Steam Up 2gether – Lesson 7

Robotics Coding with WhalesBot AI Module 1

Introduction to Fan Graphic Coding

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PhD in Optical Communication from Technical University of Denmark

Extensive teaching and curriculum development experience in Coding and Robotics Education for Kids

WhalesBot

About us

Focus on Robotic design, R&D, ODM, Marketing, Sales service & STEAM education

What we do?

WhalesBot uses interactive programming software such as Graphical coding, Scratch, Python, C and different kinds of structural parts to guide young kids to communicate with robots.

WhalesBot

Environment

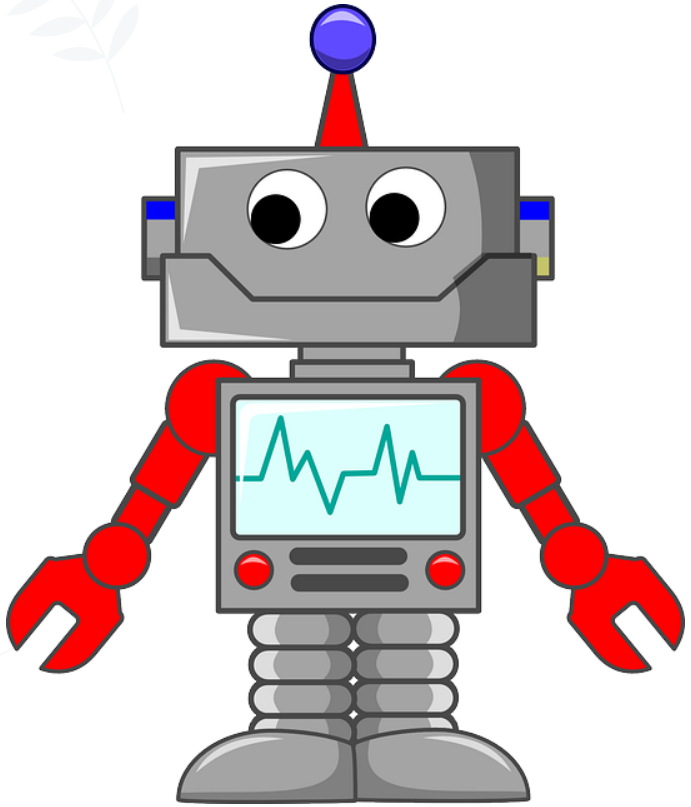
We are helping kids aged from 7 to 18 to touch and learn new technologies so that they can be creative and problem solvers.

Feedback

We saw the teenagers become smarter and innovative simply by playing with WhalesBot. We aim to improve human's life quality by using Robots.

Part 1: Robot and AI Module 1

What is robot?

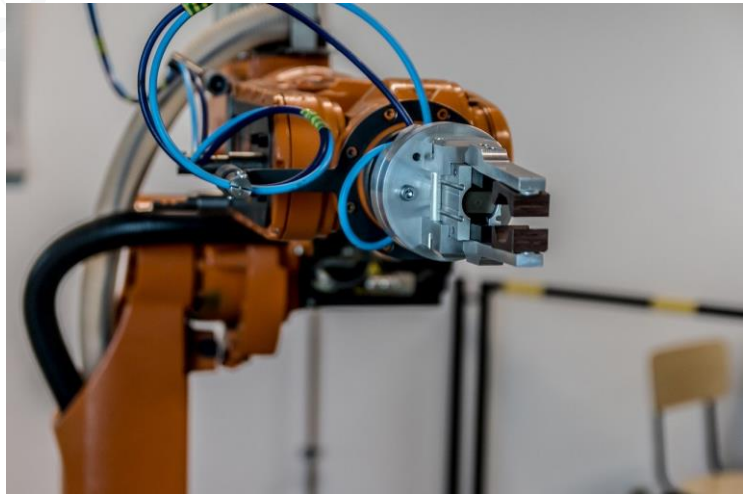


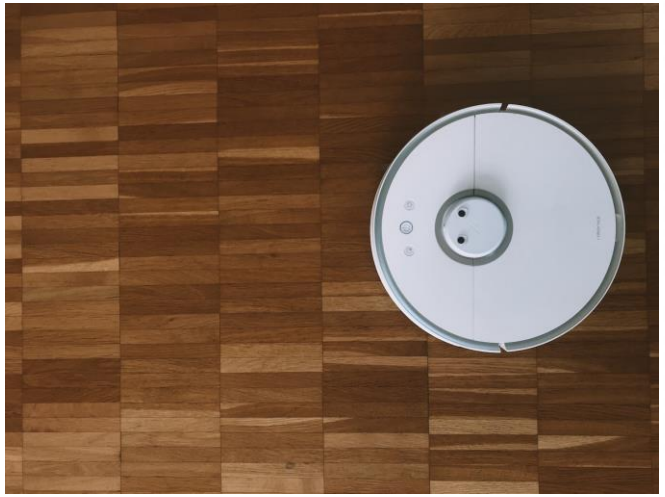
A robot is a machine — especially one programmable by a computer — capable of carrying out a complex series of actions automatically.

Robots can be guided by an external control device or the control may be embedded within.

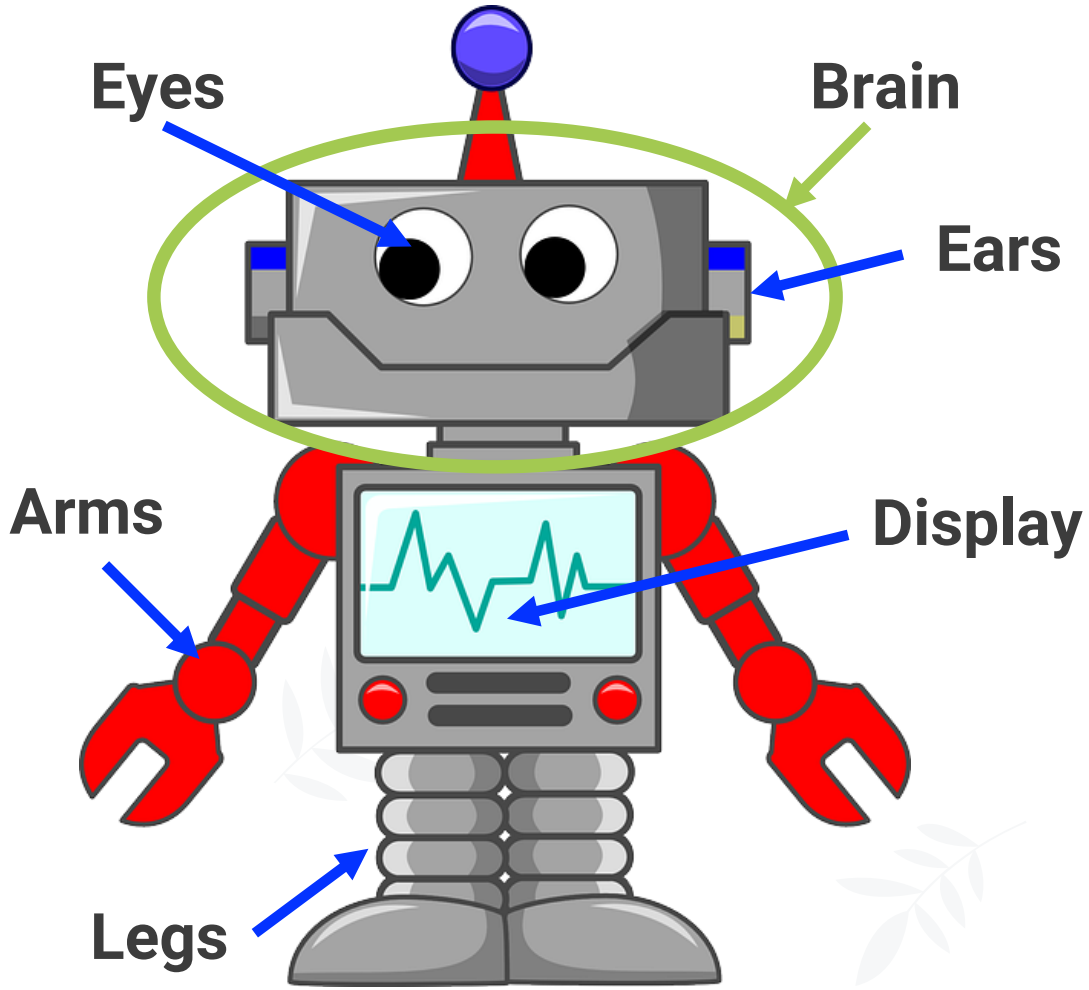
Robots may be constructed on the lines of human form, but most robots are machines designed to perform a task with no regard to their looks.

Which of the following can be considered as robots?





Overview of Robots

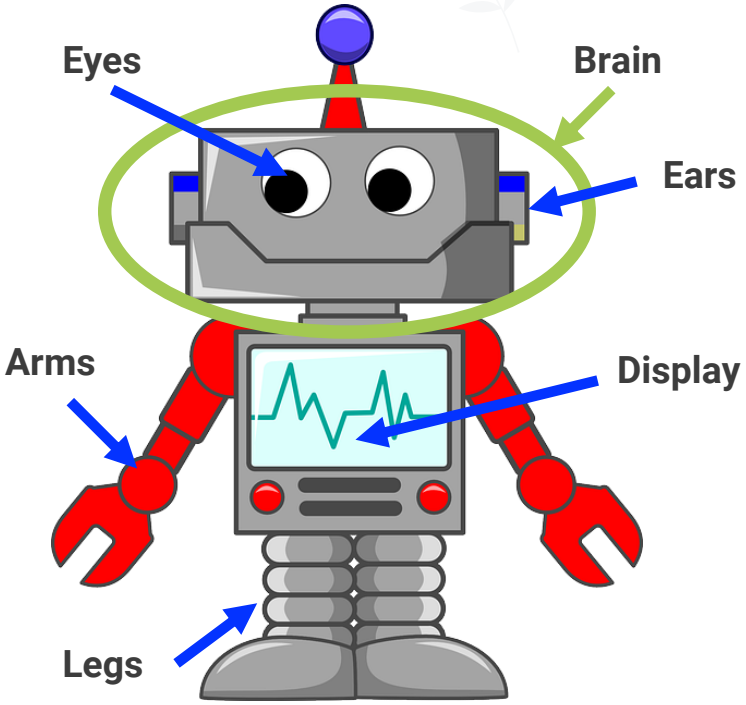


Fundamental Parts of a Robot

Controller: the brain of robot

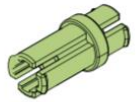
Actuator: a mechanism that puts something into automatic action, for instance, arms, legs, display

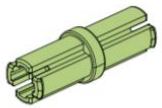
Sensor: a device for sensing and measuring light, pressure, or temperature, and sending information back to a computer, for instance: eyes, ears

