WORKSHEET

A1.2 Operations, strings and random numbers

Programming techniques and object-oriented programming · A level · AQA 7517 4.1.1.3, Eduqas A500QS 1.4 · about 20 min

Name _____ Class _____ Date _____

What this lesson is about

Integer division and MOD with negatives, rounding and truncation, XOR, string and date conversions, and pseudo-random numbers.

- Arithmetic
- Relational and Boolean operations
- String handling
- Random number generation

Questions

6 marks in all

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

```
print(-17 // 5, -17 % 5)
```

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

```
import math
x = -2.6
print(round(x), int(x), math.floor(x))
```

3. What is True XOR True? [1 mark]

- ☐ **A** False
- ☐ **B** True

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

```
s = "R135,F20"
comma = s.find(",")
print(comma, int(s[1:comma]) + 1, s[comma + 1:] + "!")
```

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

```
heading = 30
for turn in [-90, -45, 200]:
    heading = (heading + turn) % 360
    print(heading)
```

6. Why does setting the same seed before generating numbers give the same sequence each time? [1 mark]

- ☐ **A** The generator is pseudo-random: each number is calculated from the previous state, starting from the seed
- ☐ **B** The computer stores every random number it has ever made
- ☐ **C** The seed stops the numbers being random at all times
- ☐ **D** Random numbers always repeat after one use

The task: drive a command string

A route arrives as one string of commands separated by commas: `COMMANDS = "F20,L90,F15,R135,B5"`. Each command is a letter and a whole number: `F` drives forward that many cm, `B` drives backward that many cm, `R` turns right that many degrees and `L` turns left that many degrees. Go through the string and carry out each command on the robot. Keep two totals as you go: the distance driven in cm (forward and backward both add) and the heading in degrees, starting at 0, turning right adding and turning left subtracting, always kept from 0 to 359 with MOD 360. Convert each amount with `int`. At the end print `driven <cm> cm, heading <degrees>`, for this string `driven 40 cm, heading 45`. Work both totals out from the string; do not type them.

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

COMMANDS = "F20,L90,F15,R135,B5"

for command in COMMANDS.split(","):
    print(command)
```

Plan your program here, then type it in and press Run.

Do it on the robot

www.bugbotlab.com/learn/a1-2-operations-and-strings/

The simulator checks it and tells you when it passes. Nothing to install, no account.

Challenges

1. Do the task without `split`, finding each comma with `find` and taking substrings between them.
2. What do `-7 // 2`, `-7 % 2` and `int(-7 / 2)` give? Explain why two of them differ.
3. Add a command `W` that waits a number of tenths of a second, so `W15` waits 1.5 seconds.