PRESENTATION 20 · LEARNING WITH PYTHON

Final challenge

The full Juniors mission: six objects, water and land, two trips home, and unsafe areas to keep away from.

TheBotCup 2026 · AiBotCup Simulator



RECAP · THE JUNIORS TOOLBOX

Everything we can already do

Walls
Ahead turns away

Colours
metals, green, bands

Position
is it the pond?

Action functions
red, blue, green LED

LoadedObjects
when to go home

Order
first true branch wins

PART 1

The mission: Session 20

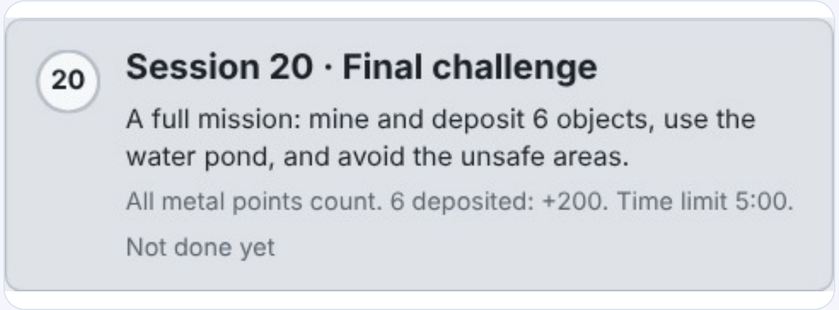
Six objects, safely

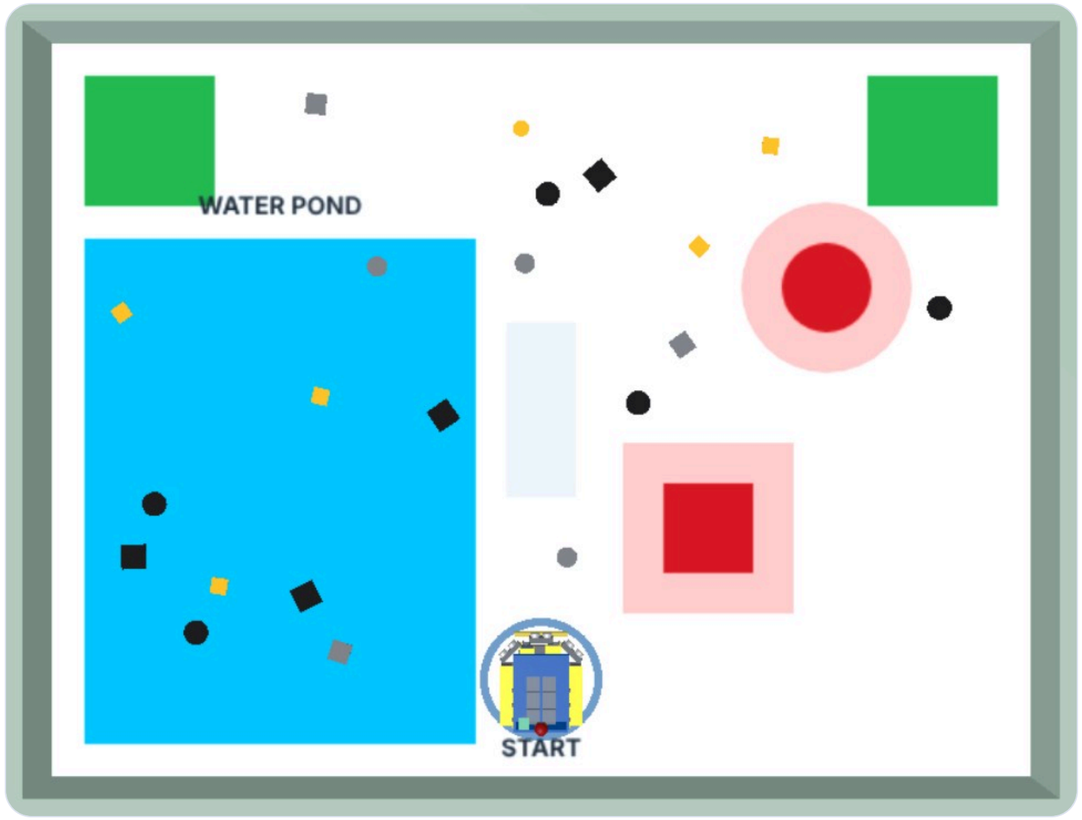
SESSION 20 · FINAL CHALLENGE

Mine and deposit 6, avoid the unsafe areas

Use the water pond. All metal points count. 6 deposited: **+200**.

Time limit **5:00**. Code challenge: at most **45** lines.





THE FIELD

Two red danger zones

Pond on the left, green corners at the top.

Two **unsafe areas** on the right, each inside a **pink warning band**.

The band is the signal: **turn back** before the red.

PART 2

Safety first, then the job

Warning branches on top, two trips

IDEA 1 · WARNING BRANCHES FIRST

Pink seen? Back away first

Warning band

R 230–255 · G 145–205 · B 145–205, on either sensor.

Back away, turning

Both wheels backwards, one faster, for **500 ms**.

At the **start** of the chain, nothing can beat them: not even a metal or a deposit.

IDEA 2 · THE PLAN

Two trips of three

1

Collect while **LoadedObjects < 3**

2

Deposit at **3 or more** (≥ 3)

3

Load back to 0: **repeat**

Line budget: 11 branches, tools and actions = **44 of 45 lines**.

PART 3

Step by step in Python

Eleven branches

STEP 1 · THE WHOLE PROGRAM