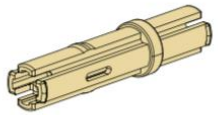


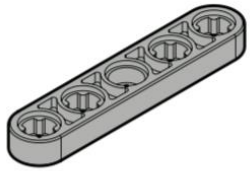
Get to Know AI Module 1

Structural Parts


1.5 Double Bolt x35

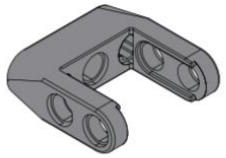

2 Double Bolt x140

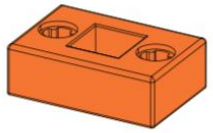

3 Double Bolt x35

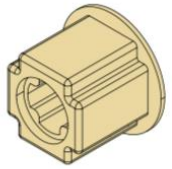

50 Single Beam x18

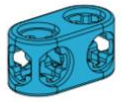

2 Double Step Bolt x4

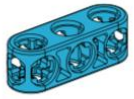

1 Double Step Bolt x8

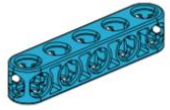

U-Shaped Beam x3

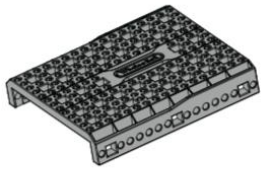

Motor Transfer Bracket x4


1 Square Cotter x4


20 Beam x15

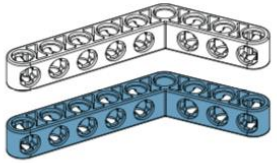

30 Beam x20

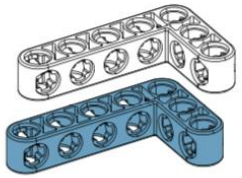

50 Beam x21

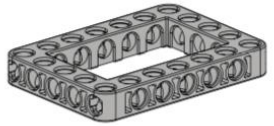

General Chassis x1


70 Beam White x12 Orange x8

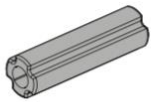

110 Beam White x6 Orange x8

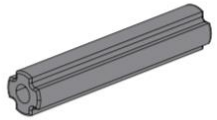

126° 4X6 Beam White x6 Blue x4

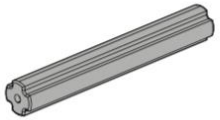

90° 3X5 Beam White x10 Blue x6


5X7 Square Beam x4

Transmission Parts


20 Axle x6


30 Axle x4

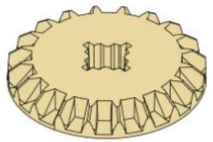

40 Axle x14

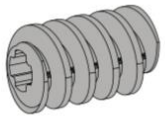

50 Axle x6

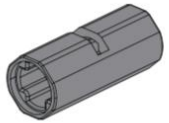

60 Axle x4


80 Axle x6

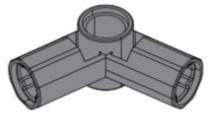

12 Half High Bevel Gear x6

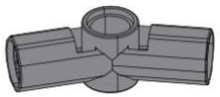

20 Half High Bevel Gear x4


Worm x2


20 Coupler x2

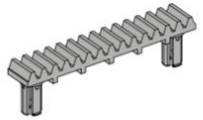

90° Coupler x4


112.5° Coupler x6


157.5° Coupler x4


12 Cone Gear x2


20 Cone Gear x4


Rack（Hole Beam）x4

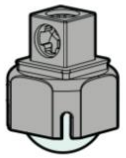

24 Straight Tooth x2


Universal Coupling x2

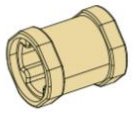

Caterpilla x60

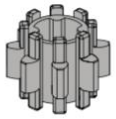

Chain Wheel x6

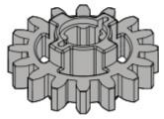

6018 Tyre x2


Universal Wheel x1

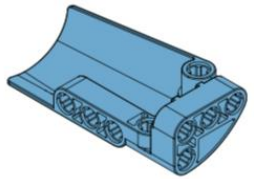

0.5 Pulley Axle Sleeve x30

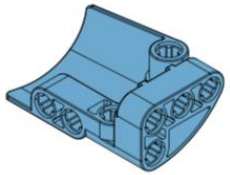

Axle Sleeve x15

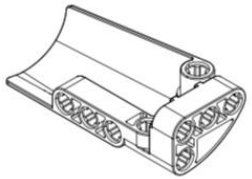

8 Straight Tooth x2

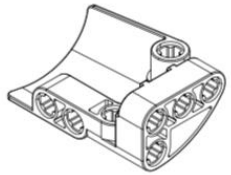

16 Straight Tooth x2

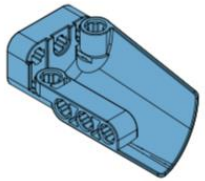
Decoration Parts

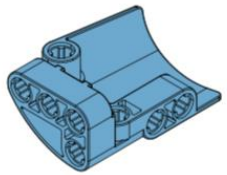

3X7 Left Decorative Part Blue x3

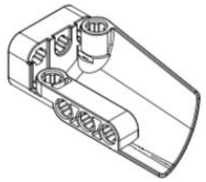

3X5 Left Decorative Part Blue x3

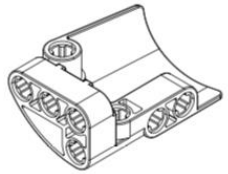

3X7 Left Decorative Part White x2

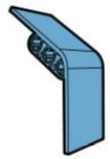

3X5 Left Decorative Part White x4


3X7 Right Decorative Part Blue x3


3X5 Right Decorative Part Blue x3

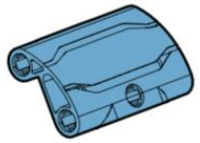

3X7 Right Decorative Part White x2

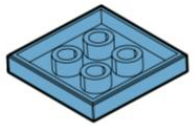

3X5 Right Decorative Part White x4


126° Decorative Part Blue x6


126° Decorative Part White x2

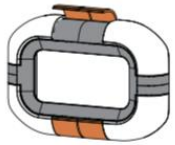

126° Decorative Part Gray x1


3X5 Corner Decoration Blue x6


3X3 Panel Decoration Blue x4

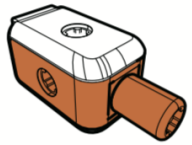

3X5 Corner Decoration White x7


3X3 Panel Decoration Orange x4

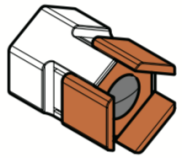

Facial Decoration x1

Electronic Components of AI Module 1

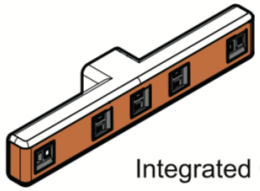
Sensors



Touch Sensor x2

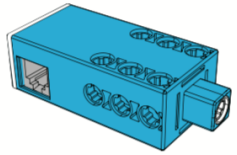


Infrared Sensor x1



Integrated Grayscale Sensor x1

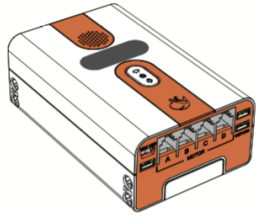
Actuators



Closed-loop Motor x3

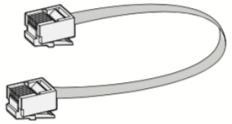
Expression Screen x2

Controller



Controller x1

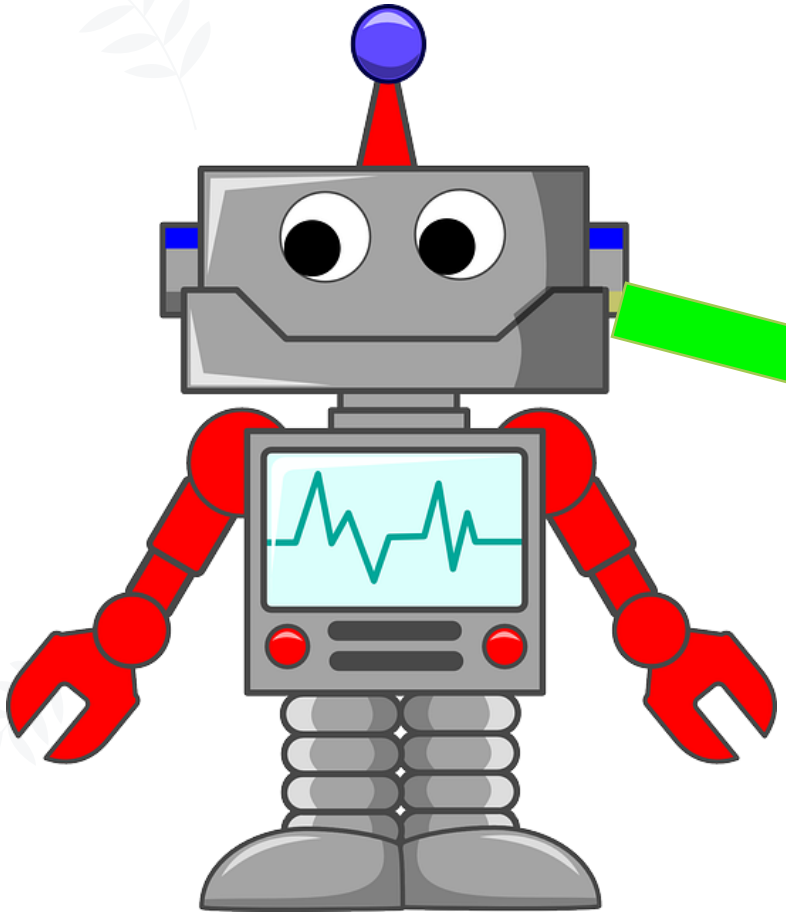
Connection Wires



6PIN Connection Wire x8

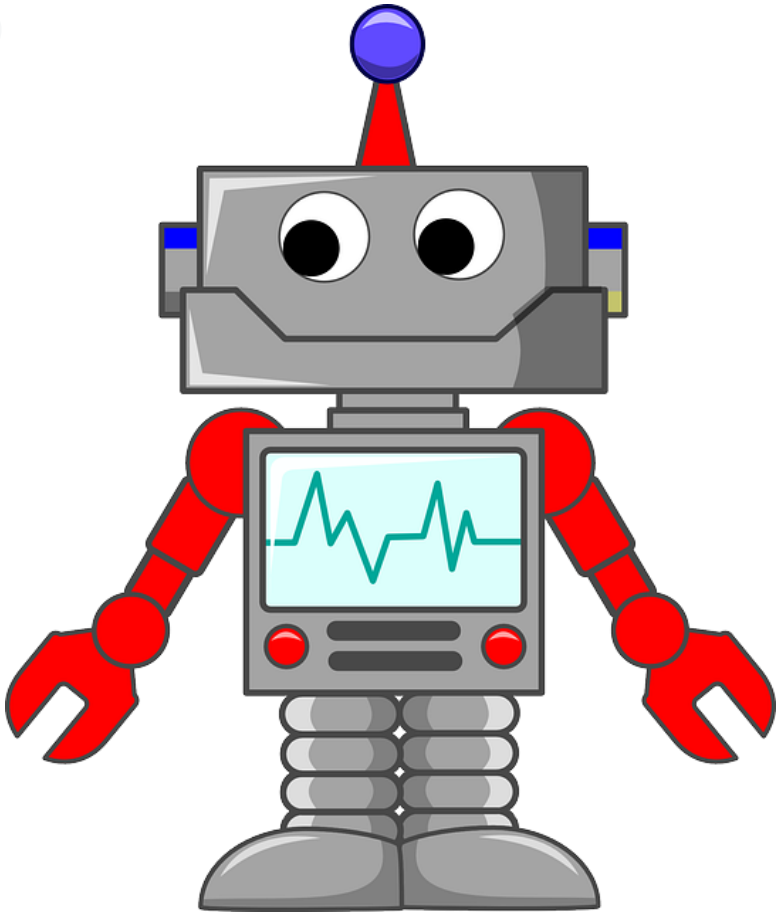
Cable x1

Controller: The Brain of Robots



Controller of AI Module 1

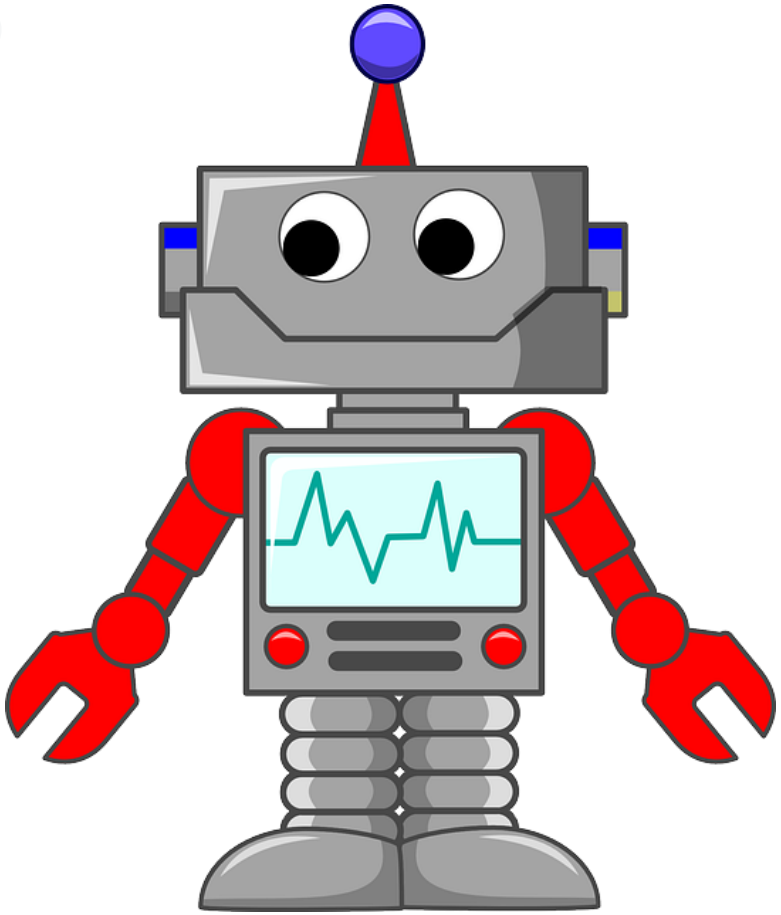
Sensors: The Eyes and Skin of Robots

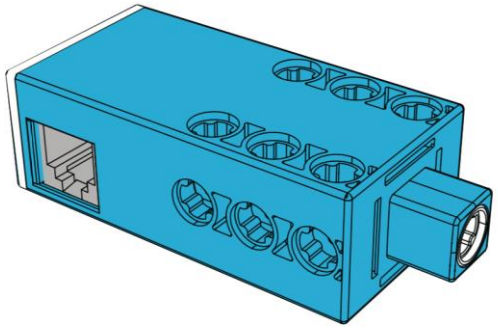


Infrared Sensor

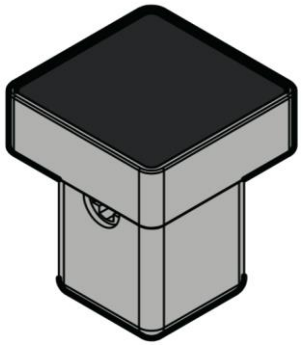
Touch Sensor

Actuators: The Arms and Legs of Robots





Motor



Emotional Screen

Install WhalesBot Software

WhalesBot APP
iOS/ Android

WhalesBot Scratch
iOS/ Android

WhalesBot Scratch
PC/ Mac

Windows Download

Mac Download

Question 1

Please complete in Corelab

What are the three main parts of a robot?

A. Legs, hands and head
B. Controller, sensors and actuators
C. Structural parts, transmission parts and decoration parts

Question 1 - Reference answer

What are the three main parts of a robot?

