



10.2 Racing the bots

Competing · Robot club · about 14 min

What this lesson is about

Practice, replay and the results board: why you lost, and the fast-then-careful pattern that wins.

- Practice is free
- Reading why you lost
- Fast, then careful

Questions

6 marks in all

1. What does this program print?

[1 mark]

```
for gap in [100, 30, 10]:
    speed = max(20, min(90, gap * 1.2))
    print("gap", gap, "-> speed", round(speed))
```

Answer:

```
gap 100 -> speed 90
gap 30 -> speed 36
gap 10 -> speed 20
```

100 x 1.2 = 120 is capped at 90, 30 x 1.2 = 36 is inside the limits, and 10 x 1.2 = 12 is raised to the floor of 20.

2. After losing a race, put the three things to look at in order.

[1 mark]

Number the lines 1 to 3 to put them in the right order.

- ___ Where did the time go?
- ___ Did the robot do what you meant?
- ___ What did the bots do differently?

Answer:

```
Did the robot do what you meant?
Where did the time go?
What did the bots do differently?
```

Most losses are a program doing exactly what it was told, so watch the replay first.

3. What are the built-in bots for?

[1 mark]

- ☐ A A measuring stick you can race again and again
- ☐ B Opponents you only need to beat once
- ☐ C Robots that copy your program
- ☐ D Helpers that push you to the finish

Answer: A. Practice is free, on your own screen, as often as you like.

4. Which pattern wins nearly every game with a target?

[1 mark]

- ☐ A Fast while the target is far, slow as you arrive, stop before you overshoot
- ☐ B Slow and steady the whole way
- ☐ C Full speed until you touch the target
- ☐ D Fast at the end to catch up

Answer: A. A robot at 30 the whole way loses to one at 90 that creeps at the end. It is proportional control used as a tactic.

5. Your robot stops inside the bay but facing 14 degrees off. What should you add?

[1 mark]

- ☐ A A correction at the end that turns back to the starting heading
- ☐ B A faster approach
- ☐ C A longer wait before stopping
- ☐ D Nothing, being in the bay is enough

Answer: A. The task wants you within 10 degrees of the way you started. Finish straight.

6. With `speed = max(20, min(90, gap * 1.2))`, below what gap does the speed stop falling and sit at 20? Give your answer to one decimal place. [1 mark]

Answer: 16.7 (accept within 0.1). $\text{gap} \times 1.2 = 20$ when $\text{gap} = 20 / 1.2$, which is about 16.7 cm.

The task: park square

Drive into the bay and stop inside it, facing the way you started, within 10 degrees. Being in the bay is not enough: finish straight.

```
from bugbot import *
connect()

forward(60, distance=35)
stop()
print("heading", heading())
```

The hint students can ask for: Drive in fast while it is far, creep at the end, and check `heading()` before you stop: a quarter of a turn out is a fail.

A solution

```
from bugbot import *
connect()
forward(70, distance=25)
while position()[1] < 52:
    forward(25)
    wait(0.1)
stop()
print('heading', heading())
```

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

