Task 1

Create a function `MultiplyAndSkip` that accepts numbers `α` and `ω`. Your function needs to return the first 7 integers multiplied by `α` and then added to `ω`:

```
      1 MultiplyAndSkip 0
1 2 3 4 5 6 7
      2 MultiplyAndSkip 0
2 4 6 8 10 12 14
      2 MultiplyAndSkip ¯3
¯1 1 3 5 7 9 11
      3 MultiplyAndSkip 1
4 7 10 13 16 19 22
```

Task 2

Consider the function `Mat1`:

```
      Mat1←{2 3⍴⍳6}   ⍝ note: no "⍵" in Mat1
      Mat1 0
1 2 3
4 5 6
```

Create functions `Mat2` and `Mat3`:

```
      Mat2 0
¯1 0 1
 2 3 4
      Mat3 0
¯1 ¯2
¯3 ¯4
¯5 ¯6
```

Task 3

Create two functions, `F` and `G`, that behave as follows:

```
      (2 3⍴1) F (2 3⍴2)
1 1 1
1 1 1
2 2 2
2 2 2
      G 3 3⍴⍳9
1 2 3 1 2 3
4 5 6 4 5 6
7 8 9 7 8 9
```

Task 4

Create a function `ToVector` that accepts any array as `⍵` and turns it into a vector with the same elements:

```
      ToVector 1 2 3 4
1 2 3 4
      ToVector 3 2⍴⍳6
1 2 3 4 5 6
      ToVector 2 2 2⍴⍳8
1 2 3 4 5 6 7 8
```

Task 5

Create a function `Sum2ndLast` that accepts a numeric array as `⍵` and sums its contents along the 2nd to last axis:

```
      Sum2ndLast 2 3⍴⍳6
5 7 9
      Sum2ndLast 2 10 2⍴⍳40
100 110
300 310
      Sum2ndLast 2 2 10 2⍴⍳80
100 110
300 310

500 510
700 710
```

Task 6

Write a function `DropRandRows` that accepts a matrix as `⍵` and drops, from the top, between 1 and all the rows of the matrix (chosen randomly).
Here are some example runs:

```
      DropRandRows 3 4⍴⍳12
5  6  7  8
9 10 11 12
      DropRandRows 3 4⍴⍳12        ⍝ Empty result!
      DropRandRows 3 4⍴⍳12
9 10 11 12
      DropRandRows 3 4⍴⍳12
9 10 11 12
```

Task 7

Write a function `PickRandCols` that accepts a matrix as `⍵` and extracts between 1 and all columns from the left (chosen randomly).
Here are some example runs:

```
      PickRandCols 2 5⍴⍳10
1 2 3
6 7 8
      PickRandCols 2 5⍴⍳10
1
6
      PickRandCols 2 5⍴⍳10
1 2 3 4
6 7 8 9
```

Task 8

Write a function `RIota` that takes a positive integer ω and produces the same result as $\iota\omega$, but in the reverse order:

```
      RIota 5
5 4 3 2 1
      RIota 1
1
      RIota 10
10 9 8 7 6 5 4 3 2 1
```

Task 9

Using `RIota`, write a function `Reverse` that takes a vector `⍵` and returns the same vector in the reverse order:

```
      Reverse ⍳5
5 4 3 2 1
      Reverse 'Hello, world!'
!dlrow ,olleH
      Reverse 15 30 2 8
8 2 30 15
```

Task 10

Create a function `ColumnsSurpass` that accepts a number as `⍺` and a matrix as `⍵`, and returns all columns of `⍵` whose sum is strictly greater than `⍺`:

```
      40 ColumnsSurpass 4 5⍴⍳20
 3  4  5
 8  9 10
13 14 15
18 19 20
      48 ColumnsSurpass 4 5⍴⍳20
 5
10
15
20
```

Task 11

Define a function `Range` that accepts a numeric vector `⍵` and returns the amplitude of `⍵`, that is, returns the difference between the largest element of `⍵` and the smallest element of `⍵`:

```
      Range ⍳10
9
      Range 0 100
100
      Range 100 0
100
      Range 15 64 23 ¯64 ¯15
128
```

Task 12

Create a function `MaxRangeRow` that accepts a numeric matrix ω and returns the row with the largest range:

```
      MaxRangeRow 2 3⍴0 10 5 1 2 3
0 10 5
      MaxRangeRow 2 3⍴1 2 3 10 0 5
10 0 5
      MaxRangeRow 5|2 3⍴⍳6
4 0 1
```

