

# The Parachute Message

Those clever folks at JPL like to hide secret messages in their missions. The last time they sent a rover to Mars, the tracks on the Curiosity rover spelled out "JPL" in Morse code.



Image source: NASA/JPL-Caltech  
[https://www.nasa.gov/mission\\_pages/msl/news/msl20120829f.html](https://www.nasa.gov/mission_pages/msl/news/msl20120829f.html)



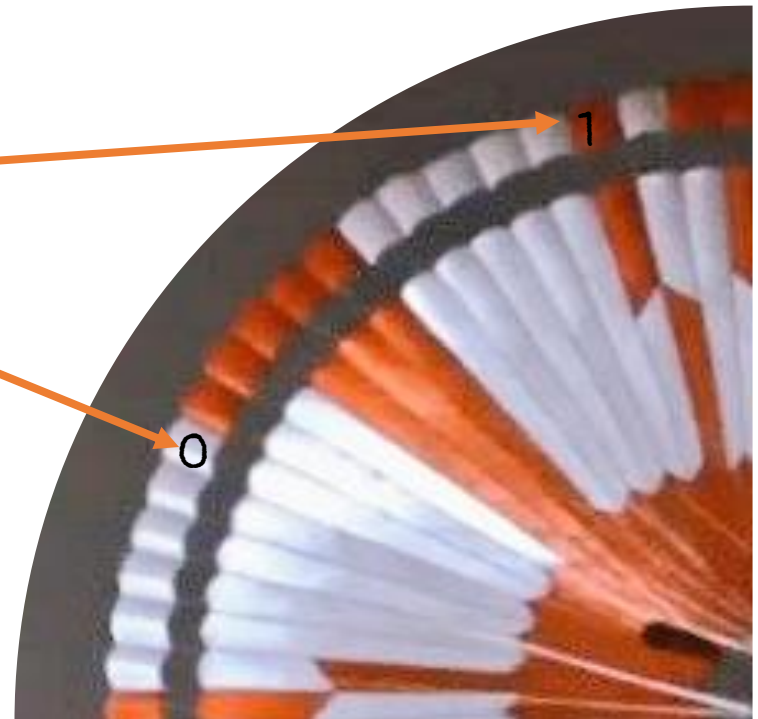
This time they hid some morse code on Perseverance, and also a secret message on the parachute!

# What does orange and white mean?

Some parts of the parachute are orange, and some are white. We can guess that orange is some colour, and white is no colour.

We can write each orange bit as 1  
And each white bit as 0.

The system of 0's and 1's is called a **binary** counting system.

