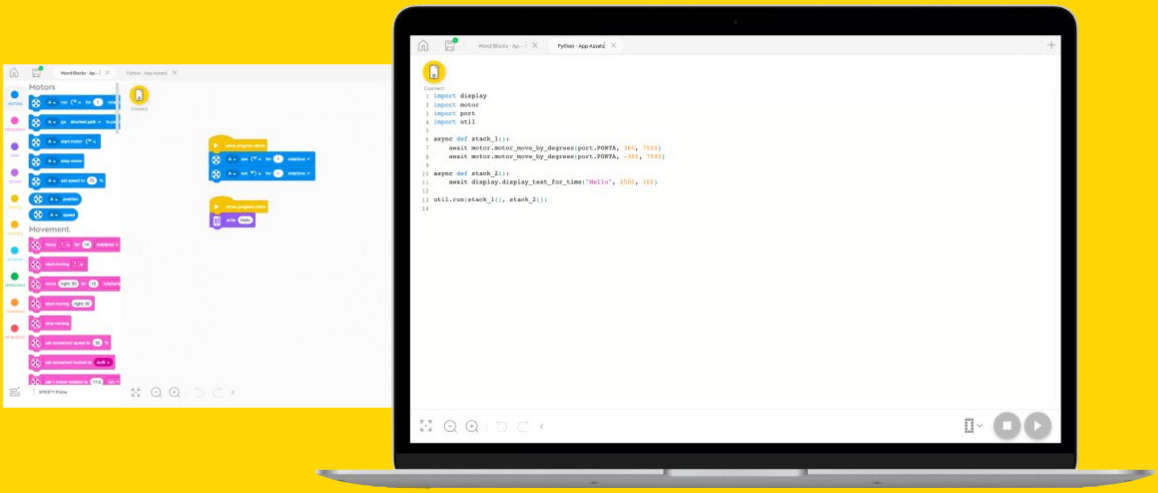

Explore Python

with LEGO® Education SPIKE™ Prime

LEGO® Education SPIKE™ Prime

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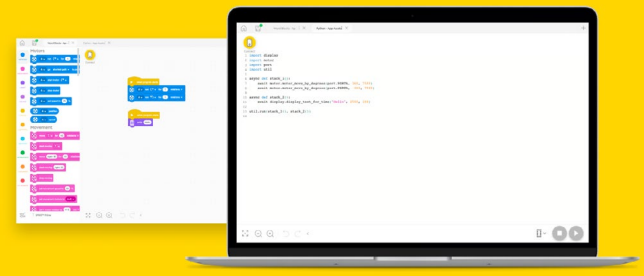

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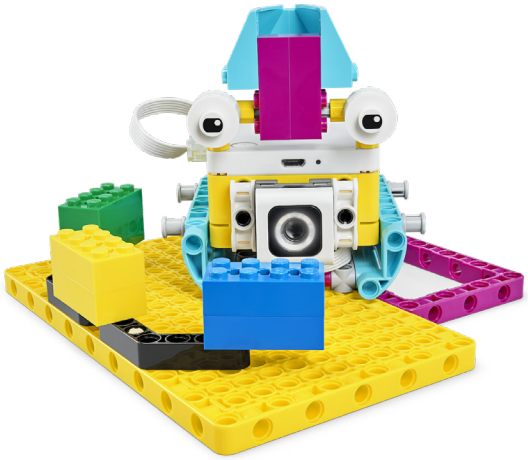
Help!



```
from hub import port, button
from app import sound
import runloop
import color_sensor
import color


async def main():
    # This is story #1: Kiki is going for a walk. She's outside and happy, until...
    await runloop.until(lambda: button.pressed(button.LEFT))

    await runloop.until(lambda: color_sensor.color(port.B) is color.BLUE)
    await sound.play('Traffic')


    await runloop.until(lambda: color_sensor.color(port.B) is color.YELLOW)
    await sound.play('Ring Tone')


    await runloop.until(lambda: color_sensor.color(port.B) is color.GREEN)
    await sound.play('Dog Bark 1')
    await sound.play('Dog Bark 1')


    # This is story #2.
    await runloop.until(lambda: button.pressed(button.RIGHT))


    await runloop.until(lambda: color_sensor.color(port.B) is color.BLUE)
    await sound.play('Door Knock')


    await runloop.until(lambda: color_sensor.color(port.B) is color.YELLOW)
    await sound.play('Glass Breaking')


    await runloop.until(lambda: color_sensor.color(port.B) is color.GREEN)
    await sound.play('Dog Bark 3')


runloop.run(main())
```

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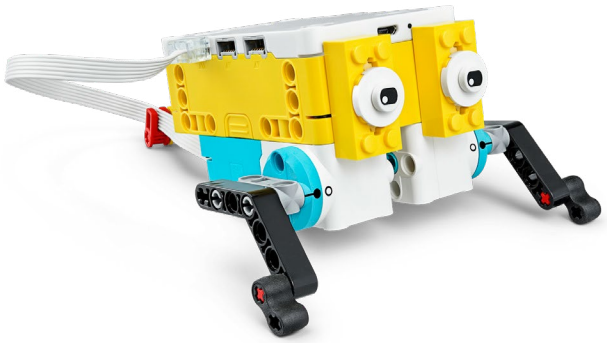
Hopper Race



```
from hub import light_matrix, port
import runloop
import motor_pair


async def main():
    # Pair your motors on port E and F.
    motor_pair.pair(motor_pair.PAIR_1, port.E, port.F)


    # Count down from three.
    await light_matrix.write('3')
    await runloop.sleep_ms(1000)


    await light_matrix.write('2')
    await runloop.sleep_ms(1000)


    await light_matrix.write('1')
    await runloop.sleep_ms(1000)
    light_matrix.clear()


    # Adjust this to change the distance your Hopper will move.
    # ------------------------------------------v
    motor_pair.move_for_time(motor_pair.PAIR_1, 10000, 0, velocity=500)


runloop.run(main())
```