Safety, home, water, land, drive

Branch	Condition	Also	Action
1 WarnLeft	warn(left sensor)	—	−1 / −4 · Duration 500
2 WarnRight	warn(right sensor)	—	−4 / −1 · Duration 500
3 Deposit	onGreen()	LoadedObjects >= 3	deposit()
4 PondIronLeft	left iron · in the pond	LoadedObjects < 3	collectWater()
5 PondIronRight	right iron · in the pond	LoadedObjects < 3	collectWater()
6 IronLeft	left iron	LoadedObjects < 3	collect()
7 IronRight	right iron	LoadedObjects < 3	collect()
8 GoldLeft	left gold	LoadedObjects < 3	collect()
9 GoldRight	right gold	LoadedObjects < 3	collect()
10 Ahead	US_Front ≤ 20	—	−2 / 2 · Duration 700
11 Forward	the else	—	4.5 / 4.5

STEP 2 · LINES 3–24

The toolbox, plus warn()

```
3  def iron(r, g, b): return r <= 60 and g <= 60 and b <= 60
4  def gold(r, g, b): return r >= 195 and 135 <= g <= 200 and b <= 80
5  def green(r, g, b): return r <= 75 and 130 <= g <= 200 and 40 <= b <= 110
6  def warn(r, g, b): return r >= 230 and 145 <= g <= 205 and 145 <= b <= 205
7  def onGreen():
8      return green(CSLeft_R, CSLeft_G, CSLeft_B) and green(CSRight_R, CSRight_G, CSRight_B)
9  def inPond(): return PositionX <= 104 and PositionY <= 132
10
11 def collect():
12     WheelLeft = 0; WheelRight = 0
13     LED_1 = 2; LED_R = 255; LED_G = 0; LED_B = 0     # flashing red
14     Duration = 3200
15
16 def collectWater():
17     WheelLeft = 0; WheelRight = 0
18     LED_1 = 2; LED_R = 0; LED_G = 0; LED_B = 255     # flashing blue
19     Duration = 3200
20
21 def deposit():
22     WheelLeft = 0; WheelRight = 0
23     LED_1 = 1; LED_R = 0; LED_G = 255; LED_B = 0     # steady green
24     Duration = 3200
```

