Open Source Turtle Robot

- *Robotics* is the exciting intersection of a number of engineering fields including mechanical engineering, electrical engineering, and computer science. This project was designed to make learning about these fields accessible and exciting.
- *Open Source* means every aspect of its design from its 3D parts, electronics, and software are available for study and modification, making it easy to build, modify, and improve.
- *Turtle robots* are controlled by simple instructions like `forward, backward, left,` and `right,` and their visual tracks are instructive as well as entertaining. They also demonstrate how systems with simple rules can have complex behaviors, something we see in nature all the time.
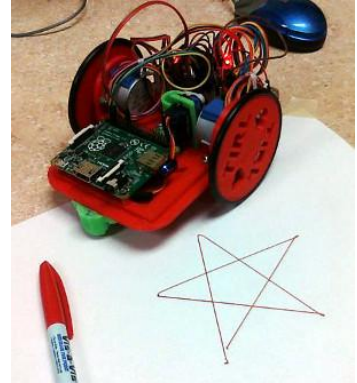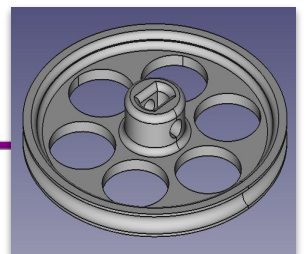
WHAT IS A ROBOT? ROBOTS ARE MACHINES THAT ARE PROGRAMMED TO REACT TO AND MANIPULATE THEIR ENVIRONMENTS.

WHICH OF THE FOLLOWING WOULD YOU CONSIDER TO BE A ROBOT?
- ❏ MARS ROVER
- ❏ 3D PRINTER
- ❏ AUTONOMOUS CAR
- ❏ ARTIFICIAL ARM
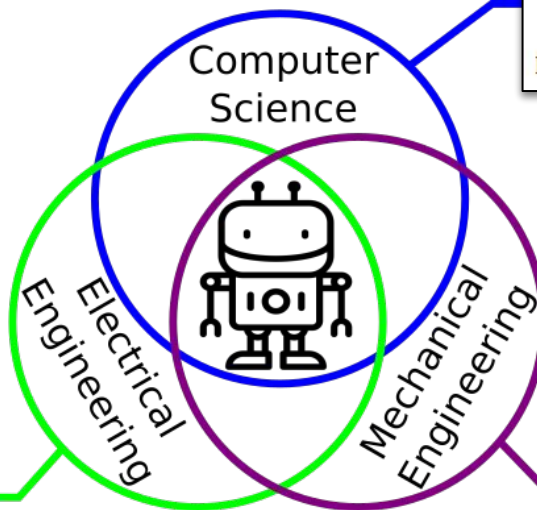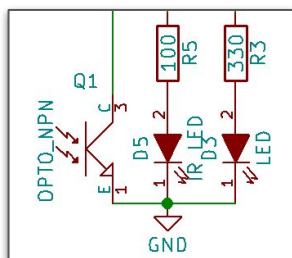
```
from turtle import *

pendown()
for x in range(5):
    forward(100)
    right(144)
penup()
```

Computer Science

Electrical Engineering

Mechanical Engineering

Going Further:
- Build a Turtle Robot of your own from Instructables: *http://bit.ly/OSTurtle*
- Play with Turtle graphics online at :
  - *https://blockly-games.appspot.com/* (block programming)
  - *http://bit.ly/ttturtle* (JavaScript)
  - *https://groklearning.com/hoc/activity/snowflake/* (Python)
- Do an "Hour of Code" activity at *https://hourofcode.com/us/learn*
- Check for Maker Spaces or programs in your community or at the library.
- ChickTech Workshops: *https://chicktech.org/*

ChickTECH Turtle Robot Datasheet

#TurtleRobot @ChickTechOrg @TheMakersBox

Robot Name: _____

Builder's Name: _____

Motion: 2 x 28byj 5 volt, Uni-polar Stepper Motors with 1:64 Gearing

Control: Adafruit ItsyBitsy M4

Pen Control: 9g Servo

Output: LEDs

3D Printed Chassis and wheels

Input: Push button

Sensing: 2x IR Emitter/Detector pair

Power Switch

Power: 4 x AA (6 Volts)