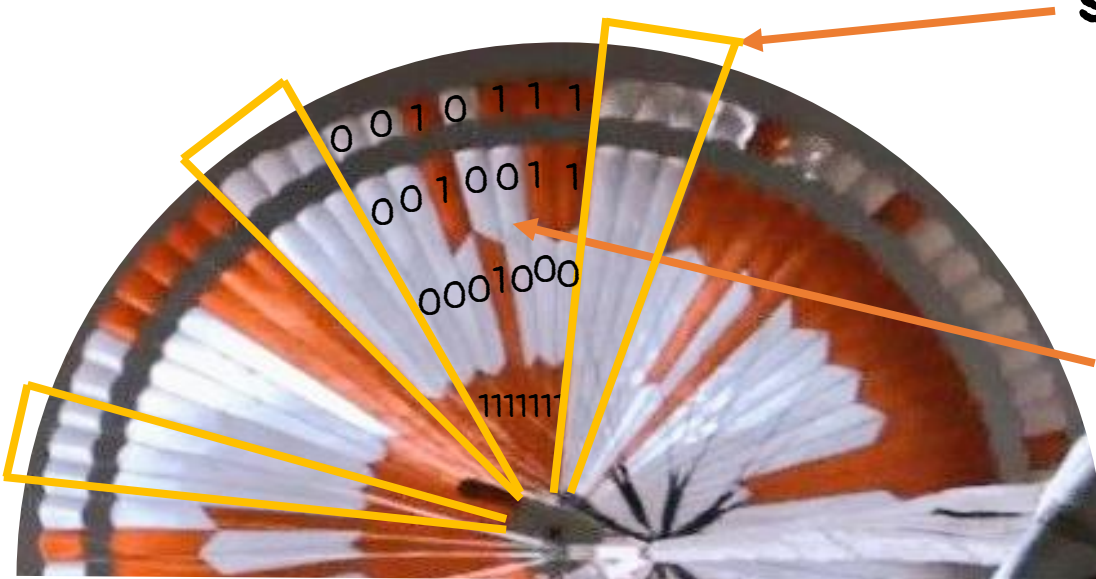


# How do you know when to start and stop?

Usually codes like this have a start, and you just count off every 8 digits, decoding them as you go.

The parachute is a circle so we don't know where the beginning and end is! This is why we need to look for **separators**, which are blocks of the same colour. They show you the gaps.

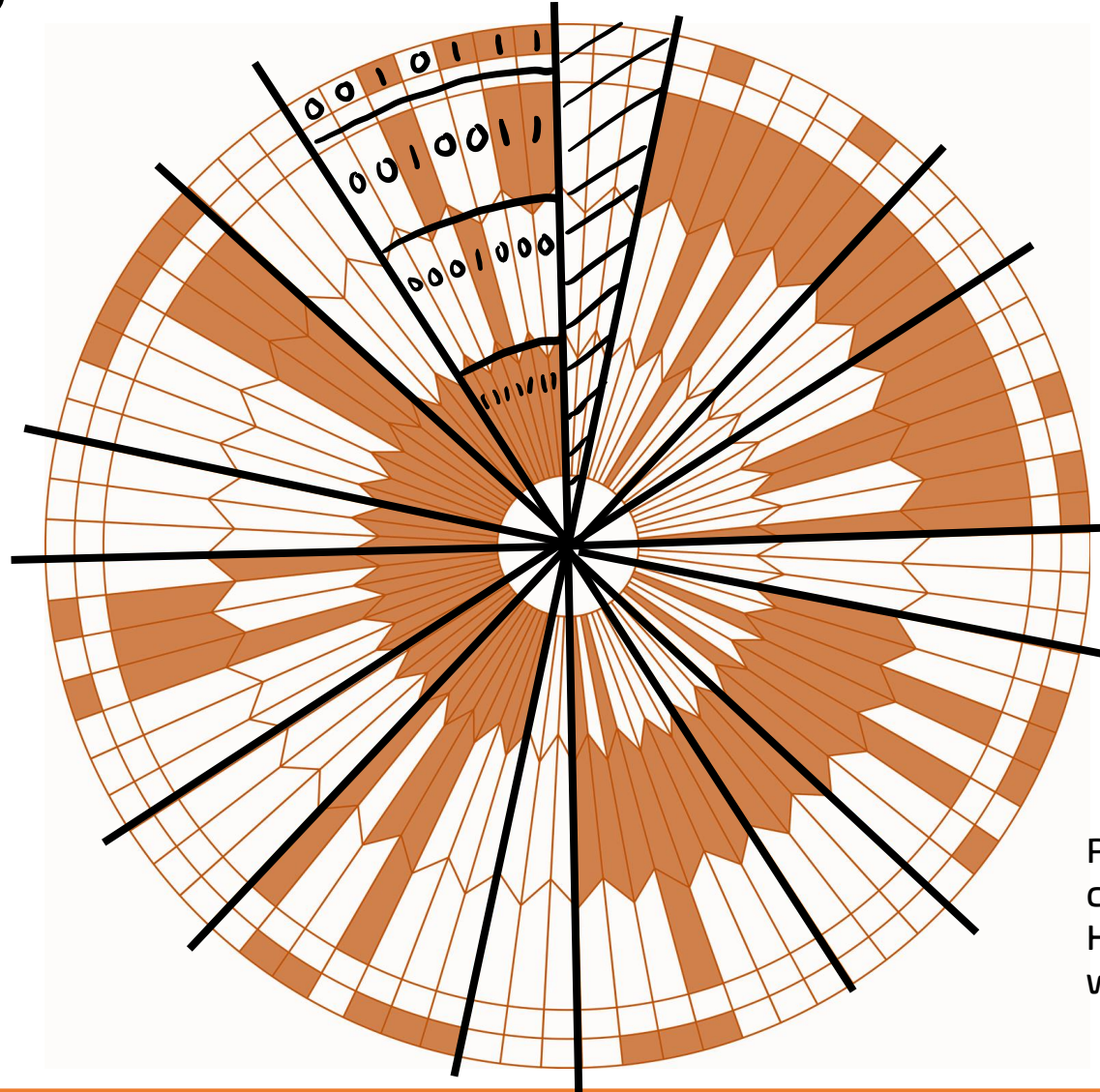
In between the gaps is the actual code! You have to look very carefully.