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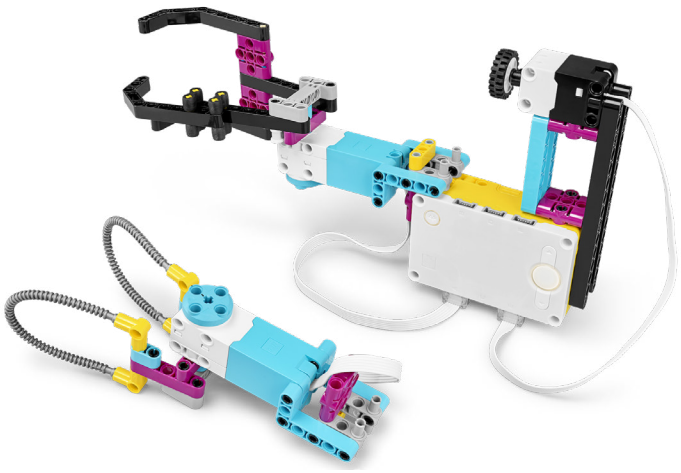
Super Cleanup



```
from hub import port
import runloop
import motor
import force_sensor


async def main():
    while True:
        # Wait for the force sensor to be pressed.
        await runloop.until(lambda: force_sensor.pressed(port.E))
        motor.run(port.A, -750)


        # Wait for the force sensor to released.
        await runloop.until(lambda: not force_sensor.pressed(port.E))
        motor.run(port.A, 750)


runloop.run(main())
```

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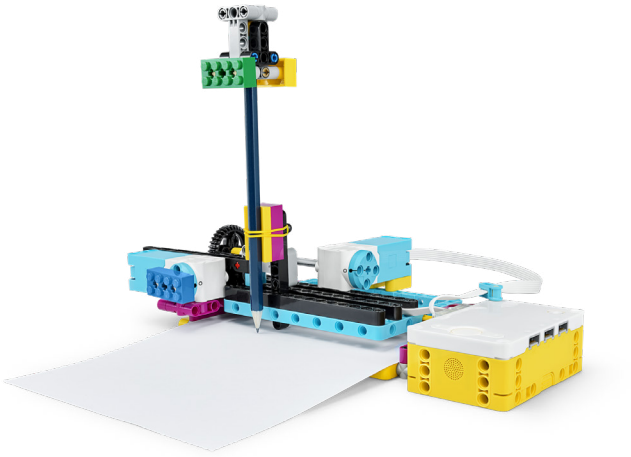
Broken



```
from hub import port, button
import runloop
import motor


# X motor is in port A.
# Y motor is in port C.


async def main():
    # Wait for the left button to be pressed.
    await runloop.until(lambda: button.pressed(button.LEFT))
    await motor.run_for_time(port.A, 1500, -1000)
    await runloop.sleep_ms(1000)


    # This block of code should 'cut' a square.
    await motor.run_for_degrees(port.A, 400, 1000)
    await motor.run_for_degrees(port.C, 575, 1000)
    await motor.run_for_degrees(port.A, -400, 1000)
    await motor.run_for_degrees(port.C, -575, 1000)


    # Wait for the right button to be pressed.
    await runloop.until(lambda: button.pressed(button.RIGHT))
    await motor.run_for_time(port.A, 1500, 1000)
    await runloop.sleep_ms(1000)


    # This block of code should 'cut' a rectangle.
    await motor.run_for_degrees(port.A, -60, 1000)
    await motor.run_for_degrees(port.A, -400, 1000)
    await motor.run_for_degrees(port.C, -800, 1000)
    await motor.run_for_degrees(port.A, 400, 1000)
    await motor.run_for_degrees(port.C, 800, 1000)


runloop.run(main())
```

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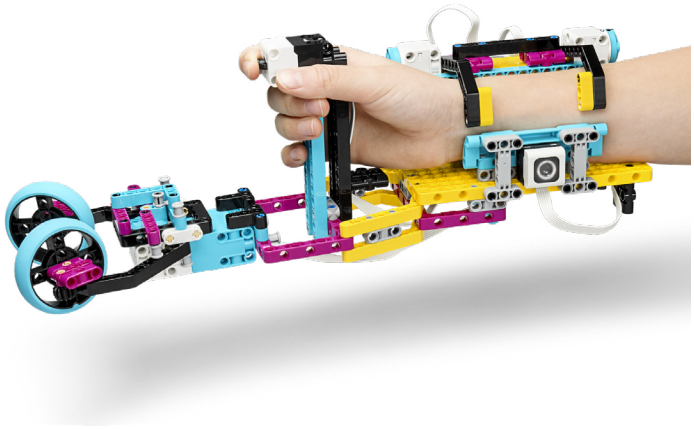
Design for Someone



```
from hub import light_matrix, port, sound, button
import runloop
import motor
import force_sensor


async def main():
    await motor.run_to_absolute_position(port.A, 0, 750)
    await motor.run_to_absolute_position(port.E, 0, 750)
    await sound.beep(262, 500)
    await sound.beep(523, 500)


    # Make the prothesis grab onto someones arm.
    await motor.run_for_time(port.A, 1000, 750, stop=motor.HOLD)
    await motor.run_for_time(port.E, 1000, -750, stop=motor.HOLD)


    while True:
        if button.pressed(button.RIGHT):
            # Make the prothesis let go.
            await motor.run_to_absolute_position(port.A, 0, 750)
            await motor.run_to_absolute_position(port.E, 0, 750)
            break


        if force_sensor.force(port.B) > 50:
            light_matrix.show_image(light_matrix.IMAGE_SQUARE)
            # You can add code to make a gripper open and close here.
        else:
            light_matrix.clear()
        runloop.sleep_ms(10)


runloop.run(main())
```

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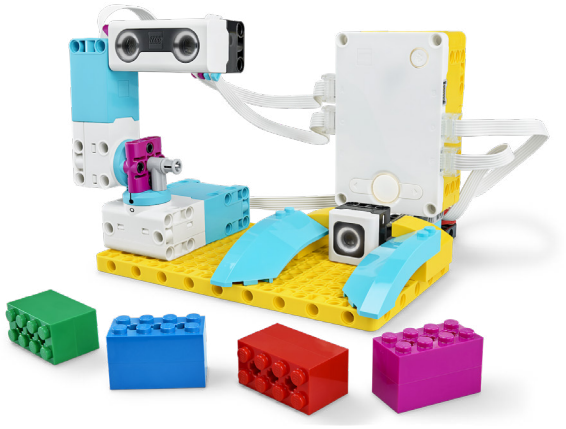
Place your Order



```
from hub import light_matrix, port
from app import sound
import runloop
import motor
import color_sensor
import color
import distance_sensor


async def main():
    # Arm motor is in port A.
    # Base motor is in port F.
    await motor.run_to_absolute_position(port.A, 350, 500)
    await motor.run_to_absolute_position(port.F, 350, 500)


    sound.play('Connect')
    pixels = [100] * 4
    distance_sensor.show(port.C, pixels)


    for x in range(10):
        light_matrix.show_image(light_matrix.IMAGE_HEART)
        await runloop.sleep_ms(500)
        light_matrix.show_image(light_matrix.IMAGE_HEART_SMALL)
        await runloop.sleep_ms(500)

    light_matrix.show_image(light_matrix.IMAGE_HEART)


    while True:
        # Wait for the color sensor to see magenta.
        await runloop.until(lambda: color_sensor.color(port.D) is color.MAGENTA)
        await motor.run_for_degrees(port.A, 30, 500)
        await motor.run_for_degrees(port.A, -60, 500)
        await motor.run_for_degrees(port.A, 60, 500)
        await motor.run_for_degrees(port.A, -30, 500)
        sound.play('Connect')
        light_matrix.show_image(light_matrix.IMAGE_HEART)


runloop.run(main())
```

