MISC | base64隐写

原创

Sn0w/ 于 2020-11-08 22:51:13 发布 912 收藏 3
分类专栏： CTF训练计划

本文链接：https://blog.csdn.net/qq_43431158/article/details/109525795
版权

CTF训练计划 专栏收录该内容
3 篇文章 1 订阅
订阅专栏

前言

懒狗一个，最近打比赛才知道还有base64隐写，有很多大师傅已经记录了原理，这里简单写一下。

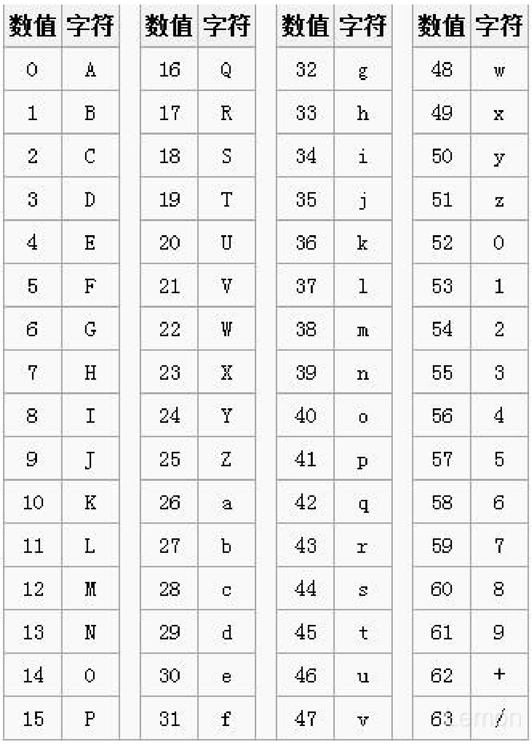
base64

base64编码就是用64个ascii字符作为基础来编码二进制内容的一种编码方式。编码后的数据是一个字符串，包含的字符为: `A-Za-z0-9+/` 共 64 个字符, `=` 是填充字符.

编码与解码

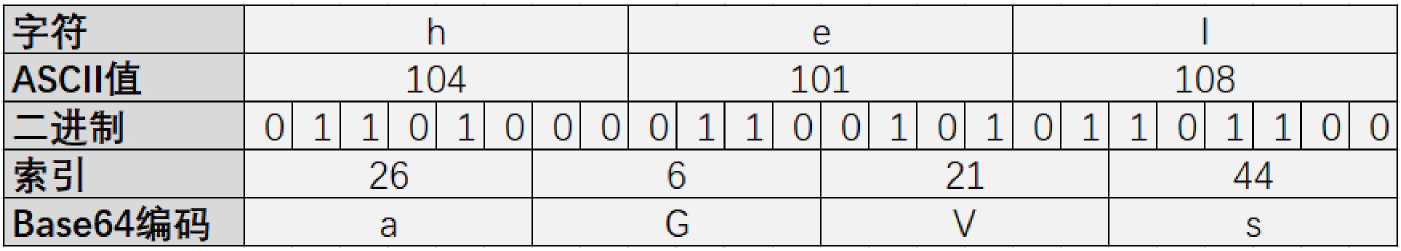
编码

编码时，将要编码的内容转换为二进制数据（一个字符对应8位二进制），每6位作为一组，从索引表中找到对应的字符



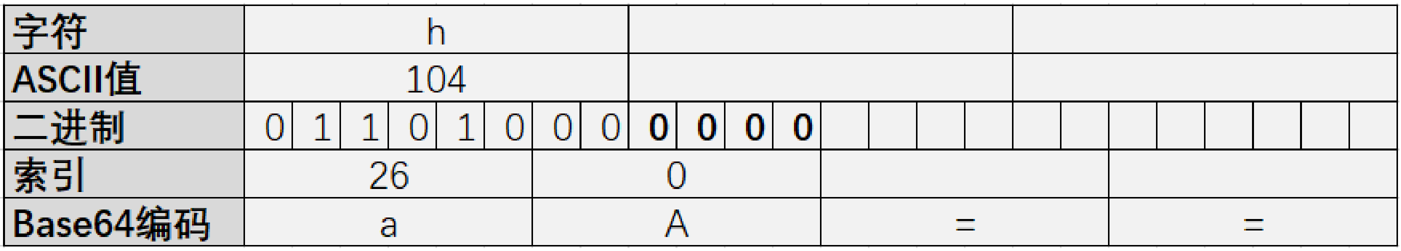
数值	字符	数值	字符	数值	字符	数值	字符
0	A	16	Q	32	g	48	w
1	B	17	R	33	h	49	x
2	C	18	S	34	i	50	y
3	D	19	T	35	j	51	z
4	E	20	U	36	k	52	0
5	F	21	V	37	l	53	1
6	G	22	W	38	m	54	2
7	H	23	X	39	n	55	3
8	I	24	Y	40	o	56	4
9	J	25	Z	41	p	57	5
10	K	26	a	42	q	58	6
11	L	27	b	43	r	59	7
12	M	28	c	44	s	60	8
13	N	29	d	45	t	61	9
14	O	30	e	46	u	62	+
15	P	31	f	47	v	63	/

