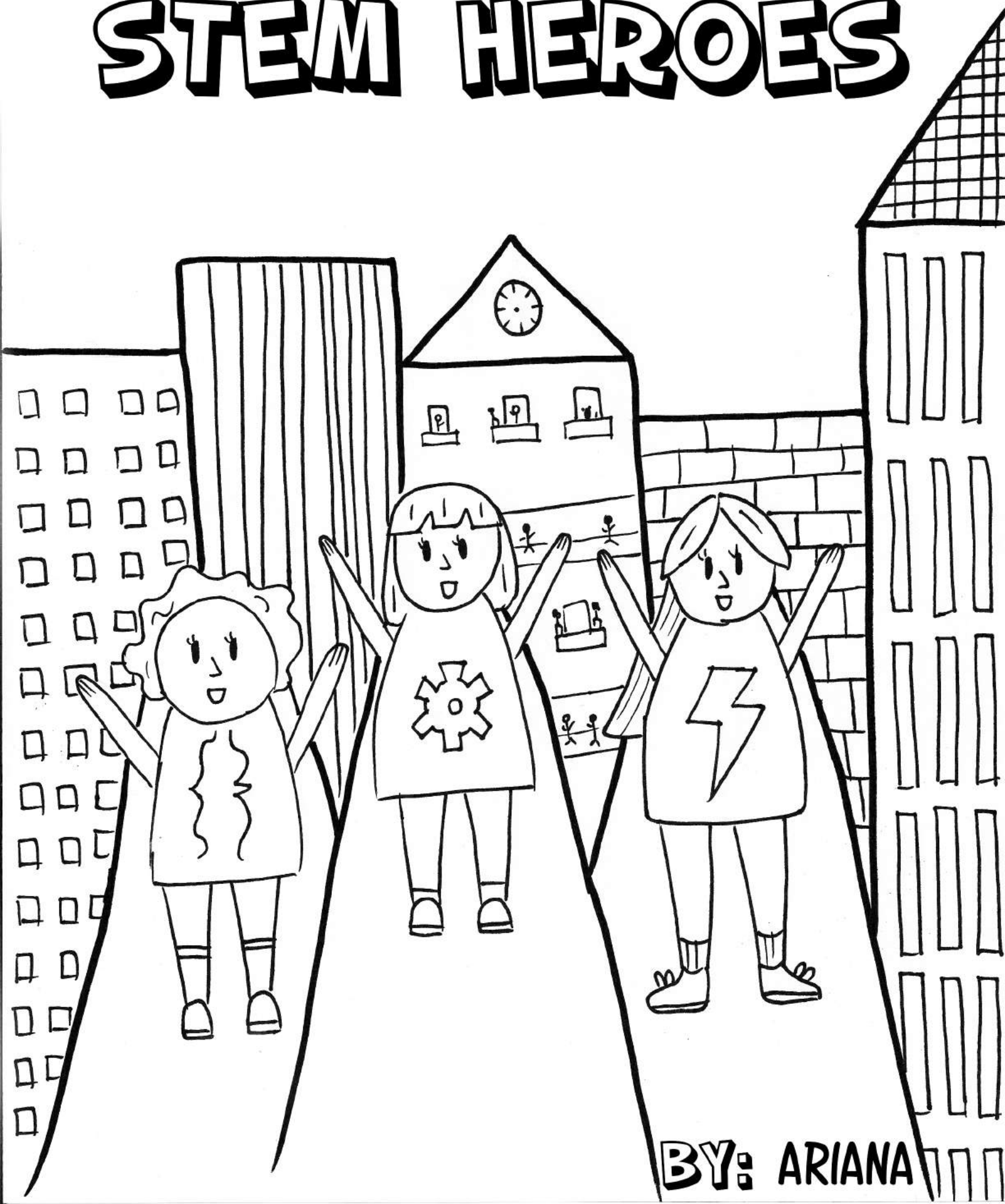


# STEM HEROES

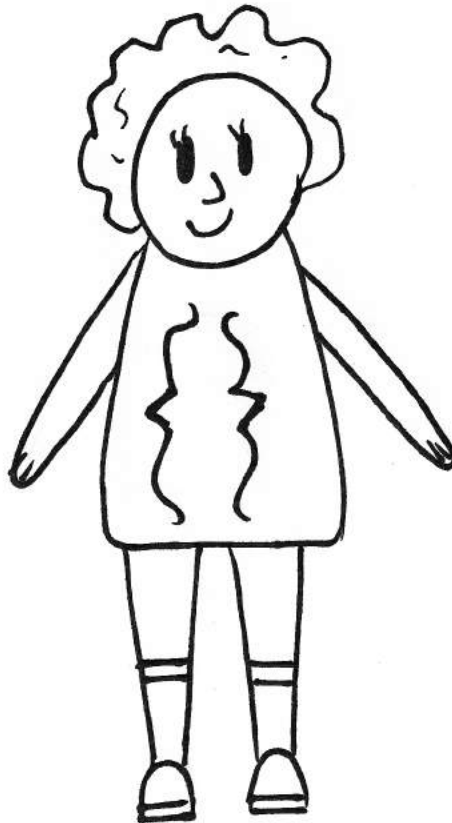


BY: ARIANA

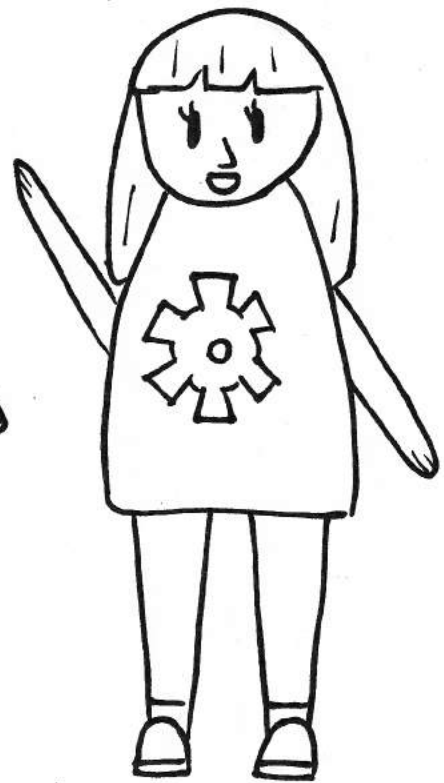
**NAME YOUR HEROES!