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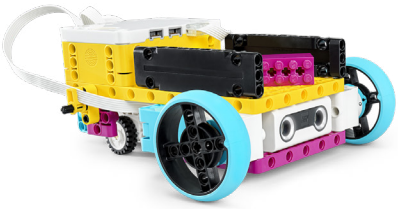
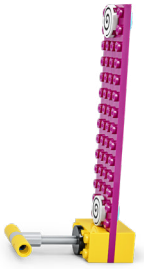
Out of Order





```
from hub import port, button
import runloop
import motor
import motor_pair
import distance_sensor


# Back motor is in port C.
# Pair motors with left in port A and right in port E
motor_pair.pair(motor_pair.PAIR_1, port.A, port.E)


async def main():
    # Wait until the left button is pressed.
    await runloop.until(lambda: button.pressed(button.LEFT))
    await motor.run_to_absolute_position(port.C, 0, 1000)
    motor_pair.move(motor_pair.PAIR_1, 0, velocity=500)
    # Adjust the distance in mm here --------------------------------v
    await runloop.until(lambda: distance_sensor.distance(port.B) < 150)
    motor_pair.stop(motor_pair.PAIR_1)


    # Wait until the right button is pressed.
    await runloop.until(lambda: button.pressed(button.RIGHT))
    await motor.run_to_absolute_position(port.C, 0, 1000)
    motor_pair.move(motor_pair.PAIR_1, 0, velocity=500)
    # Adjust the distance in mm here --------------------------------v
    await runloop.until(lambda: distance_sensor.distance(port.B) < 150)
    motor_pair.stop(motor_pair.PAIR_1)
    # Adjust the position of the turn here ------v
    await motor.run_to_absolute_position(port.C, 20, 1000)
    await runloop.sleep_ms(1000)
    await motor_pair.move_for_degrees(motor_pair.PAIR_1, -1028, 0, velocity=500)
    await motor.run_to_absolute_position(port.C, 0, 1000)
    runloop.sleep_ms(1000)
    # Adjust the distance in degrees here -----------------v
    await motor_pair.move_for_degrees(motor_pair.PAIR_1, 1028, 0, velocity=500)

runloop.run(main())
```

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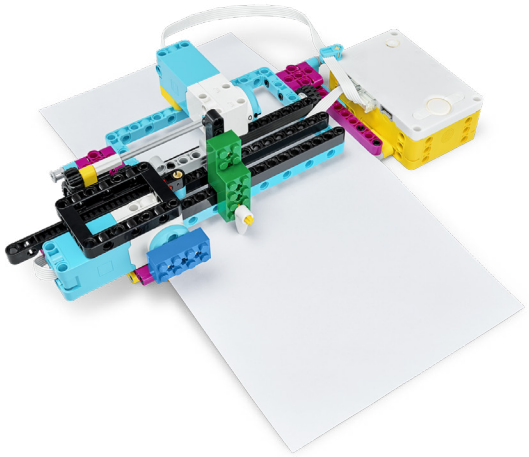
Track your Packages



```
from hub import port, button
import runloop
import motor


# The horizontal motor is in port A.
# The vertical motor is in port C.


async def main():
    await runloop.until(lambda: button.pressed(button.LEFT))
    await motor.run_for_time(port.A, 1000, 750)
    await runloop.sleep_ms(1000)


    # This will track your package on map #1
    await motor.run_for_degrees(port.C, 475, 750)
    await motor.run_for_degrees(port.A, -545, 750)
    await motor.run_for_degrees(port.C, 950, 750)
    await motor.run_for_degrees(port.A, 550, 750)
    await motor.run_for_degrees(port.C, 380, 750)


    # Run both motors at the same time to move diagonally
    motor.run(port.C, 750)
    await motor.run_for_degrees(port.A, -540, 500)
    motor.stop(port.C)


    await motor.run_for_degrees(port.C, 175, 750)


runloop.run(main())
```

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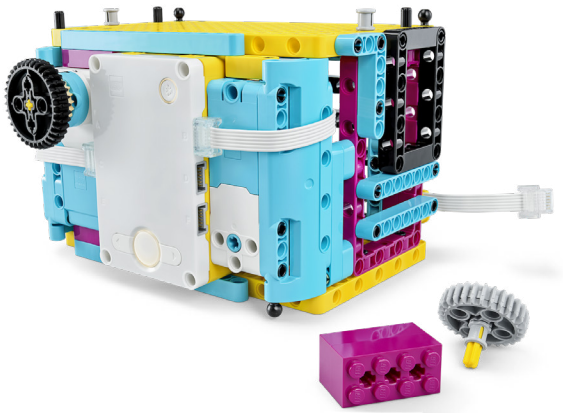
Keep it Safe



```
from hub import port, sound, light_matrix, button
import motor, runloop


async def main():
    await sound.beep(262, 500)
    await sound.beep(523, 500)


    # This locks the safe.
    await motor.run_to_absolute_position(port.C, 270, 500)
    await motor.run_to_absolute_position(port.B, 0, 750, stop=motor.COAST)
    motor.reset_relative_position(port.B, 0)
    light_matrix.show_image(light_matrix.IMAGE_NO)


    # This unlocks the safe.
    await runloop.until(lambda: button.pressed(button.LEFT))
    await sound.beep(523, 500)
    await runloop.until (lambda: motor.relative_position(port.B) > 180)
    await sound.beep(262, 500)
    await motor.run_for_time(port.C, 1000, 500)
    light_matrix.show_image(light_matrix.IMAGE_NO)
    await runloop.sleep_ms(2000)
    light_matrix.show_image(light_matrix.IMAGE_YES)
    await runloop.sleep_ms(5000)


runloop.run(main())
```