A. Legs, hands and head

B. Controller, sensors and actuators

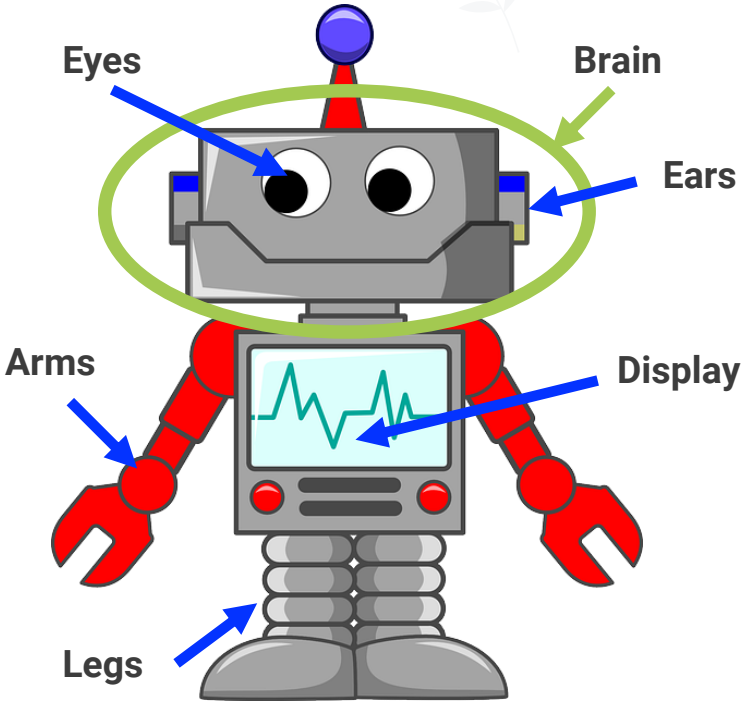
C. Structural parts, transmission parts and decoration parts

Fundamental Parts of a Robot

Controller: the brain of robot

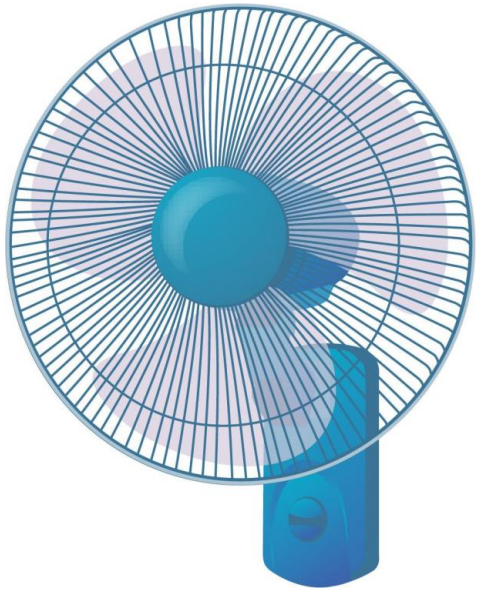
Actuator: a mechanism that puts something into automatic action, for instance, arms, legs, display

Sensor: a device for sensing and measuring light, pressure, or temperature, and sending information back to a computer, for instance: eyes, ears



Part 2: Hand-controlled Fan

Different Types of Fan

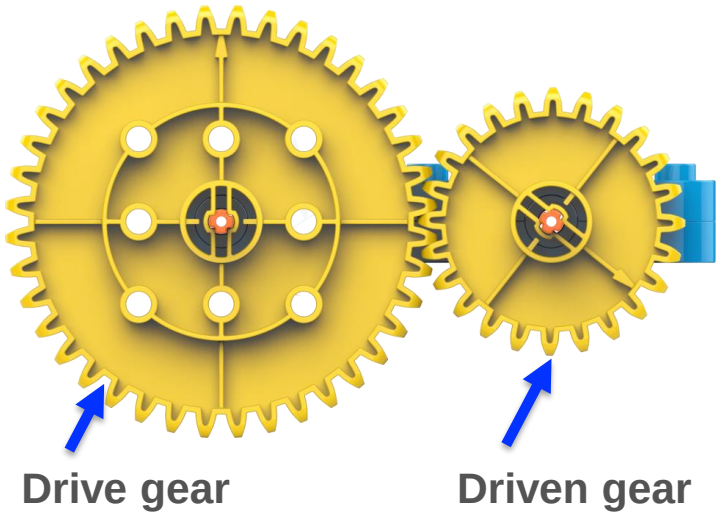


Live Demo: Gear Drive

Gear Ratio

In mechanical engineering, a gear ratio is a direct measure of the ratio of the rotational speeds of two or more interlocking gears.

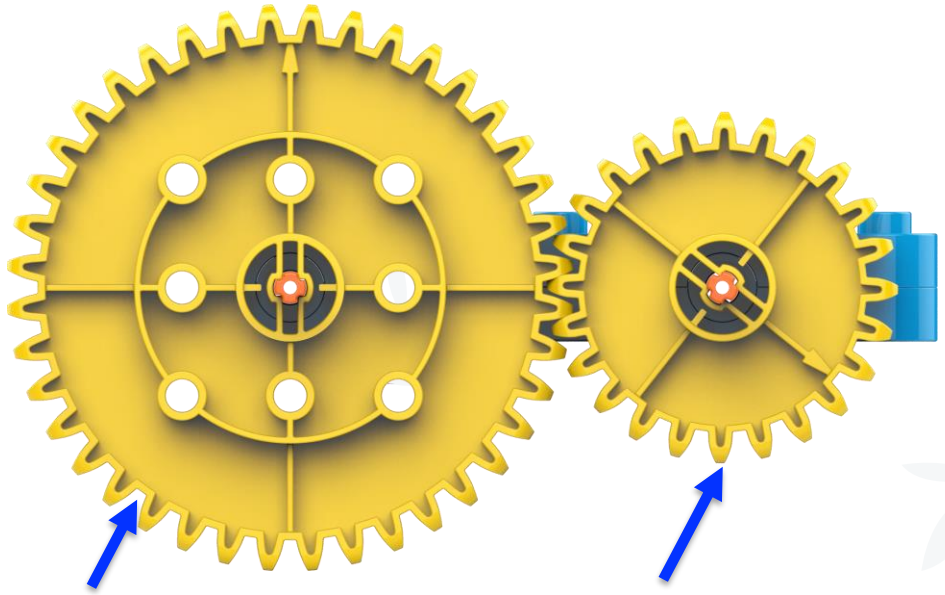
As a general rule, when dealing with two gears, if the drive gear (the one directly receiving rotational force from the engine, motor, etc.) is bigger than the driven gear, the latter will turn more quickly, and vice versa.



Gear Ratio Calculation

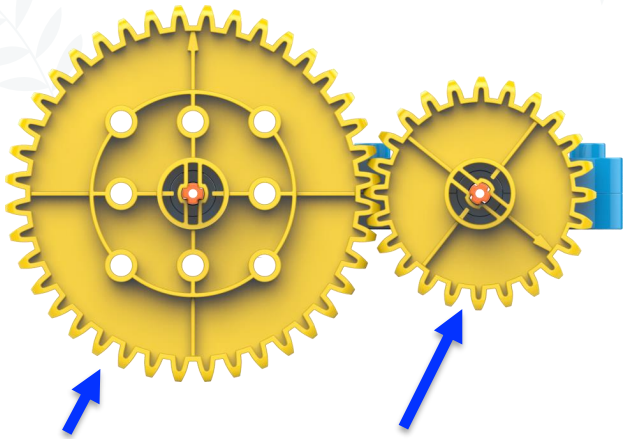
Gear ratio = T2/T1

T1 is the number of teeth on the first gear (drive gear)
T2 is the number of teeth on the second gear (driven gear)

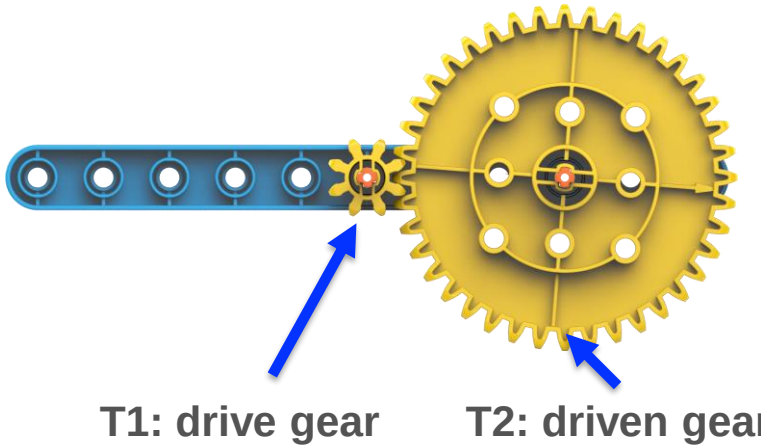


T1: drive gear **T2: driven gear**

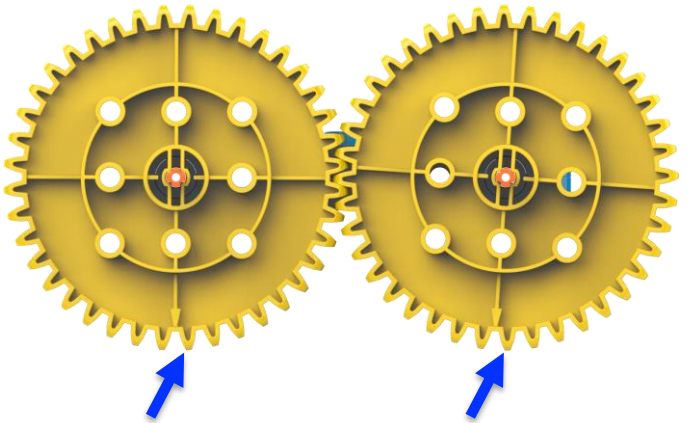
Gear ratio = T2/T1



Gear ratio < 1,
T2 will accelerate.



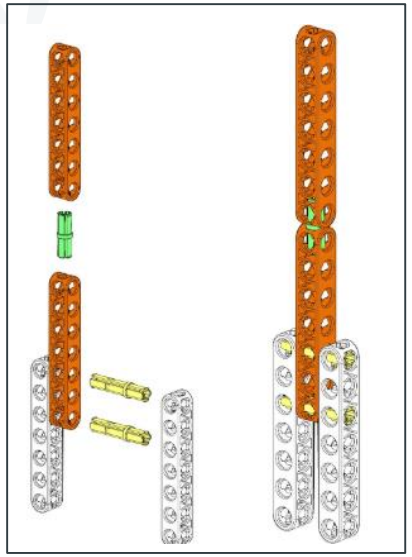
Gear ratio > 1,
speed of T2 will decrease.

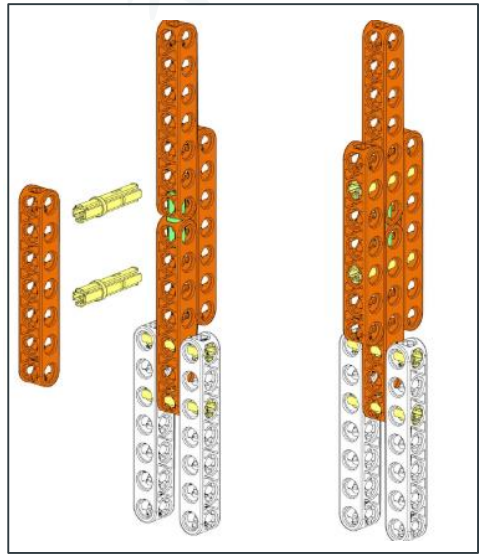


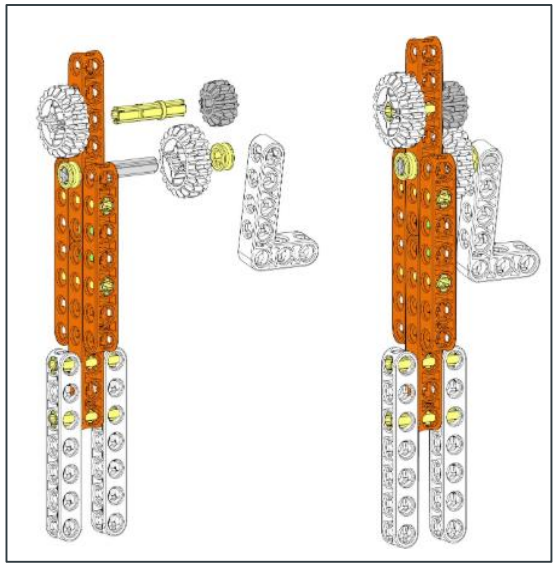
Gear ratio = 1,
same rotation speed.