**



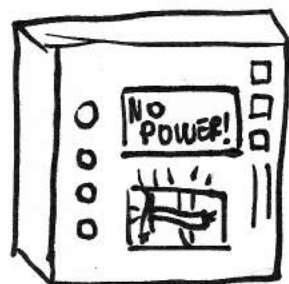
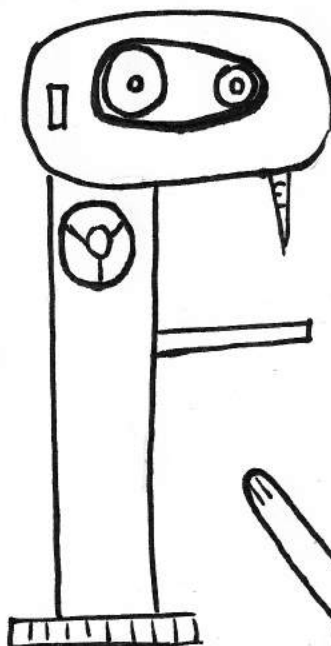
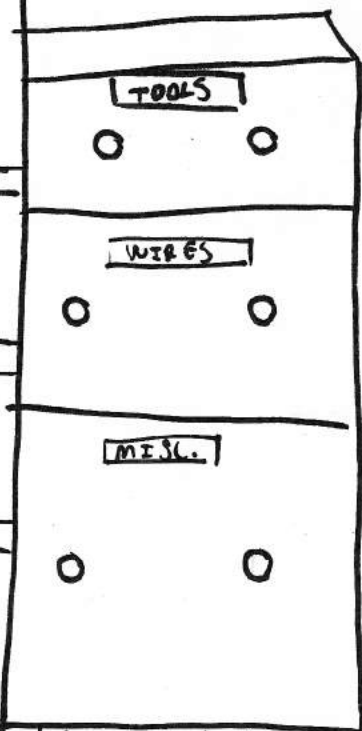
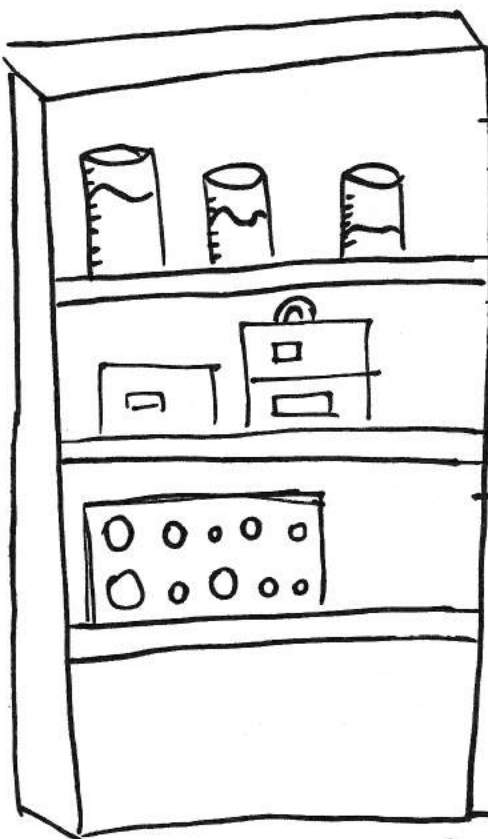
**ELECTRICAL  
ENGINEER**