# Can you fill in the codes?

Here is a tidy version of the parachute.

We have started to fill in the zeroes and ones – can you finish it?



Parachute image created by James Houston and used with permission

# A tiny bit of background...

Binary is clever because you can make any number using just 0's and 1's (on and offs).

0	0	1	0	1	1	1
64	32	16	8	4	2	1



Each on or off is called a "bit". On the parachute they used 7 bits (7 on or offs).

The bit on the right is worth one, the bit to its left is worth two, the bit next left is 4, and so on. You need to add up the "on" bits to get a final number.

0	0	1	0	1	1	1
64	32	16	8	4	2	1

$$16 + 4 + 2 + 1 = 23$$

See if you can work out this message. (hint: you wear it)

0	0	0	1	0	0	0
---	---	---	---	---	---	---

0	0	0	0	0	0	1
---	---	---	---	---	---	---

0	0	1	0	1	0	0
---	---	---	---	---	---	---

A	1
B	2
C	3
D	4
E	5
F	6
G	7
H	8
I	9
J	10
K	11
L	12
M	13
N	14
O	15
P	16
Q	17
R	18
S	19
T	20
U	21
V	22
W	23
X	24
Y	25
Z	26

# What do the codes mean?

Binary is a way of counting.

Starting from the right, and going left, you collect the doubling numbers every time there is a 1.

0	0	1	0	1	1	1
64	32	16	8	4	2	1

$$16 + 4 + 2 + 1 = 23$$

23 can be the number 23, or the 23<sup>rd</sup> letter in the alphabet, which is W.

0	0	0	0	1	1	1
64	32	16	8	4	2	1

$$4 + 2 + 1 = 7$$

7 can be the number 7, or the 7<sup>th</sup> letter in the alphabet, which is G.

To find out more about binary have a look at: <https://www.mathsisfun.com/binary-number-system.html>

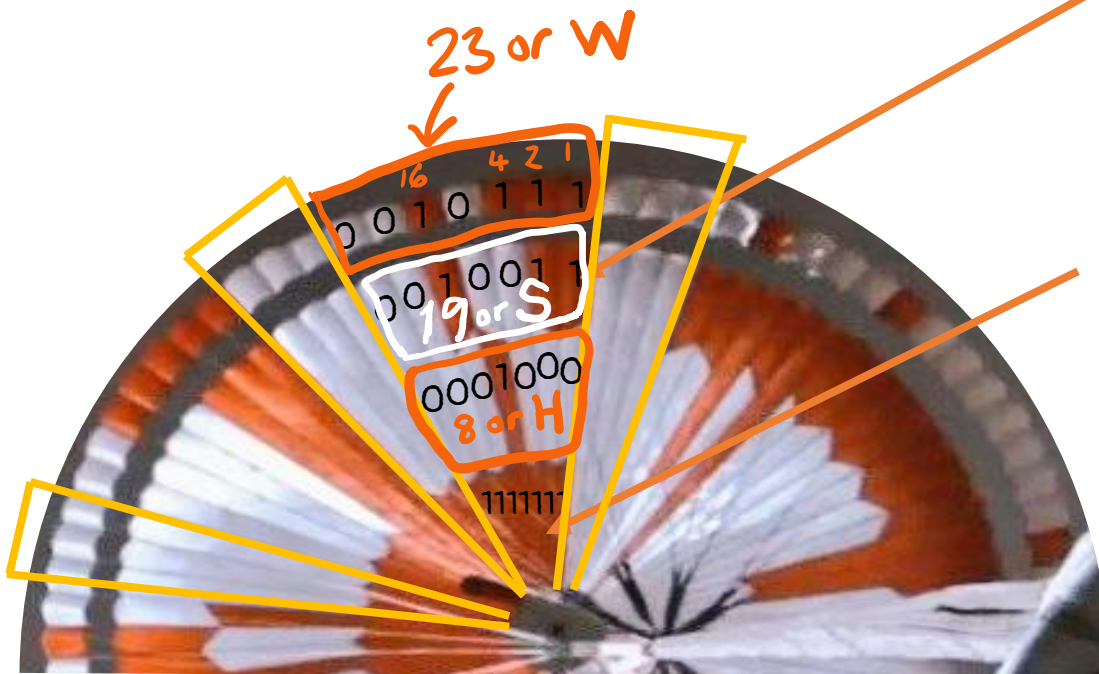
# Decode your parachute!

