ASCII and Unicode 1

Challenge 1

ASCII and Unicode are two character coding schemes.

From the statements below that relate to either ASCII or Unicode, select the **three** statements that are correct.

- [ ] Unicode can be used to represent up to 256 different characters.
- [ ] The first 128 codes in ASCII and Unicode are used to represent the same characters.
- [ ] Extended ASCII uses 8 bits to represent each character.
- [ ] The Unicode character set typically uses 16 bits per character.
- [ ] ASCII is able to represent characters from languages other than English.

What is a character?

Practice 1

With ASCII and Unicode character sets, each character has a bit pattern assigned to it.
Which **four** of the following are characters?

- [ ] Letters
- [ ] Emojis
- [ ] Non-printing commands. For example: Enter, Delete, F1
- [ ] Images
- [ ] Punctuation symbols. For example: `?/|\£$`

Quiz:
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ASCII character code 3

Challenge 1

The **ASCII character codes** for the lower case letters of the alphabet run in a sequence.
Codes are always stored in binary but can be displayed in denary or binary (or even in hex).

- The **denary code** for the letter "a" is 97.
- The **binary code** (8-bit ASCII code) for the letter "p" is 01110000.

Using this information, work out the **binary code** (8-bit ASCII code) for the letter "n".

Type your answer with **no spaces** between the binary digits.

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ASCII to string 2

Challenge 1

Divya wants to send a secret message to her friend, so she has written a program to create her own cipher. Divya's cipher involves taking each letter of the plaintext message and converting it to the corresponding ASCII code.

Using Divya's program, the message "hi" would appear as:

```
plaintext - "hi"
ciphertext - "104 105"
```

The message Divya sent to her friend looks like this:

```
109 101 101 116 32 97 116 32 49 48 44 32 98 114 105 110 103 32 99 104 111 99
111 108 97 116 101
```

Unfortunately, someone was able to decipher the message by writing a program to convert each ASCII code back into a character. What was the message?

You may like to try writing a program to solve this.

Quiz:
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Bitmap characteristics: 2

Practice 1

A bitmapped graphic is stored as an array (grid) of pixels. From the following list of options, **select all** that correctly describe a pixel.

- [x] A pixel is the smallest element of a bitmapped graphic.
- [ ] A pixel can be made up of more than one colour.
- [x] The value of each pixel is stored as a binary number.
- [ ] A pixel can be resized without losing definition.

Quiz:
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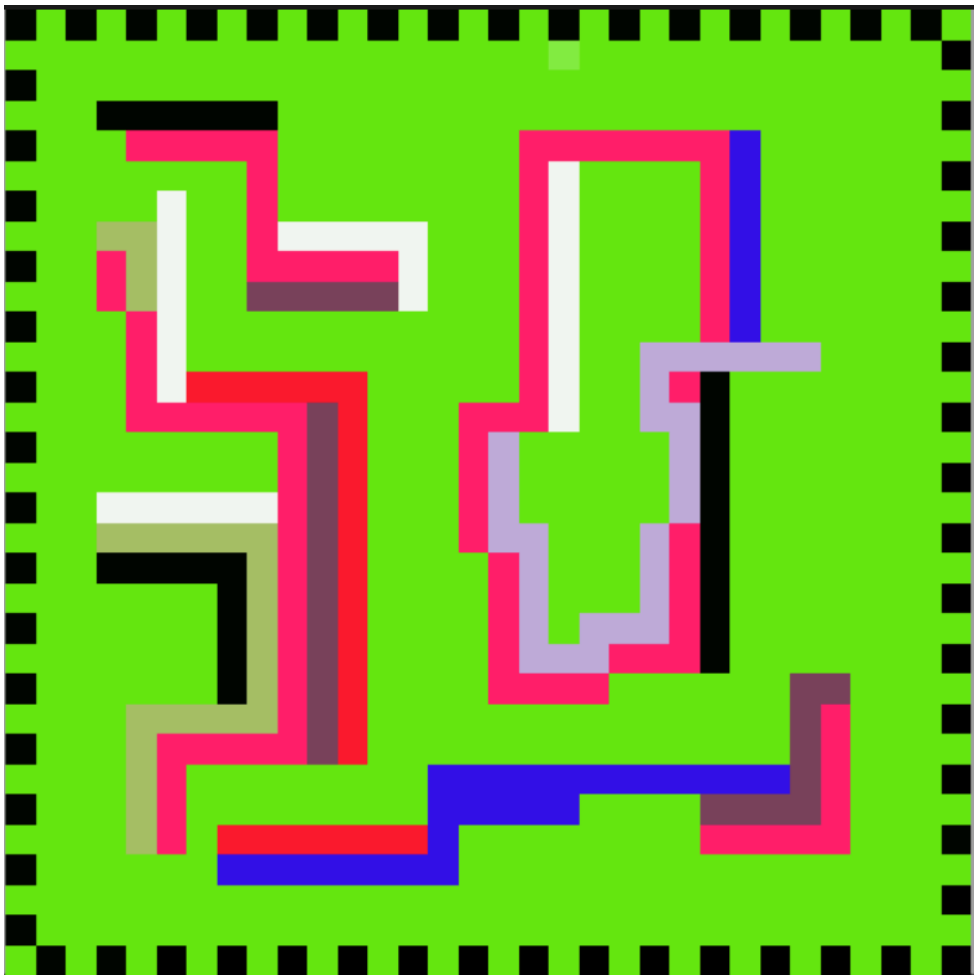
Calculate image file size: 4

Challenge 1

Naga has made an icon for a maze solving game she has created. The icon has been created as a bitmapped graphic. It is 32 pixels wide and 32 pixels high and uses 9 different colours.



Naga's icon

Part A How many pixels?

How many pixels does the image have in total?

Part B Colour depth

To represent 9 different colours, what is the minimum colour depth needed? Give your answer in **bits**.

Part C File size in bits

What is the total file size (excluding any metadata)? Give your answer in **bits**.

Part D File size in bytes

What is the total file size (excluding any metadata) in **bytes**?

Quiz:
[STEM SMART Computer Science Week 4]

Bitmapped or vector?

Challenge 1

Bitmapped graphics and vector graphics are two distinct ways of storing image data.

Drag and drop the most suitable graphic type against each statement.

Statement	Type of graphic
Best for logos and business cards	
Best for photos of family celebrations	
Best for images that may need lots of editing	
Best for small file sizes	
Best for images that will need to be resized significantly	

Items:

Vector Bitmapped

Quiz:
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Sampling a sound

Practice 1

Shannon recorded a sound wave by sampling it. Which of the following characteristics of sound is being measured when a sound wave is sampled?

- Hertz
- Bit rate
- Amplitude
- Frequency

Quiz:
STEM SMART Computer Science Week 4

Sound: sample resolution 1

Practice 1

Brian has recorded his speech for the family's New Year celebration using his phone. The below table shows the representation of three samples of Brian's recording.

`0000 0101 0111 1001`
`0000 0101 0111 1111`
`0000 0101 0111 1001`

Part A What sample resolution?

What sample resolution has been used? Give your answer in bits.

Part B How much storage?

If the sampling rate is set to 16kHz, what is the storage space required for 5 minutes of audio? Give your answer in MB. 1MB is 1000000 (1 million) bytes.

Quiz:
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Sound: Nyquist 1

Challenge 2

Andriana wants to capture the sound of birds singing. She knows that the frequency range of many bird songs vary between 1000Hz and 8000Hz.

According to the Nyquist theorem, what is the minimum sampling rate that she needs to use in order to produce accurate digital recordings?

Give your answer in kHz (1kHz is 1000Hz).