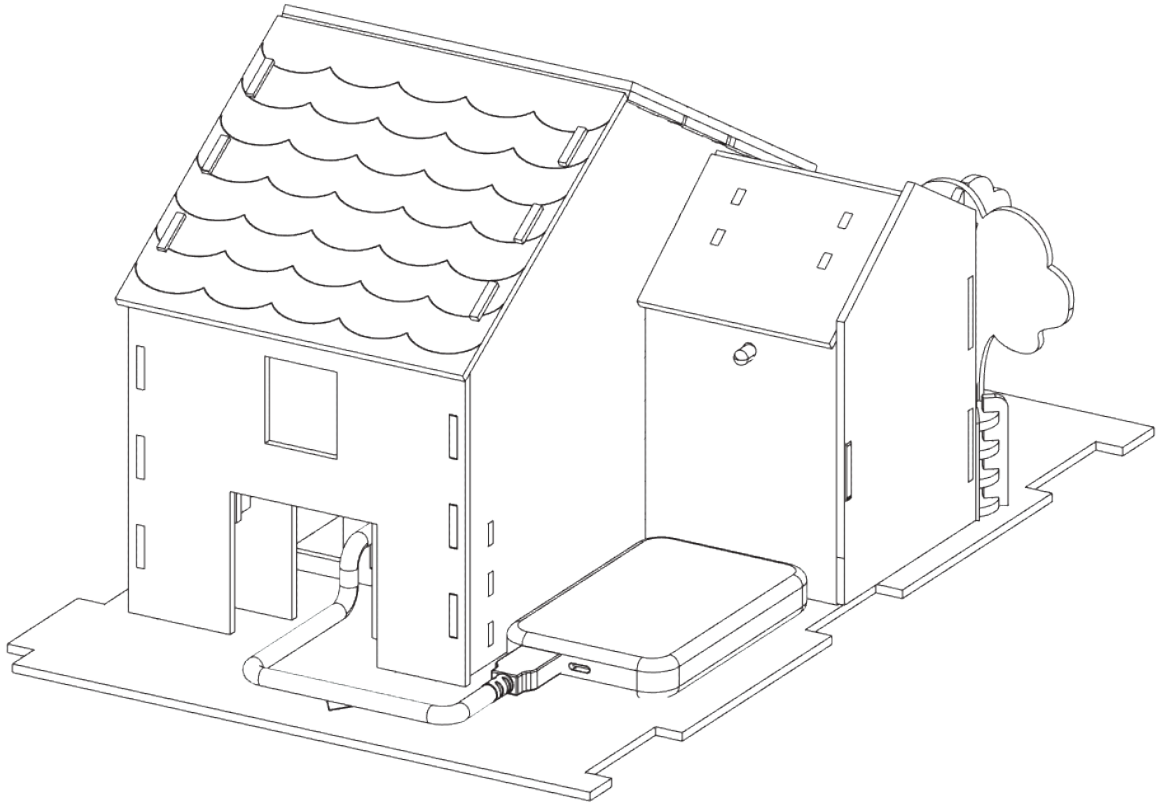- How will you sell the house of the future, what features do you believe are worth highlighting?

Working in teams complete the following challenges below. In your teams think about your roles, you could all go through each challenge together, or you could play to your strengths with each team member taking charge of a certain challenge.

Pitch your company back to the class at the end of the challenge.

Name of Housing Company

_____

Slogan

McDonalds = I'm Loving It

_____

_____

Logo

Using the square on the right to design your company's logo or, alternatively, use a website/app to create a digital logo. Use Wates' logo as an example. Your logo should be easily recognisable and relevant.

BRANDING

Target Market

Consider the demographic that would want to buy your House of the Future.
For example:
◦ First time buyers
◦ Young couples
◦ Rich
◦ Senior

_____

_____

House of the Future Key Features

List and describe 3-5 key features that you will have in your company's house of the future.

Consider features that could save homeowners money on bills, make certain chores easier, renewable energy, features for hobbies/leisure, ect...
You should also consider your target market, for example, a swimming pool powered by renewable energy would be too expensive for most first time buyers.

1. _____
2. _____
3. _____
4. _____
5. _____

Unique Selling Point (USP)

Write below what your USP is. A USP (Unique Selling Point) is what can help you stand out over your competitors.

Consider your houses' key features, target market, ect...

_____

_____

_____

MARKETING CAMPAIGN

Marketing Media

Have a think about what media/resources your company would use to advertise.

This could be social media, leaflets, posters, TV, radio, ect...