It is time to look back on your zeros and ones. See if you can change each segment into a number.

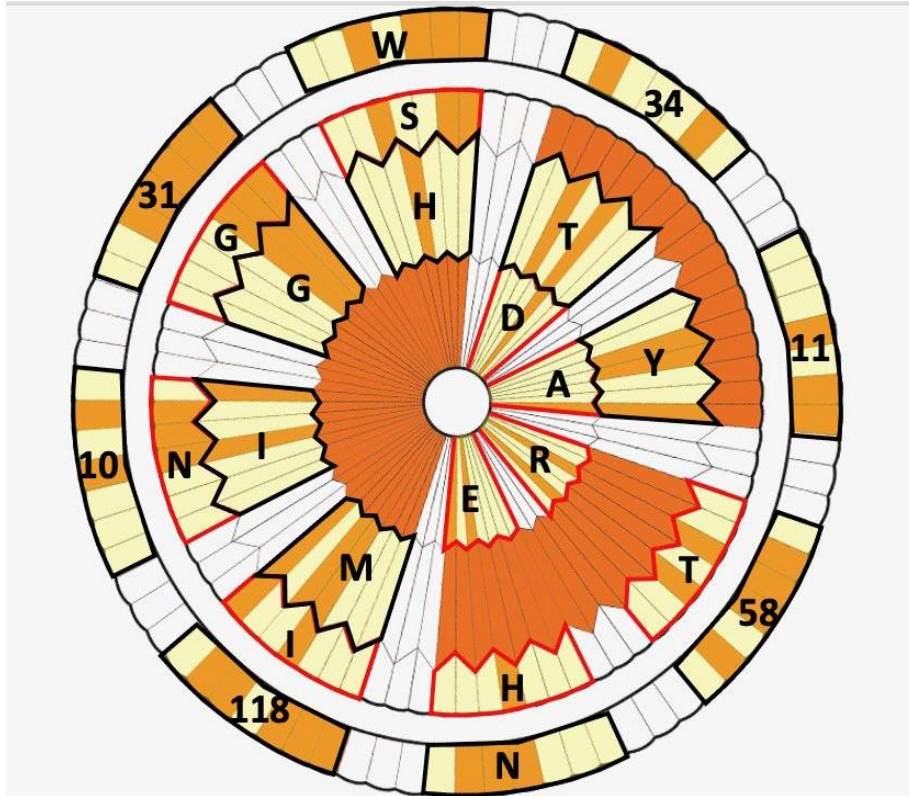
Carefully write your number, and the letter it could be, into each segment like we have shown here.

If a segment is ALL orange, it is a space and does not need checking.

Before you look at the next page, can you see the message?



# The Solution!



The message is the motto  
on the walls at JPL.

Look up the co-ordinates  
around the outside to see  
where it takes you!

This image was shared by Adam Steltzner on Twitter.  
<https://twitter.com/steltzner/status/1364076615932645379>