STEP 3 · LINES 26–33

Safety first, then Deposit at 3 or more

```
26  def game1():
27      LED_1 = 0
28      if warn(CSLeft_R, CSLeft_G, CSLeft_B):
29          WheelLeft = -1; WheelRight = -4; Duration = 500    # WarnLeft
30      elif warn(CSRight_R, CSRight_G, CSRight_B):
31          WheelLeft = -4; WheelRight = -1; Duration = 500    # WarnRight
32      elif LoadedObjects >= 3 and onGreen():
33          deposit()                                          # Deposit
```

WarnLeft / WarnRight: back away, −1 / −4 or −4 / −1, Duration 500.

LoadedObjects >= 3 means “3 or more”. After a deposit the load is 0 again.

STEP 4 · LINES 34–50

Water before land, as in Presentation 19

```
34      elif LoadedObjects < 3 and inPond() and iron(CSLeft_R, CSLeft_G, CSLeft_B):
35          collectWater()                                  # PondIronLeft
36      elif LoadedObjects < 3 and inPond() and iron(CSRight_R, CSRight_G, CSRight_B):
37          collectWater()                                  # PondIronRight
38      elif LoadedObjects < 3 and iron(CSLeft_R, CSLeft_G, CSLeft_B):
39          collect()                                       # IronLeft
40      elif LoadedObjects < 3 and iron(CSRight_R, CSRight_G, CSRight_B):
41          collect()                                       # IronRight
42      elif LoadedObjects < 3 and gold(CSLeft_R, CSLeft_G, CSLeft_B):
43          collect()                                       # GoldLeft
44      elif LoadedObjects < 3 and gold(CSRight_R, CSRight_G, CSRight_B):
45          collect()                                       # GoldRight
46      elif US_Front <= 20:
47          WheelLeft = -2; WheelRight = 2                  # Ahead
48          Duration = 700
49      else:
50          WheelLeft = 4.5; WheelRight = 4.5               # Forward
```

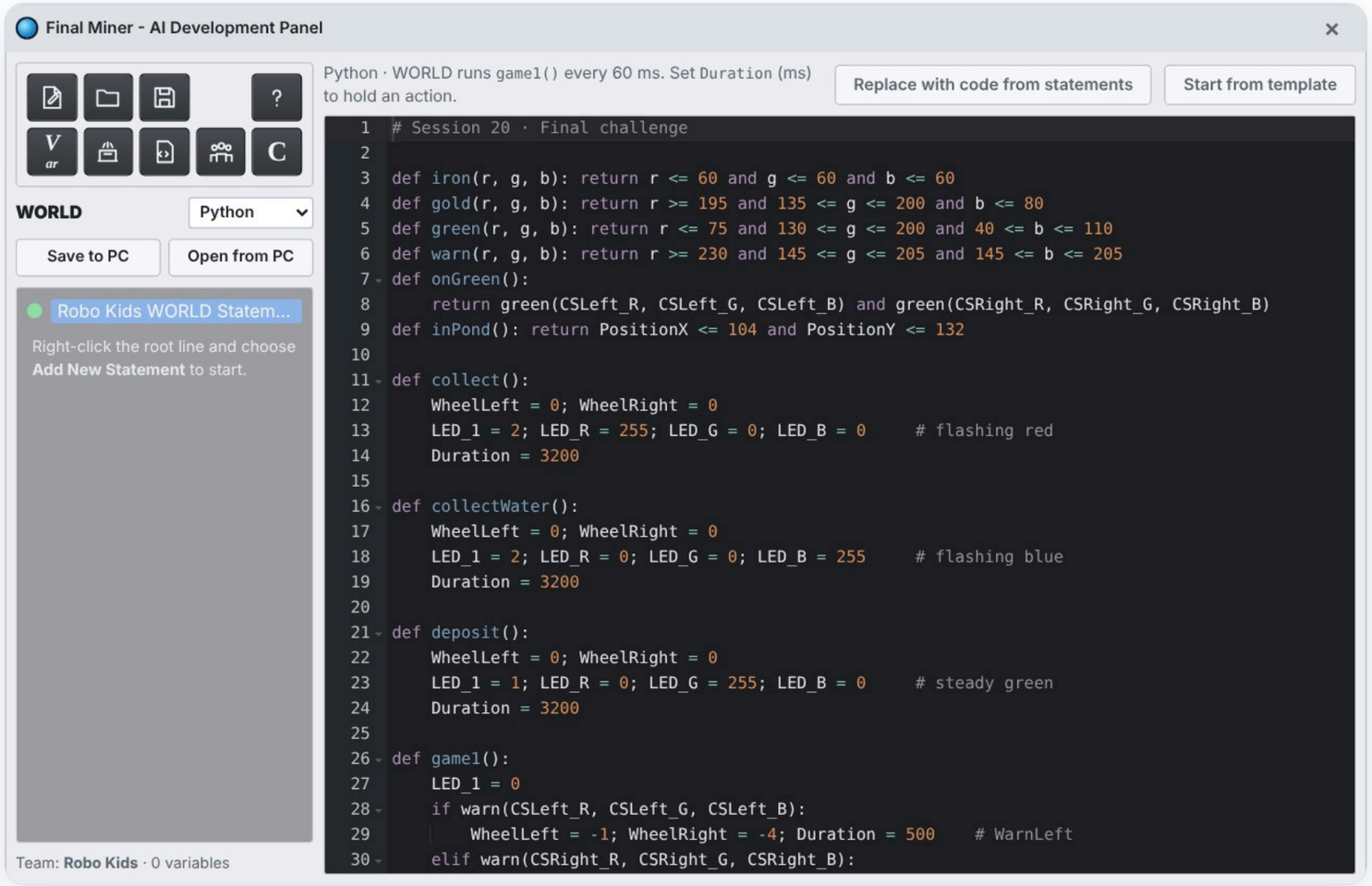
Pond irons first, with **inPond() and** → collectWater().