> 编码的文本字节数是3的倍数时，刚好可以编码成4个字符



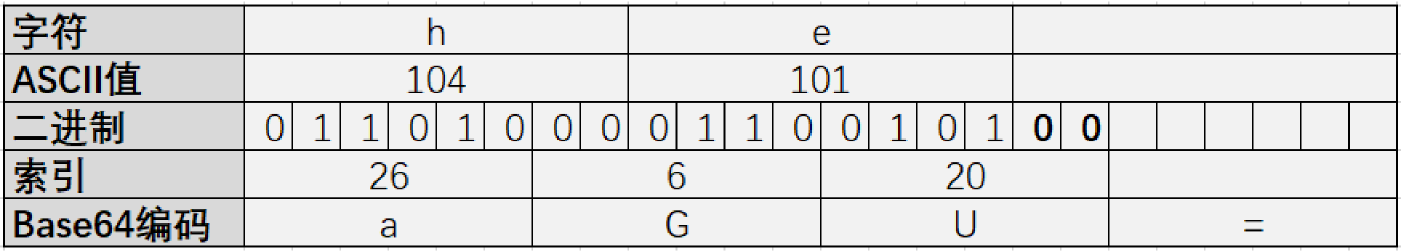
字符	h								e								l							
ASCII值	104								101								108							
二进制	0	1	1	0	1	0	0	0	0	1	1	0	0	1	0	1	0	1	1	0	1	1	0	0
索引	26						6						21						44					
Base64编码	a						G						V						s					

编码的文本字节数不是3的倍数时，剩下1个字符时



字符	h																							
ASCII值	104																							
二进制	0	1	1	0	1	0	0	0	**0**	**0**	**0**	**0**												
索引	26						0																	
Base64编码	a						A						=						=					

编码的文本字节数不是3的倍数时，剩下2个字符时



字符	h								e															
ASCII值	104								101															
二进制	0	1	1	0	1	0	0	0	0	1	1	0	0	1	0	1	**0**	**0**						
索引	26						6						20											
Base64编码	a						G						U						=					

这就是base编码方式

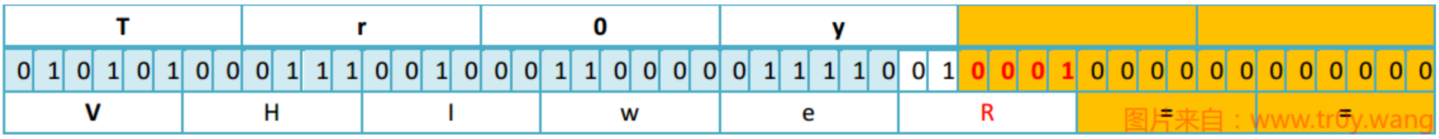
解码

1. 首先把填充字符`=`去掉
2. 每个字符查表转换为对应的6位索引，得到一串二进制字符串
3. 接着从左到右，每8位一组，多余位丢掉，转为对应的字符

base64隐写原理

base64之所以可以隐藏信息，便是在于在解密过程中,在解码的第3步中，会有部分数据被丢弃（即不会影响解码结果），这些数据正是在编码过程中补的0。也就是说，如果在编码过程中不全用0填充，而是用其他的数据填充，仍然可以正常编码解码，因此这些位置可以用于隐写。

解开隐写的方法就是将这些不影响解码结果的位提取出来组成二进制串（一行 base64 最多有 2 个等号, 也就是有 22 位的可隐写位.），然后转换成ASCII字符串。这就是为什么出base64隐写时会有很多大段 base64 的原因*



T								r								0								y																							
0	1	0	1	0	1	0	0	0	1	1	1	0	0	1	0	0	0	1	1	0	0	0	0	0	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
V						H						I						w						e						R						=						=					

图片来自：www.tr0y.wang

这里借用下Tr0y师傅的图

例如第三幅图，将最后两位改成01、10、11其实都不会对结果产生任何影响

```
aGU=
aGV=
aGW=
aGX=
base64解码后全为
he
```

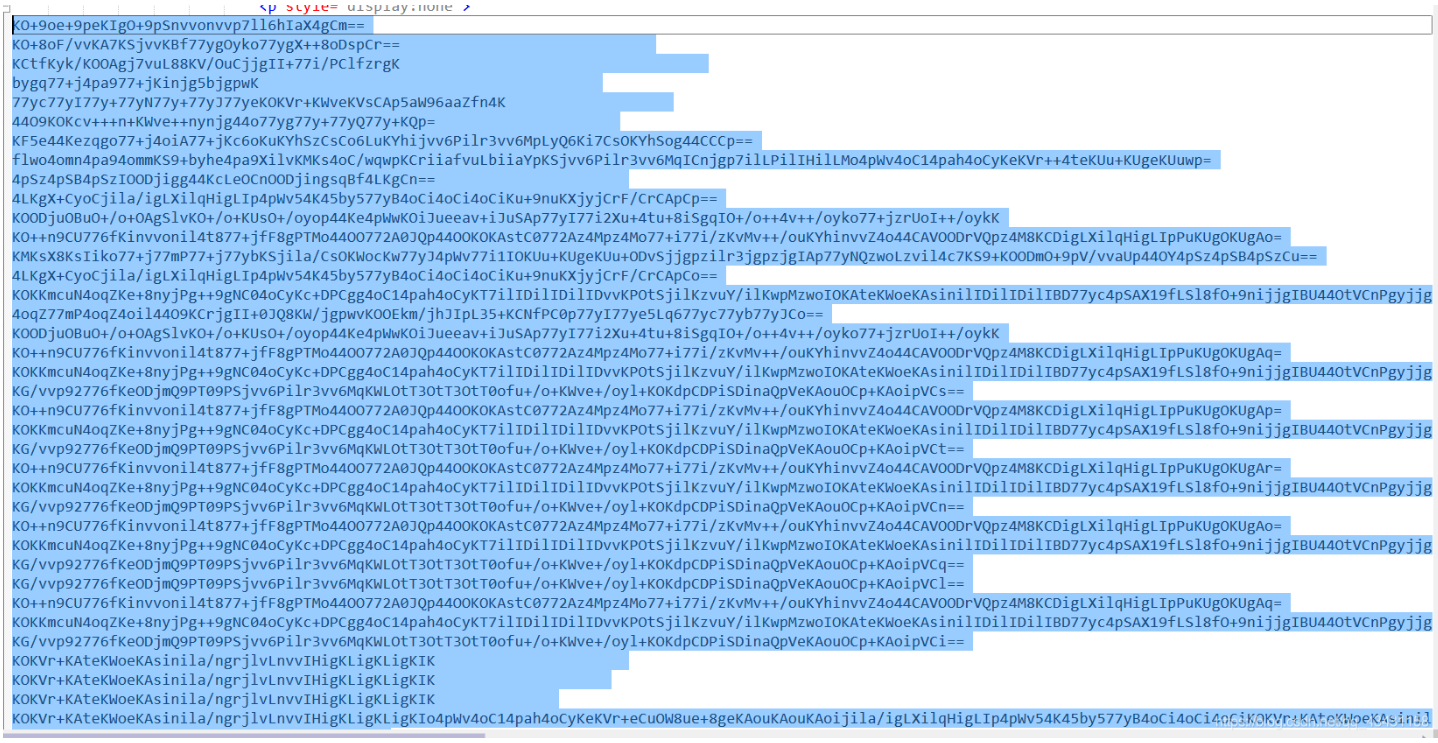
需要注意的是等号的那部分 0 不能用于隐写，因为修改那里的二进制值会导致等号数量变化, 解码的第 1 步会受影响. 自然也就破坏了源字符串。

