

```

> with(StringTools):
> convert("Yo! Whazzup? hi", bytes);
      [89, 111, 33, 32, 32, 87, 104, 97, 122, 122, 117, 112, 63, 32, 104, 105]      (1)
> convert(%, bytes);
      "Yo! Whazzup? hi"      (2)
> convert([seq(i, i=1..255)], bytes);
      "      (3)
      !"#$$%&'()*C ,-. /0123456789:;! =O ?
      @ABCDEFGHIJKLMN O PQRSTUVWXYZ[\]^_abcdefghijklmnopqrstuvwxy z{}
      ~ , ,,... † ‡ %o " " " • QR TM - G
      , 1/4 1/2 3/4 #
      O "
> IsPrintable("q");
      true      (4)
> IsPrintable("\023");
      false      (5)
> cat("\n", Select(IsPrintable, convert([seq(i, i=1..255)], bytes)));
      "      (6)
      !"#$$%&'()*C ,-. /0123456789:;! =O ?@ABCDEFGHIJKLMN O PQRSTUVWXYZ[\]^_
      ^_abcdefghijklmnopqrstuvwxy z{}~"
> Prufrock:="I have heard the mermaids singing, each to each\nI do
not think they will sing to me";
      Prufrock := "I have heard the mermaids singing, each to each      (7)
      I do not think they will sing to me"
> Alphabet:=cat("\n", Select(IsPrintable, convert([seq(i, i=1..255)],
bytes)));
      Alphabet := "      (8)
      !"#$$%&'()* +, -. /0123456789: <=> ?@ABCDEFGHIJKLMN O PQRSTUVWXYZ[\]^_
      ^_abcdefghijklmnopqrstuvwxy z{}~"
> length(Alphabet);
      96      (9)
Write the analogue of convert(...,bytes) using our Alphabet.
> SearchText("I", Alphabet);
      43      (10)
> SearchText("\n", Alphabet);
      1      (11)
> seq( SearchText(Prufrock[i], Alphabet)-1, i=1..length(Prufrock));
      42, 1, 73, 66, 87, 70, 1, 73, 70, 66, 83, 69, 1, 85, 73, 70, 1, 78, 70, 83, 78, 66, 74, 69, 84, 1, 84,      (12)
      74, 79, 72, 74, 79, 72, 13, 1, 70, 66, 68, 73, 1, 85, 80, 1, 70, 66, 68, 73, 0, 42, 1, 69, 80, 1,
      79, 80, 85, 1, 85, 73, 74, 79, 76, 1, 85, 73, 70, 90, 1, 88, 74, 77, 77, 1, 84, 74, 79, 72, 1, 85,
      80, 1, 78, 70
> Alphabet:=cat("\n", Select(IsPrintable, convert([seq(i, i=1..255)],

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bytes));
> StringToList := proc(text::string)
  local i;
  global Alphabet;
  [seq(SearchText(text[i],Alphabet)-1,i=1..length(text))];
end:
> StringToList("Hello"); StringToList(17*x^2);
      [41, 70, 77, 77, 80, 80]
Error, invalid input: StringToList expects its 1st argument,
text, to be of type string, but received 17*x^2
> ListToString := proc(numlist::list(nonnegint))
  local i;
  global Alphabet;
  seq(Alphabet[numlist[i]+1],i=1..nops(numlist));
end:
> ListToString([41,70,77,77,80,80]);
      "H", "e", "l", "l", "o", "o"
(13)
> ListToString := proc(numlist::list(nonnegint))
  local i;
  global Alphabet;
  cat(seq(Alphabet[numlist[i]+1],i=1..nops(numlist)));
end:
> ListToString([41,70,77,77,80,80, x]);
Error, invalid input: ListToString expects its 1st argument,
numlist, to be of type list(nonnegint), but received [41, 70,
77, 77, 80, 80, x]
> Caesar:=proc( text::string, shift::integer)
  local numlist, codenum,p;
  global Alphabet;
  p:=length(Alphabet);
  numlist:=StringToList(text);
  codenum:=[seq( modp(numlist[i]+shift,p),i=1..length(text))];
  return(ListToString(codenum));
end:
> Caesar("Veni, Vidi, Vici", 3);
      "Yhql/#Ylgl/#Ylfl"
(14)
> Caesar(%,-3);
      "Veni, Vidi, Vici"
(15)
> Caesar(Prufrock,27);
      "d;#|1 ;# |-
      ;# ;(-(|$
      ;.$)"$)"G; |~#/*; |~#:d;
      *;)*/*;/#$)&;/# 4;2$";.$)";/*;( "
(16)
> Caesar(%,-27);
      "I have heard the mermaids singing, each to each
      I do not think they will sing to me"
(17)

