Q3: A Cold Compress Cures Everything

An ASCII string represents each character using 8 full bits. In many ways this is quite wasteful for common strings composed from a mix of upper- and lower-case characters and spaces. Consider using just three bits to represent 7 high-frequency characters as shown on right. In this way, the string "noise" would require just 15-bits as "101|011|100|110|000". However, you must represent strings with other characters as well. For an arbitrary string, construct a sequence of *bit buffers*, whose structure is shown below; each buffer is composed of a 4-bit header, an arbitrary-shaped contents of anywhere between 3-56 bits, and an optional zero padding trailer of up to three bits that ensures each bit-buffer contains a number of bits evenly divisible by four. Each buffer represents up to 7 letters.

Encoding	Char.
000	e
001	t
010	a
011	o

Encoding	Char.
100	i
101	n
110	s
111	SPACE (' ')

	Original String	Header		Contents	Optional Zero Padding Trailer
		Type (1 bit)	Count (3 bits)		
Uncompressed	"Th"	0	010	0101010001101000	
Compressed	"noise"	1	101	101011100110000	0

Note that 'T' (ASCII of 84) is 01010100 in binary, as you can see in the start of the contents for the uncompressed row. These buffers are concatenated together from left-to-right. To compress the 9-character string "The noise", for example, concatenate a 20-bit uncompressed buffer (for "Th") with a 24-bit compressed buffer (for "e noise"), resulting in a 44-bit total shown below in base-16 notation.

Uncompressed Buffer for "**Th**"	Compressed buffer for "**e noise**"	Base-16 Output
00100101010001101000	111100011110101110011000000	25468F1EB980

Input

Your input will be a single string on a line by itself, composed of between 1 and 32 valid characters. A valid character is an uppercase letter – 'A' (ASCII of 65) to 'Z' (ASCII of 90) – or lowercase letter – 'a' (ASCII of 97) to 'z' (ASCII of 122) or a space ' ' (ASCII of 32).

Output

Your output will be a single string of base-16 characters (**A** .. **F** and **0** .. **9**) on a line by itself.

Sample Input and Output

Input	Output
noise	DAE60
Th	25468
Programming Contest	2507296267729426D6DA941679E143E748C4
soon it is easiest	FCDDF08FF370B0C831
e	90
A	141
Thee	25468A00