**COMPUTER  
SCIENTIST**



**MECHANICAL  
ENGINEER**

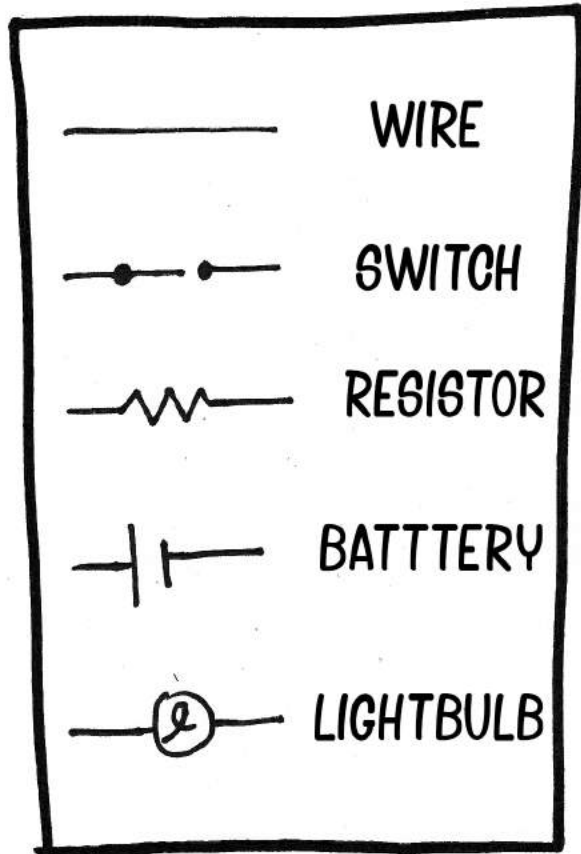


AH!  
HELP!

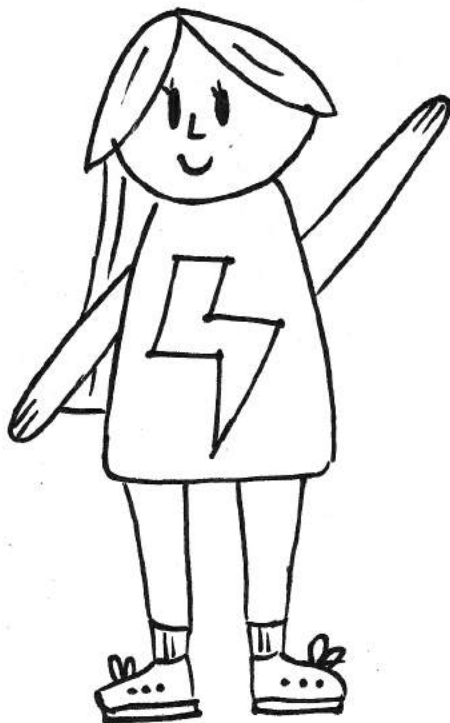
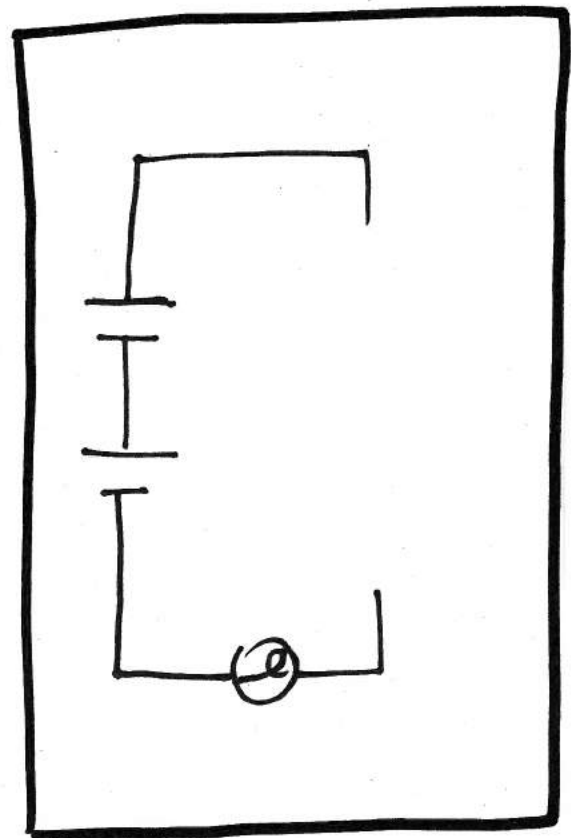


OH NO! AN EVIL VILLAIN IS  
DESTROYING THE CITY! THE  
WHOLE CITY'S POWER IS OUT. YOU  
NEED TO HELP YOUR STEM HERO  
GET THE SHOP RUNNING AGAIN.

LET'S LEARN ABOUT CIRCUIT DIAGRAMS! YOU CAN HELP THE STEM HEROES BY COMING UP WITH A PLAN TO GET POWER BACK TO THE SHOP.