Task 13

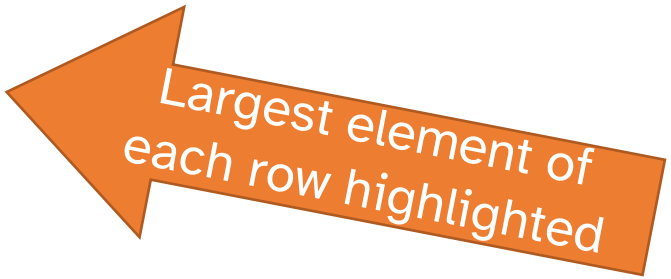
Create a function `IsInteger` that takes a numeric vector `⍵` and returns `1` if `⍵` is an integer, and `0` otherwise:

```
      IsInteger 3
1
      IsInteger 3.3
0
      IsInteger ¯3 3 3.3
1 1 0
      IsInteger (⍳10)÷2
0 1 0 1 0 1 0 1 0 1
```

Task 14

Write a function `TopDown` that accepts a numeric matrix `⍵` and reorders its rows so that the row with the largest number shows up first and the row with the smallest largest number shows at the bottom:

```
      TopDown 4 3⍴0 12 9 8 1 2 3 4 10 5 6 7
0 12  9
3  4 10
8  1  2
5  6  7
      TopDown 3 3⍴⍳9
7 8 9
4 5 6
1 2 3
```



Task 15

Write a function `RemoveFrom` that accepts a vector `⍺` and removes those items from the vector `⍵`:

```
      'abc' RemoveFrom 'cabana'
n
      'abc' RemoveFrom 'cape'
pe
      1 2 3 RemoveFrom 0 1 0 2 0 45
0 0 0 45
```

Task 16 (hard)

Write a function `RemoveExtra` that accepts a vector ω and returns the same vector after removing the occurrences of its most common element:

```
      RemoveExtra 'banana'
bnn
      RemoveExtra 2|ι7
0 0 0
      RemoveExtra 'Mississippi'
Miippi
```

Task 17

Write the function `TimesTable` to generate the multiplication table for numbers up to ω:

```
        TimesTable 3
1  2  3
2  4  6
3  6  9
        TimesTable 5
1   2   3   4   5
2   4   6   8  10
3   6   9  12  15
4   8  12  16  20
5  10  15  20  25
```

Task 18

Write the function `IsSorted` which determines if a given array is already in ascending order:

```
      IsSorted 3 1 4 1 5
0
      IsSorted 2 3 5 7 11
1
      IsSorted 3 4⍴'Bob Abe Carl'
0
      IsSorted 3 4⍴'Abe Bob Carl'
1
```

Task 19

Write the function `AnyCopies` which determines if the vector `⍵` has any duplicates:

```
      AnyCopies 'India'
0
      AnyCopies 'Indian'   ⍝ there are 2 "n"s
1
```

Task 20

Write the function `Trim` which removes leading spaces from the vector ω:

```
      Trim '     poof'
poof
      Trim '   I have spaces'
I have spaces
      Trim 'nospace'
nospace
```

Task 21

Write the function `KeepOnly` which removes from the vector α any element not in ω:

```
      'Hello World' KeepOnly ⎕A
HW
      3 1 4 1 5 KeepOnly ⍳3
3 1 1
```

Task 22

Write the function `HasElements` which determines if the array `⍵` has any elements (i.e. it isn't empty):

```
      HasElements 3 1 4
1
      HasElements ⍳0
0
      HasElements 3 2 4⍴⎕A
1
      HasElements 3 0 4⍴⎕A
0
      HasElements 42
1
```

Task 23

Write the function `Overlaps` which determines if the arrays α and ω have any elements in common.

```
      2 7 1 8 Overlaps 3 1 4
1
      1 2 3 Overlaps 7 8 9 10
0
```

Task 24

Write the function `OfLength` which takes a matrix `⍺` and returns the rows that have exactly `⍵` letters. Remove any spaces from the result.

```
      names←7 6⍴'Patel Arya  Babu  Dewan Singh GandhiGupta '

      names OfLength 5
Patel
Dewan
Singh
Gupta
      ⍴names OfLength 5
4 5
      names OfLength 6
Gandhi
      ⍴names OfLength 6
1 6
```

Task 25

Write the function `Explode` which generates a vector consisting of one 1, two 2s, three 3s, until the argument number:

```
        Explode 5
1  2  2  3  3  3  4  4  4  4  5  5  5  5  5
        Explode 3
1  2  2  3  3  3
        Explode 1
1
        Explode 0
0
```

Task 26

Write the function `NoFizzBuzz` which removes any elements from the vector `⍵` which are divisible by 3 or 5.

```
      NoFizzBuzz ⍳10
1 2 4 7 8
      NoFizzBuzz 2 4 6 8 10 12
2 4 8
      NoFizzBuzz 2 4 6 8 ¯10 12   ⍝ don't forget negatives!
2 4 8
```

Task 27 (hard)

Write the function `CentreIn` which takes a character vector `⍺` and adds spaces on the left and right so it becomes `⍵` characters long, with the original text approximately centred. The number of added spaces on the left and right must not differ by more than 1.

```
      'Boo' CentredIn 5
 Boo 
      ⍴'Boo' CentredIn 5
5
      'Boom' CentredIn 5   ⍝ returning 'Boom ' is also OK
 Boom
      'Hi' CentredIn 10
    Hi    
```