



6.4 Seeing other robots

Seeing more · Robot club · about 15 min

What this lesson is about

Tags from 100 up say who and how far; LEDs say what.

- Why colour and not a tag
- Finding one
- Distance and bearing
- Telling them apart
- Talking with light

Questions

7 marks in all

1. The camera reads a tag with id 101. What is it?

[1 mark]

- ☐ A A marker on the mat
- ☐ B Another robot
- ☐ C A blob
- ☐ D A misread, because ids stop at 99

Answer: A. Every tag is a marker on the mat. A robot wears none, so a tag reading is never another robot.

2. What does this program print?

[1 mark]

```
seen = [['green', 60, 120, 55.0], ['red', 240, 110, 42.0]]
for colour, cx, cy, dist in seen:
    print(colour, dist, round((cx - 160) * 120 / 320, 1))
```

Answer:

```
green 55.0 -37.5
red 42.0 30.0
```

The green one is 100 pixels left, -37.5 degrees. The red one is 80 pixels right, 30 degrees.

3. What does `robots()` give?

[1 mark]

- ☐ A Only the robots in view, each as `[colour, cx, cy, distance]`
- ☐ B Every robot in the arena, seen or not
- ☐ C The ids of the robots, as plain numbers
- ☐ D The tags on the robots

Answer: A. It reads the lit dome on each one, so a robot with its LED off is not in the list.

4. Which of these are true?

[1 mark]

Tick every answer that is true.

- ☐ A A robot's dome colour says which robot it is
- ☐ B Its dome can also say what it is doing
- ☐ C A robot with its LED off is not in `robots()`
- ☐ D Domes are best told apart by shade, like light and dark green

Answer: A, B, C. A lit dome washes out towards white in a camera, so tell robots apart by colour, not shade. About four colours is the limit.

5. A robot's dome is at `cx = 272`. What is its bearing in degrees?

[1 mark]

Answer: 42 (accept within 0.5). 272 minus 160 is 112 pixels, and 112 times 0.375 is 42 degrees to the right.

6. Your robot runs `led("red")`. What can the other robots see?

[1 mark]

- ☐ A A red blob, if they look for red with the blob detector
- ☐ B A tag with a new id
- ☐ C Nothing, the LED is only for people
- ☐ D A red line

Answer: A. Light works both ways. A team could agree on what each colour means.

7. What does this program print?

[1 mark]

```
seen = [['green', 90, 120, 30.0], ['red', 200, 115, 42.0], ['blue', 20, 110, 80.0]]
near = [r[0] for r in seen if r[3] < 50]
print("near:", near)
print("nearest:", seen[0][0])
```

Answer:

```
near: ['green', 'red']
nearest: green
```

`robots()` comes back nearest first, so the first one is the closest without any sorting of your own.

The task: spot the robot

Print robot at <cm> cm, bearing <degrees> and dome: <colour>, both from robots(). Do not drive.

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

# every robot in view, nearest first
print(robots())
```

The hint students can ask for: Another robot is ahead to the right with its dome lit. robots() gives you every robot in view as [colour, cx, cy, distance]. Turn cx into a bearing the way lesson 4.2 did, then print both lines. Do not drive.

A solution

```
from bugbot import *
connect()
seen = robots()[0]
bearing = (seen[1] - 160) * 120 / 320
print(f'robot at {seen[3]} cm, bearing {round(bearing, 1)}')
print('dome:', seen[0])
```

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