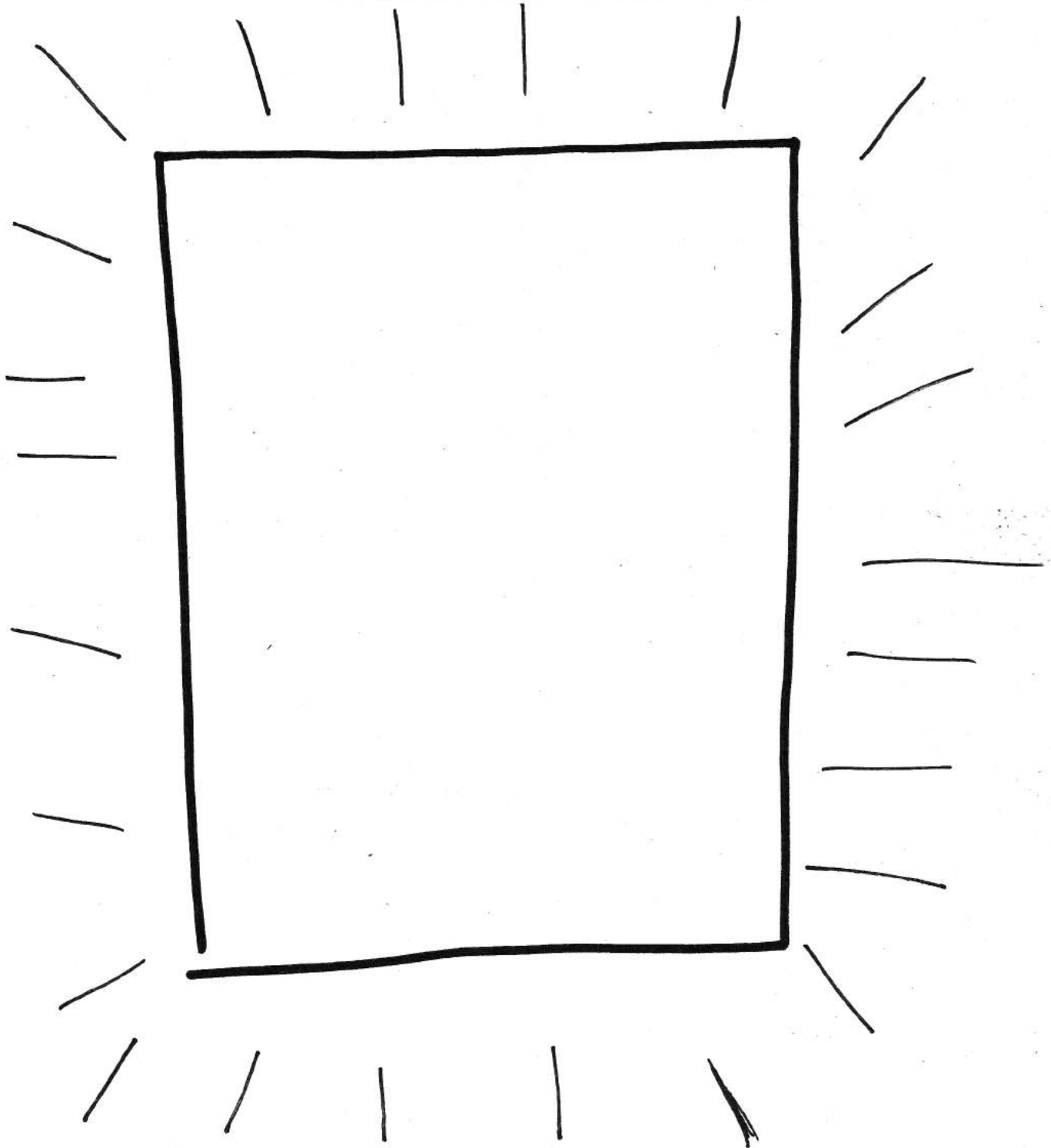


NOW COMPLETE THE DIAGRAM!



\*REMEMBER, A CIRCUIT MUST HAVE AT LEAST ONE BATTERY, ONE RESISTOR OR LIGHTBULB, AND MUST BE CLOSED.

NOW IT'S YOUR TURN TO MAKE YOUR OWN CIRCUIT! USE THE  
SYMBOLS FROM PAGE 3 TO DESIGN A CIRCUIT THAT BRINGS  
POWER BACK TO THE SHOP.



HINT : YOUR CIRCUIT CAN LOOK HOWEVER YOU  
WANT, BUT REMEMBER THE RULES FROM  
PAGE 3.

# THE ENGINEERING DESIGN PROCESS


THE CITY IS STILL ON FIRE! ENGINEERS COME UP WITH WAYS TO FIX PROBLEMS LIKE THIS ONE. THE ENGINEERING DESIGN PROCESS HELPS ENGINEERS COME UP WITH SOLUTIONS TO PROBLEMS.

