`$Id: cmps112-2009q1-exam1.mm,v 9.38 2009-01-29 19:51:02-08 - - $`

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Total / 30 ○

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1. In the following table, there are fragmentary examples of various kinds of polymorphism. In each box, identify the example by writing one of the words : ***ad hoc*** ; ***universal***. Then further identify them by writing one of the words : ***conversion*** ; ***inheritance*** ; ***overloading*** ; ***template***. **[2✔]**

`class foo {void f(); }`
`class bar: public foo {`
`void f(); }`
	`class stack<item_t> {`
	`void push (item_t); }`

`int add (int x, int y);`
`double add (double x,`
`double y);`
	`double f (double x);`
	`f (6);`

2. Write a Perl program which reads in a sequence of lines using **`<>`**. Each line consists of a key and a value separated by an equal (**`=`**) sign. Strip off leading and trailing whitespace from each key and value. Put the key and value into a hash. Print an error message if any line does not have an equal sign, but ignore any line containing only whitespace. At end of file, print out each key and value pair in lexicographic order. You need not **`use strict`** or **`use warnings`**. **[4✔]**

3. Write a function in Perl which takes a filename as an argument and prints out a lexicographically sorted list of words in the file. Each word is printed only once, followed by a list of line numbers where they occur. A word is any sequence of characters that match **`\S+`** (Note the capital S, meaning non-whitespace.) **[4✔]**

```
sub makexref ($) {
   my ($filename) = @_;
   open my $file, "<$filename" or die "$0: $filename: $!\n";
```

Example output :

```
bar 7 7 88 88 9
foo 3 44 98
```

4. Write the prototypes for the four default members of class **box** that are automatically added to a class if not explicitly overriden. **[2✓]**

```
class box {
```

5. In perl, lexical scope is introduced by the **my** declaration, while dynamic scope is introduced via a **local** declaration. Lacking a declaration implies global scope. What is the output of running this program with each of the statements on the right ? **[2✓]**

```
%fn = ("0" => sub {print "0=$var."},
       "d" => sub {local $var = "dyn"; yes(); print "d=$var. "},
       "s" => sub {my $var = "stat"; yes(); print "s=$var. "},
       "g" => sub {$var = "foo"; yes(); print "f=$var. "},
      );
sub yes {$var = "yes"}
$var = "glo"; $fn{$ARGV[0]}(); print "//$var\n";
```

```
scope.perl 0
```

```
scope.perl s
```

```
scope.perl d
```

```
scope.perl g
```

6. Inheritance in C++. Your answers should be as minimal as possible, provided the question is answered. You don't need to provide a main function nor any constructors.

   (a) Define a base class **base** with an abstract function **void print()**. Define a class **dstr** which is derived form **base** with a private **string** field and which overrides the base's function **print**. Define a class **dint** which does the same, but with an **int** field. Show only what goes in **base.h** and do not define any inline functions. If we have a variable **base *p**, then **p->print();** should print the string or integer field, as appropriate. **[3✓]**

   (b) Show the implementation of both **print** functions as they would appear in **base.cc**. **[3✓]**

Multiple choice. To the ***left*** of each question, write the letter that indicates your answer. Write ‘***Z***’ if you don’t want to risk a wrong answer. Wrong answers are worth negative points. **[11✔]**

number of correct answers		× 1 =	= *a*
number of wrong answers		× ½ =	= *b*
number of missing answers		× 0 =	0
column total $c = \max(a - b, 0)$	11		= *c*

1. Which expression is not valid, given the following two declarations?

   ```
   int *p; int i;
   ```

   (A) `i + i`
   (B) `i + p`
   (C) `p + i`
   (D) `p + p`

2. C++ is primarily thought of as an example of what kind of language?
   (A) functional
   (B) imperative
   (C) logic
   (D) object oriented

3. The address of a static variable in C++ is determined at what time?
   (A) compile
   (B) during a function call
   (C) link
   (D) program exec

4. What time is the address returned by `new` determinaed?
   (A) compile
   (B) during a function call
   (C) link
   (D) program exec

5. What is the name of the C++ variable used to print error messages?
   (A) `STDERR`
   (B) `System.err`
   (C) `cerr`
   (D) `stderr`

6. The following two declarations are examples of:

   ```
   ostream &operator<< (ostream &,
               const string &);
   template <typename item_t>
   ostream &operator<< (ostream &,
               const vector<item_t> &);
   ```

   (A) overhanging
   (B) overlapping
   (C) overloading
   (D) overriding

7. In C++, a `protected` field of a class `foo` is visible only to functions which are members:
   (A) of foo, and any class that inherits from foo.
   (B) of foo, any class that inherits from foo, and any class that foo names as a friend
   (C) of foo, any class that inherits from foo, and any class that names foo as a friend
   (D) only of foo.

8. Of the following languages, which is oldest?
   (A) Algol 60
   (B) C++
   (C) Fortran
   (D) Java

9. Which of these is a C++ keyword that might cause a pointer to become dangling?
   (A) `delete`
   (B) `free`
   (C) `malloc`
   (D) `new`

10. In C++, if we have a call of the form `a.f(x,y)`, inside the function `f`, how is a field `x` in the object `a` referred to?
    (A) `this->*x`
    (B) `this->x`
    (C) `this.x`
    (D) `this[x]`

11. A Case against the GO TO Statement.
    (A) Edsger Dijkstra
    (B) Grace Hopper
    (C) Donald Knuth
    (D) Niklaus Wirth

Total: 31 ✔