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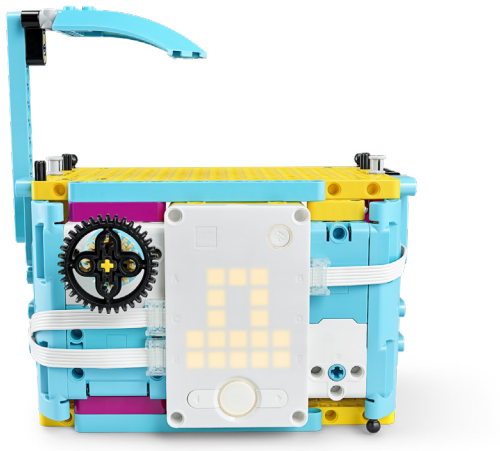
Keep it really safe!



```
from hub import port, light_matrix, button, sound
import runloop
import app
import motor
import time

# The lock motor is in port C.
# The dial motor is in port B.
# The dial cover motor is in port E.

# This function unlocks the safe.
# This is a async function to work with the async main function.
async def unlock():
    start_time = time.ticks_ms()

    # While the left button is not pressed or the dial motor is less than 180 degrees,
    # Move the dial cover closer to the dial.
    while not button.pressed(button.LEFT) or motor.relative_position(port.B) < 180:
        await sound.beep(262, 200)
        await motor.run_for_degrees(port.E, 15, 500)
        await runloop.sleep_ms(800)

        # If the time gets to five seconds, play the bonk sound.
        if time.ticks_diff(time.ticks_ms(), start_time) > 5000:
            await app.sound.play('Bonk')
            return

    # If the left button is pressed and the dial is greater than 180 degrees, open the safe.
    light_matrix.show_image(light_matrix.IMAGE_YES)
    await motor.run_to_absolute_position(port.E, 0, 500)
    await motor.run_for_time(port.C, 1000, 500)
    await app.sound.play('Wand')

async def main():
    await sound.beep(262, 200)
    await sound.beep(523, 200)
    # This locks the safe.
    await motor.run_for_time(port.C, 1000, -500)
    await motor.run_to_absolute_position(port.B, 0, 500, stop=motor.COAST)
    motor.reset_relative_position(port.B, 0)
    await motor.run_to_absolute_position(port.E, 0, 500)
    light_matrix.show_image(light_matrix.IMAGE_NO)

    # This unlocks the safe by calling the unlock function.
    await unlock()

runloop.run(main())
```

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Automate it!

```
from hub import port
import app
import runloop
import motor
import color_sensor
import color

# The base motor is in port A.
# The arm motor is in port F.
# The color sensor is in port D.

# It is an async function to work with the async main function.
async def check_color():
    # This will check the color of the package.
    await motor.run_to_absolute_position(port.F, 235, 250)
    await runloop.sleep_ms(4000)
    # If it senses magenta it will place the bricks in the bin.
    if color_sensor.color(port.D) is color.MAGENTA:
        await motor.run_to_absolute_position(port.A, 0, 250)
        await motor.run_to_absolute_position(port.F, 25, 250)
        await app.sound.play('Triumph')
        await motor.run_to_absolute_position(port.F, 240, 250)
    # If it does not sense magenta it will drop the bricks.
    else:
        await app.sound.play('Oops')
        await motor.run_to_absolute_position(port.F, 25, 250)

        for x in range(3):
            await motor.run_for_degrees(port.F, -100, 1000)
            await motor.run_for_degrees(port.F, 100, 1000)

async def main():
    # This powers up the robot and makes it grab one package from each side
    await motor.run_to_absolute_position(port.A, 0, 250)
    await motor.run_to_absolute_position(port.F, 240, 250)

    await motor.run_to_absolute_position(port.A, 90, 250)
    await motor.run_to_absolute_position(port.F, 25, 250)

    # This calls the check_color function
    await check_color()

    await motor.run_to_absolute_position(port.A, 0, 250)
    await motor.run_to_absolute_position(port.F, 240, 250)
    await motor.run_to_absolute_position(port.A, 270, 250)
    await motor.run_to_absolute_position(port.F, 25, 250)

    await check_color()

    await motor.run_to_absolute_position(port.A, 0, 250)
    await motor.run_to_absolute_position(port.F, 240, 250)


runloop.run(main())
```

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Break Dance

```
from hub import light_matrix, port
import runloop
import motor


# The arm motor is in port B.
# The leg motor is in port F.


async def main():
    # Move arms and legs to 0 position.
    motor.run_to_absolute_position(port.B, 0, -800)
    await motor.run_to_absolute_position(port.F, 0, -800)
    await runloop.sleep_ms(1000)


    for x in range(10):
        await light_matrix.write('1')
        # Move arms and legs at the same time.
        motor.run_for_degrees(port.F, 360, -800)
        await motor.run_for_degrees(port.B, 360, -800)
        await runloop.sleep_ms(450)


        await light_matrix.write('2')
        # Move arms and legs at the same time.
        motor.run_for_degrees(port.F, 360, -800)
        await motor.run_for_degrees(port.B, 360, -800)
        await runloop.sleep_ms(450)


        await light_matrix.write('3')
        # Move arms and legs at the same time.
        motor.run_for_degrees(port.F, 360, -800)
        await motor.run_for_degrees(port.B, 360, -800)
        await runloop.sleep_ms(450)


runloop.run(main())
```

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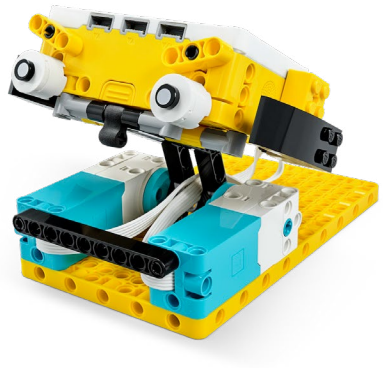
Repeat 5 Times



```
from hub import light_matrix, port, motion_sensor
from app import sound
import runloop
import motor_pair


# Leg motors are paired with the left motor in port F an the right motor in port B.
motor_pair.pair(motor_pair.PAIR_1, port.F, port.B)


async def main():
    motor_pair.move(motor_pair.PAIR_1, 0, velocity=-500)
    await runloop.until(lambda: motion_sensor.up_face() is motion_sensor.LEFT)
    motor_pair.stop(motor_pair.PAIR_1)


    await sound.play('Sport Whistle 1')


    for count in range(5):
        motor_pair.move(motor_pair.PAIR_1, 0, velocity=500)
        await runloop.until(lambda: motion_sensor.up_face() is motion_sensor.TOP)
        motor_pair.stop(motor_pair.PAIR_1)
        await sound.play('Male Jump 1')
        await light_matrix.write(str(count + 1))
        await runloop.sleep_ms(500)
        motor_pair.move(motor_pair.PAIR_1, 0, velocity=-500)
        await runloop.until(lambda: motion_sensor.up_face() is motion_sensor.LEFT)
        motor_pair.stop(motor_pair.PAIR_1)
    await sound.play('Sport Whistle 2')


runloop.run(main())
```

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Rain or shine?

