

The University of British Columbia
Faculty of Sciences
DATA 101

1. Write out the decimal representation of the following binary number: 0.101_2 . (2 points)
2. Write out the binary representation of the following decimal number: 0.101_{10} . (2 points)
3. Consider the following programs, designed to calculate $x^4 - y^4$, for $x = 1000000$ and $y = 999999$: (3 points)

Program A:

```
x <- 1000000
y <- 999999
A <- x^4 - y^4
```

Program B:

```
x <- 1000000
y <- 999999
B <- (x^2+y^2)*(x+y)*(x-y)
```

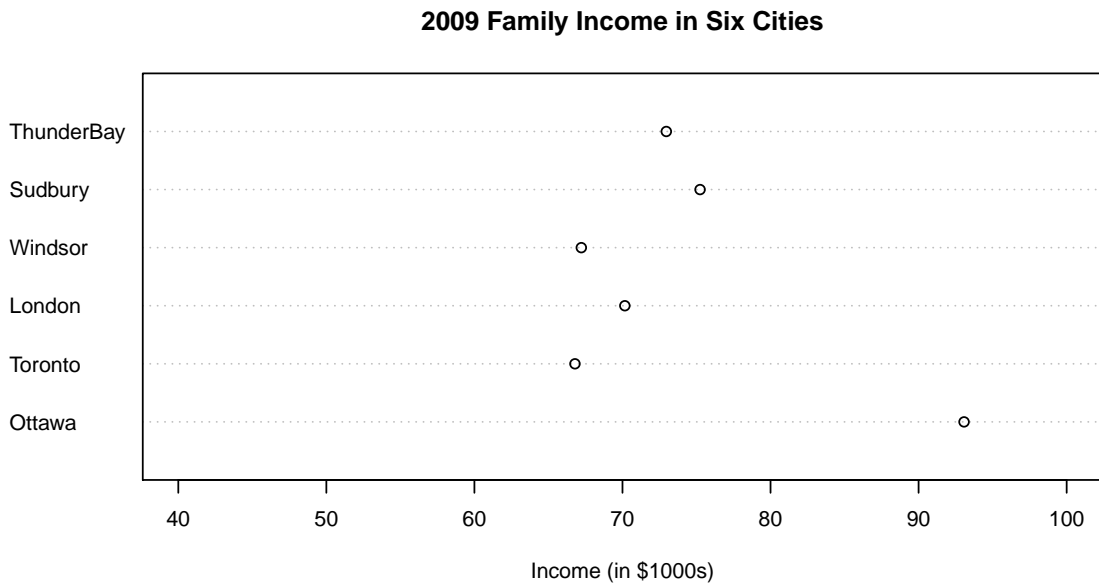
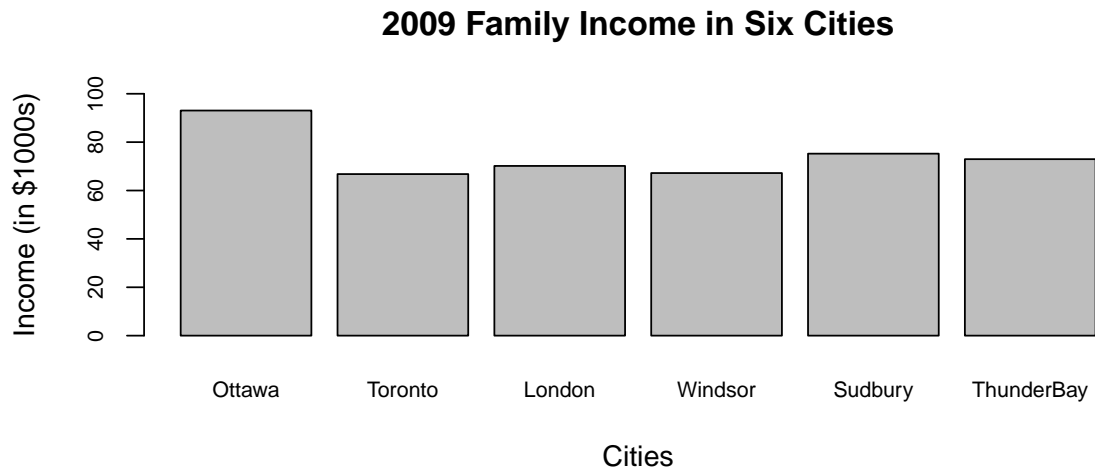
Which of A and B is most accurate? Explain briefly.

4. Suppose the vector `primes` contains the first 10000 prime numbers. (4 points)
 - (a) Write down the R code which, when executed, would print the last 100 elements of this vector into the R console window.
 - (b) Write down the R code which, when executed, would add up the first 9000 prime numbers.
5. Suppose $x = 100$ and $y = 99$. Find the **true** value of (2 points)

$$x^{16} \left[\frac{(x^8 - y^8)}{(196059601)(19801)(199)} - 1 \right].$$

6. Tom started to work in IBM on July 5, 1999. David started on December 12, 2003. How many days did Tom start earlier than David? Using R to solve this question. (4 points)
7. Enter the following numeric data on 2009 family income (in \$1000s) for 6 Ontario cities into a 1 row matrix called `income`. Assign the city names to `colnames(income)`. Construct a bar plot and dot plot for this data set as shown below. (8 points)

Ottawa	Toronto	London	Windsor	Sudbury	ThunderBay
93.07	66.79	70.16	67.22	75.24	72.96



8. Consider the closing price data in `EuStockMarkets`, a data set that is built in to R.
- Closing prices often have trends which can be removed by taking successive differences using the `diff()` function, yielding what are called “returns”. Create a vector called `returns1` which contains the successive differences of the first column of `EuStockMarkets`. (3 points)
 - Plot a histogram of the data in `returns1`, using the `scott` breaks and then using the `fd` breaks. Which procedure gives smaller binwidths? (3 points)
 - Based on the histograms that you have plotted, would you say that the returns symmetrically distributed or highly skewed to the right or to the left? (1 points)