Pick one media/resource for your campaign.

Consider your target market, for example, if your target market is senior citizens then most would not use Tik Tok, but they may read the newspaper.

_____

_____

_____

Pitch

It is time to advertise your company. With your marketing media choice in mind, write a pitch/script to sell your houses.

What to include:

- Company
- The features of your house
- Slogan
- Language used must suit your target audience
- Consider the features of the marketing media that you chose
- Use language that is catchy, for example, alliteration, tripling, rhyming, ect...

_____

_____

_____

_____

_____

_____

_____

_____

_____

ARDUINO BLINK TEST

AN ARDUINO BLINK TEST IS TURNING AN LED ON AND OFF. IT IS A BASIC EXERCISE FOR PEOPLE WHO ONLY JUST STARTED LEARNING ABOUT ARDUINO.

To open Blink code, you need to open Arduino Software. On the left-top corner choose File -> Examples -> 01. Basics -> Blink.
A new window will open and you'll see the same code as we have on the right hand side of this page.

There are two main parts in Arduino code:
void Setup() and void Loop(). Void Setup() will only run once and will test Arduino board for which pins and functions we are using. Whereas void Loop() will run constantly until we unplug our board and it will tell the board what to do with the pins specified in void Setup(). In this exercise we will be using a built in LED. We will make it blink ever second. On the diagram below it is shown where the built in LED is located on the Arduino Uno board.

CHALLENGE 1: Can you try to modify the code, so that the LED blinks every 3 seconds?

```
void setup() {
  // initialize digital pin LED_BUILTIN as an output.
  pinMode(LED_BUILTIN, OUTPUT);
}

// the loop function runs over and over again forever
void loop() {
  digitalWrite(LED_BUILTIN, HIGH);
// turn the LED on (HIGH is the voltage level)
  delay(1000);   // wait for a second
  digitalWrite(LED_BUILTIN, LOW);   // turn the LED off by making the voltage LOW
  delay(1000);   // wait for a second
}
```
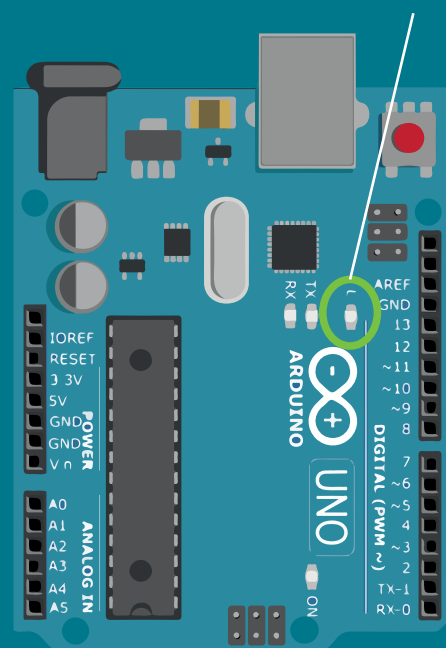
NOTES:

HIGH means on, LOW means off.

OUTPUT - sending information

INPUT - receiving information

BUILTIN LED

ARDUINO BLINK TEST

AN ARDUINO BLINK TEST IS TURNING AN LED ON AND OFF. THIS EXERCISE WILL BE USING AN EXTERNAL LED AND WILL SHOW HOW TO USE PINS ON ARDUINO BOARD.

Now we will try to use an external LED. Find an LED in your electronic kit. Follow the diagram below to connect your LED to Arduino board.
As you can see, the positive cable on the LED was attached to pin 13 on Arduino.
On the right hand side there is the same code as on previous page but with small change.
LED_BUILTIN has been modified to 13. Why to you think this happened?

CHALLENGE 2: Can you try to modify the code, so that the LED is connected to pin 8?

```
void setup() {
  // initialize digital pin LED_BUILTIN as an output.
  pinMode(13, OUTPUT);
}

// the loop function runs over and over again forever
void loop() {
  digitalWrite(13, HIGH);
// turn the LED on (HIGH is the voltage level)
  delay(1000);   // wait for a second
  digitalWrite(13, LOW);   // turn the LED off by making the
voltage LOW
  delay(1000);   // wait for a second
}
```