base64隐写解密脚本

```
def get_base64_diff_value(s1, s2):
    base64chars = 'ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz0123456789+/'
    res = 0
    for i in xrange(len(s2)):
        if s1[i] != s2[i]:
            return abs(base64chars.index(s1[i]) - base64chars.index(s2[i]))
    return res


def solve_stego():
    with open('shy.txt', 'rb') as f:
        file_lines = f.readlines()
        bin_str = ''
        for line in file_lines:
            steg_line = line.replace('\n', '')
            norm_line = line.replace('\n', '').decode('base64').encode('base64').replace('\n', '')
            diff = get_base64_diff_value(steg_line, norm_line)
            print diff
            pads_num = steg_line.count('=')
            if diff:
                bin_str += bin(diff)[2:].zfill(pads_num * 2)
            else:
                bin_str += '0' * pads_num * 2
            print goflag(bin_str)


def goflag(bin_str):
    res_str = ''
    for i in xrange(0, len(bin_str), 8):
        res_str += chr(int(bin_str[i:i + 8], 2))
    return res_str


if __name__ == '__main__':
    solve_stego()
```

题目实践

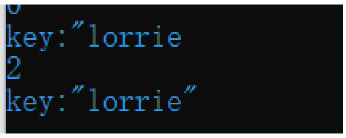
湖湘杯中的颜文字之谜便考察了base64隐写



```
<p style="display:none">
KO+9oe+9peKIgO+9pSnvvonvvp7ll6hIaX4gCm==
KO+8oF/vvKA7KSjvvKBf77ygOyko77ygX++8oDspCr==
KCtfKyk/KOOAgj7vuL88KV/OuCjjgII+77i/PClfzrgK
bygq77+j4pa977+jKinjg5bjgpwK
77yc77yI77y+77yN77y+77yJ77yeKOKVr+KWveKVsCAp5aW96aaZfn4K
44O9KOKcv+++n+KWve++nynjg44o77yg77y+77yQ77y+KQp=
KF5e44Kezqgo77+j4oiA77+jKc6oKuKYhSzCsCo6LuKYhijvv6Pilr3vv6MpLyQ6Ki7CsOKYhSog44CCCp==
flwo4omn4pa94ommKS9+byhe4pa9XilvKMKs4oC/wqwpKCriiafvuLbiiaYpKSjvv6Pilr3vv6MqICnjgp7ilLPilIHilLMo4pWv4oC14pah4oCyKeKVr++4teKUu+KUgeKUuwp=
4pSz4pSB4pSzIOODjigg44KcLeOCnOODjingsqBf4LKgCn==
4LKgX+CyoCjila/igLXilqHigLIp4pWv54K45by577yB4oCi4oCi4oCiKu+9nuKXjyjCrF/CrCApCp==
KOODjuOBuO+/o+OAgSlvKO+/o+KUsO+/oyop44Ke4pWwKOiJueeav+iJuSAp77yI77i2Xu+4tu+8iSgqIO+/o++4v++/oyko77+jzrUoI++/oykK
KO++n9CU776fKinvvonil4t877+jfF8gPTMo44O0772A0JQp44OOKOKAstC0772Az4Mpz4Mo77+i77i/zKvMv++/ouKYhinvvZ4o44CAVOODrVQpz4M8KCDigLXilqHigLIpPuKUgOKUgAo=
KMKsX8KsIiko77+j77mP77+j77ybKSjila/CsOKWocKw77yJ4pWv77i1IOKUu+KUgeKUu+ODvSjjgpzilr3jgpzjgIAp77yNQzwoLzvil4c7KS9+KOODmO+9pV/vvaUp44OY4pSz4pSB4pSzCu==
4LKgX+CyoCjila/igLXilqHigLIp4pWv54K45by577yB4oCi4oCi4oCiKu+9nuKXjyjCrF/CrCApCo==
KOKKmcuN4oqZKe+8nyjPg++9gNC04oCyKc+DPCgg4oC14pah4oCyKT7ilIDilIDilIDvvKPOtSjilKzvuY/ilKwpMzwoIOKAteKWoeKAsinilIDilIDilIBD77yc4pSAX19fLSl8fO+9nijjgIBU44OtVCnPgyjjg
4oqZ77mP4oqZ4oil44O9KCrjgII+0JQ8KW/jgpwvKOOEkm/jhJIpL35+KCNfPC0p77yI77ye5Lq677yc77yb77yJCo==