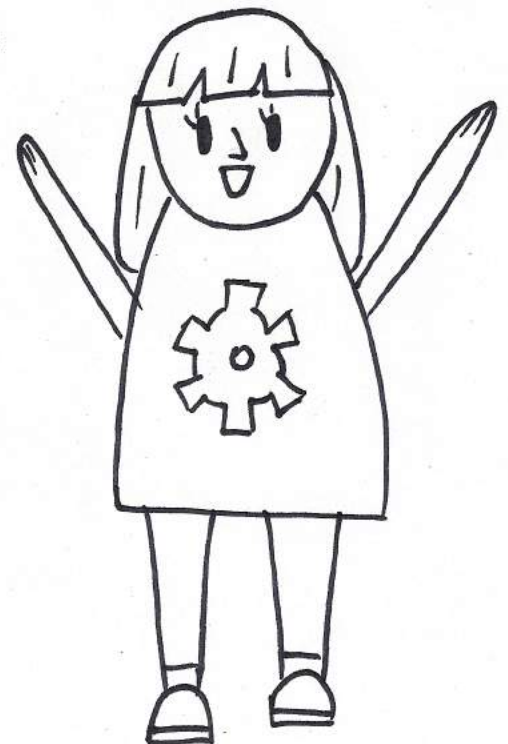
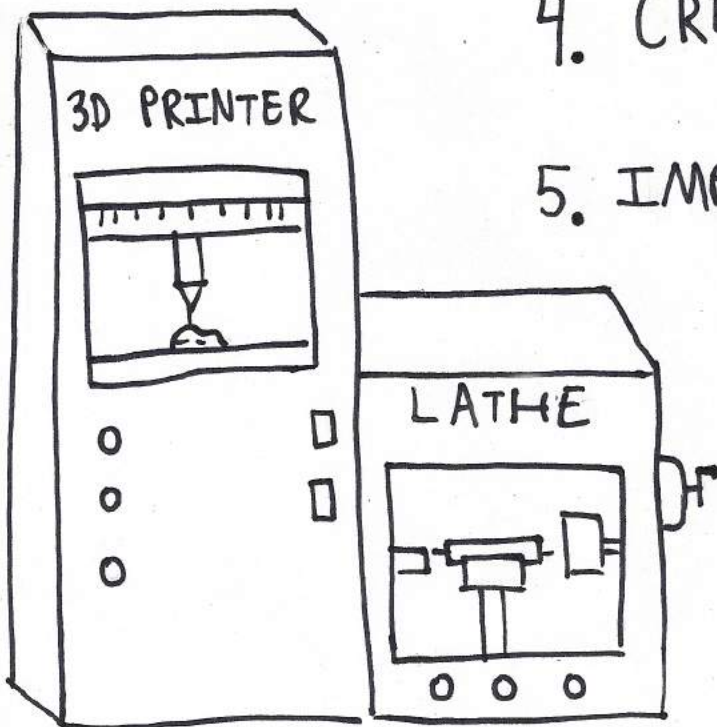
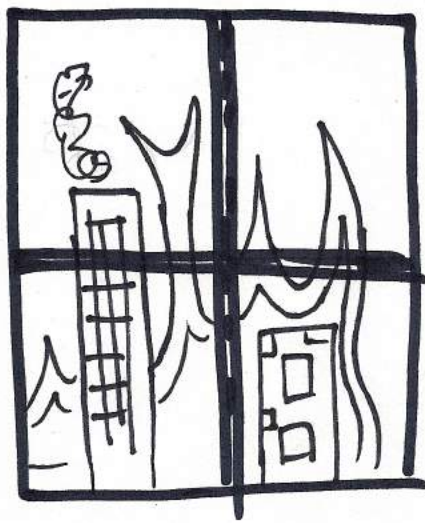
1. ASK ?

2. IMAGINE 

3. PLAN 

4. CREATE 

5. IMPROVE 

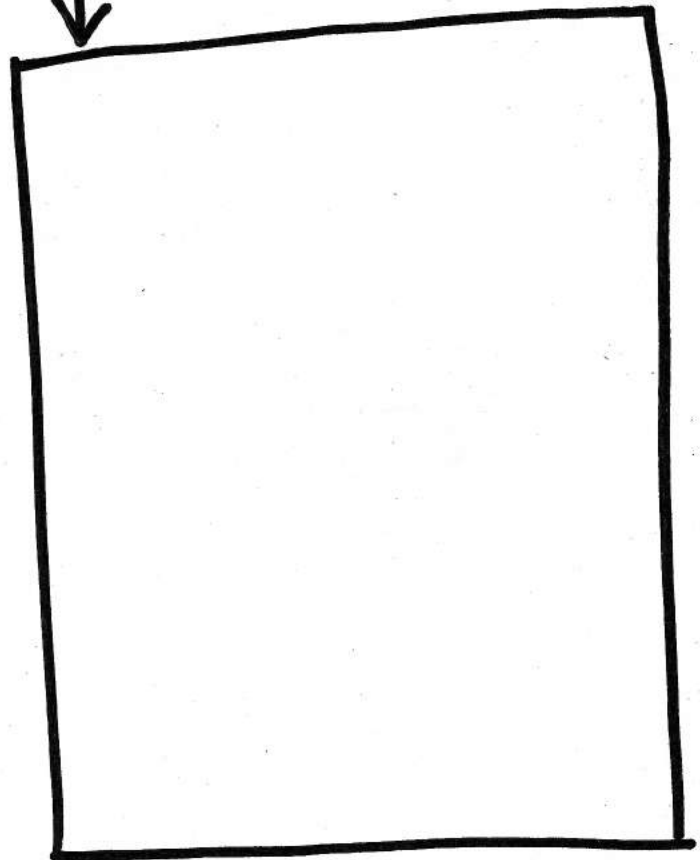
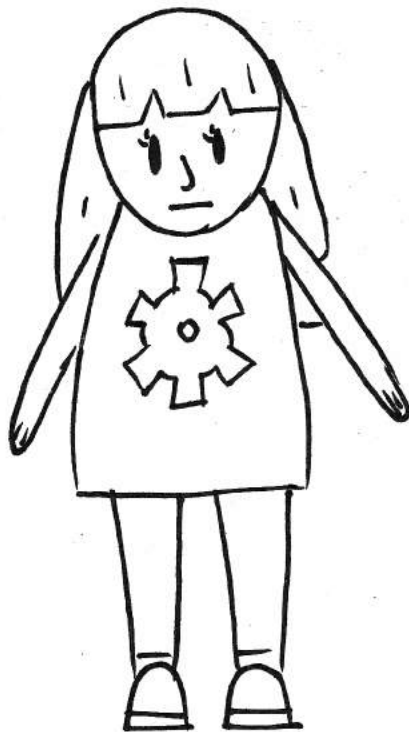
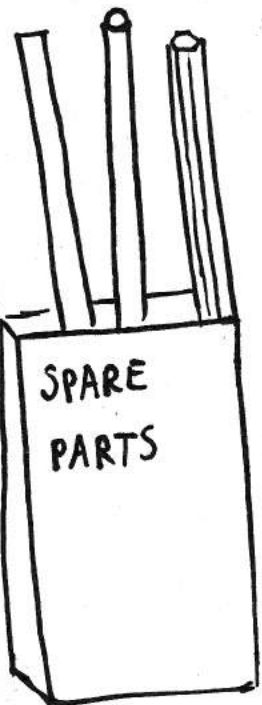




