

CS 5045 – Computation for the Life Sciences
Fall 2003

Exam 01

October 6, 2003

Note: good programs are carefully commented.

1

Write a program that reads a radius from the STDIN and computes the area of a circle. Recall that

$$Area = \pi r^2, \quad \pi = 3.1415926 .$$

Your program will have to deal explicitly with the case where the user inputs an erroneous negative radius.

2

Explain the meaning of the following Perl code sequence (by showing the value of each variable at each step):

```
@a = (0, 2..6, 10, 12);  
$fred = pop(@a);  
$barney = pop @a;  
push @a, 12..15;  
$b = shift @a;  
unshift(@a,44);  
@a = reverse @a;  
$b = @a;  
($c) = @a;
```

3

Explain the following code sequences, and the differences between them if any.

```
while (<STDIN>
  print "I saw $_\n";
}
```

```
while (defined($1=<STDIN>))
  chomp $1;
  print "I saw $1\n";
}
```

```
foreach (<STDIN>)
  print "I saw $_\n";
}
```

4

Write a program `appy.pl` which will be invoked with 3 command line arguments

```
appy.pl file1.seq file2.seq file3.txt
```

`file1.seq`

`file2.seq` contain DNA sequences. The program will concatenate the `file1.seq` with the first line of `file2.seq`; will compute the complementary DNA of this concatenated sequence; and will write it as a line in `file3.seq`. Similarly the program will process all lines in `file1`, `file2`, until there are no more lines in either file. If `file1` is shorter than `file 2` (or vice-versa) then the concatenation will only contain the corresponding line in `file2` (or `file1` respectively). The program should be very safe to run, i.e. should give error messages if a file does not exist, or cannot be open for reading/writing.

5

Write a Perl program that prompts for and reads a string from the keyboard; if the string contains both `wilma` and `fred` the program prints the line, otherwise mentions that at least one of the names is missing. The match should be reported for the names written in both lower and upper case (or any combination). The program will continue to read lines from the keyboard until the user provides an empty line.

6

Explain the family of strings that match following regular expressions

```
/(fred){3,7}/
```

```
/^ab+a$/
```

```
/\s+/
```

Make a pattern that matches strings which contain a single Perl scalar variable (e.g. \$wilma will match but wilma will not).

7

Write a program which reads a string from the keyboard of the form

hour : minute : when : where

The hour and minute fields may contain 1 or 2 digits. The "when" field contains wither "pm" or "am". The "where" field may contain EST, CST, MST, PST and stands for the time zone. The program will print the time in Paris (which is the Eastern time plus 6 hours).

8

Write a program that chooses a random number between 1 and 100

```
$num = int ( 1 + rand(100) );
```

The program asks repeatedly the user to guess the number; reads the number and reports too high, too low, or exact. If user's guess is too high or too low the program continues to ask for another guess, until the correct value or a blank string is entered.