KOODjuOBuO+/o+OAgSlvKO+/o+KUsO+/oyop44Ke4pWwKOiJueeav+iJuSAp77yI77i2Xu+4tu+8iSgqIO+/o++4v++/oyko77+jzrUoI++/oykK
KO++n9CU776fKinvvonil4t877+jfF8gPTMo44O0772A0JQp44OOKOKAstC0772Az4Mpz4Mo77+i77i/zKvMv++/ouKYhinvvZ4o44CAVOODrVQpz4M8KCDigLXilqHigLIpPuKUgOKUgAq=
KOKKmcuN4oqZKe+8nyjPg++9gNC04oCyKc+DPCgg4oC14pah4oCyKT7ilIDilIDilIDvvKPOtSjilKzvuY/ilKwpMzwoIOKAteKWoeKAsinilIDilIDilIBD77yc4pSAX19fLSl8fO+9nijjgIBU44OtVCnPgyjjg
KG/vvp92776fKeODjmQ9PT09PSjvv6Pilr3vv6MqKWLOtT3OtT3OtT0ofu+/o+KWve+/oyl+KOKdpCDPiSDinaQpVeKAouOCp+KAoipVCs==
KO++n9CU776fKinvvonil4t877+jfF8gPTMo44O0772A0JQp44OOKOKAstC0772Az4Mpz4Mo77+i77i/zKvMv++/ouKYhinvvZ4o44CAVOODrVQpz4M8KCDigLXilqHigLIpPuKUgOKUgAp=
KOKKmcuN4oqZKe+8nyjPg++9gNC04oCyKc+DPCgg4oC14pah4oCyKT7ilIDilIDilIDvvKPOtSjilKzvuY/ilKwpMzwoIOKAteKWoeKAsinilIDilIDilIBD77yc4pSAX19fLSl8fO+9nijjgIBU44OtVCnPgyjjg
KG/vvp92776fKeODjmQ9PT09PSjvv6Pilr3vv6MqKWLOtT3OtT3OtT0ofu+/o+KWve+/oyl+KOKdpCDPiSDinaQpVeKAouOCp+KAoipVCt==
KO++n9CU776fKinvvonil4t877+jfF8gPTMo44O0772A0JQp44OOKOKAstC0772Az4Mpz4Mo77+i77i/zKvMv++/ouKYhinvvZ4o44CAVOODrVQpz4M8KCDigLXilqHigLIpPuKUgOKUgAr=
KOKKmcuN4oqZKe+8nyjPg++9gNC04oCyKc+DPCgg4oC14pah4oCyKT7ilIDilIDilIDvvKPOtSjilKzvuY/ilKwpMzwoIOKAteKWoeKAsinilIDilIDilIBD77yc4pSAX19fLSl8fO+9nijjgIBU44OtVCnPgyjjg
KG/vvp92776fKeODjmQ9PT09PSjvv6Pilr3vv6MqKWLOtT3OtT3OtT0ofu+/o+KWve+/oyl+KOKdpCDPiSDinaQpVeKAouOCp+KAoipVCn==
KO++n9CU776fKinvvonil4t877+jfF8gPTMo44O0772A0JQp44OOKOKAstC0772Az4Mpz4Mo77+i77i/zKvMv++/ouKYhinvvZ4o44CAVOODrVQpz4M8KCDigLXilqHigLIpPuKUgOKUgAo=
KOKKmcuN4oqZKe+8nyjPg++9gNC04oCyKc+DPCgg4oC14pah4oCyKT7ilIDilIDilIDvvKPOtSjilKzvuY/ilKwpMzwoIOKAteKWoeKAsinilIDilIDilIBD77yc4pSAX19fLSl8fO+9nijjgIBU44OtVCnPgyjjg
KG/vvp92776fKeODjmQ9PT09PSjvv6Pilr3vv6MqKWLOtT3OtT3OtT0ofu+/o+KWve+/oyl+KOKdpCDPiSDinaQpVeKAouOCp+KAoipVCq==
KG/vvp92776fKeODjmQ9PT09PSjvv6Pilr3vv6MqKWLOtT3OtT3OtT0ofu+/o+KWve+/oyl+KOKdpCDPiSDinaQpVeKAouOCp+KAoipVCl==
KO++n9CU776fKinvvonil4t877+jfF8gPTMo44O0772A0JQp44OOKOKAstC0772Az4Mpz4Mo77+i77i/zKvMv++/ouKYhinvvZ4o44CAVOODrVQpz4M8KCDigLXilqHigLIpPuKUgOKUgAq=
KOKKmcuN4oqZKe+8nyjPg++9gNC04oCyKc+DPCgg4oC14pah4oCyKT7ilIDilIDilIDvvKPOtSjilKzvuY/ilKwpMzwoIOKAteKWoeKAsinilIDilIDilIBD77yc4pSAX19fLSl8fO+9nijjgIBU44OtVCnPgyjjg
KG/vvp92776fKeODjmQ9PT09PSjvv6Pilr3vv6MqKWLOtT3OtT3OtT0ofu+/o+KWve+/oyl+KOKdpCDPiSDinaQpVeKAouOCp+KAoipVCi==
KOKVr+KAteKWoeKAsinila/ngrjlvLnvvIHigKLigKLigKIK
KOKVr+KAteKWoeKAsinila/ngrjlvLnvvIHigKLigKLigKIK
KOKVr+KAteKWoeKAsinila/ngrjlvLnvvIHigKLigKLigKIK
KOKVr+KAteKWoeKAsinila/ngrjlvLnvvIHigKLigKLigKIo4pWv4oC14pah4oCyKeKVr+eCuOW8ue+8geKAouKAouKAoijila/igLXilqHigLIp4pWv54K45by577yB4oCi4oCi4oCiKOKVr+KAteKWoeKAsinil
```