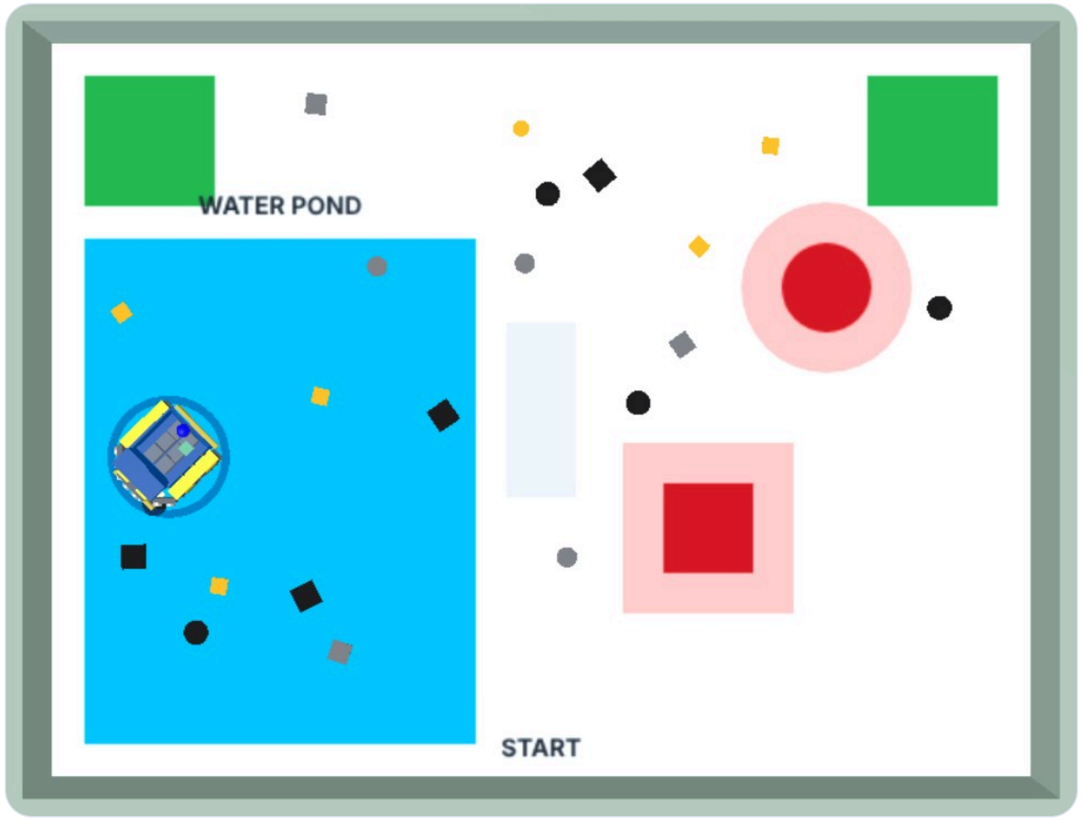
Then land iron and gold → collect(). Ahead and the else at the end.