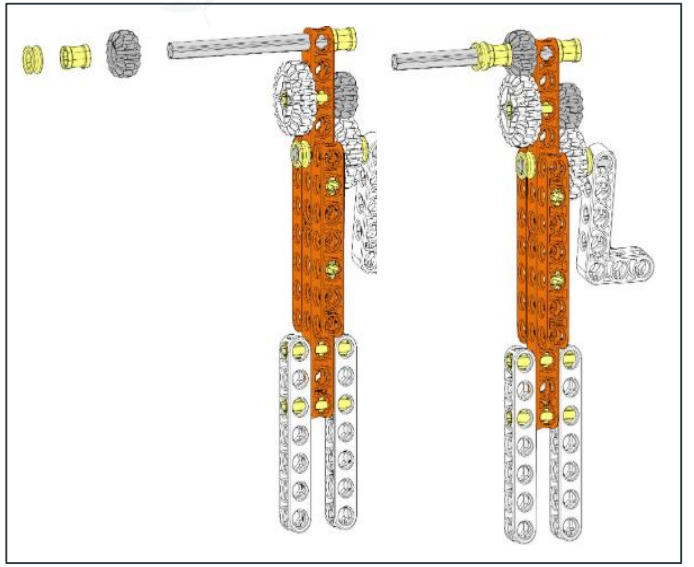
Live Demo: Gear for Fan

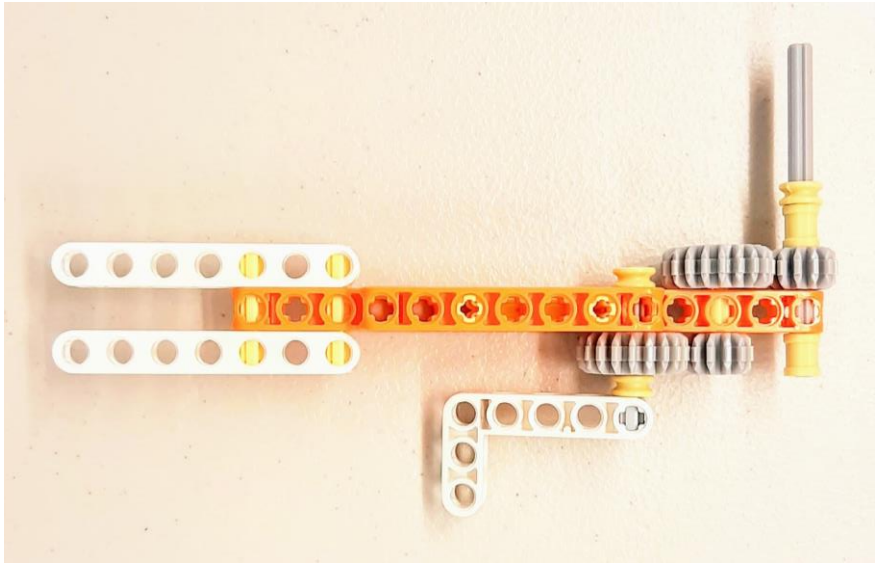
Hand-controlled Fan - Building Steps



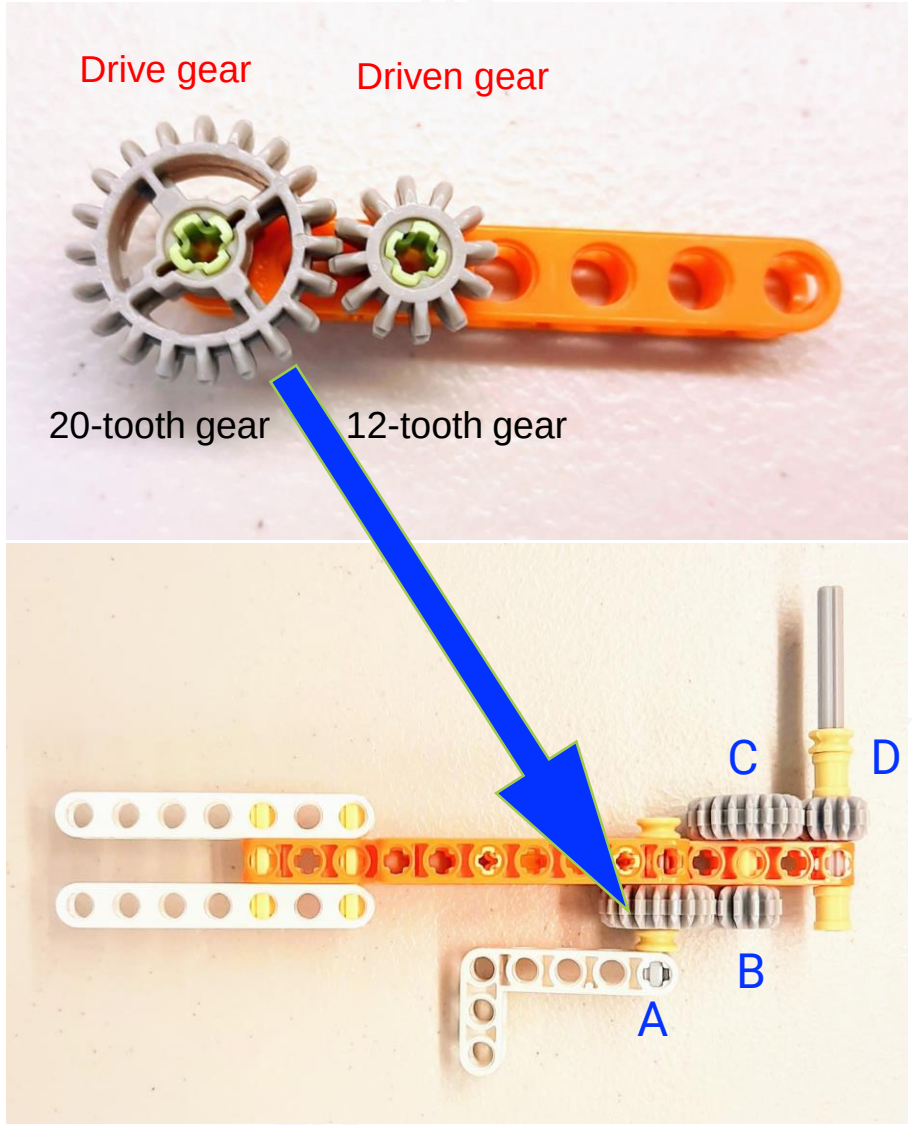








Gear Ratio Calculation for Fan

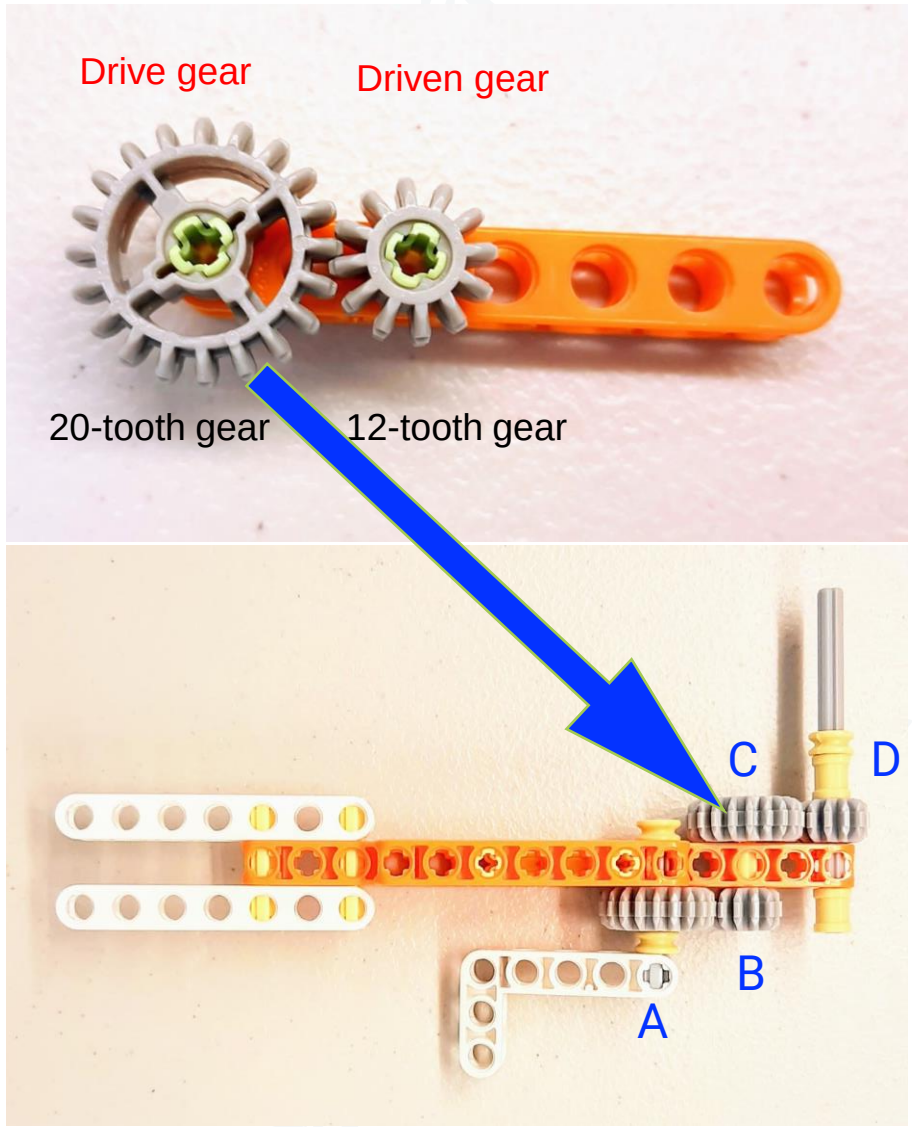


The 20-tooth gear (A) is the drive gear and 12-tooth gear (B) is the driven gear.

Gear ratio: 12 ÷ 20 = 3/5 < 1

Speed of 12-tooth gear (B) can be increased.

Gear Ratio Calculation for Fan

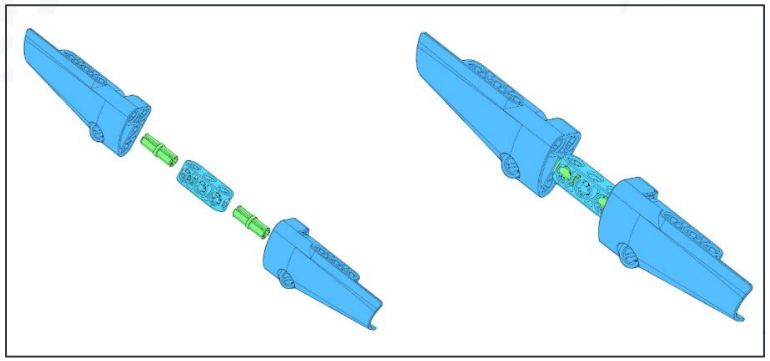


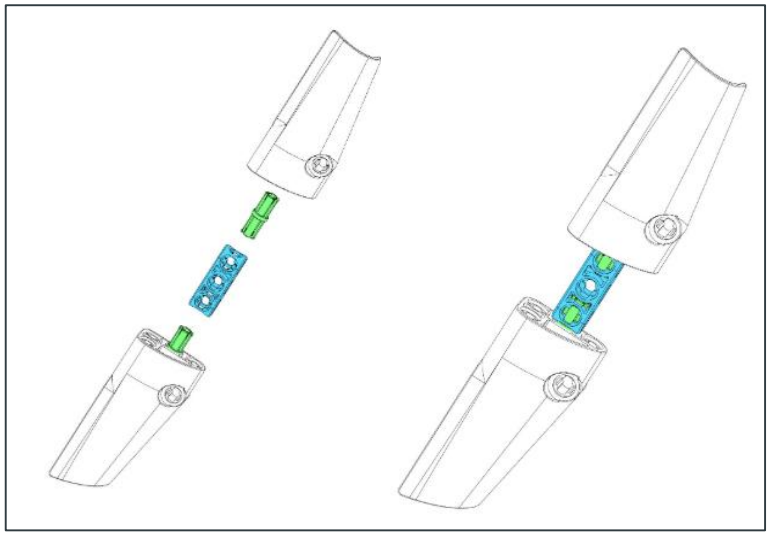
The 20-tooth gear (C) and the 12-tooth gear (B) are connected on the same axle, they have the same rotation speed, the gear ratio of D to C is the same as B to A, which is 3/5, the gear ratio of D to A:

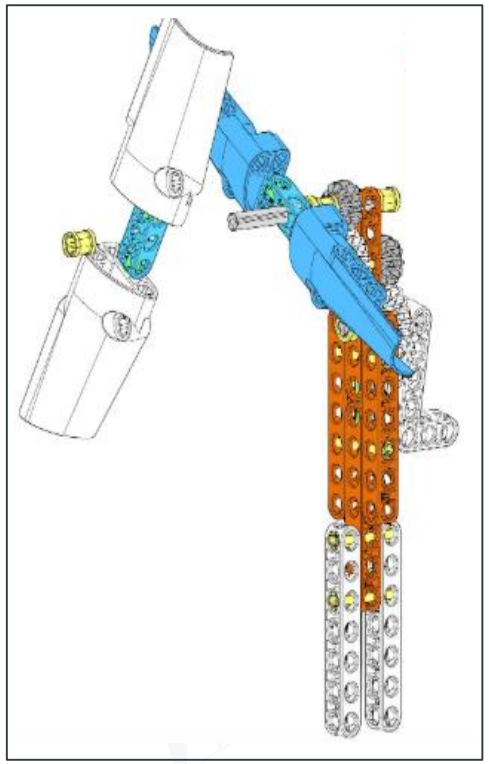
(D/C)*(B/A)=(12 ÷ 20)* (12 ÷ 20)= (3/5) * (3/5)=9/25<1

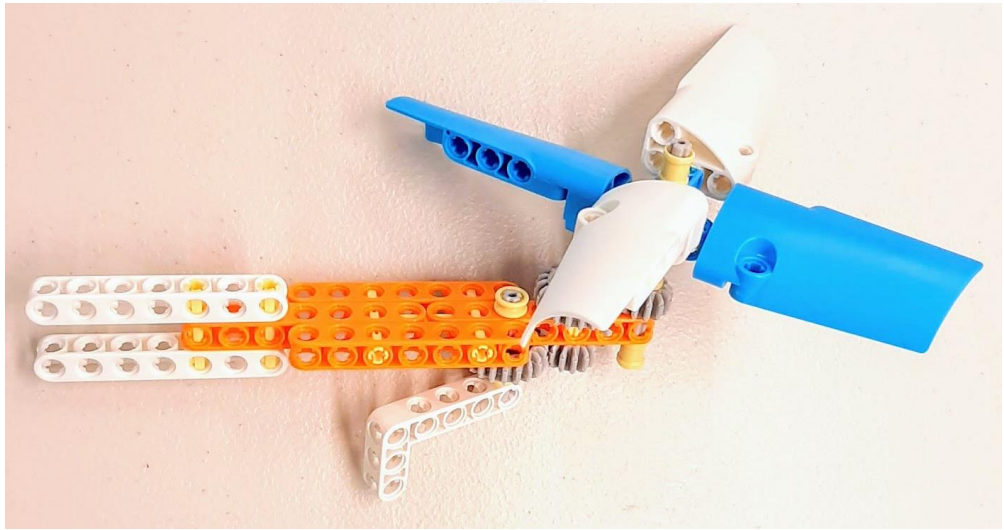
The speed of 12-tooth gear (D) can be increased.

