

HOMEWORK #3 – SOLUTION

PROBLEM: A group of students use encrypted messages when communicating with each other via e-mail. The encryption they apply works as follows: in the original message the blanks between the words are removed and then all characters are replaced by encrypted letters according to the encryption method which can be easily understood by inspection of Figure 1 and Table 1 given below. In Figure 1 letters sorted alphabetically in the inner circle are circumscribed by letters in the outer circle, that will be the corresponding characters in the encrypted message. It can be seen that outer letters are displaced two cell positions and, therefore, the conversion of characters will be as is shown in Table 1. However, further rotation of the outer ring will result in different encryption.

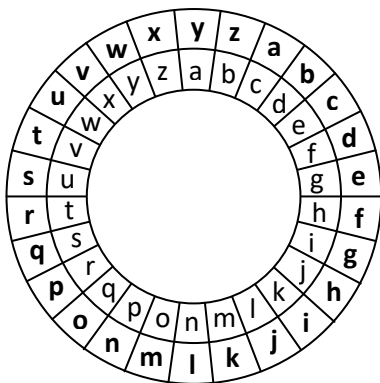


Figure 1. Encryption method illustrated.

Table 1. Correspondence of letters in original message and letters in encrypted message when outer ring is displaced two positions with respect to inner ring.

Letter - original message	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
Encrypted letter	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x

In table 2, encryption of the original message “a short expression” for three different positions of outer circle is given. But the table can be extended to contain 25 encryption messages, in total, since it is possible to choose 25 different positions for the outer circle.

Table 2. Encryption example.

Original message	displacement/rotation	Encrypted message
<i>a short expression</i>	1 cell	<i>btipsufyqsfttjpo</i>
	2 cells	<i>cujatvgzrtguukqp</i>
	3 cells	<i>dvkruwhasuhvvlrq</i>

One of the students receives a message, that is shown in Table 3. It is your task now to write a function and driver program to decrypt messages encrypted using the method defined above and find out what this message is. The decrypted message won't have blanks in it, so you must figure out what the meaningful distinct words of the original expression are. Add your answer to your program after the END statement as a comment (exclamation mark followed by your answer).

Table 3.

Encrypted e-mail received	Decrypted message
<i>rzzopgpytyrotojzfdzgwpszxphzcvescpp</i>	?

SOLUTION:

```
program cyphers
use enc
character(len=50) :: t
read "(a)", t ! rzzopgpytyrotozjzfdzwgpszphzcvescpp
do i = 1,26
print *, convv(t,i), i
end do
end program cyphers
```

!good evening did you solve homework three

```
module enc
contains

function convv(a, p) result(b)
character(*), intent(in):: a
integer, intent(in) :: p
character(len=len(a)) :: b
integer :: n
b=""
do n = 1, len_trim((a))
b(n:n) = char(modulo(ichar(a(n:n))-97+p,26)+97)
end do
end function convv

end module enc
```