



7.1 Servos

Hands and feet · Robot club · about 15 min

What this lesson is about

Angles, speed, what a servo can and cannot do.

- What a servo is
- They take time
- Sweeping
- What a servo cannot do

Questions

7 marks in all

1. What does the number 90 mean in `servo(0, 90)`? [1 mark]

- ☐ A The angle for servo 0 to go to and hold
- ☐ B How fast servo 0 should spin
- ☐ C How many seconds servo 0 should run for
- ☐ D How many degrees to turn from where it is now

Answer: A. A servo goes to an angle between 0 and 180 and stays there. You say where to be, not how fast.

2. Which servo works which attachment on BugBot? [1 mark]

- ☐ A Servo 0 the gripper, servo 1 the kicker
- ☐ B Servo 0 the kicker, servo 1 the gripper
- ☐ C Servo 1 the gripper, servo 2 the kicker
- ☐ D Both servos work the gripper together

Answer: A. Servo 0 opens and closes the jaws; servo 1 winds the kicker.

3. What does this program print? [1 mark]

```
for angle in range(0, 181, 45):  
    print("servo 0 at", angle)
```

Answer:

```
servo 0 at 0  
servo 0 at 45  
servo 0 at 90  
servo 0 at 135  
servo 0 at 180
```

The third number in `range` is the step. Stopping at 181 rather than 180 is what lets 180 itself be included.

4. A hobby servo turns about 60 degrees in a tenth of a second. About how many seconds does it take to swing from 0 to 180? Give your answer to one decimal place. [1 mark]

Answer: 0.3 (accept within 0.05). 180 degrees is three lots of 60, and each takes 0.1 s, so about 0.3 s. That is why `wait` sits between moves.

5. A program runs `servo(0, 180)` and on the very next line `servo(0, 0)`, with no wait between. What [1 mark] does servo 0 do?
- ☐ A It barely moves, because it is sent back to 0 before it gets anywhere near 180
 - ☐ B It goes all the way to 180, then back to 0
 - ☐ C Python stops with an error
 - ☐ D It waits at 180 until you call wait

Answer: A. `servo` does not wait for the move to finish. Without a `wait`, the second command arrives while the first is still starting.

6. Which of these can a normal (not continuous-rotation) servo NOT do? [1 mark]

Tick every answer that is true.

- ☐ A Spin round and round
- ☐ B Tell you what it touched
- ☐ C Push harder than its small gearbox allows
- ☐ D Hold an angle once it gets there
- ☐ E Go to 45 degrees

Answer: A, B, C. 0 to 180 is the whole range, it has no sense of touch, and forcing it strains the gears. Holding an angle is exactly what it is for.

7. What does this program print? [1 mark]

```
for angle in range(180, -1, -60):  
    print(angle)
```

Answer:

```
180  
120  
60  
0
```

A negative step counts down. Stopping at -1 means 0 is the last value printed.

The task: servo sweep

Move servo 0 to 0, 45, 90, 135 and 180 in turn, printing `servo 0 at <angle>` each time. Do not drive.

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

# servo 0 to 90 degrees
servo(0, 90)
print("servo 0 at", 90)
```

The hint students can ask for: Move servo 0 to 0, 45, 90, 135 and 180 degrees in turn, printing `servo 0 at <angle>` each time, with a short wait between. Do not drive.

A solution

```
from bugbot import *
connect()
for angle in [0, 45, 90, 135, 180]:
    servo(0, angle)
    print('servo 0 at', angle)
    wait(0.5)
```

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