Hand-controlled Fan - Building Steps









Live Demo: Hand-controlled Fan

Question 2

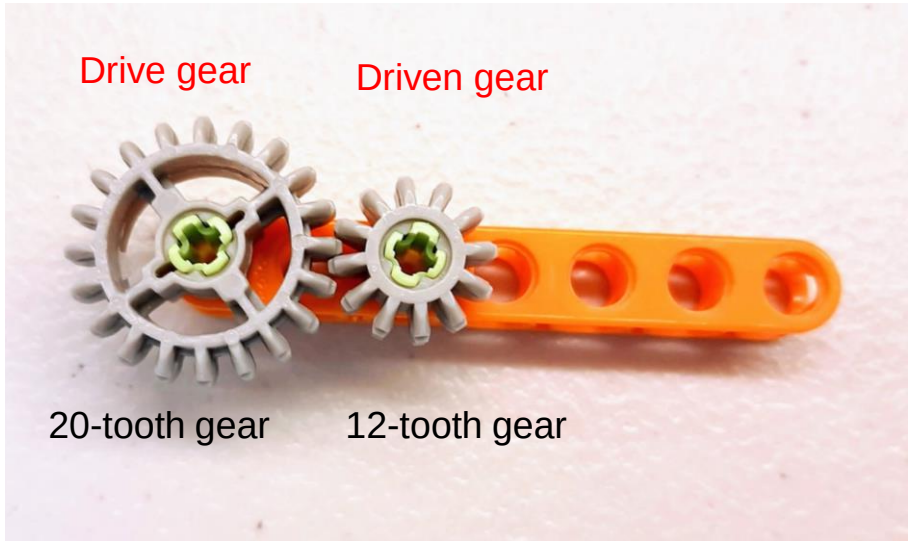
Please complete in Corelab

If the 20-tooth gear rotates 3 turns, how many times the 12-tooth gear will rotate?

A. 1.5

B. 5

C. 1.8



Question 2 - Reference Answer

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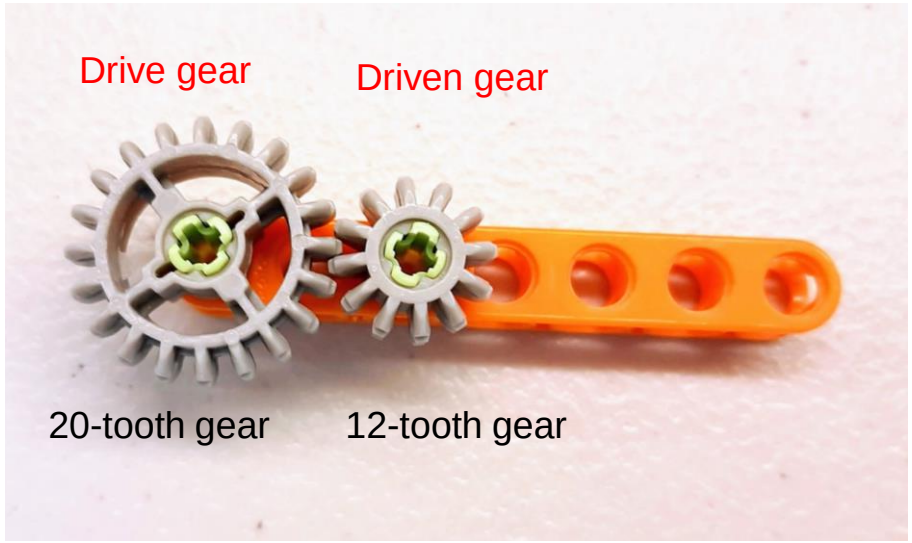
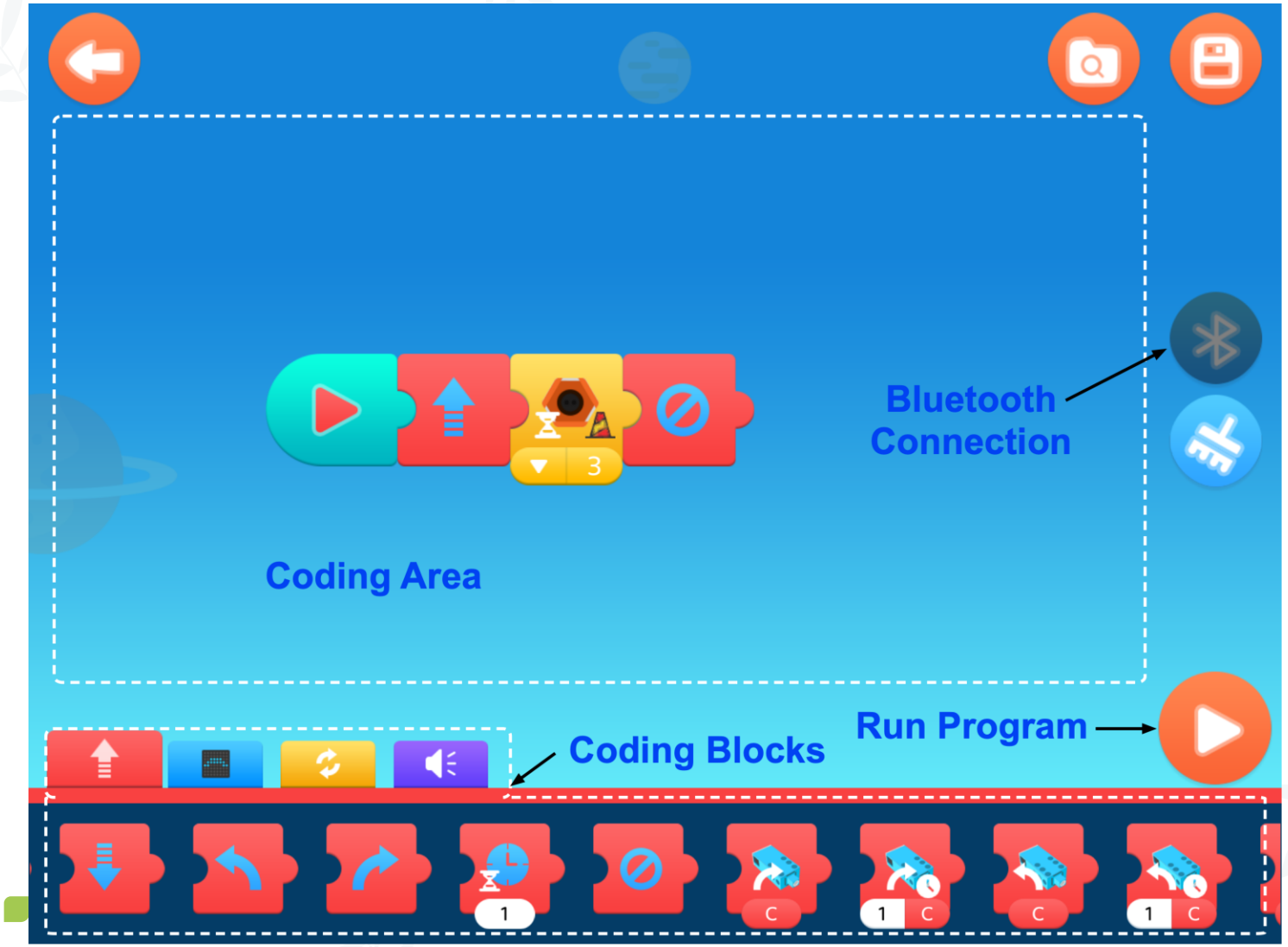
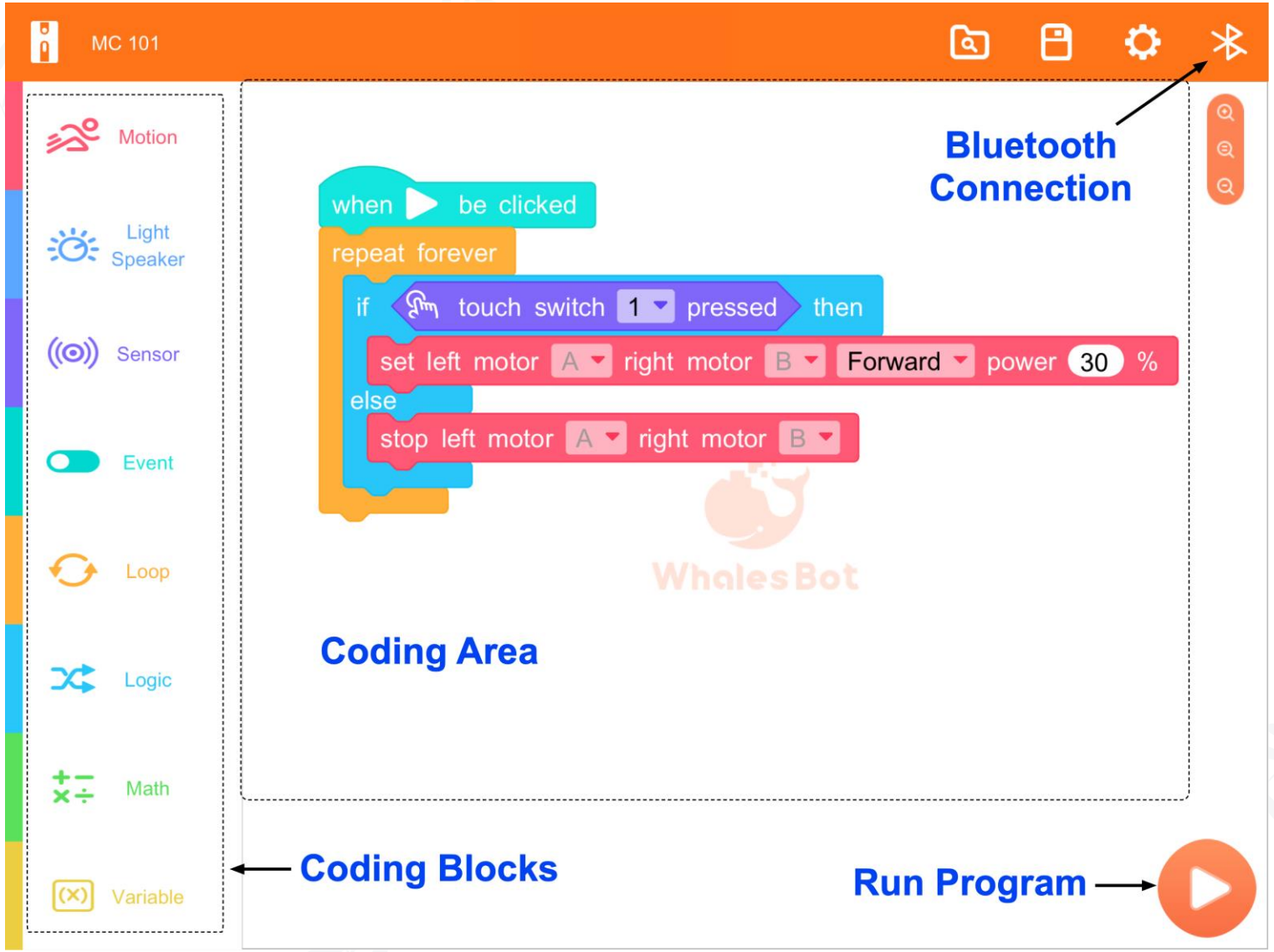


Part 3: Sensor-triggered Fan

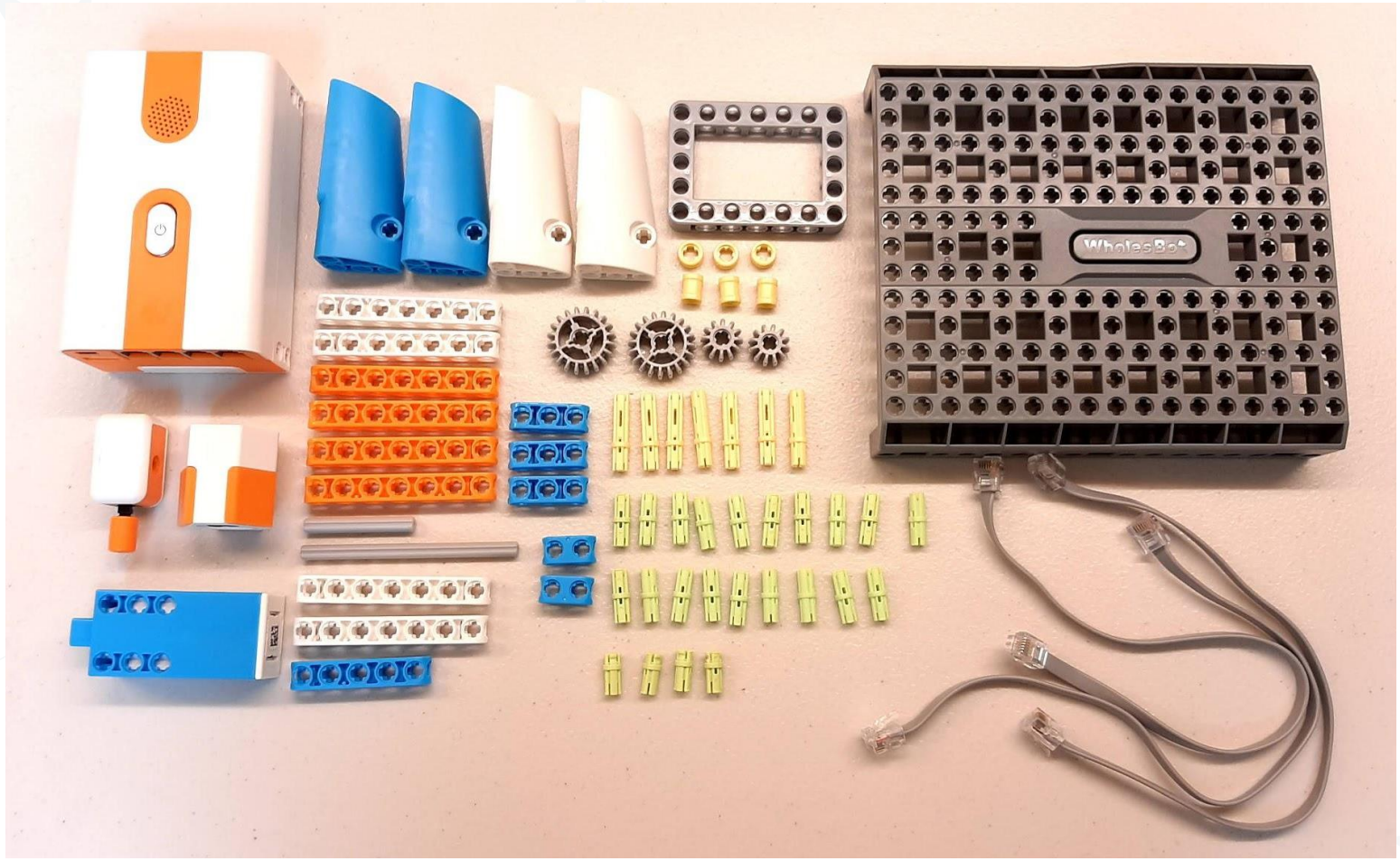
Mobile WhalesBot APP (Graphical Coding) Interface