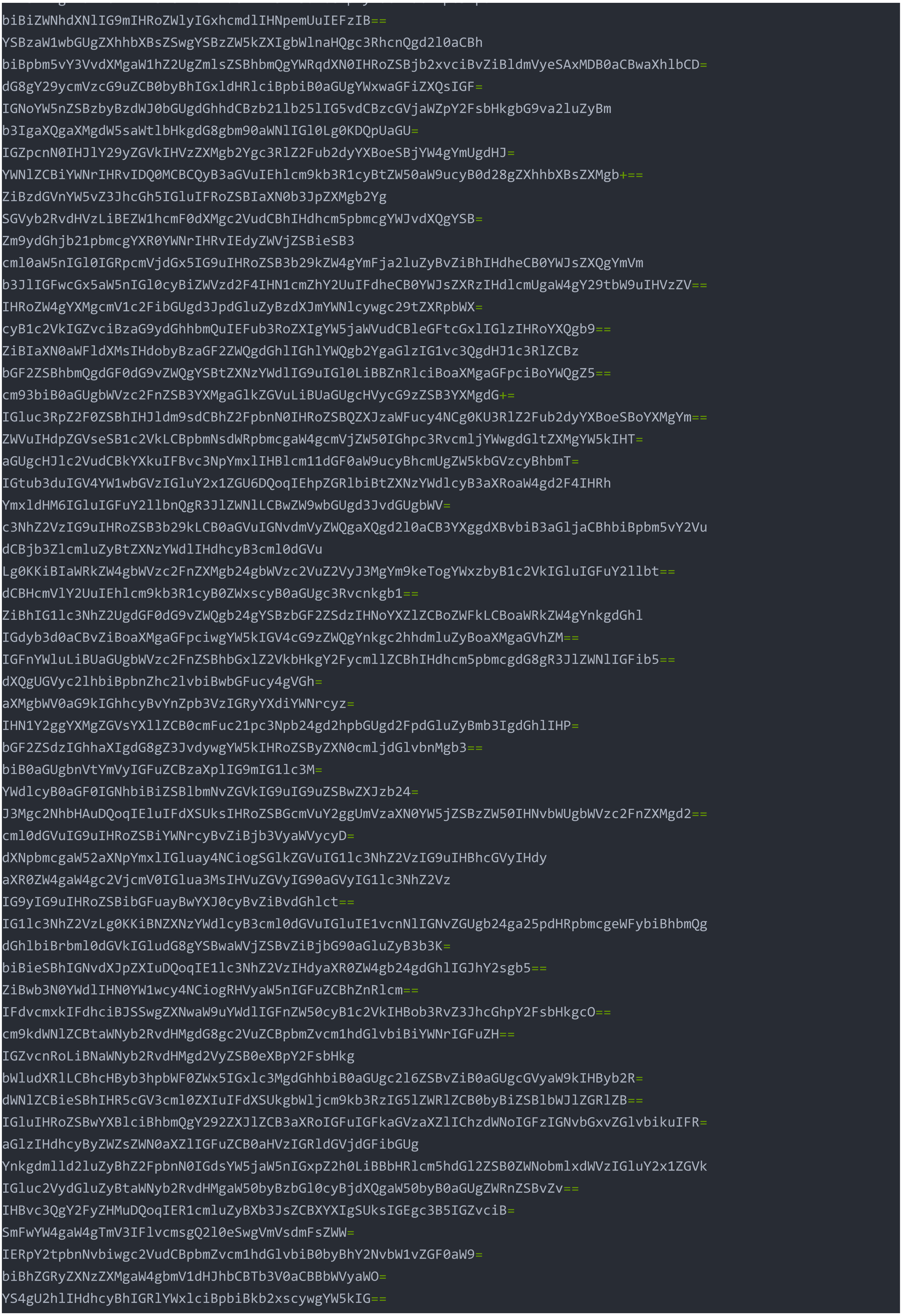
https://blog.csdn.net/qq_45431158

直接跑脚本

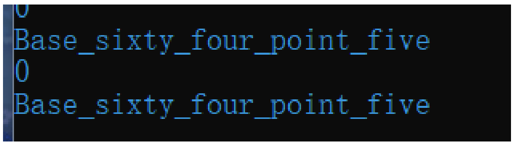


```
0
key:"lorrie
2
key:"lorrie"
```

```
U3RlZ2Fub2dyYXBoeSBpcyB0aGUgYXJ0IGFuZCBzY2llbmNlIG9m
IHdyaXRpbmcgaGlkZGVuIG1lc3NhZ2VzIGluIHN1Y2ggYSB3YXkgdGhhdCBubyBvbmV=
LCBhcGFydCBmcm9tIHRoZSBzZW5kZXIgYW5kIGludGVuZGVkIHJlY2lwaWVudCwgc3VzcGU=
Y3RzIHRoZSBleGlzdGVuY2Ugb2YgdGhlIG1lc3M=
YWdlLCBhIGZvcm0gb2Ygc2VjdXJpdHkgdGhyb3VnaCBvYnNjdXJpdHkuIFS=
aGUgd29yZCBzdGVnYW5vZ3JhcGh5IGlzIG9mIEdyZWVrIG9yaWdpbiBhbmQgbWVhbnMgImNvbmNlYW==
bGVkIHdyaXRpbmciIGZyb20gdGhlIEdyZWVrIHdvcmRzIHN0ZWdhbm9zIG1lYW5pbmcgImNv
dmVyZWQgb3IgcHJvdGVjdGVkIiwgYW5kIGdyYXBoZWluIG1lYW5pbmcgInRvIHc=
cml0ZSIuIFRoZSBmaXJzdCByZWNvcmRlZCB1c2Ugb2YgdGhlIHRlcm0gd2FzIGluIDE0OTkgYnkgSm9o
YW5uZXMgVHJpdGhlbWl1cyBpbiBoaXMgU3RlZ2Fub2dyYXBoaWEsIGEgdHJlYV==
dGlzZSBvbiBjcnlwdG9ncmFwaHkgYW5kIHN0ZWdhbm9ncmFwaHkgZGlzZ8==
dWlzZWQgYXMgYSBib29rIG9uIG1hZ2ljLiBHZW5lcmFsbHksIG1lc3P=
YWdlcyB3aWxsIGFwcGVhciB0byBiZSBzb21ldGhpbmcgZWxzZTogaW1hZ2VzLCBhcnRp
Y2xlcywgc2hvcHBpbmcgbGlzdHMsIG9yIHNvbWUgb3R=
aGVyIGNvdmVydGV4dCBhbmQsIGNsYXNzaWNhbGx5LCB0aGUgaGlkZGVuIG1lc3NhZ2UgbWF5IGJlIGluIGludmm=
c2libGUgaW5rIGJldHdlZW4gdGhlIHZpc2libGUgbGluZXMgb2YgYSBwcml2YXRlIGxldHRlci4NCg0KVGhl
IGFkdmFudGFnZSBvZiBzdGVnYW5vZ3JhcGh5LCBvdmVyIGNy
eXB0b2dyYXBoeSBhbG9uZSwgaXMgdGhhdCBtZXNzYWdlcyBkbyBub3QgYXR0cmFjdCBhdHRlbnRpb25=
IHRvIHRoZW1zZWx2ZXMuIFBsYWlubHkgdmlzaWJsZSBlbmNyeXB0ZWQgbWVzc2FnZXOXbm8gbWF0dGVyIF==
aG93IHVuYnJlYWthYmxll3dpbGwgYXJvdXNlIHN=
dXNwaWNpb24sIGFuZCBtYXkgaW4gdGhlbXNlbHZlcyBiZSBpbmNyaW1pbmF0aW5nIP==
aW4gY291bnRyaWVzIHdoZXJlIGVuY3J5cHRpb24gaXMgaWxsZWdhbC4gVGhlcmVmb3JlLH==
IHdoZXJlYXMgY3J5cHRvZ3JhcGh5IHByb3RlY3RzIHRoZSBjb250ZW50cyBvZj==
IGEgbWVzc2FnZSwgc3RlZ2Fub2dyYXBoeSBjYW4gYmUgc2FpZCB0byBwcm90ZWN0IGJ=
b3RoIG1lc3NhZ2VzIGFuZCBjb21tdW5pY2F0aW5nIHBhcnRpZXMuDQoNClN0ZWdhbm9ncmFwaHkgaW5jbHW=