STEP 5 · BUILD AND LOAD

The whole program, built

1. WORLD menu: **Python**.
2. Type the program, name it **Final Miner**.
3. Press **Build**, then **OK**.
4. Press **Load** on the BLUE side.





Colour Sensors

Left R	22	(CSLeft_R)
G	22	(CSLeft_G)
B	28	(CSLeft_B)

left sees this colour

Right R	0	(CSRight_R)
G	171	(CSRight_G)
B	241	(CSRight_B)

right sees this colour

Robot

Wheels L **0.0** · R **0.0** · LED **2**

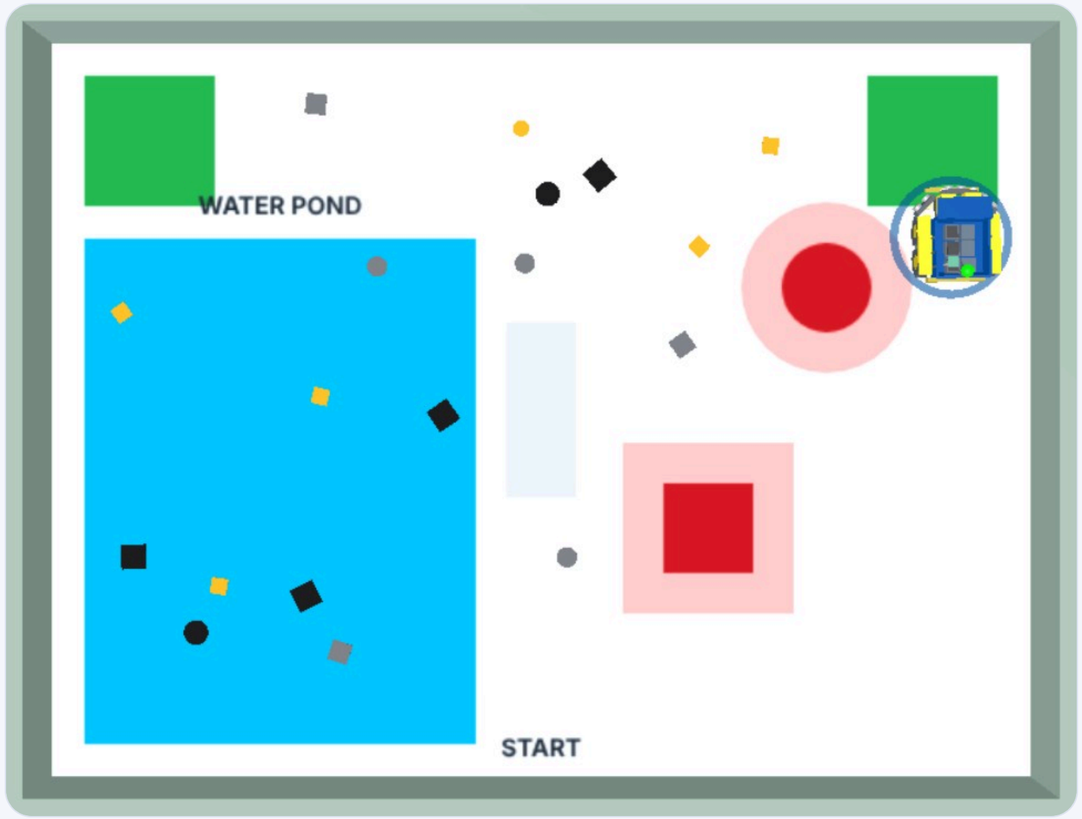
Load **0**/6 · Fe 0 Ag 0 Au 0

On **water pond · collecting 1.5 / 3 s**