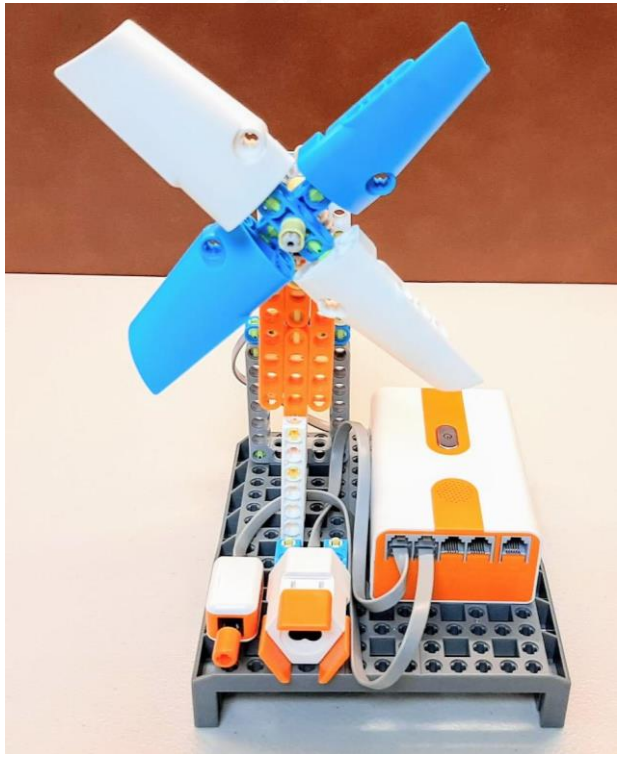


Mobile WhalesBot Scratch Interface

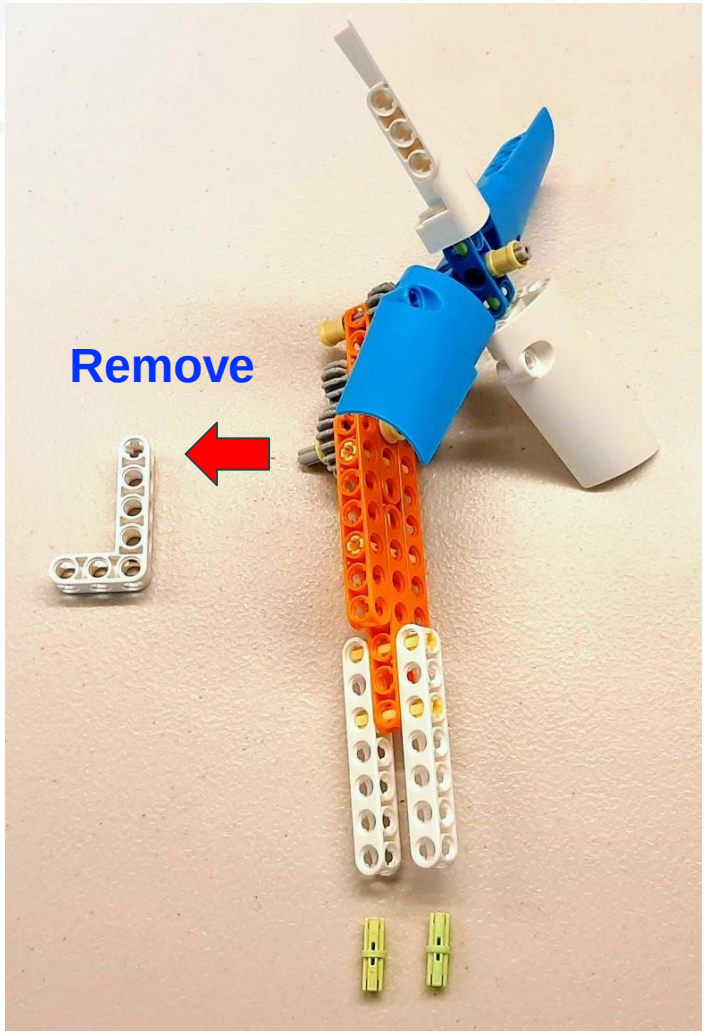


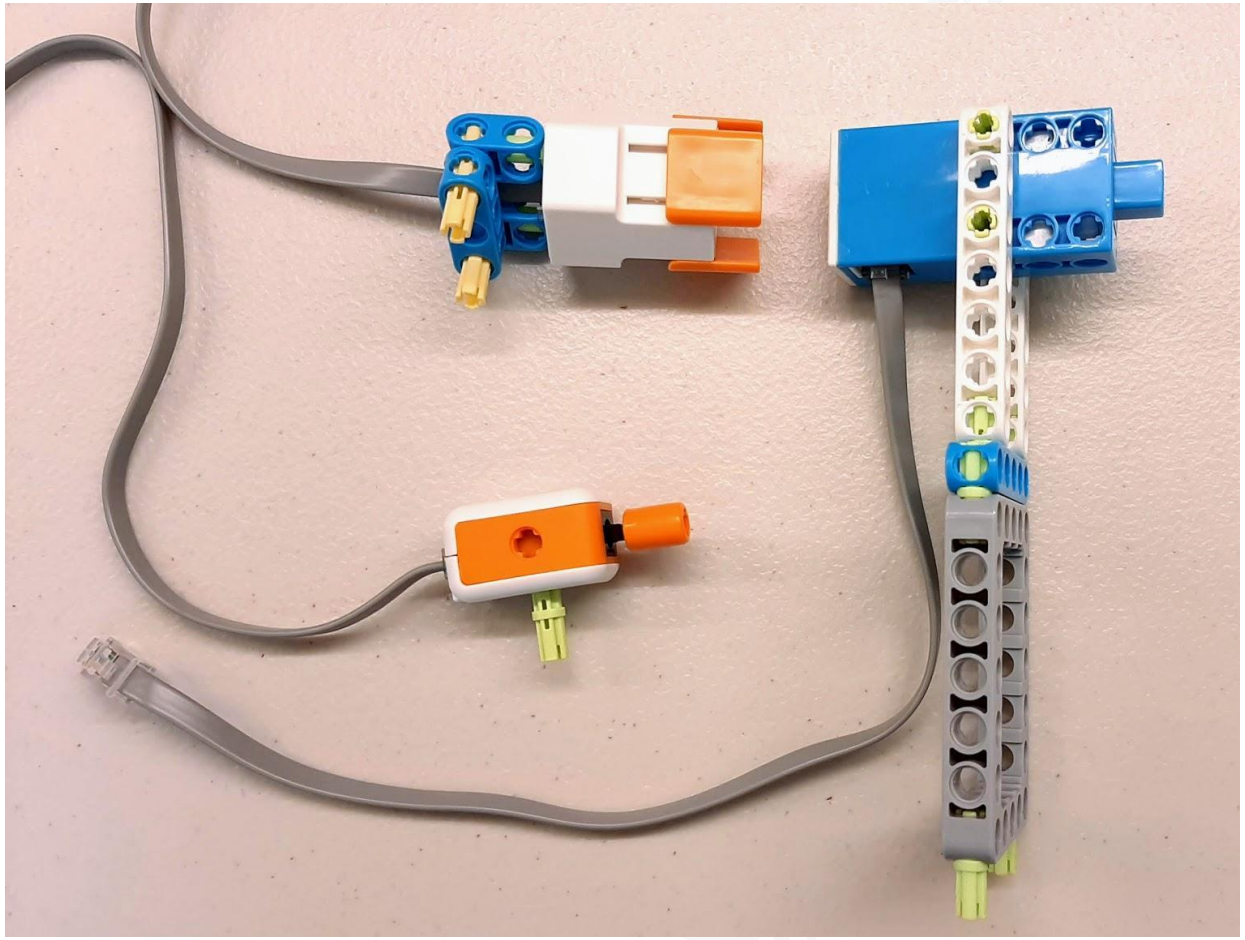
Sensor-triggered Fan - Finished Model





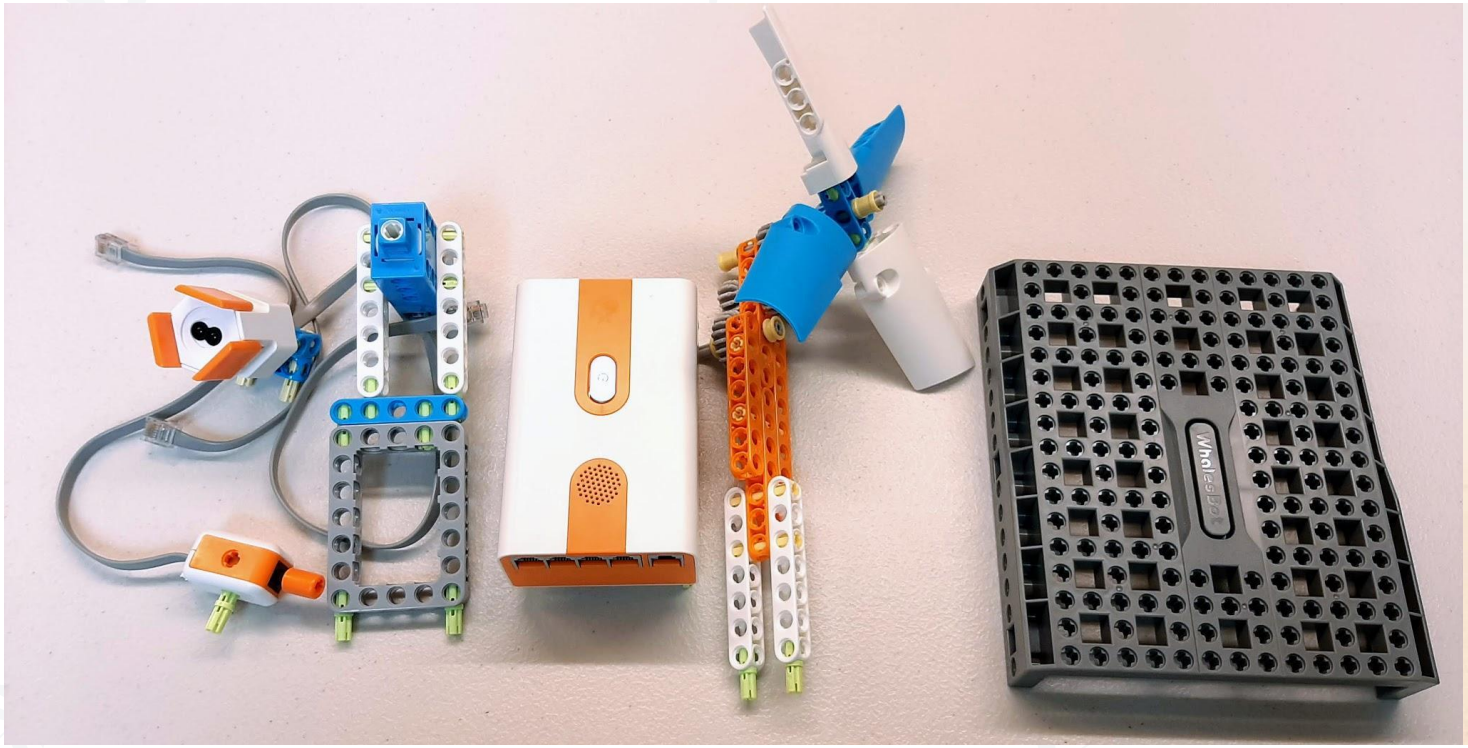
Sensor-triggered Fan - Part A

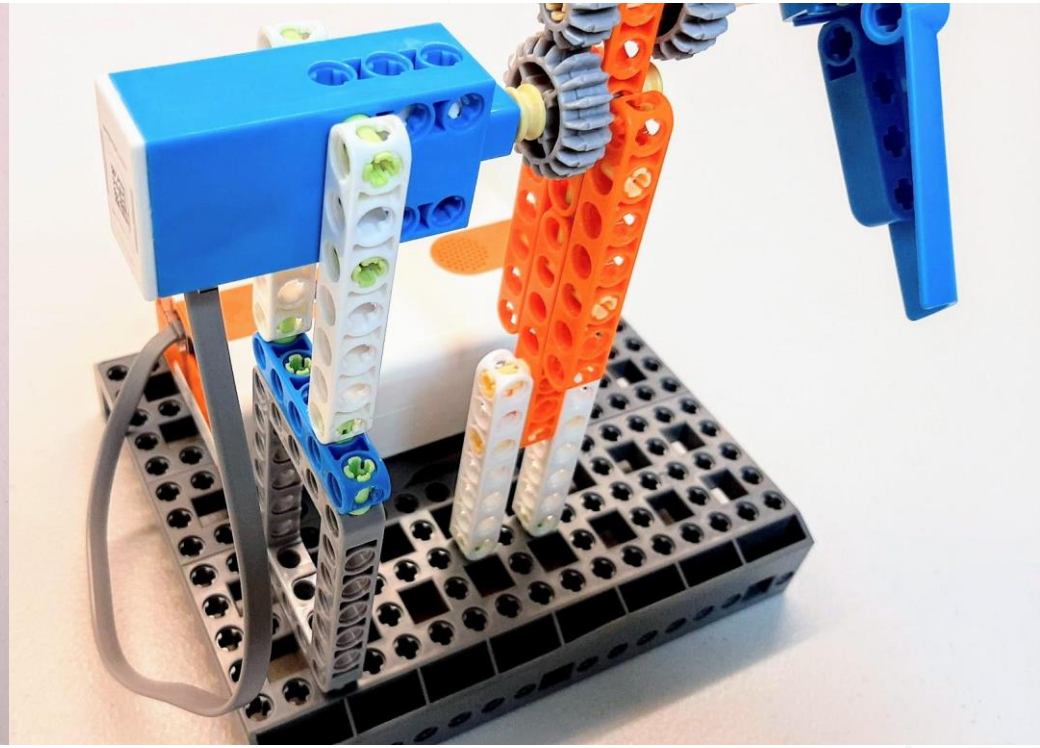




Prepare motor and infrared sensor and touch sensor.