THE VILLAIN IS STILL TERRORIZING THE CITY. THE STEM HEROES NEED TO TAKE HIM DOWN. HELP YOUR HERO DESIGN A ROBOT TO SAVE THE CITY.

USING SPARE PARTS IS ALWAYS A GOOD WAY TO SAVE MATERIALS AND MONEY.

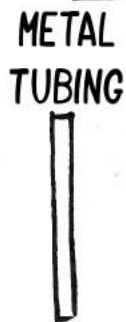
YOUR ROBOT HERE



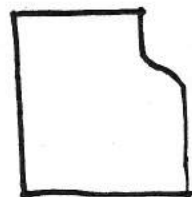
MOTOR



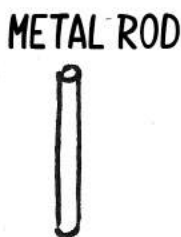
PISTON



METAL TUBING



SHEET METAL



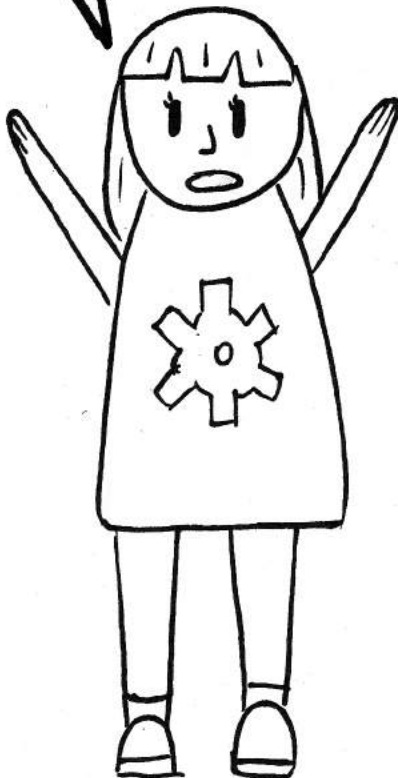
METAL ROD

USE SOME OF THE PIECES ABOVE FOR INSPIRATION. REMEMBER TO USE THE ENGINEERING DESIGN PROCESS.

# TOOL SEARCH

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

HELP ME FIND THE  
TOOLS I NEED TO  
USE!



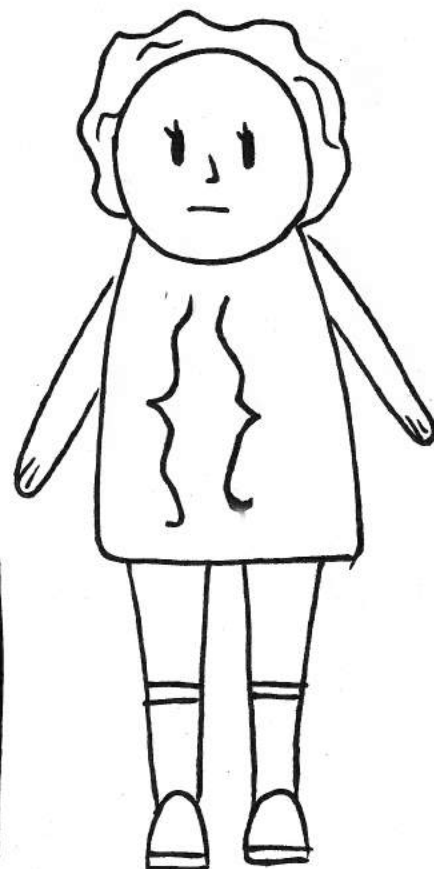
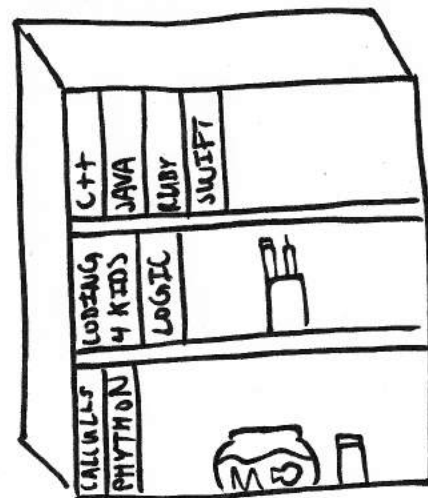
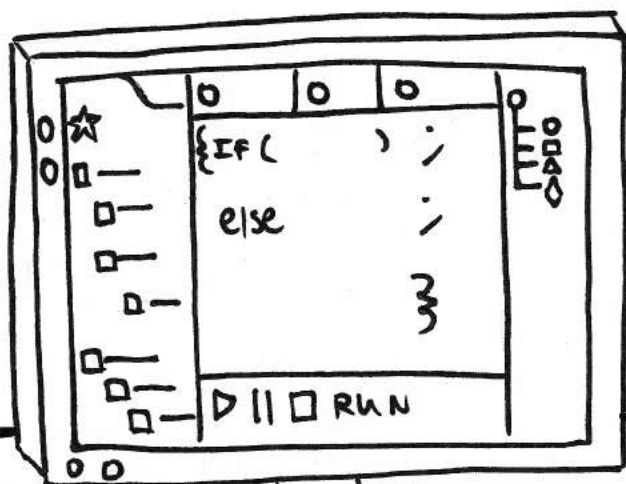
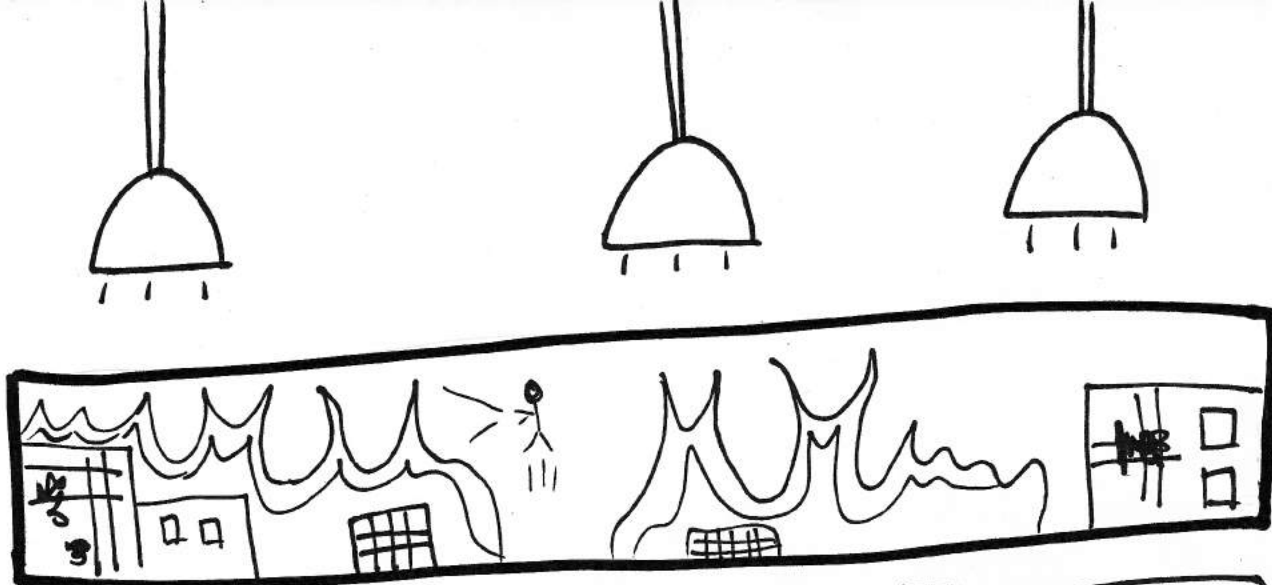
BANDSAW  
 CLAMP  
 DRILL  
 HACKSAW  
 HAMMER  
 LATHE  
 MILL  
 PLANER  
 SCREWDRIVER  
 SOCKET  
 WRENCH

EACH OF THESE TOOLS ARE USED FOR DIFFERENT  
FUNCTIONS. TRY TO FIGURE OUT WHICH TOOL DOES WHAT  
AND PUT THEM INTO ONE OF THESE TWO GROUPS!

ASSEMBLY

MANUFACTURING

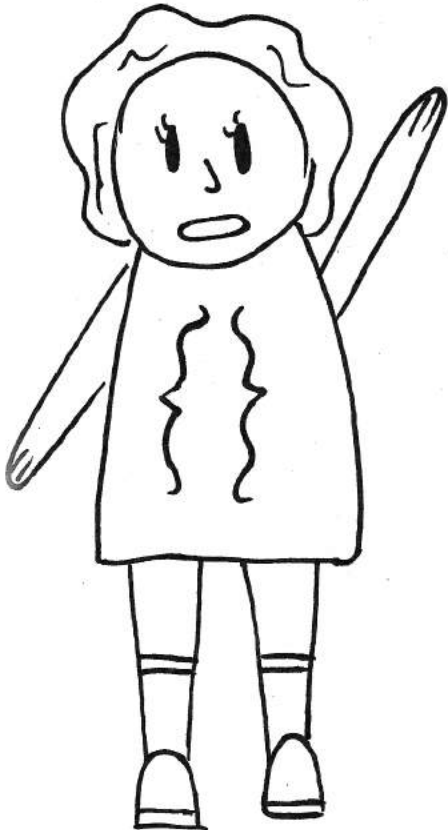




THE EVIL VILLAIN IS STILL RAVAGING THE CITY, NOW THAT YOU HAVE DESIGNED THE ROBOT YOU HAVE TO PROGRAM IT!