Currently, it isn't possible to use the weather forecast functions with our Python programming language.

Here is a program that will make the weather caster move!

```
from hub import light_matrix, port, sound
import app
import runloop
import motor


# The umbrella motor is in port B.
# The sunglasses motor is in port F.


async def main():
    YOUR_LOCAL_FORECAST = 'sunny'

    # This gets the robot in the correct starting position.
    await motor.run_to_absolute_position(port.B, 45, 750)
    await motor.run_to_absolute_position(port.F, 300, 750)

    await sound.beep(262, 200)
    await sound.beep(523, 200)

    # If sunny, then put on sunglasses.
    if YOUR_LOCAL_FORECAST == 'sunny':
        await motor.run_to_absolute_position(port.F, 0, 750)
        light_matrix.show_image(light_matrix.IMAGE_SQUARE)
        await runloop.sleep_ms(2000)
        await motor.run_to_absolute_position(port.F, 300, 750)
    elif YOUR_LOCAL_FORECAST == 'rainy':
        # Or if rainy, lift umbrella.
        await motor.run_to_absolute_position(port.B, 340, 750)
        await app.sound.play('Rain')
        await motor.run_to_absolute_position(port.B, 45, 750)
    else:
        # Otherwise show X.
        light_matrix.show_image(light_matrix.IMAGE_NO)


runloop.run(main())
```

LEGO® Education SPIKE™ Prime

Wind Speed

Currently, it isn't possible to use the weather forecast functions with our Python programming language.

Here is a program that will make your model move!

```
from hub import port
import runloop
import motor


# The tilt motor is in port A.


async def main():
    WIND_SPEED_FORECAST = 8

    # This moves the tilt motor into position.
    motor.run_to_absolute_position(port.A, 5, 200)


    # If the wind speed is less than 5.5 move the indicator to the correct position.
    if WIND_SPEED_FORECAST < 5.5:
        await motor.run_for_degrees(port.A, 30, 200)
        await runloop.sleep_ms(1000)
        await motor.run_for_degrees(port.A, -30, 200)
    else:
        await motor.run_for_degrees(port.A, 60, 200)
        await runloop.sleep_ms(1000)
        await motor.run_for_degrees(port.A, -60, 200)


runloop.run(main())
```

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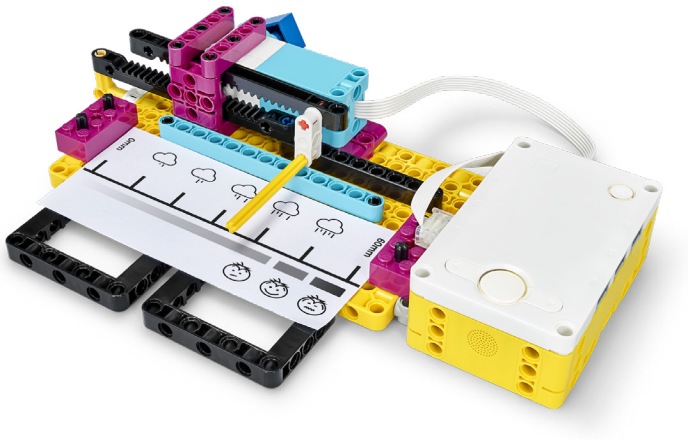
Veggie Love



Currently, it isn't possible to use the weather forecast functions with our Python programming language.

Here is a program that will make the weather caster move!

```
from hub import light_matrix, port, button
import runloop
import motor


# The pointer motor is in port E.


WEEK_RAIN = 50
ROTATION = 0


async def main():
    # Wait until the left button is pressed.
    await runloop.until(lambda: button.pressed(button.LEFT))
    await motor.run_for_time(port.E, 2000, -500)
    motor.reset_relative_position(port.E, 0)
    await motor.run_for_time(port.E, 2000, 500)


    await light_matrix.write(str(abs(motor.relative_position(port.E))))

    # Calculate the rotation.
    ROTATION = int(WEEK_RAIN * abs(motor.relative_position(port.E)) / 60)
    print(ROTATION)


    # Wait until the right button is pressed.
    await runloop.until(lambda: button.pressed(button.RIGHT))
    motor.reset_relative_position(port.E, 0)
    await motor.run_for_degrees(port.E, ROTATION, -500)

    await light_matrix.write(str(WEEK_RAIN))
    print(WEEK_RAIN)


runloop.run(main())
```

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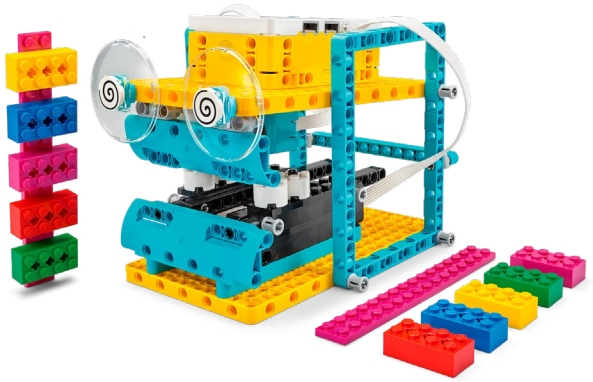
Brain Game



```
from hub import light_matrix, button, port
import runloop
import motor
import color_sensor
import color
from app import sound


async def main():


   #create lists
    candy1 = []
    candy2 = []


   #this makes the Game Master eat candy stick 1
    await runloop.until(lambda: button.
pressed(button.LEFT))
    light_matrix.clear()
    candy1.clear()
    await motor.run_for_time(port.A, 2000, -500)
    await sound.play('Bite')
    await sound.play('Bite')


   #this will read and record its sequence of
colors in the list called candy 1
    for x in range(5):
        candy1.append(color_sensor.col-
or(port.B))
        await runloop.sleep_ms(1000)
        await motor.run_for_degrees(port.A, 95,
500)


   #this makes the Game Master eat candy stick 2
    await runloop.until(lambda: button.
pressed(button.RIGHT))
    candy2.clear()
    await motor.run_for_time(port.A, 2000, -500)
    await sound.play('Bite')
    await sound.play('Bite')
```

```
#this will read and record its sequence of
colors in the list called candy 2
    for x in range(5):
        candy2.append(color_sensor.col-
or(port.B))
        await runloop.sleep_ms(1000)
        await motor.run_for_degrees(port.A, 95,
500)


#light up the position of red bricks if it is
in the same postion in both candy sticks
    candy1_red_index = candy1.index(color.RED)
    candy2_red_index = candy2.index(color.RED)


    for x in range(5):
        print(candy1[x])


    if candy1_red_index == candy2_red_index:
        for x in range(5):
            light_matrix.set_pixel(x, candy1_
red_index, 100)
            await sound.play('Win')


    else:
        light_matrix.show_image(light_matrix.
IMAGE_NO)
        await sound.play('Oops')


runloop.run(main())
```

