

Assignment:  
DECRYPTION

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# Chapter 1

## Decryption

### 1.1 Knowledge Base

#### **Encrypted paragraph:**

aceah toz puvg vcdl omj puvg yudqecov, omj loj auum  
klu thmjuv hs klu zlcvu shv zcbkg guovz, upuv zcndu lcz  
vuovvroaeu jczoyyuovomdu omj qmubyudkuj vukqvm.  
klu vcdluz lu loj avhqnlk aodr svhw lcz kvopuez loj mht  
audhwu o ehdoe eunumj, omj ck toz yhyqeoveg auecupuj,  
tlokupuv klu hej sher wcnlk zog, klok klu lcee ok aon umj  
toz sqee hs kqmmuez zkqssuj tckl kvuozqv. omj cs klok  
toz mhk umhqnl shv sowu, kluvu toz oezh lcz yvhehmnuj  
pcnhqv kh wovpue ok. kcwu thvu hm, aqk ck zuuwuj  
kh lopu eckkeu ussude hm wv. aonncmz. ok mcmukg  
lu toz wqdl klu zowu oz ok scskg. ok mcmukg-mcmu  
klug aunom kh doee lcu tuee-yvuzuvpuj; aqk qmdlomnuj  
thqej lopu auum muovuv klu wovr. kluvu tuvu zhvu klok  
zlhhr klucv luojz omj klhqnlk klcz toz khw wqdl hs o nhhj  
klcmn; ck zuuwuj qmsocv klok omghmu zlhqej yhzuzuz  
(oyyovumkeg) yuvyukqoe ghqkl oz tuee oz (vuyqkujeg)  
cmubloqzkcae tuoecl. ck tcee lopu kh au yocj shv,  
klug zocj. ck czm'k mokqvoe, omj kvhvaeu tcee dhvu

hs ck! aqk zh sov kvhqaeu loj mhk dhwu; omj oz wv.  
 aonncmz toz numuvhqz tckl lcz whmug, whzk yuhyeu  
 tuv u tceecmn kh shvnepu lew lcz hjjckcuz omj lcz nhhj  
 shvkqmu. lu vuwocmuj hm pczckcmn kuvwz tckl lcz  
 vueokcpuz (ubduyk, hs dhqvzu, klu zodrpceeu aonncmzuz),  
 omj lu loj womg juphkuj ojwcvuvz owmhn klu lhaackz  
 hs yhhv omj qmcwyhvkomp sowcecuz. aqk lu loj mh  
 dehzu svcumjz, qmkce zhwu hs lcz ghqmnuv dhqzcmz  
 aunom kh nvht qy. klu uejuzk hs kluzu, omj aceah'z  
 sophqvcku, toz ghqmn svhjh aonncmz. tlum aceah toz  
 mcmukg-mcmu lu ojhykuj svhjh oz lcz lucv, omj avhqnlk  
 lew kh ecpu ok aon umj; omj klu lhyuz hs klu zodrpceeu-  
 aonncmzuz tuv scmoeeg jozluj. aceah omj svhjh loyyumuj  
 kh lopu klu zowu acvkljog, zuykuwauv 22mj. ghq loj  
 aukku dhwu omj ecpu luvu, svhjh wg eoj, zocj aceah  
 hmu jog; omj klum tu dom dueuavoku hqv acvkljog-  
 yovkcuz dhwshvkoaeg khnuklu. ok klok kcwu svhjh toz  
 zkcee cm lcz ktuumz, oz klu lhaackz doeeuj klu cvvuzymzcae  
 ktumkcuz auktuom dlcejllhj omj dhwcmm hs onu ok  
 klevkg-klvuu

Here is the chart of letter frequencies of English Language  
 that we used as our knowledge base to decrypt the encrypted  
 paragraph:

### Frequency distribution English characters

a: 8.05%	b: 1.67%	c: 2.23%	d: 5.10%
e: 12.22%	f: 2.14%	g: 2.30%	h: 6.62%
i: 6.28%	j: 0.19%	k: 0.95%	l: 4.08%
m: 2.33%	n: 6.95%	o: 7.63%	p: 1.66%
q: 0.06%	r: 5.29%	s: 6.02%	t: 9.67%
u: 2.92%	v: 0.82%	w: 2.60%	x: 0.11%
y: 2.04%	z: 0.06%		

#### Frequent one letter word

'a','i'

#### Frequent two letter word

'of', 'to', 'in', 'it', 'is', 'be', 'as', 'at', 'so', 'we', 'he', 'by',  
'or', 'on', 'do', 'if', 'me', 'my', 'up', 'an', 'go', 'no', 'us',  
'am'

