What's a Number?

Description

Each line of numbers is the ascii value of the character in the flag encoded in a different base. The base of each number follows the sequence of the Radicals of the Integers such that the base corresponds to the character's position in the flag string. This starts from 1, as one cannot encode in base 0.

The Radical of an integer *n* is defined as the product of the distinct prime numbers dividing *n* (Wikipedia)

$$rad(n) = \prod_{\substack{p|n \\ p\ prime}} p$$

Some examples:

1 is special, it is represented as n ones, where n is the value of the number
23 is prime, so 23 is in the sequence. The 23rd character will be encoded in base 23 [0-9, A-M]
4 = 2^2 so in the Radicals of the Integers, the 4th term is 2. The 4th character in the string is base 2 encoded
10 = 2 * 5 so in the Radical of the integers the 4th term in 10. The 10th character is encoded in base 10s

Solution

The first 27 numbers of the sequence are all that are needed to solve this challenge. However, challenges could incorporate up to 36 characters. Because of the way that it is, base 64 ruins everything after that, as ordering of uppercase vs lowercase letters becomes arbitrary.

1, 2, 3, 2, 5, 6, 7, 2, 3, 10, 11, 6, 13, 14, 15, 2, 17, 6, 19, 10, 21, 22, 23, 6, 5, 26, 3, 14,

29, 30, 31, 2, 33, 34, 35, 6

The most straightforward way to find the flag is to convert each base into a commonly used base (i.e. base 2, 10, or 16) or finding/creating a conversion tool.

ciphertext flag:
1111111111111111111111111111111111111111111111111111111111111111111111111111:1
001001:10010:1010011:234:151:234:1100010:1221:115:47:311:74:6D:57:1100101:5A:310:2E:100:27:4
B:45:300:340:2G:11100:72:1M:3P:41

plaintext flag:
RITSEC{b4s3s_aRe_r4d1cal_Dud3s}

Helpful Links:

https://en.wikipedia.org/wiki/Radical_of_an_integer

http://www.asciitable.com/

https://www.dcode.fr/base-n-convert

http://www.math.com/tables/general/base_conv.htm

http://www.maths.surrey.ac.uk/hosted-sites/R.Knott/IntegerReps/intreps.html