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The Coach

```python
from hub import port
import runloop
import motor
import time


# The left leg motor is in port F.
# The right leg motor is in port B.


async def main():
    # Set the coach to stand straight up.
    motor.run_to_absolute_position(port.F, 0, 800)
    motor.run_to_absolute_position(port.B, 0, 800)

    start_time = time.ticks_ms()


    # The coach will dance for five seconds.
    while time.ticks_diff(time.ticks_ms(), start_time) < 5000:
        motor.set_duty_cycle(port.B, -7000)
        motor.set_duty_cycle(port.F, 7000)

        await runloop.sleep_ms(200)

        motor.set_duty_cycle(port.B, 7000)
        motor.set_duty_cycle(port.F, -7000)

        await runloop.sleep_ms(200)

    motor.stop(port.B)
    motor.stop(port.F)


runloop.run(main())
```

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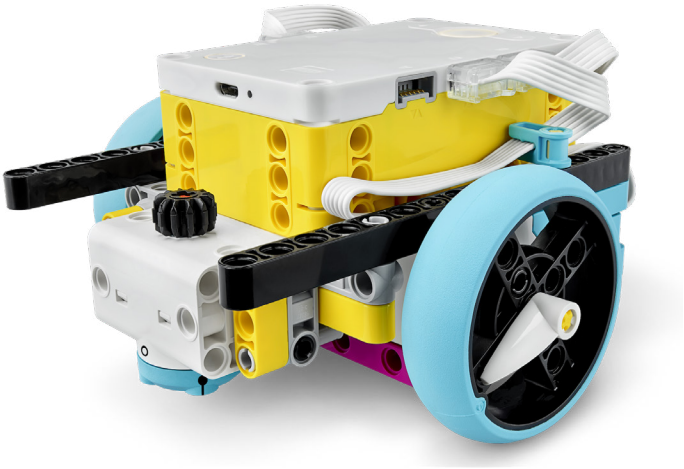
Training Camp 1



```
from hub import port
import runloop
import motor_pair


# The left leg motor is in port C.
# The right leg motor is in port D.
motor_pair.pair(motor_pair.PAIR_1, port.C, port.D)


async def main():
    # Loop four times to travel in a square.
    for x in range(4):
        # (Distance / 17.5) * 360 will get you the degrees needed to travel the distance needed.
        # To travel 10 cm, calculate (10 / 17.5 * 360 = 206)
        # Adjust the degrees here ----------------------------v
        await motor_pair.move_for_degrees(motor_pair.PAIR_1, 206, 0, velocity=300)
        await runloop.sleep_ms(500)
        # Make a right turn.
        await motor_pair.move_for_degrees(motor_pair.PAIR_1, 182, 100, velocity=300)


runloop.run(main())
```

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Training Camp 2

```python
from hub import port, sound, button
import runloop
import motor_pair
import motor
import distance_sensor


# The left leg motor is in port C.
# The right leg motor is in port D.
# The arm motor is in port E.
# The distance sensor is in port F.
motor_pair.pair(motor_pair.PAIR_1, port.C, port.D)


async def main():
    # Move arm motor up and then partially down.
    await motor.run_for_time(port.E, 1000, -200)
    await motor.run_for_degrees(port.E, 75, 200)

    await sound.beep(262, 200)
    await sound.beep(523, 200)

    # Wait for the right button to be pressed.
    await runloop.until(lambda: button.pressed(button.RIGHT))

    await runloop.sleep_ms(1000)

    # Drive base will travel forward until the distance sensor senses closer than 100 mm.
    motor_pair.move(motor_pair.PAIR_1, 0, velocity=300)
    await runloop.until(lambda: distance_sensor.distance(port.F) < 100)
    motor_pair.stop(motor_pair.PAIR_1)

    # Move the arm all the way down.
    await motor.run_for_degrees(port.E, -75, 200)

    await sound.beep(600, 500)
    await sound.beep(720, 500)

    # (Distance / 17.5) * 360 will get you the degrees needed to travel the distance needed.
    # To travel 20 cm, calculate (20 / 17.5 * 360 = 411)
    # To move the drive base in reverse you make the degrees negative
    await motor_pair.move_for_degrees(motor_pair.PAIR_1, -411, 0, velocity=300)


runloop.run(main())
```

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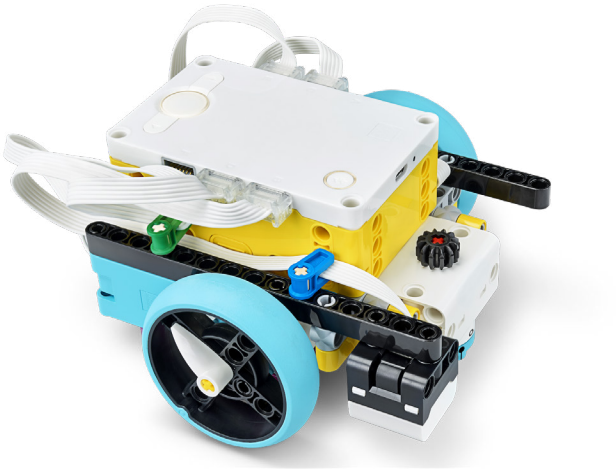
Training Camp 3



```
from hub import port, button
import runloop
import motor_pair
import color_sensor
import color


# The left leg motor is in port C.
# The right leg motor is in port D.
# The color sensor is in port B.
motor_pair.pair(motor_pair.PAIR_1, port.C, port.D)


async def main():
    # Set the velocity.
    velocity_value = 400


    while True:
        # If the left button is pressed, the drive base stops at a black line.
        if button.pressed(button.LEFT):
            motor_pair.move(motor_pair.PAIR_1, 0, velocity=velocity_value)
            await runloop.until(lambda: color_sensor.color(port.B) is color.BLACK)
            motor_pair.stop(motor_pair.PAIR_1)


        # If the right button is pressed, the drive base follows a blcak line,
        if button.pressed(button.RIGHT):
            while True:
                motor_pair.move_tank(motor_pair.PAIR_1, 0, velocity_value)
                await runloop.until(lambda: color_sensor.color(port.B) is color.BLACK)
                motor_pair.move_tank(motor_pair.PAIR_1, velocity_value, 0)
                await runloop.until(lambda: color_sensor.color(port.B) is color.WHITE)


runloop.run(main())
```