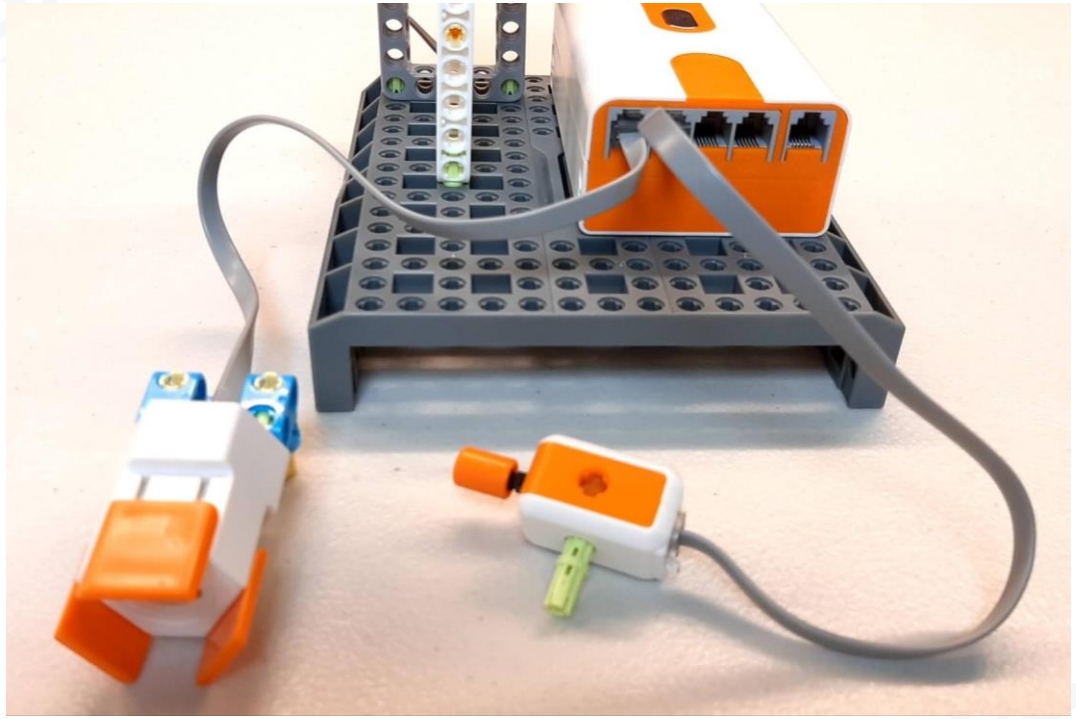
Sensor-triggered Fan - Part B

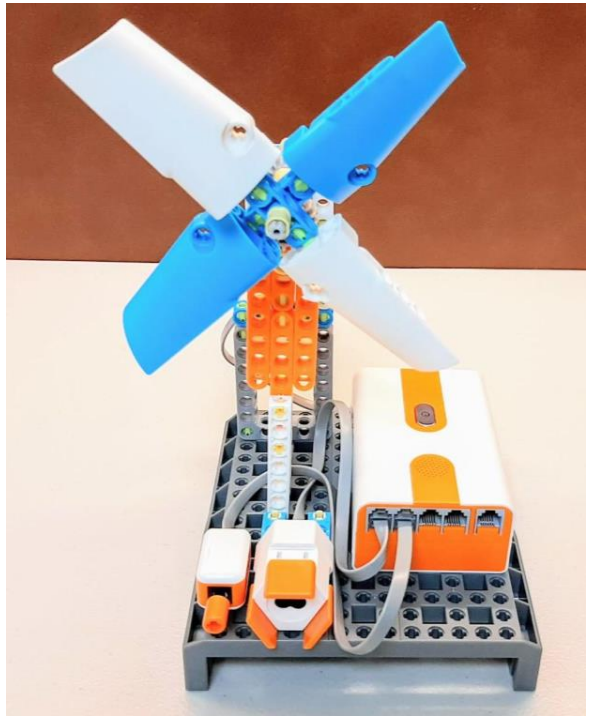




Connect the fan, motor and sensors.

Sensor-triggered Fan - Part C





Connect sensors to port 1 and 2.

Live Demo:

Alternating-direction Fan

By Graphical Coding

Live Demo:

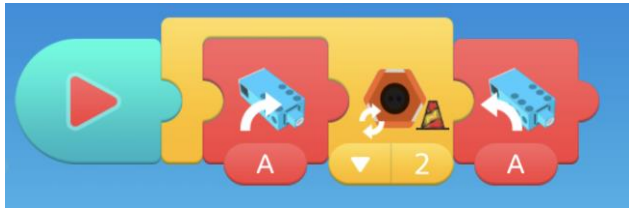
Infrared Sensor-triggered Fan By Mobile WhalesBot Scratch

Question 3

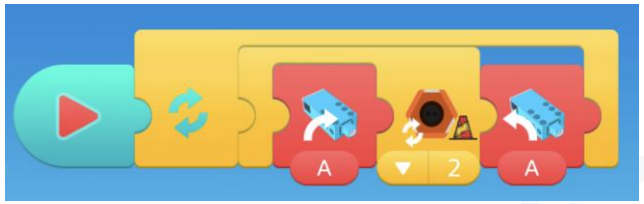
Please complete in Corelab

If you wish to make fan to rotate clockwise at first, when infrared sensor detects obstacle, it rotates counter-clockwise, and the fan will repeat the same action. Which of the following is correct?

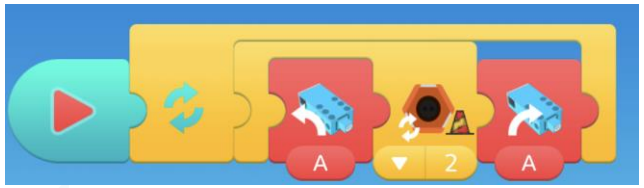
A.



B.



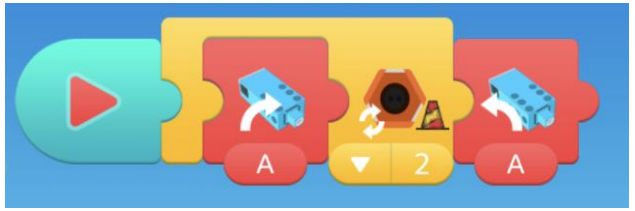
C.



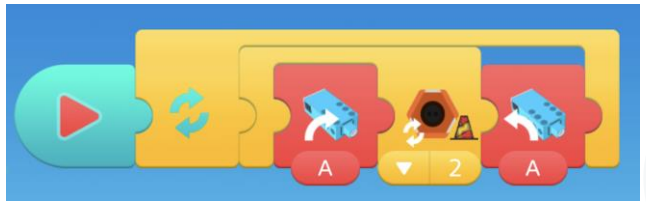
Question 3 - Reference Answer

If you wish to make fan to rotate clockwise at first, when infrared sensor detects obstacle, it rotates counter-clockwise, and the fan will repeat the same action. Which of the following is correct?

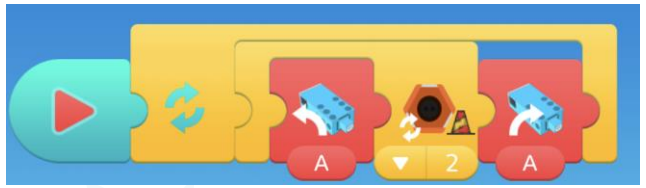
A.



B.



C.



Question 4

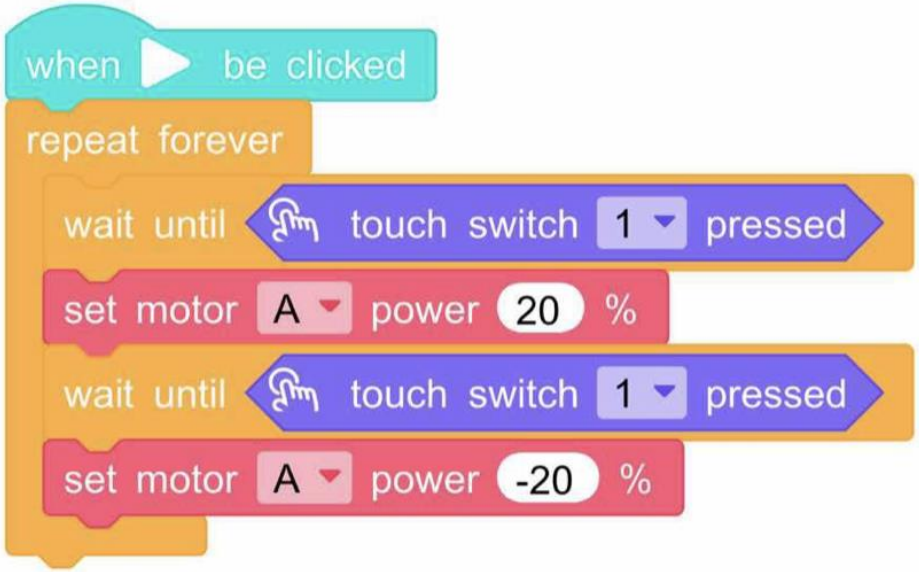
Please complete in Corelab

What of the following is correct about the program?

A. If touch switch is pressed, motor A will always rotate in the same direction.

B. As touch switch is pressed, motor A will rotate with 20% and -20% power, the eventual result is motor A will not rotate at all.

C. If touch switch is pressed, motor A will rotate in one direction, if touch switch is pressed again, motor A will rotate in an opposite direction.



Question 4 - Reference Answer

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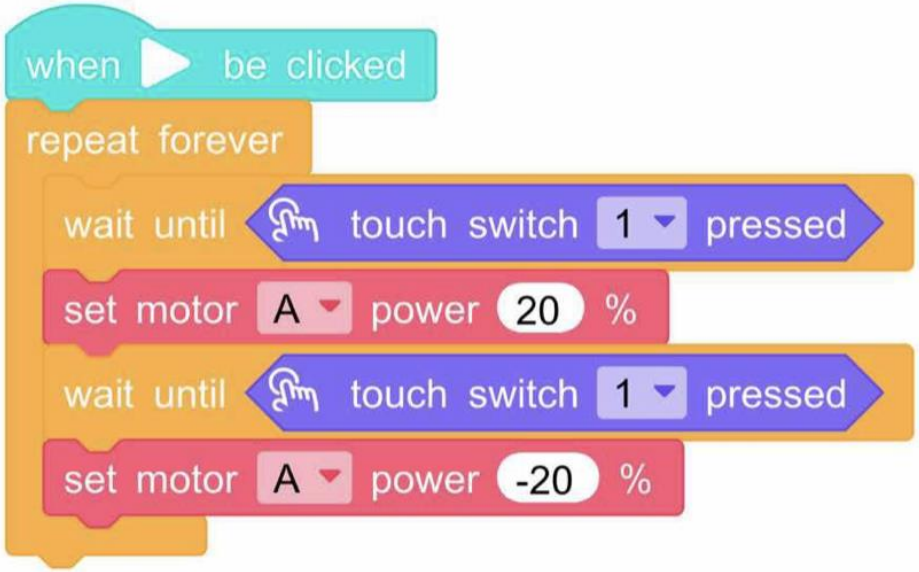

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B. As touch switch is pressed, motor A will rotate with 20% and -20% power, the eventual result is motor A will not rotate at all.