# LOGIC: AND, OR, NOT

A LOT OF PROGRAMMING USES INPUTS AND FUNCTIONS TO DETERMINE OUTPUTS. THESE OUTPUTS ALLOW YOUR CODE TO CONTROL YOUR ROBOT.



## AND

THE OUTPUT IS TRUE IF BOTH OF THE INPUTS ARE 1.

EXAMPLE.  $1, 1 = 1$  (TRUE)

$0, 1 = 0$  (FALSE)

## OR

THE OUTPUT IS TRUE IF ONE OR MORE OF THE INPUTS IS 1.

EXAMPLE.  $1, 0 = 1$  (TRUE)

$0, 0 = 0$  (FALSE)

## NOT

THE OUTPUT IS THE OPPOSITE OF THE INPUT. TYPICALLY THERE IS ONLY ONE INPUT IN THESE CASES.

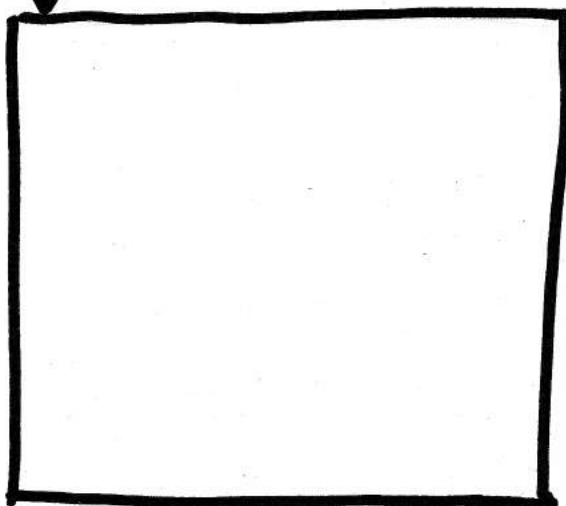
EXAMPLE.  $1 = 0$  (FALSE)

$0 = 1$  (TRUE)

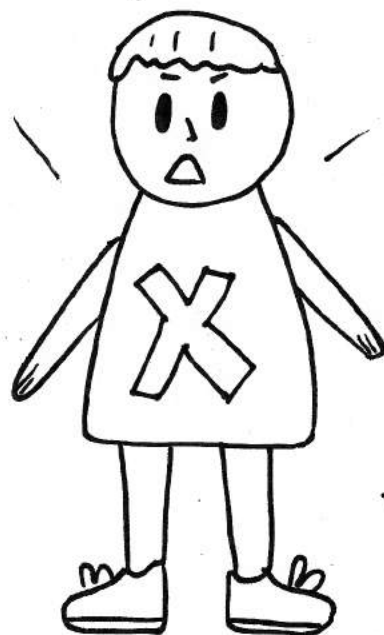
IN LOGIC, ONE (1) IS THE SYMBOL FOR TRUE, WHILE ZERO (0) IS THE SYMBOL FOR FALSE.

CONGRATULATIONS! YOU HELPED THE STEM  
HEROES SAVE THE CITY BY USING  
TECHNOLOGY.

YOUR ROBOT HERE



YOU'VE STOPPED ME  
AGAIN. I WAS NO MATCH  
FOR YOUR ROBOT.



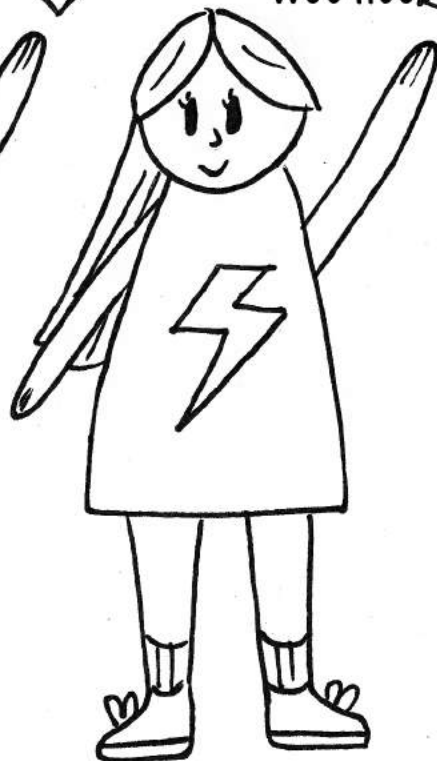
YOU CAN BE THE  
NEXT STEM HERO



YOU ROCK!



WOO HOO



# ANSWERS

## PAGE 4

THE CIRCUIT DIAGRAM MUST BE CLOSED, THERE SHOULD BE A CONTINUOUS LINE. THERE ALSO MUST BE AT LEAST ONE BATTERY, AND ONE RESISTOR OR LIGHTBULB. MAKE SURE YOUR DIAGRAM FOLLOWS THOSE RULES.

## PAGE 7

### ASSEMBLY

WRENCH  
SOCKET  
SCREW DRIVER  
HAMMER  
CLAMP

### MANUFACTURING

BANDSAW  
DRILL  
HACKSAW  
LATHE  
MILL  
PLANER