

Statistics 406 Lab 1 Notes

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Course web page:

<http://www.stat.lsa.umich.edu/~kshedden/Courses/Stat406/>

Lab web page:

<http://www.stat.lsa.umich.edu/~ajrothma/Stat406/>

Exercises

1. Write a short R program to find and print the factors of a positive integer x including 1 and excluding x .

Solution:

```
x <- 6                # x is our input positive integer

for (i in 1:(x-1) )  # i will run from 1 to x-1 (1 to 5)
{
  if ( x %% i == 0 ) # will be true when i is a factor
  {
    print(i)
  }
}
```

Here is a solution that saves the factors and only iterates up to half of x :

```
x <- 6
factors <-NULL

for (i in 1:floor(x/2) )
{
  if ( x %% i == 0 ) { factors <- c(factors, i) }
}
factors      # prints the vector of factors
```

2. Write an R program that tests if a variable x is a perfect number. Your program should construct an integer variable f such that at the end of execution, the value of f is 1 if x is perfect and 0 if it is not. Note a perfect number is a positive integer that is equal to the sum of its positive integer factors including 1 but excluding itself. For example, 6 is a perfect number since $1+2+3 = 6$.

Solution:

```
x <- 6
f <- 0

factors <-NULL

for (i in 1:(x-1) )
{
  if ( x %% i == 0 ) { factors <- c(factors, i) }
}
if (sum(factors) == x ) { f=1 }
f
```

3. Building on your solution to problem 2, write a program to count and print the perfect numbers between 2 and 10000.

Solution:

```
perfectNumbers <- NULL

for (x in 2:10000)
{
  factors <-NULL
  f <- 0
  for (i in 1:floor(x/2) )
  {
    if ( x %% i == 0 ) { factors <- c(factors, i) }
  }
  if (sum(factors) == x ) { f <- 1 }

  if ( f ) { perfectNumbers <- c(perfectNumbers, x) }
}
perfectNumbers
```

4. Write a short R program to extract the tens digit of a positive integer x.

Solution:

```
x <- 256  
floor((x %% 100)/10)
```