STEP 6 · RUN · 7.2 S

Trip 1 begins

Pond iron: **PondIronLeft**, blue LED, +20.



Colour Sensors

Left R	27	(CSLeft_R)
G	159	(CSLeft_G)
B	69	(CSLeft_B)

left sees this colour

Right R	28	(CSRight_R)
G	160	(CSRight_G)
B	73	(CSRight_B)

right sees this colour

Robot

Wheels L **0.0** · R **0.0** · LED **1**

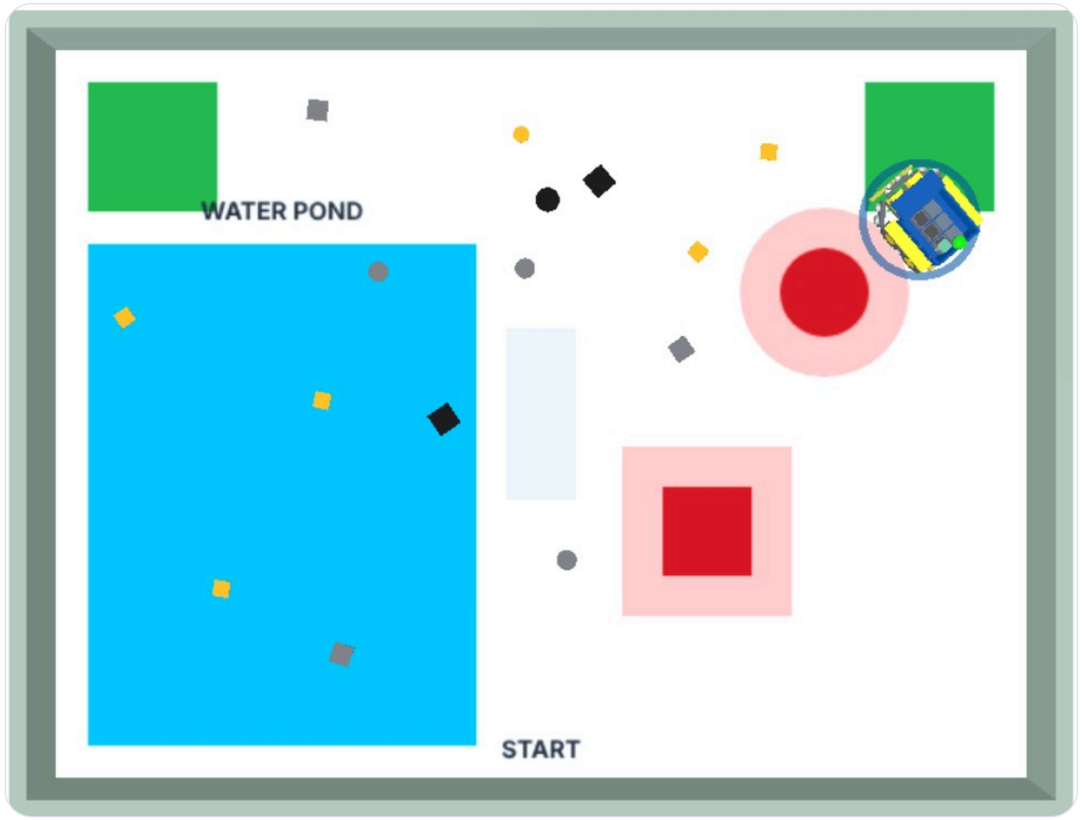
Load **3**/6 · Fe 3 Ag 0 Au 0

On **deposit area · depositing 1.5 / 3 s**

STEP 7 · RUN · 81.8 S

Trip 1 home

Load **3**, both green: **Deposit** in the top-right corner, right next to the warning band.



Colour Sensors

Left R	33	(CSLeft_R)
G	158	(CSLeft_G)
B	69	(CSLeft_B)

left sees this colour

Right R	28	(CSRight_R)
G	159	(CSRight_G)
B	68	(CSRight_B)

right sees this colour

Robot

Wheels L **0.0** · R **0.0** · LED **1**

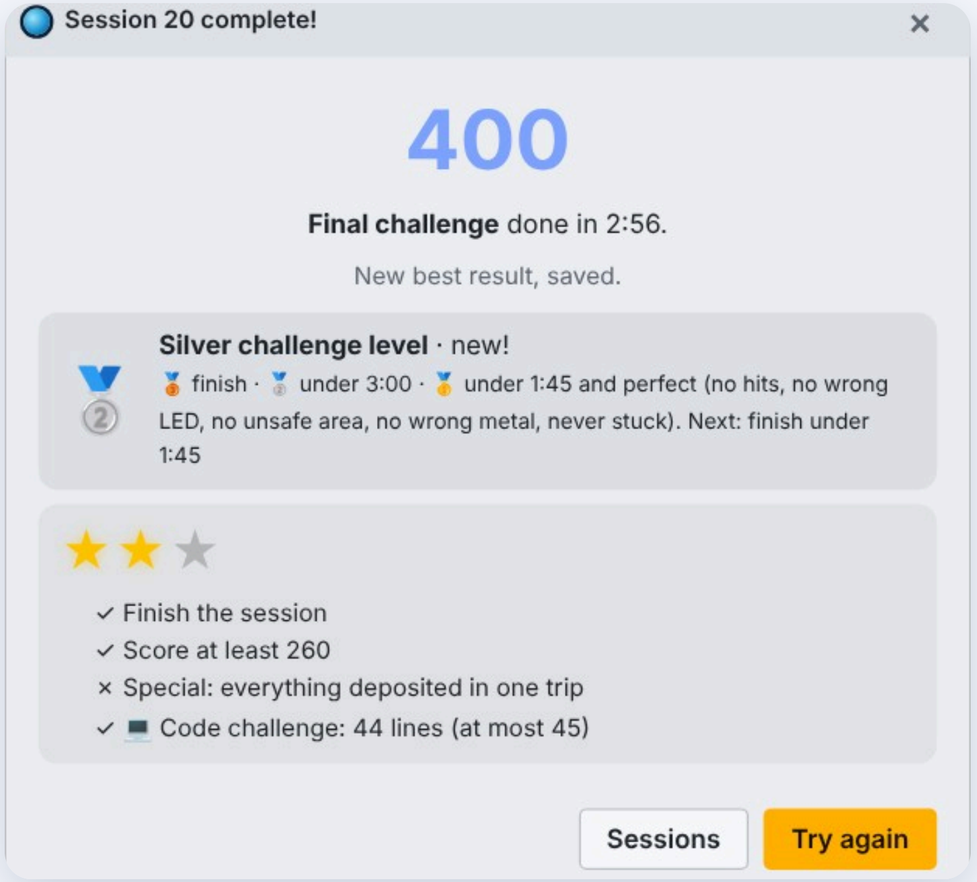
Load **3**/6 · Fe 3 Ag 0 Au 0

On **deposit area · depositing 1.6 / 3 s**

STEP 8 · RUN · 173.7 S

Trip 2 home

Three pond irons this time (+60), back to the same corner: **Deposit**. Six done.



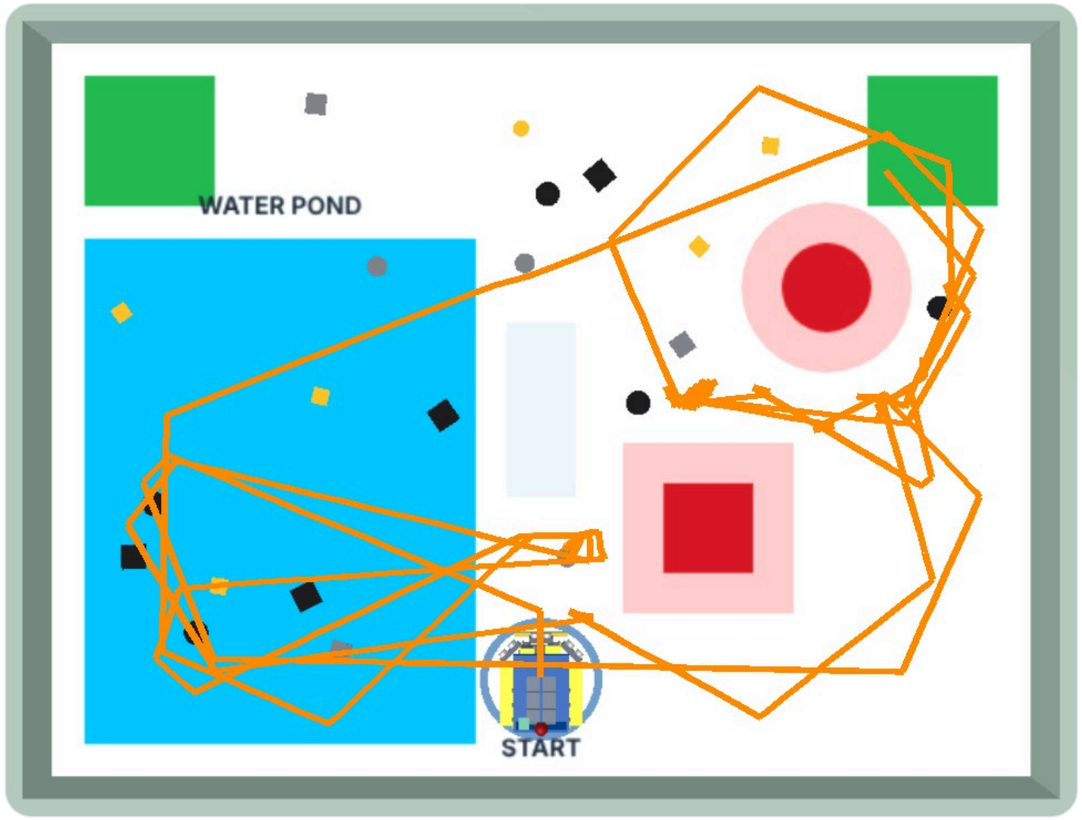
RESULT · TESTED

400 points in 2:56 · Silver

Score · metals 100 + deposited 100 + bonus 200.

Medals · Silver: under 3:00 · Gold: under 1:45 and perfect.

Still to win · gold, and the one-trip star. Your turn.



THE PATH · RECORDED

Never inside the red

Look for the small **spikes** at the pink bands: that is WarnLeft and WarnRight at work.

Safety first, then the job: **order is a decision**.

DID NOT WORK?

Check first, then tune carefully

What you see	What to do
Drives into a red area	WarnLeft and WarnRight must be the **first two**
Wobbles on the band	Back away (both wheels negative), Duration 500
Stuck flashing red in the pond	A land collect fired on a pond metal: add that metal’s **pond branch before** it
Old program still on the robot	**Build** again, then **Load** on BLUE

WELL DONE

Juniors course complete in Python

Now beat our score: **gold** under 1:45, or all six in **one trip**.