1. This week's Problem of the Week in Math is described as follows:

> *There are thirty positive integers less than 100 that share a certain property. Your friend, Blake, wrote them down in the table to the left. But Blake made a mistake! One of the numbers listed is wrong and should be replaced with another. Which number is incorrect, what should it be replaced with, and why?*

The numbers are listed below.

6	10	14	15	21
22	26	33	34	35
38	39	46	51	55
57	58	62	65	69
75	77	82	85	86
87	91	93	94	95

Use the fact that the "certain" property is that these numbers are all supposed to be the product of *unique* prime numbers to find and fix the mistake that Blake made.
Reminder: Code your solution in an `R` script and copy it over to this `.Rnw` file.
Hint: You may find the `%in%` operator and the `setdiff()` function to be helpful.

Solution:

```
library(gmp)

################################################################################
matrix_data <- matrix(c(6, 22, 38, 57, 75, 87,
                        10, 26, 39, 58, 77, 91,
                        14, 33, 46, 62, 82, 93,
                        15, 34, 51, 65, 85, 94,
                        21, 35, 55, 69, 86, 95),
                      nrow = 5, byrow = TRUE)

factorization_results <- list()

positions_with_duplicates <- c()

for (i in 1:length(matrix_data)) {
  factors <- factorize(matrix_data[i])

  if (any(duplicated(factors))) {
    positions_with_duplicates <- c(positions_with_duplicates, i)
  }
}
Incorrect_Number = matrix_data[positions_with_duplicates]
################################################################################
New_Matrix = matrix(70:76)

factorization_results_new <- list()

positions_with_duplicates_new <- c()

for (i in 1:length(New_Matrix)) {
  factors_new <- factorize(New_Matrix[i])

  if (!any(duplicated(factors_new))) {
    positions_with_duplicates_new <- c(positions_with_duplicates_new, i)
  }
}
New_Possible_Numbers = New_Matrix[positions_with_duplicates_new]
for (i in 1:length(New_Possible_Numbers)) {
  Final_Numbers <- factorize(New_Possible_Numbers[i])
  if (length(Final_Numbers) == 2) {
    return(New_Possible_Numbers[i])
  }
}
Replacement_Number = New_Possible_Numbers[i]

################################################################################
print(paste("Incorrect Number  =" , Incorrect_Number))
```

```
## [1] "Incorrect Number  = 75"
```

```
print(paste("Replacement Number = ", Replacement_Number))
```

```
## [1] "Replacement Number =  74"
```