#### Frequent three letter word

'the', 'and', 'for', 'are', 'but', 'not', 'you', 'all', 'any', 'can',  
'had', 'her', 'was', 'one', 'our', 'out', 'day', 'get', 'has',  
'him', 'his', 'how', 'new', 'now', 'old', 'see', 'two', 'way',  
'who', 'boy', 'did', 'let', 'put', 'say', 'she', 'too'

## 1.2 Decryption Process:

### 1.2.1 Letter Frequencies:

#### One Letter Word

o : 2

#### Two Letter Word

hm : 3 ok : 8 oz : 6 au : 1 ck : 6 cm : 1 cs : 1 qy : 1 tu : 1 wg : 1 wv : 2 zh : 1 hs : 10 kh : 8 lu : 6 mh : 1

#### Three Letter Word

aqk : 4 dom : 1 eoj : 1 mhk : 2 mht : 1 omj : 18 onu : 1 shv : 3 sov : 1 toz : 11 umj : 1 zog : 1 ghq : 1 hej : 1 hmu : 1 hqv : 1 khh : 1 klu : 15 lew : 3 lcz : 10 loj : 7 aon : 2

### 1.2.2 One Letter Word

Frequent one letter words are 'a' and 'i'. There are two sentences in the paragraph which includes 'o' in the middle of sentence. If it is 'I' then after that there would be a conjunction of three letter. But in the paragraph after 'I', there is word with four and five letters. So, it can't be 'I' and here 'o' means 'a'. So, we get our first decrypted letter: 'o' = 'a'

### 1.2.3 Three Letter Word

In the given paragraph, most frequent three letter word is 'omj'. So, from the list of frequent three letter word and letter frequency chart, we can easily guess the word is

'and' starting with 'a'. So we can map another two letter:  
'm'='n' and 'j'='d'.

Next frequent word is 'klu' which is used 15 times in the paragraph. It is used in the beginning and middle of a sentence. There are also words such as 'klucv, kluvu, klum, klug'. So, from our knowledge base we can say that 'klu' means 'the' as those words can be 'the, their, there, they'. Therefore, another four letters are: 'k' = 't', 'l' = 'h', 'u' = 'e', 'v' = 'r'.

'toz' is the third frequent three letter word. And there is a two letter word 'oz'. So, we can say from our knowledge base 'toz' means 'was' and 't' = 'w' and 'z' = 's'.

From the three letter word 'umj' and two letter word 'lu' we can say that word is 'end' as we already know the value of 'm', 'j' and 'l'. So, 'u' = 'e'.

From the word 'kh' and 'khh', we can say 'kh' means 'to' as 'k' = 't'. So, here is another letter 'h' = 'o'.

There are another two words 'hs' and 'sov', we already know value of h, o, v. So, 's' = 'f'.

Similarly, we get all value of letters used in the paragraph, and our key turns out to be: **"bxi cl yo dthngavukfwermps"**

### 1.3 Decrypted Paragraph

Finally, our decrypted paragraph is:

bilbo was very rich and very peculiar, and had been the wonder of the shire for sixty years, ever since his remarkable disappearance and unexpected return. the

riches he had brought back from his travels had now become a local legend, and it was popularly believed, whatever the old folk might say, that the hill at bag end was full of tunnels stuffed with treasure. and if that was not enough for fame, there was also his prolonged vigour to marvel at. time wore on, but it seemed to have little effect on mr. baggins. at ninety he was much the same as at fifty. at ninety-nine they began to call him well-preserved; but unchanged would have been nearer the mark. there were some that shook their heads and thought this was too much of a good thing; it seemed unfair that anyone should possess (apparently) perpetual youth as well as (reputedly) inexhaustible wealth. it will have to be paid for, they said. it isn't natural, and trouble will come of it! but so far trouble had not come; and as mr. baggins was generous with his money, most people were willing to forgive him his oddities and his good fortune. he remained on visiting terms with his relatives (except, of course, the sackvillebagginses), and he had many devoted admirers among the hobbits of poor and unimportant families. but he had no close friends, until some of his younger cousins began to grow up. the eldest of these, and bilbo's favourite, was young frodo baggins. when bilbo was ninety-nine he adopted frodo as his heir, and brought him to live at bag end; and the hopes of the sackville- bagginses were finally dashed. bilbo and frodo happened to have the same birthday, september 22nd. you had better come and live here, frodo my lad, said bilbo one day; and then we can celebrate our birthday-parties comfortably together. at that time frodo was still in his tweens, as the hobbits called the irresponsible twenties between childhood and coming of age at thirty-three