ZGVzIHRoZSBjb25jZWFsbWVudCBvZiBpbmZvcm1hdGlvbiB3aXRoaW4gY29t
cHV0ZXIgZmlsZXMuIEluIGRpZ2l0YWwgc3RlZ2Fub2dyYXBoeSwgZWxlY3Ryb25pYyBjb21tdW5pY2F0aW9u
cyBtYXkgaW5jbHVkZSBzdGVnYW5vZ3JhcGhpYyBjb2RpbmcgaW5zaZ==
ZGUgb2YgYSB0cmFuc3BvcnQgbGF5ZXIsIHN1Y2ggYXMgYSBkb2N1bWVudCBmaWxlLCBpbWFnZSBmaWx=
ZSwgcHJvZ3JhbSBvciBwcm90b2NvbC4gTWVkaWEg
ZmlsZXMgYXJlIGlkZWFsIGZvciBzdGVnYW5vZ3JhcGhpYyB0cmFuc21pc3Npb+==
```



```
biBiZWNhdXNlIG9mIHRoZWlyIGxhcmdlIHNpemUuIEFzIB==
YSBzaW1wbGUgZXhhbXBsZSwgYSBzZW5kZXIgbWlnaHQgc3RhcnQgd2l0aCBh
biBpbm5vY3VvdXMgaW1hZ2UgZmlsZSBhbmQgYWRqdXN0IHRoZSBjb2xvciBvZiBldmVyeSAxMDB0aCBwaXhlbCD=
dG8gY29ycmVzcG9uZCB0byBhIGxldHRlciBpbiB0aGUgYWxwaGFiZXQsIGF=
IGNoYW5nZSBzbyBzdWJ0bGUgdGhhdCBzb21lb25lIG5vdCBzcGVjaWZpY2FsbHkgbG9va2luZyBm
b3IgaXQgaXMgdW5saWtlbHkgdG8gbm90aWNlIGl0Lg0KDQpUaGU=
IGZpcnN0IHJlY29yZGVkIHVzZXMgb2Ygc3RlZ2Fub2dyYXBoeSBjYW4gYmUgdHJ=
YWNlZCBiYWNrIHRvIDQ0MCBCQyB3aGVuIEhlcm9kb3R1cyBtZW50aW9ucyB0d28gZXhhbXBsZXMgb+==
ZiBzdGVnYW5vZ3JhcGh5IGluIFRoZSBIaXN0b3JpZXMgb2Yg
SGVyb2RvdHVzLiBEZW1hcmF0dXMgc2VudCBhIHdhcm5pbmcgYWJvdXQgYSB=
Zm9ydGhjb21pbmcgYXR0YWNrIHRvIEdyZWVjZSBieSB3
cml0aW5nIGl0IGRpcmVjdGx5IG9uIHRoZSB3b29kZW4gYmFja2luZyBvZiBhIHdheCB0YWJsZXQgYmVm
b3JlIGFwcGx5aW5nIGl0cyBiZWVzd2F4IHN1cmZhY2UuIFdheCB0YWJsZXRzIHdlcmUgaW4gY29tbW9uIHVzZV==
IHRoZW4gYXMgcmV1c2FibGUgd3JpdGluZyBzdXJmYWNlcywgc29tZXRpbWX=
cyB1c2VkIGZvciBzaG9ydGhhbmQuIEFub3RoZXIgYW5jaWVudCBleGFtcGxlIGlzIHRoYXQgb9==
ZiBIaXN0aWFldXMsIHdobyBzaGF2ZWQgdGhlIGhlYWQgb2YgaGlzIG1vc3QgdHJ1c3RlZCBz
bGF2ZSBhbmQgdGF0dG9vZWQgYSBtZXNzYWdlIG9uIGl0LiBBZnRlciBoaXMgaGFpciBoYWQgZ5==
cm93biB0aGUgbWVzc2FnZSB3YXMgaGlkZGVuLiBUaGUgcHVycG9zZSB3YXMgdG+=
IGluc3RpZ2F0ZSBhIHJldm9sdCBhZ2FpbnN0IHRoZSBQZXJzaWFucy4NCg0KU3RlZ2Fub2dyYXBoeSBoYXMgYm==
ZWVuIHdpZGVseSB1c2VkLCBpbmNsdWRpbmcgaW4gcmVjZW50IGhpc3RvcmljYWwgdGltZXMgYW5kIHT=