Programming (via USB):
- Python
- Arduino C

CHICKTECH.ORG

Calibration Parameters:
wheel_dia (mm): _____
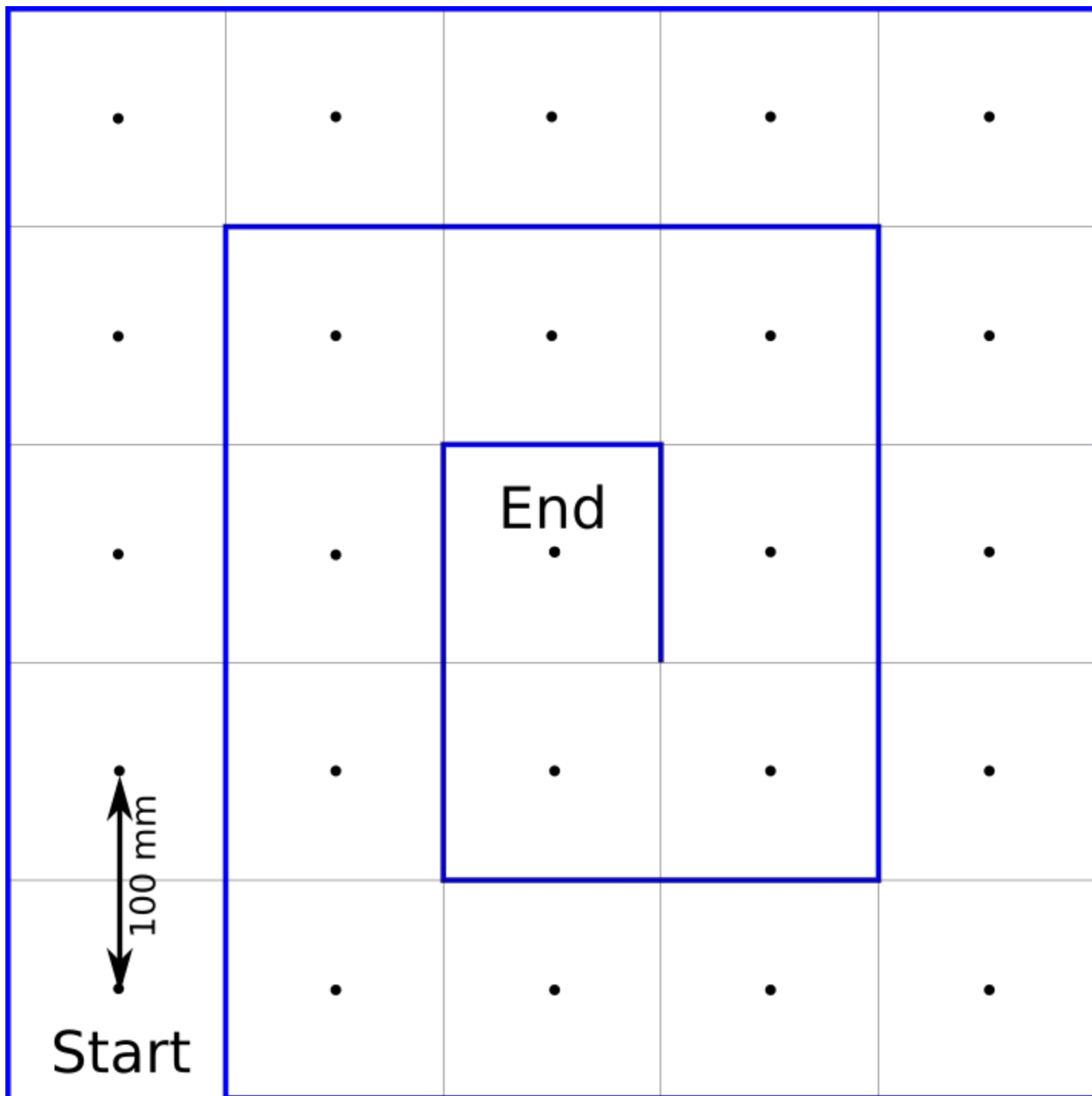wheel_base (mm): _____
PEN_UP (angle): _____
PEN_DOwn (angle): _____

Turtle Commands:
```
left(degrees)
right(degrees)
forward(distance) mm
backwards(distance) mm
penup()
pendown()
goto(x, y)
```

