

**Preamble:** In NXC, `string` was used to declare some variables. Also statements like `Num2Str` and `StrCat` were used. These were needed when displaying messages on the Brick's LCD like:

```
strIrSensorValue = NumToStr(irSensorValue);  
strMessageAndValue = StrCat("IR reads:", strIrSensorValue);
```

Computers need to distinguish between a numeric value like the integer “9” and the alphanumeric character “9”. The former refers to a quantity, that perhaps one wishes to manipulate mathematically. The latter refers to a character, that would be a part of some sentence.

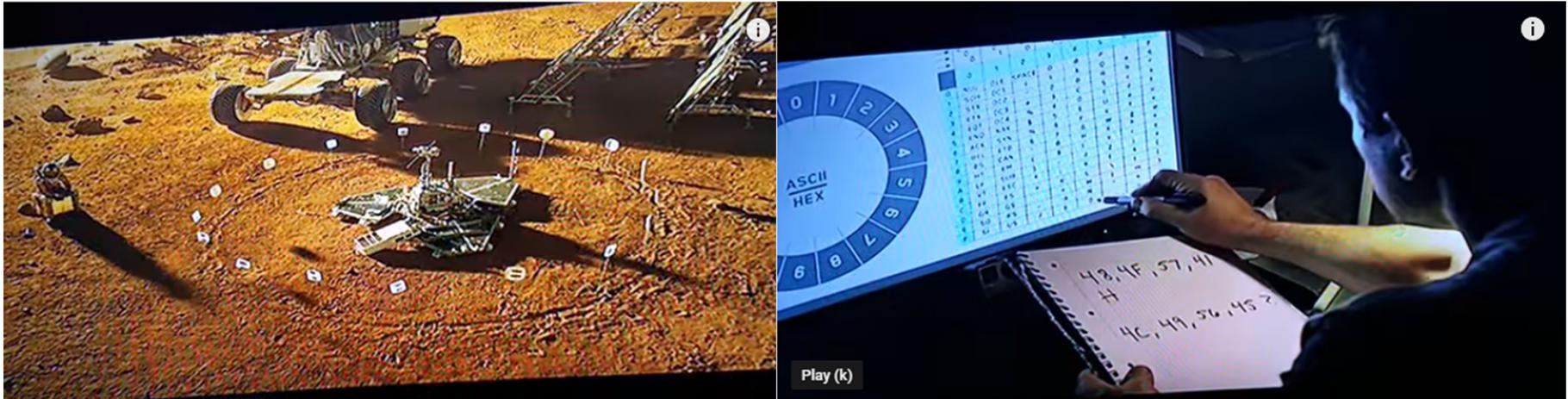
Computers distinguish these differences by applying the ASCII Standard. This standard encodes each character with a number (0 to 127). These encoded numbers represents digits 0 to 9, lower and upper case letters a to z, and A to Z, as well as special characters like punctuation and teletype functions like “carriage return”.

## **Why ASCII and What is Hexadecimal, Decimal and Binary?**

Decimal numbers are what people are most familiar with. It's a base 10 system (digits 0 to 9). By contrast computers use a Base 2 system (also called binary or digits 0 and 1) and hence, math is performed much quicker. While efficient, Base 2 is often too difficult for people to easily recognize. Hex is a Base 16 system (digits 0 to 9, and letters A, B, C, D and F) – and more recognizable than binary.

## The Martian (2015 Film) – and Hexadecimal

In a dramatic scene, Matt Damon's character communicates to/from Earth for the first time

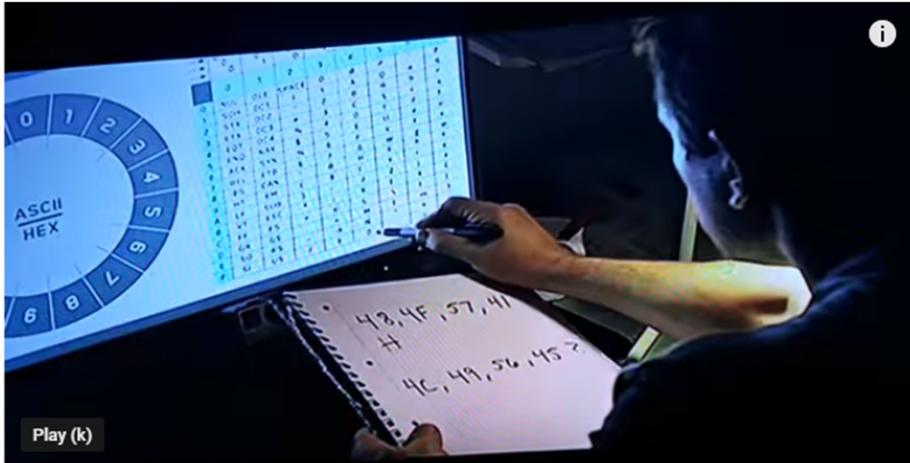


See clip on <https://www.youtube.com/watch?v=ffB0Je-xjKg>

The left shows 16 sign-posts surrounding a Mars rover. Earth can rotate rover's camera 360 degrees. Thus, Earth can point to specific signs. One assumes that the signs are 0, 1, 2, 3, ..., 9 and the letters A, B, C, D, E, F. This represents a Hexadecimal system.

In the clip, NASA points to a sign and Matt Damon's character scribbles it down. Later he returns to his base station and references an ASCII/Hexadecimal chart (right photo). Recall the quote

Mark Watney : I figured **one of you guys kept an ASCII table lying around**. And I was right. Ladies and gentlemen, I give you super-nerd Beth Johanssen, who also had copies of "Zork II" and "Leather Goddesses of Phobos" on her personal laptop. Seriously, Johanssen... it's like the Smithsonian of loneliness on there.



Q1. Reference an ASCII/Hex Chart – to decipher the encoded messages in the movie

48	4F	57	41	4C	49	56	45

43	52	4F	50	53	3F

42	52	49	4E	47	53	4A	52	4E	52	4F	55	54

P.Oh Comment: If one only used the (uppercase) alphabet and digits, then need 36 signs. I suppose a 10-degree separation (vs. 22) between sign posts would still be OK. So, I don't think one really needed Hex – but it makes for a good story.