```

To make it better, we could several different shifts

ie, shift the first letter by 3, second by 19, third by 7, ..

```
> keyword:= "T.S. Eliot"; shifts:=StringToList(keyword);
      keyword := "T.S. Eliot"
      shifts := [53, 15, 52, 15, 1, 38, 77, 74, 80, 85] (18)
```

```
> Vignere:=proc( text::string, keyword::string)
  local numlist, codenum, shifts, p, n;
  global Alphabet;
  p:=length(Alphabet);
  n:=length(keyword);
  shifts:=StringToList(keyword);
  numlist:=StringToList(text);
  codenum:=[seq( modp(numlist[i]+shifts[modp( i-1,n)+1],
    p), i=1..length(text))];
  return(ListToString(codenum));
end:
> Vignere("AAAAAA", "ABCD");
      "cdefcd" (19)
```

```
> Vignere(Prufrock, keyword);
"! p~wC mRUVGsT#iC mWUgBp=stF`S^O };;!C NMXuL~Ttb)Ui9u9~T}p:m^X^CzT#iC
fjg^A{T"j4TjddU|9" (20)
```

```
> unVignere:=proc( text::string, keyword::string)
  local numlist, codenum, shifts, p, n;
  global Alphabet;
  p:=length(Alphabet);
  n:=length(keyword);
  shifts:=StringToList(keyword);
  numlist:=StringToList(text);
  codenum:=[seq( modp(numlist[i]-shifts[modp( i-1,n)+1],
    p), i=1..length(text))];
  return(ListToString(codenum));
end:
> Vignere(Prufrock, keyword); unVignere(%, keyword);
"! p~wC mRUVGsT#iC mWUgBp=stF`S^O };;!C NMXuL~Ttb)Ui9u9~T}p:m^X^CzT#iC
fjg^A{T"j4TjddU|9"
      "I have heard the mermaids singing, each to each (21)
      I do not think they will sing to me"
```

```
> rand();
      395718860534 (22)
```

```
> rand();
      193139816415 (23)
```

```
> randomize();
      1361997906 (24)
```

```
> rand();
      995178731199 (25)
```

```
> randomize(314159);
      314159 (26)
```

```
> rand();
      47578237695 (27)
```

```
> myrand:=rand(0..96);
myrand := proc( ) (28)
```

```

proc( ) option builtin = RandNumberInterface; end proc(6, 97, 7)
end proc
> myrand();
81 (29)
> OneTimePad:=proc( text::string, seed::posint)
local numlist, codenum, myrand, p;
global Alphabet;
p:=length(Alphabet);
randomize(seed);
myrand:=rand(0..p);
numlist:=StringToList(text);
codenum:=[seq( modp(numlist[i]+myrand(),p),i=1..length(text))];
return(ListToString(codenum));
end:
UnTimePad:=proc( text::string, seed::posint)
local numlist, codenum, myrand, p;
global Alphabet;
p:=length(Alphabet);
randomize(seed);
myrand:=rand(0..p);
numlist:=StringToList(text);
codenum:=[seq( modp(numlist[i]-myrand(),p),i=1..length(text))];
return(ListToString(codenum));
end:
> OneTimePad("Hi ho, hi ho", 15);
"0u%hC GgS^Oe " (30)
> UnTimePad(%,15);
"Hi ho, hi ho" (31)
> crypted:=OneTimePad(Prufrock, 240158);
crypted:= " G4IVBnF!y!wO*,d==3P/3iqxj\~4iCFCnz6~Y7\m]RTSk{=@e!C<\G
l~}nUE4OI5~my3
vBoTa*kVnxzy" (32)
> UnTimePad(crypted,240158);
"I have heard the mermaids singing, each to each (33)
I do not think they will sing to me"
> UnTimePad(crypted,240159);
"4[!@@EGCeS"y?T:2 e`zEV2 (34)
O|@^K*]s'*W%ooiG:eW|C|j5,RLD-
7P|6{5OG } ) ,JO oJ)7(5-l0("
> randomize(2); seq(myrand(),i=1..20);
2
40, 15, 72, 22, 43, 82, 75, 7, 34, 49, 95, 75, 85, 47, 63, 31, 90, 20, 37, 39 (35)
> randomize(2); seq(myrand(),i=1..20);
2
40, 15, 72, 22, 43, 82, 75, 7, 34, 49, 95, 75, 85, 47, 63, 31, 90, 20, 37, 39 (36)
> randomize(3); seq(myrand(),i=1..20);
3
24, 3, 56, 72, 0, 21, 19, 74, 41, 10, 21, 38, 96, 20, 44, 93, 39, 14, 26, 81 (37)

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```
> randomize(4); seq(myrand(),i=1..20);
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4
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```
46, 55, 69, 1, 87, 72, 50, 9, 58, 94, 55, 55, 57, 36, 50, 44, 38, 52, 3, 0
```

**(38)**