



7.4 The kicker

Hands and feet · Robot club · about 15 min

What this lesson is about

kick(): aiming, and how far the ball goes.

- Kick
- One strength
- Aim is your heading
- Held or loose

Questions

7 marks in all

1. The kicker's servo is a continuous-rotation servo. What does `servo(1, 90)` do to it? [1 mark]

- ☐ A Stops it turning
- ☐ B Turns it to the 90 degree position
- ☐ C Spins it at full speed
- ☐ D Fires one kick

Answer: A. For this kind of servo 90 means stop. Numbers further from 90 turn it faster.

2. Every kick goes about 45 cm. How do you change where the ball ends up? [1 mark]

- ☐ A Change where you kick from and which way you face
- ☐ B Pass a power, such as `kick(30)`
- ☐ C Use `servo(1, 180)` for a harder kick
- ☐ D Wait longer before calling `kick()`

Answer: A. A spring has one strength, so there is no power to choose. Position and heading are what you control.

3. Put the three steps that `kick()` does underneath in order. [1 mark]

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

- ___ `servo(1, 90)`
- ___ `wait(1)`
- ___ `servo(1, 91)`

Answer:

```
servo(1, 91)
wait(1)
servo(1, 90)
```

Start the servo turning, let it make one turn (which fires the lever), then stop it before it fires again.

4. Which of these are true about the kicker?

[1 mark]

Tick every answer that is true.

- ☐ A It fires straight ahead, along the way the robot faces
- ☐ B It works on a ball held in the jaws
- ☐ C It aims itself at the nearest ball
- ☐ D Left to keep turning, it fires again every turn
- ☐ E It sends the ball about 45 cm

Answer: A, B, D, E. The kicker does not aim: aiming is turning the robot. It will kick a held ball out of the jaws, and `kick()` stops after one turn so it fires once.

5. What does this program print?

[1 mark]

```
width = 23
print(round(4 * 92 / width), "cm")
```

Answer:

16 cm

A 4 cm ball that looks 23 pixels wide is $4 \times 92 / 23 = 16$ cm from the camera.

6. The robot faces up the mat. The target zone is 30 degrees to its left. Which line aims the kick?

[1 mark]

- ☐ A `turn_left(30, angle=30)`
- ☐ B `turn_right(30, angle=30)`
- ☐ C `servo(1, 30)`
- ☐ D `kick()` then `turn_left(30, angle=30)`

Answer: A. The ball flies the way the robot faces, so turn first, then kick. Turning after the kick is too late.

7. One turn of the kicker takes about 1 s and fires once, half a second in. You run `servo(1, 91)`, wait 3 s, then `servo(1, 90)`. How many times does it fire?

Answer: 3. It fires at about 0.5, 1.5 and 2.5 s. That is why `kick()` stops the servo after one turn.

The task: kick it

The ball lies 8 cm away, straight towards the green zone, but you are facing 30 degrees to the right of it, so it is not in front of the kicker yet. Turn to face the zone, then kick so the ball stops in it. Do not drive.

```
# the two lines every program starts with: the commands, then the robot
from bugbot import *
connect()

# kick: one turn of the kicker winds the spring and lets it go
kick()
# pause 4 s (the robot keeps doing what it was told)
wait(4)
```

The hint students can ask for: The ball lies 8 cm away, straight towards the green zone, but you are facing 30 degrees right of it, so the kicker cannot reach it yet. Turn to face the zone, then kick: a kick goes about 45 cm. Do not drive.

A solution

```
from bugbot import *
connect()
turn_left(30, angle=30)
kick()
wait(5)
```

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