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Advanced Driving Base

```python
from hub import port, motion_sensor
import runloop
import motor_pair


# The drive motors are in port A (left) and port E (right).
# The wheel circumference is 27.63 cm.

# Pair the motors.
motor_pair.pair(motor_pair.PAIR_1, port.A, port.E)

# Create a function to make a right turn 90 degrees.
async def right_turn():
    motion_sensor.reset_yaw(0)
    motor_pair.move(motor_pair.PAIR_1, 100, velocity= 50)
    await runloop.until(lambda: motion_sensor.tilt_angles()[0] <= -900)
    motor_pair.stop(motor_pair.PAIR_1)


# Create a function to make a left turn 90 degrees.
async def left_turn():
    motion_sensor.reset_yaw(0)
    motor_pair.move(motor_pair.PAIR_1, 100, velocity= 50)
    await runloop.until(lambda: motion_sensor.tilt_angles()[0] >= 900)
    motor_pair.stop(motor_pair.PAIR_1)


async def main():
    # 20 cm / (circumverence / 360) = 260 degrees.
    await motor_pair.move_for_degrees(motor_pair.PAIR_1, 260, 0, velocity=100)
    await motor_pair.move_for_degrees(motor_pair.PAIR_1, -260, 0, velocity=100)

    await motor_pair.move_for_degrees(motor_pair.PAIR_1, 260, -40, velocity=100)

    await right_turn()
    await runloop.sleep_ms(1000)
    await left_turn()


runloop.run(main())
```

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My Code, Our Program

```
from hub import port, sound
import runloop
import motor_pair


# The drive motors are in port A (left) and port E (right).
# The wheel circumference is 27.63 cm.


# Pair the motors.
motor_pair.pair(motor_pair.PAIR_1, port.A, port.E)


async def square():
    for x in range(4):
        await motor_pair.move_for_degrees(motor_pair.PAIR_1, 540, 0, velocity= 500)
        await motor_pair.move_for_degrees(motor_pair.PAIR_1, 145, 100, velocity= 500)


async def triange():
    for x in range(3):
        await motor_pair.move_for_degrees(motor_pair.PAIR_1, 540, 0, velocity= 500)
        await motor_pair.move_for_degrees(motor_pair.PAIR_1, 200, 100, velocity= 500)


async def circle():
    await motor_pair.move_for_degrees(motor_pair.PAIR_1, 1500, 40, velocity= 500)


async def main():
    await square()
    await sound.beep(262, 200)


    await triange()
    await sound.beep(262, 200)


    await circle()
    await sound.beep(262, 200)


runloop.run(main())
```

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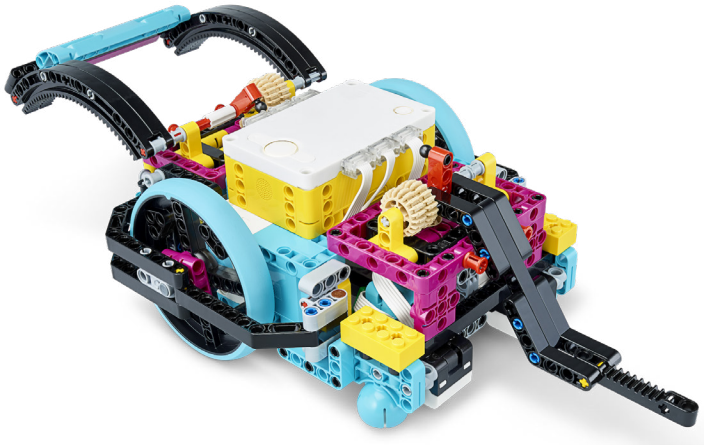
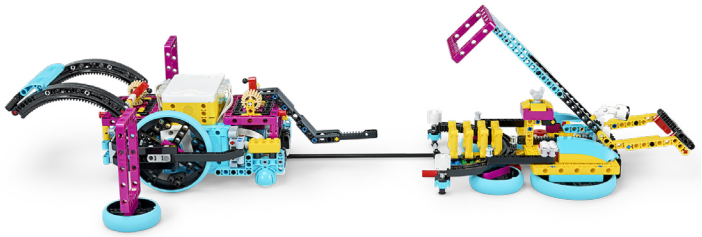
Time for an Upgrade



```
from hub import port, sound
import runloop
import motor


# The lift arm motor is in port D.
# The dozer blade motor is in port C


async def main():

    await motor.run_for_time(port.D, 500, -1000)
    await motor.run_for_time(port.C, 500, -1000)


    await motor.run_for_degrees(port.D, 70, 1000)
    await motor.run_for_degrees(port.C, 70, 1000)
    await sound.beep(262, 200)


    await motor.run_for_degrees(port.D, 180, 1000)
    await motor.run_for_degrees(port.D, -180, 1000)
    await motor.run_for_degrees(port.C, 180, 1000)
    await motor.run_for_degrees(port.C, -180, 1000)
    await sound.beep(262, 200)


    await motor.run_for_degrees(port.D, 180, 150)
    await motor.run_for_degrees(port.D, -180, 150)
    await motor.run_for_degrees(port.C, 180, 150)
    await motor.run_for_degrees(port.C, -180, 150)


runloop.run(main())
```