aGUgcHJlc2VudCBkYXkuIFBvc3NpYmxlIHBlcm11dGF0aW9ucyBhcmUgZW5kbGVzcyBhbmT=
IGtub3duIGV4YW1wbGVzIGluY2x1ZGU6DQoqIEhpZGRlbiBtZXNzYWdlcyB3aXRoaW4gd2F4IHRh
YmxldHM6IGluIGFuY2llbnQgR3JlZWNlLCBwZW9wbGUgd3JvdGUgbWV=
c3NhZ2VzIG9uIHRoZSB3b29kLCB0aGVuIGNvdmVyZWQgaXQgd2l0aCB3YXggdXBvbiB3aGljaCBhbiBpbm5vY2Vu
dCBjb3ZlcmluZyBtZXNzYWdlIHdhcyB3cml0dGVu
Lg0KKiBIaWRkZW4gbWVzc2FnZXMgb24gbWVzc2VuZ2VyJ3MgYm9keTogYWxzbyB1c2VkIGluIGFuY2llbt==
dCBHcmVlY2UuIEhlcm9kb3R1cyB0ZWxscyB0aGUgc3Rvcnkgb1==
ZiBhIG1lc3NhZ2UgdGF0dG9vZWQgb24gYSBzbGF2ZSdzIHNoYXZlZCBoZWFkLCBoaWRkZW4gYnkgdGhl
IGdyb3d0aCBvZiBoaXMgaGFpciwgYW5kIGV4cG9zZWQgYnkgc2hhdmluZyBoaXMgaGVhZM==
IGFnYWluLiBUaGUgbWVzc2FnZSBhbGxlZ2VkbHkgY2FycmllZCBhIHdhcm5pbmcgdG8gR3JlZWNlIGFib5==
dXQgUGVyc2lhbiBpbnZhc2lvbiBwbGFucy4gVGh=
aXMgbWV0aG9kIGhhcyBvYnZpb3VzIGRyYXdiYWNrcyz=
IHN1Y2ggYXMgZGVsYXllZCB0cmFuc21pc3Npb24gd2hpbGUgd2FpdGluZyBmb3IgdGhlIHP=
bGF2ZSdzIGhhaXIgdG8gZ3JvdywgYW5kIHRoZSByZXN0cmljdGlvbnMgb3==
biB0aGUgbnVtYmVyIGFuZCBzaXplIG9mIG1lc3M=
YWdlcyB0aGF0IGNhbiBiZSBlbmNvZGVkIG9uIG9uZSBwZXJzb24=
J3Mgc2NhbHAuDQoqIEluIFdXSUksIHRoZSBGcmVuY2ggUmVzaXN0YW5jZSBzZW50IHNvbWUgbWVzc2FnZXMgd2==
cml0dGVuIG9uIHRoZSBiYWNrcyBvZiBjb3VyaWVycyD=
dXNpbmcgaW52aXNpYmxlIGluay4NCiogSGlkZGVuIG1lc3NhZ2VzIG9uIHBhcGVyIHdy
aXR0ZW4gaW4gc2VjcmV0IGlua3MsIHVuZGVyIG90aGVyIG1lc3NhZ2Vz
IG9yIG9uIHRoZSBibGFuayBwYXJ0cyBvZiBvdGhlct==
IG1lc3NhZ2VzLg0KKiBNZXNzYWdlcyB3cml0dGVuIGluIE1vcnNlIGNvZGUgb24ga25pdHRpbmcgeWFybiBhbmQg
dGhlbiBrbml0dGVkIGludG8gYSBwaWVjZSBvZiBjbG90aGluZyB3b3K=
biBieSBhIGNvdXJpZXIuDQoqIE1lc3NhZ2VzIHdyaXR0ZW4gb24gdGhlIGJhY2sgb5==
ZiBwb3N0YWdlIHN0YW1wcy4NCiogRHVyaW5nIGFuZCBhZnRlcm==
IFdvcmxkIFdhciBJSSwgZXNwaW9uYWdlIGFnZW50cyB1c2VkIHBob3RvZ3JhcGhpY2FsbHkgcO==
cm9kdWNlZCBtaWNyb2RvdHMgdG8gc2VuZCBpbmZvcm1hdGlvbiBiYWNrIGFuZH==
IGZvcnRoLiBNaWNyb2RvdHMgd2VyZSB0eXBpY2FsbHkg
bWludXRlLCBhcHByb3hpbWF0ZWx5IGxlc3MgdGhhbiB0aGUgc2l6ZSBvZiB0aGUgcGVyaW9kIHByb2R=
