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:

```
blakesnumbers <- c(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)
primes <- c(2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37,
            41, 43, 47)  # all prime numbers less than 50
uniqueproducts <- vector()  # empty vector to store unique products

for (i in 1:length(primes)) {
  for (j in (i+1):length(primes)) {  # start the second loop at i+1 to avoid duplicates
    product = primes[i] * primes[j]  # calculate the product
    if (!is.na(product) && product < 100) {  # only include products less than 100
      uniqueproducts = c(uniqueproducts, product)  # add the product to the vector
    }
  }
}
(uniqueproducts=sort(uniqueproducts))


##  [1]  6 10 14 15 21 22 26 33 34 35 38 39 46 51 55 57 58 62 65 69 74 77 82 85 86
## [26] 87 91 93 94 95


numbers_not_in_uniqueproducts = setdiff(blakesnumbers, uniqueproducts) #finds incorrect number in blakes numbers
numbers_not_in_blakesnumbers =setdiff(uniqueproducts, blakesnumbers) #finds number that needs to be put into blakes numbers to correct error
#The number 75 should be replaced by 74 since 75 is not the product of
#two unique prime numbers, 75=3*5*5 whereas 74 is the product of two
#prime numbers, 74=2*37
```