NOTES:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

NEGATIVE -> GND

POSITIVE -> 13
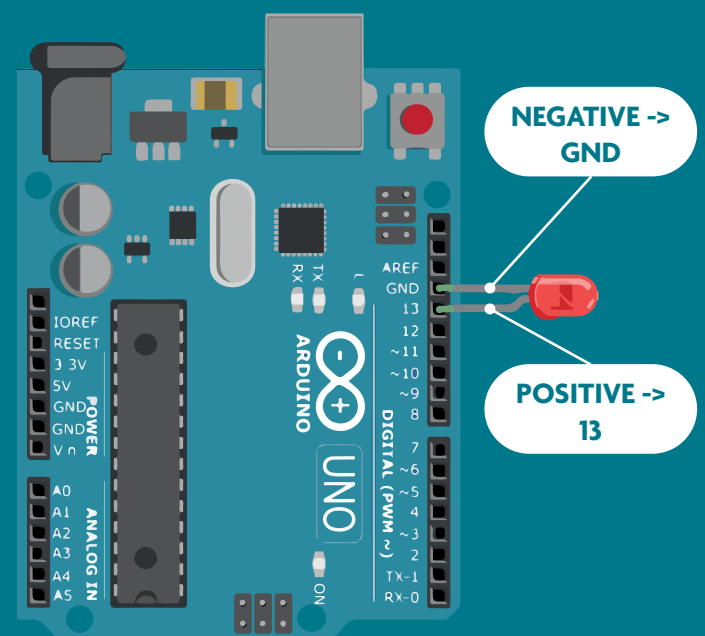
CODING CHALLENGE

USE THE FOLLOWING PUZZLES TO DECIPHER THE CODE AND WRITE YOUR VICTORY MESSAGE ON THE LED DISPLAY.

Open Arduino to start coding your LED display message.

Be sure to verify the code after each step to ensure that your answers are correct. If your answer is wrong the code will "fail to compile" in an orange warning in the bottom left of the screen (on most steps, but not all). Verify by clicking the 'tick' on the top left hand corner, check that you have the correct answers.

1. Here are your first three lines of the code. Write this **ABOVE** the void setup( ) {
#include <_ _ _ P _ _ _ l_.h>
#include _MD_ _ _X7_x_._
#include <_ _ _ .h>

Use the table below to fill in the gaps.

<SPI.h>	<MD_MAX72xx.h>	<FLY.h>	<MD_MAX27xxh.>
{_ _ _P _ _ _ 1.h>	<PIE.h>	<MD_Parola.h>	_MD_ _ _ MAX27x_._

2. The next line is code is as follows. You can copy and paste the code and replace the answer until you find the correct answer.
#define HARDWARE_TYPE [insert answer here] : : FC16_HW
A. <nowinaminute>
B. <USBmodem>
C. <MD_MAX72xx.h>
D. <DJ_C++>

3. The next line in code is as follows. You can copy and paste the code then insert your answer.

#define MAX_DEVICES [insert answer here]

How many planets are there in our solar system?

CODING CHALLENGE

4. The next line is code is as follows. You can copy and paste the code then insert your answer.

#[insert answer here] CS_Pin 3

A. include
B. exclude
C. redefine
D. define

5. The next line is code is as follows. You can copy and paste the code then insert your answer.

MD_Parola [insert answer here] = MD_Parola(HARDWARE_TYPE, CS_PIN, MAX_DEVICES);

Decipher the following word for the answer: **kfNlisxpf**
Answer the following question to decide which table below to use to decipher the word.

What has many keys but opens no doors?

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
P	I	A	N	O	Z	M	J	L	B	Y	U	K	C	W	X	T	R	S	E	Q	D	G	H	F	V

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
S	K	E	L	A	T	O	N	B	C	U	P	M	Z	Q	Y	W	D	J	F	V	H	I	G	R	W

CODING CHALLENGE

6.

The next 3 lines of code are as follows. You can copy and paste the code then insert your answer.
Write this **AFTER** the void setup( ) {

myDisplay.[insert answer here]();
myDisplay.set[insert answer here](5);
myDisplay.[insert answer here]Clear();

Use the table below to decipher the answers.
yvtrm
Rmgvmhrgb
wrhkozb

EM ESREVER

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z

7.

The next lines of code is as follows. You can copy and paste the code then insert your answer.

myDisplay.displayScroll("[insert answer here]", PA_LEFT, PA_SCROLL_LEFT, 50);}

What is your victory message?

_____

8.

Well done! The last lines of code are as follows. You can copy and paste the code AFTER the void loop( ) {

if (myDisplay.displayAnimate()) {
myDisplay.displayReset();
}
}

UPLOAD THE CODE AND DISPLAY YOUR VICTORY MESSAGE TO EVERYONE!