dWNlZCBieSBhIHR5cGV3cml0ZXIuIFdXSUkgbWljcm9kb3RzIG5lZWRlZCB0byBiZSBlbWJlZGRlZB==
IGluIHRoZSBwYXBlciBhbmQgY292ZXJlZCB3aXRoIGFuIGFkaGVzaXZlIChzdWNoIGFzIGNvbGxvZGlvbikuIFR=
aGlzIHdhcyByZWZsZWN0aXZlIGFuZCB0aHVzIGRldGVjdGFibGUg
Ynkgdmlld2luZyBhZ2FpbnN0IGdsYW5jaW5nIGxpZ2h0LiBBbHRlcm5hdGl2ZSB0ZWNobmlxdWVzIGluY2x1ZGVk
IGluc2VydGluZyBtaWNyb2RvdHMgaW50byBzbGl0cyBjdXQgaW50byB0aGUgZWRnZSBvZv==
IHBvc3QgY2FyZHMuDQoqIER1cmluZyBXb3JsZCBXYXIgSUksIGEgc3B5IGZvciB=
SmFwYW4gaW4gTmV3IFlvcmsgQ2l0eSwgVmVsdmFsZWW=
IERpY2tpbnNvbiwgc2VudCBpbmZvcm1hdGlvbiB0byBhY2NvbW1vZGF0aW9=
biBhZGRyZXNzZXMgaW4gbmV1dHJhbCBTb3V0aCBBbWVyaWO=
YS4gU2hlIHdhcyBhIGRlYWxlciBpbiBkb2xscywgYW5kIIG==
aGVyIGxldHRlcnMgZGlzY3Vzc2VkIGhvdyBtYW55IG9mIHRoaXMgb3IgdGhhdCBkb2xs
IHRvIHNoaXAuIFRoZSBzdGVnb3RleHQgd2FzIHRoZSBkb2xsIG9yZGVycywgd2hpbGUgdGhl
IGNvbmNlYWxlZCAicGxhaW50ZXh0IiB3YXMgaXRzZWxmIGVuY2+=
ZGVkIGFuZCBnYXZlIGluZm9ybWF0aW9uIGFib3V0IHNoaXAgbW92ZW1lbnRzLF==
IGV0Yy4gSGVyIGNhc2UgYmVjYW1lIHNvbWV3aGF0IGZh
bW91cyBhbmQgc2hlIGJlY2FtZSBrbm93biBhcyB0aGX=
IERvbGwgV29tYW4uDQoqIENvbGQgV2FyIGNvdW50
ZXItcHJvcGFnYW5kYS4gSW4gMTk2OCwgY3JldyBtZW1iZW==
cnMgb2YgdGhlIFVTUyBQdWVibG8gKEFHRVItMikgaW50ZWxsaWdlbmNlIHNoaXAgaGVsZCBhcyBwcm==
aXNvbmVycyBieSBOb3J0aCBLb3JlYSwgY29tbXVuaWNhdGVkIGluIHNpZ25=
IGxhbmd1YWdlIGR1cmluZyBzdGFnZWQgcGhvdG8gb3Bwb3J0
dW5pdGllcywgaW5mb3JtaW5nIHRoZSBVbml0ZWQgU3RhdGVzIHRoZXkg
d2VyZSBub3QgZGVmZWN0b3JzIGJ1dCByYXRoZXIgd2VyZSBiZWluZyBoZWxkIGNh
cHRpdmUgYnkgdGhlIE5vcnRoIEtvcmVhbnMuIEluIG90aGVyIHBob3Rv
cyBwcmVzZW50ZWQgdG8gdGhlIFVTLCBjcmV3IG1lbWJlcnMgZ2F2ZSAidGhlIGZpbmdlciIgdG8g
dGhlIHVuc3VzcGVjdGluZyBOb3J0aCBLb3JlYW5zLCBpbiBhbiBhdHRlbXB0IHRvIE==
ZGlzY3JlZGl0IHBob3RvcyB0aGF0IHNob3dlZCB0aGVtIHNtaQ==
bGluZyBhbmQgY29tZm9ydGFibGUuDQoNCi0tDQpodHRwOi8vZW4ud2lraXBlZGlhLm9yZw==
L3dpa2kvU3RlZ2Fub2dyYXBoeQ0K
```



```
0
Base_sixty_four_point_five
0
Base_sixty_four_point_five
```