MB

www.MakersBox.us
tindie.com/stores/MakersBox
@TheMakersBox
648.ken@gmail.com
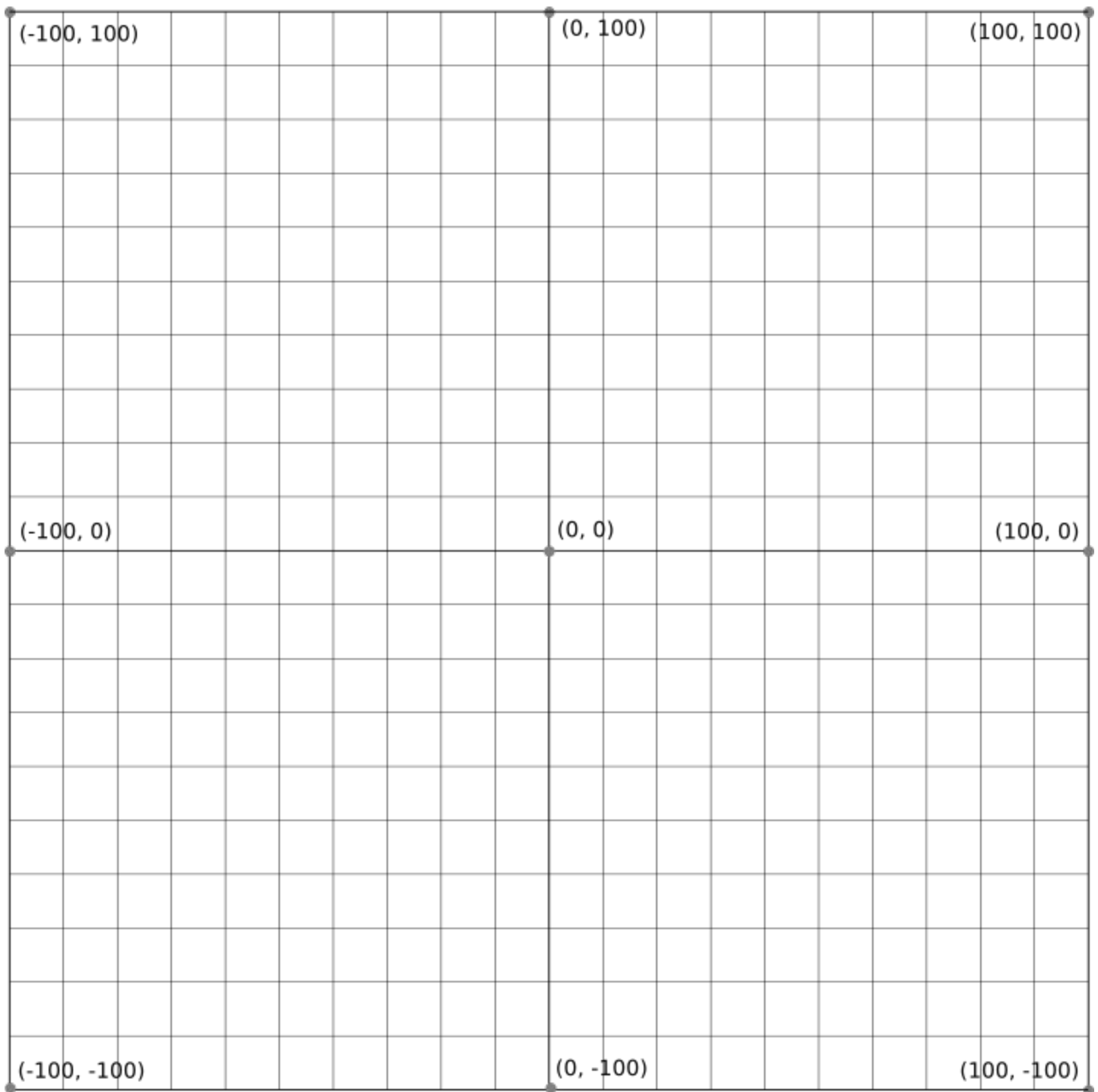
Full details at http://bit.ly/OSTurtle

End

100 mm

Start

Complete the sequence to get your robot from Start to End. Bonus for using loops.

```
forward(400)
right(90), ...
```

Turtle goto(x, y) Command

(-100, 100)   (0, 100)   (100, 100)

(-100, 0)   (0, 0)   (100, 0)

(-100, -100)   (0, -100)   (100, -100)

The **turtle goto()** command will move the turtle to the x, y cooridate. If pen is down, it will draw a line. If you put the points in a list, you can itterate through them. What shape does the following make? Can you make your own shape above?

```
points = [(0, 0), (-8, -8), (-4, -24), (-16, -36), (-28, -28), (-36, -32), (-24, -44),
          (-28, -60), (-20, -76), (-32, -88), (-24, -96), (-16, -84), (0, -92),
          (16, -84), (24, -96), (32, -88), (20, -76), (28, -60), (24, -44), (36, -32),
          (28, -28), (16, -36), (4, -24), (8, -8), (0, 0)]

for point in points:
    goto(point)
```

SAFETY PLAN

Hot Glue:

- Is hot. It burns. Remove it from skin immediately and run water over it. Contact an instructor.

Soldering & Wire cutting:

- Always wear safety glasses when soldering or cutting wires. Eyes don't grow back.
- Keep long hair in ponytail holder. Burning hair stinks!
- Run water over burns and contact instructor.
- Wash hands after soldering.

Cuts:

- Contact instructor.
- Wash, neosporin, band aid.

MAY CAUSE SEVERE BURNS

Ken's 3Ps for Problem Solving:
- **Be Patient**, ask a friend for help first.
- **Be Persistent**, it can take many tries.
- **Be Positive**, you can figure it out!

Notes: