



10.6 Project: enter a hard game

Competing · Robot club · about 25 min

What this lesson is about

Light Cycles, Rescue Line or Capture the Flag: how to practise one properly, and the line and gripper rehearsal.

- The three
- How to get good at any of them
- The rehearsal
- Where next

Questions

6 marks in all

1. Which game do you play on your own, after Module 7, using the line and the gripper at once? [1 mark]

- ☐ A Rescue Line
- ☐ B Light Cycles
- ☐ C Capture the Flag
- ☐ D Shuttle Relay

Answer: A. Follow the line, pick up the casualties, and carry them to safety without losing the line.

2. Put the steps for getting good at a game in order. [1 mark]

Number the lines 1 to 5 to put them in the right order.

- ___ Change one thing at a time
- ___ Then play people
- ___ Print, race, read
- ___ Beat one bot
- ___ Read the game page

Answer:

```
Read the game page
Beat one bot
Print, race, read
Change one thing at a time
Then play people
```

Know the rules and what `info()` gives, beat the bot that beats you most, learn from your log, and only then take it to a room.

3. You change your top speed and your turning gain together, and the next race is better. What have you learned? [1 mark]

- ☐ A Very little: you cannot tell which change helped
- ☐ B Both changes helped
- ☐ C The speed change helped
- ☐ D You should always change two things

Answer: A. Change one thing at a time, so a better result tells you why.

4. What does this program print?

[1 mark]

```
for cx in [200, 160, 100]:  
    print(cx, round((cx - 160) * 0.35, 1))
```

Answer:

```
200 14.0  
160 0.0  
100 -21.0
```

The turn is how far the line is from the middle of the picture times 0.35. Right of centre gives a positive, clockwise turn; left gives a negative one.

5. In the carry-home task, when should the jaws close?

[1 mark]

- ☐ A Once the robot has stopped with the ball in reach
- ☐ B At the very start, so they are ready
- ☐ C As soon as the line comes into view
- ☐ D When the robot reaches the green zone

Answer: A. Jaws closed at the start shut on nothing. Arrive, stop, then grip, and keep them closed until the zone.

6. In the rehearsal, `line()` sees nothing and the robot runs `drive(25, 0, 40)`. What is it doing?

[1 mark]

- ☐ A Creeping forward while turning clockwise to find the line again
- ☐ B Stopping until the line comes back
- ☐ C Reversing along its path
- ☐ D Sliding sideways

Answer: A. Slow forward speed with a turn sweeps the camera round, looking for the line.

The task: carry it home

Follow the black line to the red ball, pick it up with the gripper, and carry it into the green zone at the end without dropping it. The line bends to the right, so driving straight up the mat misses the ball by 15 cm: the line is the only way to it.

```
from bugbot import *
connect()
set_cv('line')

gripper("open")

# follow the line first: steer by where it is and where it is going,
# and slide sideways onto it if you drift
while position()[1] < 40:
    seen = line()
    if seen:
        cx, angle = seen
        drive(35, (cx - 160) * 0.15, (cx - 160) * 0.15 + angle * 1.5)
    else:
        forward(20)
    wait(0.1)

stop()
```

The hint students can ask for: The line bends to the right, and the ball is at its end, 15 cm to the side of where you start: drive straight and you miss it. Follow the line all the way, steering with where it is going as well as where it is, and slide sideways onto it if you drift. Close the gripper on the ball, then carry it into the green zone without letting go.

A solution

```
from bugbot import *
connect()
set_cv('line')
gripper('open')
# follow the line, using where it is going as well as where it is, until the ball is in the
jaws
while not holding() and position()[1] < 56:
    seen = line()
    if seen:
        cx, angle = seen
        drive(35, (cx - 160) * 0.15, (cx - 160) * 0.15 + angle * 1.5)
    else:
        forward(20)
    wait(0.1)
stop()
gripper('close')
wait(0.6)
# carry it home, holding the heading straight up the mat
while position()[1] < 78:
    err = (0 - heading() + 180) % 360 - 180
    drive(45, 0, max(-30, min(30, err * 1.5)))
    wait(0.1)
stop()
print('holding:', holding())
```

Any program that meets the task's checks is marked correct in the simulator; this is one way, not the only way.