

Counting bits

Problem 1 Text you in a bit

Text messages (SMS) use a coding scheme similar to ASCII. It is called GSM 03.38 and represents each character with a sequence of 7 bits.

Questions

Your answers

How many binary digits does it take to represent the message:

Number of binary digits:

See you tonight?

Note: Spaces are characters too!

A single text message can contain 1120 bits at most.

Maximum number of characters in a message:

What is the **maximum number of characters** in a single text message?

Hint: How many 7-bit sequences can fit into 1120 bits?

Problem 2 Bitstructions

You have built a small robot for navigating mazes. There are only four simple instructions that you can use to program it:

- Move forwards
- Move backwards
- Rotate 90 degrees left
- Rotate 90 degrees right

The robot is a digital device, so its instructions must be represented as sequences of bits.

Questions	Your answer	
<p>Decide on the instruction codes: which sequence of bits will be used for each instruction?</p> <p>There are no right or wrong answers; you get to design how the robot stores its instructions.</p> <p>However, the robot has a limited amount of memory to store its instructions, so it's best if you use as few binary digits as possible.</p>	<p>Instructions</p> <p>Move forwards</p> <p>Move backwards</p> <p>Rotate 90 degrees left</p> <p>Rotate 90 degrees right</p>	<p>Sequence of binary digits</p> <p>-----</p> <p>-----</p> <p>-----</p> <p>-----</p>
<p>A program for your robot is a sequence of instructions.</p> <p>Using your instruction codes, how many binary digits are required to represent this program?</p> <p>Move forwards Rotate 90 degrees right Move forwards Rotate 90 degrees left Move backwards</p>	<p>Number of binary digits:</p>	
<p>Your robot's memory is capable of storing programs up to 64 binary digits long.</p> <p>What's the longest program that you can store in the robot's memory (the maximum number of instructions), using the instruction codes that you just devised?</p>	<p>Maximum number of instructions that fit into 64 bits:</p>	