

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:** This code creates a vector all possible products of unique prime numbers under 100 and compares it with the original numbers with `\setdiff{}` function to isolate the 1 incorrect number.

```
original.numbers <- 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)

prime.numbers <- c(2,3,5,7,11,13,17,19,23,29,31,
                  37,41,43,47,53)

products <- c()
for(i in 1:(length(prime.numbers)-1)){
  curr <- prime.numbers[i]
  # print(prime.numbers[(i+1):length(prime.numbers)] *curr)
  for(j in prime.numbers[(i+1):length(prime.numbers)]){
    temp <- j*curr
    if(temp < 100){
      products <- append(products,temp)
    }
    else{
      break
    }
  }
}

wrong.answer <- setdiff(original.numbers,products)
correct.replacement <- setdiff(products,original.numbers)
print(paste("The wrong number is", wrong.answer, "and should be replaced with",
            correct.replacement))

## [1] "The wrong number is 75 and should be replaced with 74"
```