ANSWERS

F8.3 Hexadecimal

Data representation · GCSE · OCR J277 1.2.4, AQA 8525 3.3.2, Edexcel 1CP2 2.1.6 · about 15 min

What this lesson is about

Base 16, converting to binary and denary, and the LED's colour codes.

- Sixteen digits
- Binary and hex
- Hex and denary
- Colours in hex
- Why hex?

Questions

6 marks in all

1. Convert 10110110 to hexadecimal. [1 mark]

> **Answer:** B6. 1011 is B and 0110 is 6.

2. What is hex 3F in denary? [1 mark]

> **Answer:** 63. 3 × 16 + 15.

3. Convert 255 to hexadecimal. [1 mark]

> **Answer:** FF. 15 sixteens and 15 ones: FF.

4. Why do programmers use hexadecimal? [1 mark]

- ☐ **A** It is shorter and easier to read than binary, and easy to convert
- ☐ **B** Computers store data in hexadecimal
- ☐ **C** It takes less memory
- ☐ **D** It is more accurate than binary

> **Answer:** A. Hex is for people; the computer still stores binary.

5. What colour is #00FF00 on the LED? [1 mark]

- ☐ **A** Green
- ☐ **B** Red
- ☐ **C** Blue
- ☐ **D** White

> **Answer:** A. Red 00, green FF, blue 00.

6. How many bits does one hex digit stand for? [1 mark]

> **Answer:** 4. One hex digit is a nibble.

The task: mix a colour

Write `to_hex(n)` yourself (no `hex` or `format`) that turns 0 to 255 into two hex digits. Use it to build the colour code for red 255, green 128, blue 64, print it as `#FF8040`, and show it on the LED by passing your code to `led`.

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

DIGITS = "0123456789ABCDEF"

def to_hex(n):
    return "00"
```

The hint students can ask for: Each byte becomes two hex digits: the first is how many sixteens, the second is what is left over. Look each one up in the digit string, join the six digits behind a hash, print it and give it to the LED.

A solution

```
from bugbot import *
connect()
DIGITS = "0123456789ABCDEF"

def to_hex(n):
    return DIGITS[n // 16] + DIGITS[n % 16]

code = "#" + to_hex(255) + to_hex(128) + to_hex(64)
print(code)
led(code)
```

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