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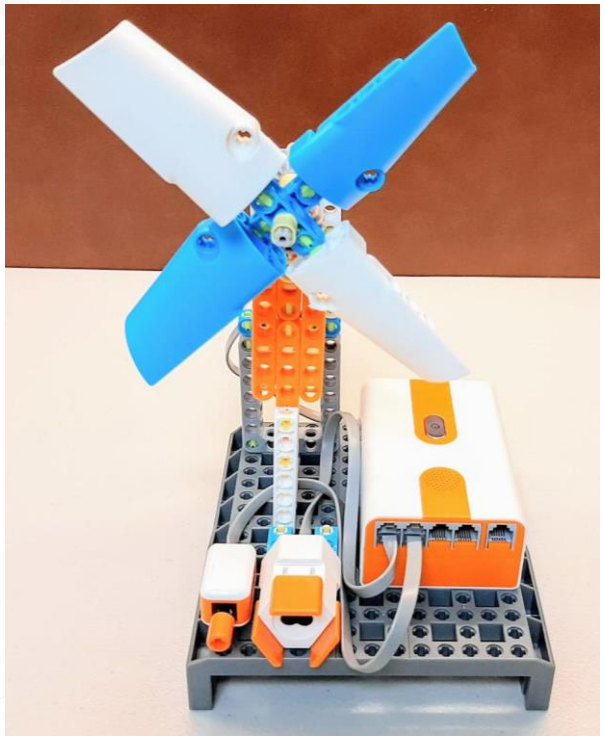
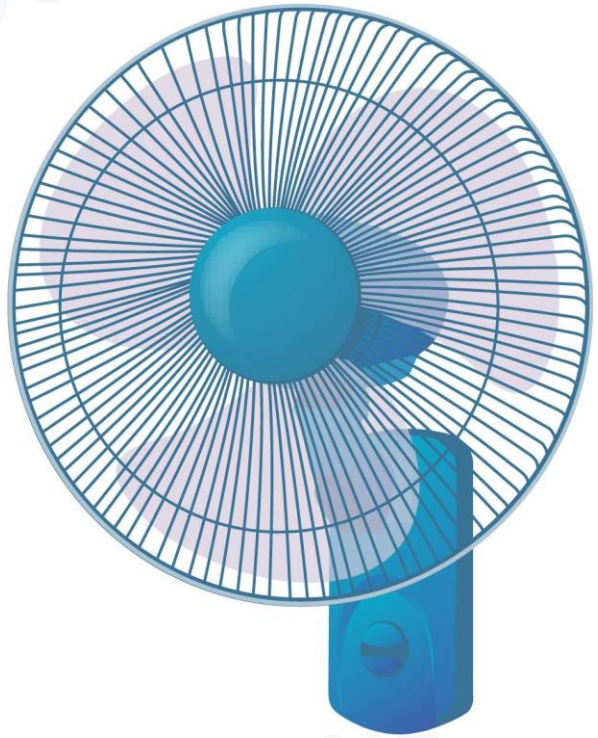
Part 4: Speed-changing Fan

Current Problem



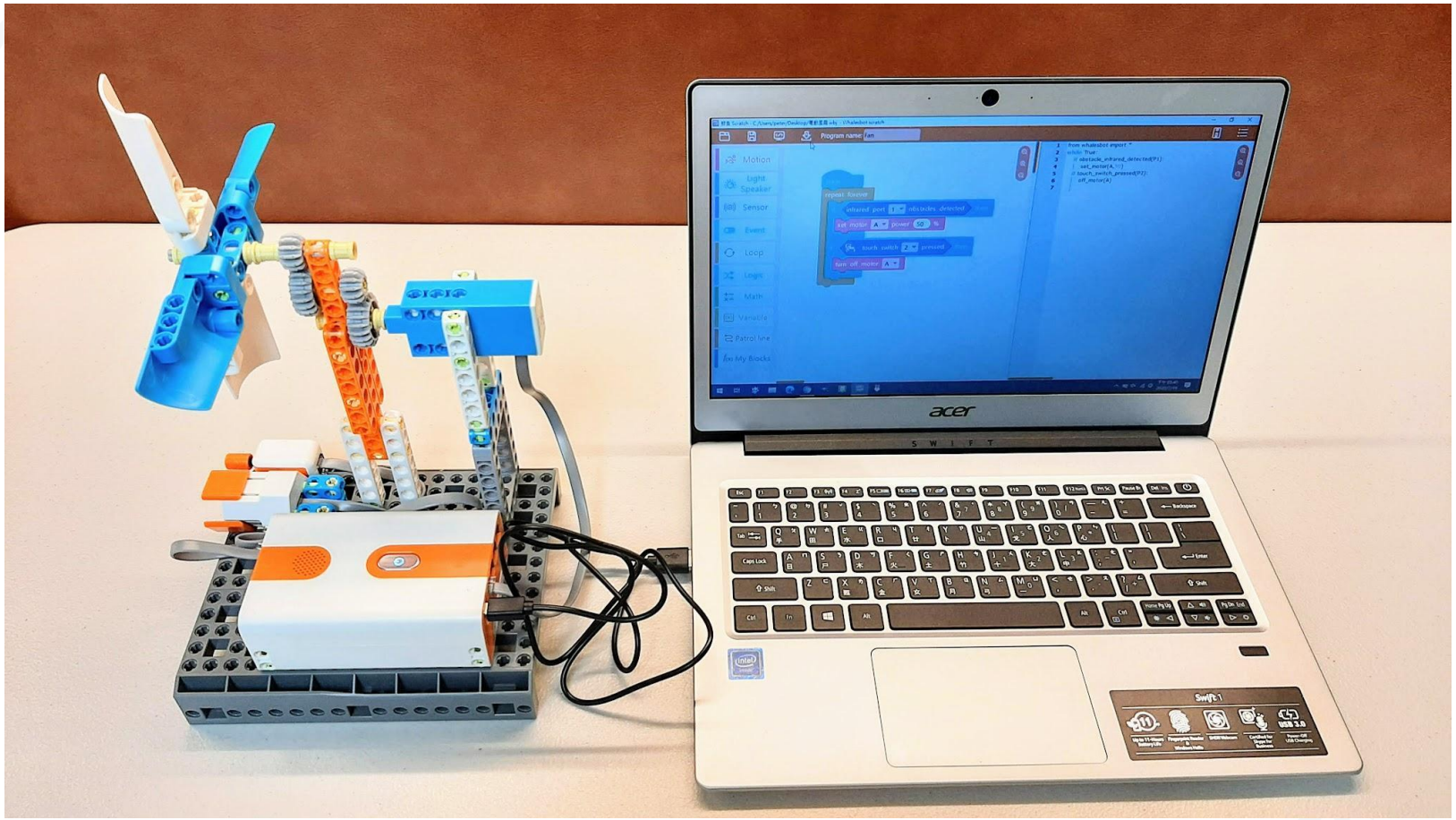


The speed of the sensor-triggered fan is fixed, the electrical fan at home normally have 3 speed modes:

1. slow
2. medium
3. fast

How can we change our program to make our fan able to change speed?

Sensor-triggered Fan and PC WhalesBot Scratch Coding



Live Demo:

Tour on PC WhalesBot Scratch Coding

Live Demo:

How many times we pressed touch switch?

By PC WhalesBot Scratch Coding

Live Demo:

Speed-changing Fan

By PC WhalesBot Scratch Coding

Question 5

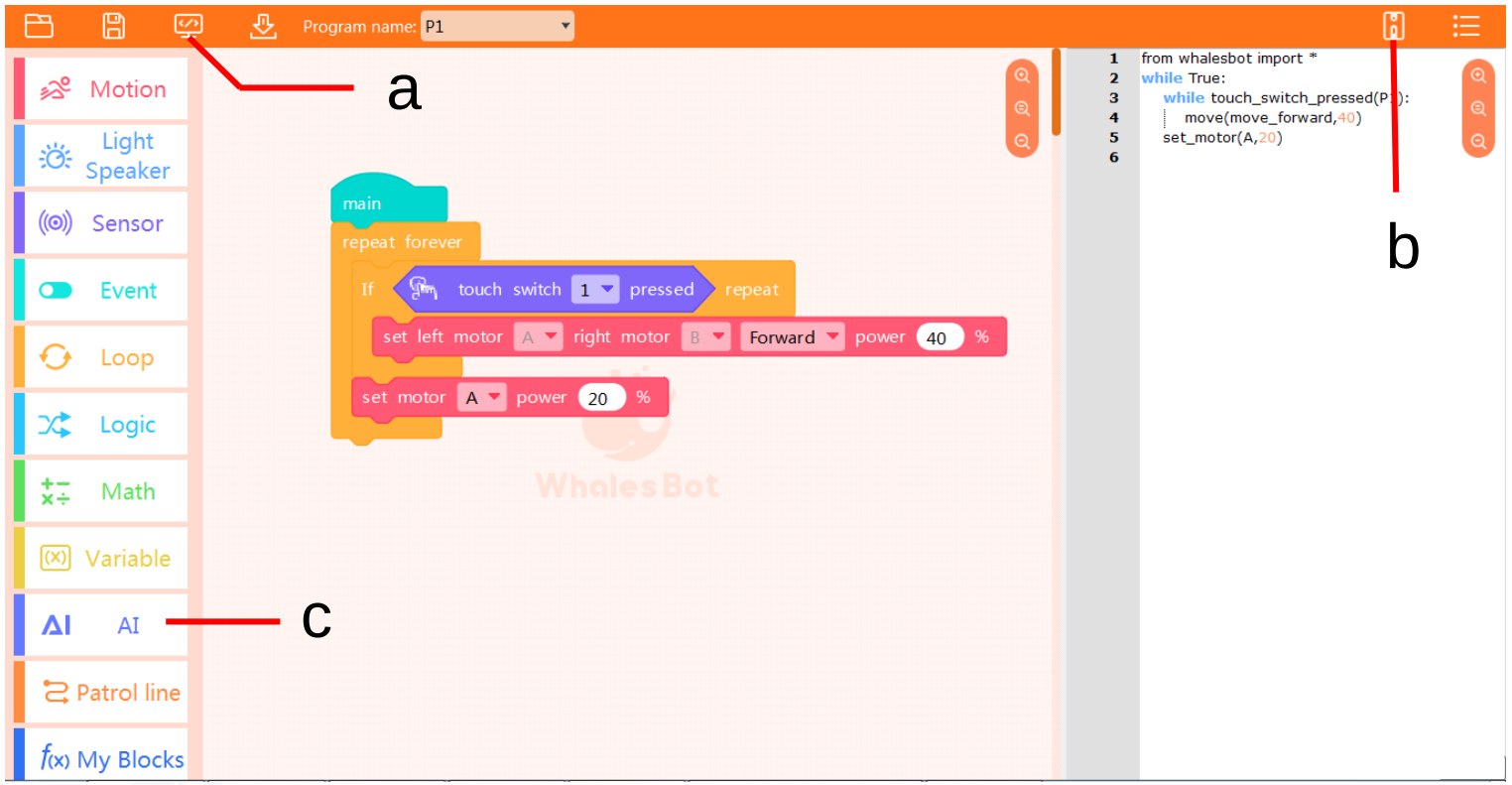
Please complete in Corelab

WhalesBot scratch programming software is capable of converting graphical programing language into C-coding or Python by clicking one button on the tool bar. Please select the correct button on the tool bar to make this code conversion.

A. a

B. b

C. c



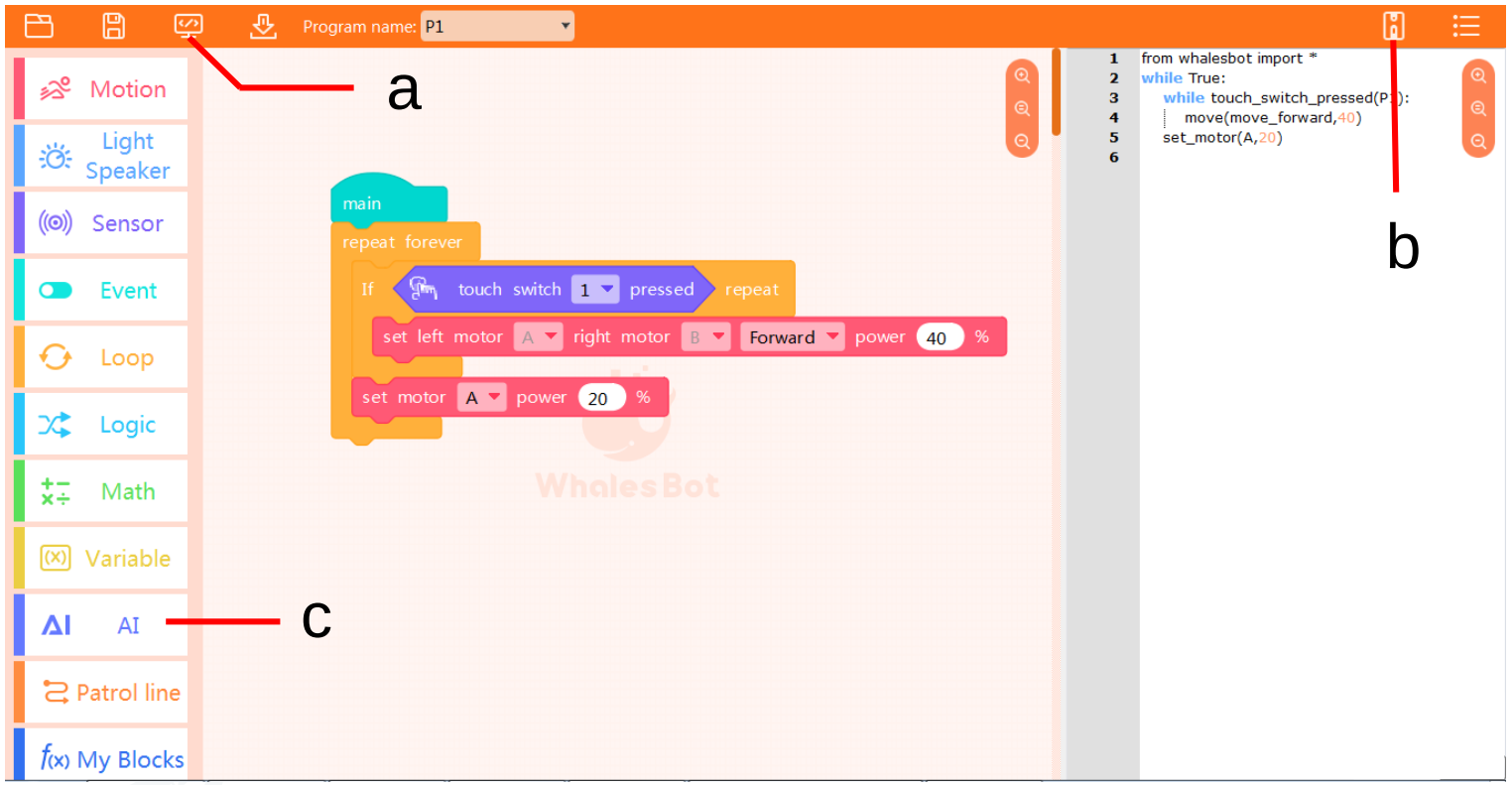
Question 5 - Reference Answer

WhalesBot scratch programming software is capable of converting graphical programing language into C-coding or Python by clicking one button on the tool bar. Please select the correct button on the tool bar to make this code conversion.

A. a

B. b

C. c



Thank You !

WhalesBot International Technology CO., Ltd

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E-mail: benmo@whalesbot.tw