LEGO® Education SPIKE™ Prime

Mission Ready



```
from hub import port
import runloop
import motor_pair
import motor


# The dozer blade motor is in port C.
# The lift arm motor is in port D.
# The drive motors are in port A (left) and port E
(right).
# The wheel circumference is 27.63 cm.


async def main():


    # Pair the motors.
    motor_pair.pair(motor_pair.PAIR_1, port.A,
port.E)


    # Prepare the dozer blade and lift arm.
    motor.run_for_time(port.C, 1000, -1000)
    await motor.run_for_time(port.D, 1000, -1000)


    await motor.run_for_degrees(port.C, 70, 1000)
    await motor.run_for_degrees(port.D, 20, 1000)


    # Move forward to push in the lock bar.
    await motor_pair.move_for_degrees(motor_pair.
PAIR_1, -26, 0, velocity= 250)
    # Back up and lift the dozer blade.
    await motor_pair.move_for_degrees(motor_pair.
PAIR_1, 137 , 0, velocity= 250)
    await motor.run_for_degrees(port.C, 180, 400)


    # Move forward and pull down the lever and then
move the dozer blade back up.
    await motor_pair.move_for_degrees(motor_pair.
PAIR_1, -78, 0, velocity= 250)
    await motor.run_for_degrees(port.C, -180, 600)
    await motor.run_for_degrees(port.C, 180, 600)


 # Back up and lower the dozer blade.
    await motor_pair.move_for_degrees(motor_pair.
PAIR_1, 91, 0, velocity= 250)
    await motor.run_for_degrees(port.C, -180, 600)


    # Turn to drive around the mission.
    await motor_pair.move_for_degrees(motor_pair.
PAIR_1, 146, -100, velocity= 250)
    await motor_pair.move_for_degrees(motor_pair.
PAIR_1, 100, 0, velocity= 250)
    await motor_pair.move_for_degrees(motor_pair.
PAIR_1, 600, -25, velocity= 250)


    # Drive to the other side of the mission.
    await motor_pair.move_for_degrees(motor_pair.
PAIR_1, 1250, 0, velocity= 250)
    # Turn and drive forward to align to the gates.
    await motor_pair.move_for_degrees(motor_pair.
PAIR_1, 300, -50, velocity= 250)
    await motor_pair.move_for_degrees(motor_pair.
PAIR_1, 228,  0, velocity= 250)
    await motor_pair.move_for_degrees(motor_pair.
PAIR_1, 140, -100, velocity= 250)


    # Drive forward to place lift arm through the
gates.
    await motor_pair.move_for_degrees(motor_pair.
PAIR_1, 450, 0, velocity= 250)


    # Lift the arm to get the gates.
    await motor.run_for_degrees(port.D, 100, 1000)


runloop.run(main())
```

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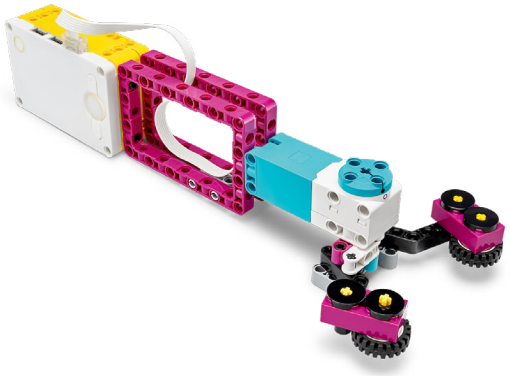
Pass the Brick



```
from hub import port, button
import runloop
import motor


async def main():
    # This will make the hand open once to start.
    motor.run_for_time(port.F, 1000, 750)


    while True:
        # Wait for the left button to be pressed.
        await runloop.until(lambda: button.pressed(button.LEFT))
        motor.run(port.F, -750)


        # Wait for the left button to be released.
        await runloop.until(lambda: not button.pressed(button.LEFT))
        motor.run(port.F, 750)


runloop.run(main())
```

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Ideas, the LEGO way!

```
from hub import light_matrix, button, sound
import runloop


async def main():
    while True:
        # If the left button is pressed count down 3, 2, 1... one second at a time.
        if button.pressed(button.LEFT):
            await light_matrix.write('3')
            await runloop.sleep_ms(1000)
            await light_matrix.write('2')
            await runloop.sleep_ms(1000)
            await light_matrix.write('1')
            await runloop.sleep_ms(1000)
            light_matrix.clear()
            await sound.beep(262, 500)
            await sound.beep(523, 500)


        # If the right button is pressed count down 5, 4, 3, 2, 1... one minute at a time.
        if button.pressed(button.RIGHT):
            await light_matrix.write('5')
            await runloop.sleep_ms(60000)
            await light_matrix.write('4')
            await runloop.sleep_ms(60000)
            await light_matrix.write('3')
            await runloop.sleep_ms(60000)
            await light_matrix.write('2')
            await runloop.sleep_ms(60000)
            await light_matrix.write('1')
            await runloop.sleep_ms(60000)
            light_matrix.clear()
            await sound.beep(262, 500)
            await sound.beep(523, 500)


runloop.run(main())
```

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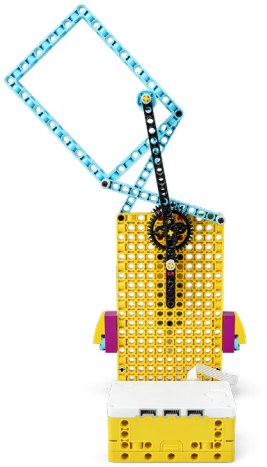
What is this?



```
from hub import port
import runloop
import motor


async def main():
    # Create a loop that repeats five times.
    for x in range(5):
        # Run the motor for two seconds at 500 degrees per second forward.
        await motor.run_for_time(port.F, 2000, 500)
        # Run the motor for two seconds at 500 degrees per second backward.
        await motor.run_for_time(port.F, 2000, -500)


runloop.run(main())
```

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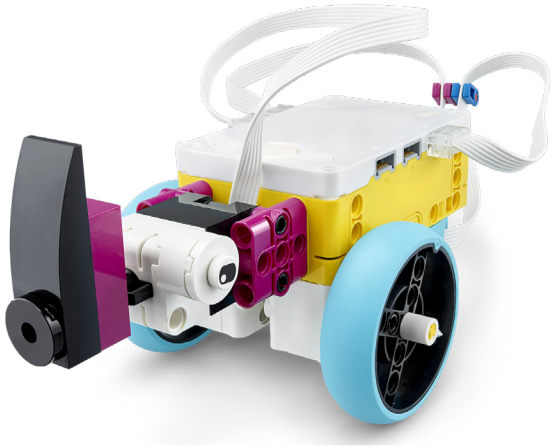
Going the Distance



```
from hub import port
import runloop
import motor_pair
import force_sensor


async def main():
    # Pair motors with the left motor on port B and right motor on port A.
    motor_pair.pair(motor_pair.PAIR_1, port.B, port.A)


    # Move potor pair straight forward at 500 degrees per second.
    motor_pair.move(motor_pair.PAIR_1, 0, velocity=500)


    # Wait for the force sensor to be pressed.
    await runloop.until(lambda: force_sensor.pressed(port.C))


    # Stop the rhino when the button is pressed.
    motor_pair.stop(motor_pair.PAIR_1)


runloop.run(main())
```

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Goal!

```
from hub import port, button
import runloop
import motor


async def main():
    while True:
        # Set the motor to the 0 degree position.
        motor.run_to_absolute_position(port.A, 0, 1000)


        # Wait for the left button to be pressed to run the motor for 360 degrees.
        await runloop.until(lambda: button.pressed(button.LEFT))
        await motor.run_for_degrees(port.A, 360, 1000)


        # Wait for one second before being able to press the button again.
        await runloop.sleep_ms(1000)


runloop.run(main())
```