EEN118
A Test
28th February 2013

No Calculators, Phones, I-pods, Radios, Computers, PDAs, Machinery, Devices, Contraptions, Items, or Things.

Name:

Student number:

Sign here if you did not give or receive aid in any form during this test, and did not consult any written, printed, or electronic material apart from this test:

Don't write in these boxes.

Question	Out of	Grade
1	33	
2	33	
3	33	
4	1	

1.

Exactly what would be printed by this program?
Here's a clue: the first line would be

<p align="center">a: 3 (int)</p>

```cpp
void show(string question, int n)
{ cout << question << ": " << n << " (int)\n"; }

void show(string question, double d)
{ cout << question << ": " << d << " (double)\n"; }

void show(string question, float f)
{ cout << question << ": " << f << " (float)\n"; }

void show(string question, bool b)
{ cout << question << ": " << b << " (bool)\n"; }

void main()
{ show("a", 1 + 2);

  show("b", 3 + 7 * 4 + 10);

  show("c", 1 / 4);

  show("d", 144 / 12/2);

  show("e", 3579 / 10);

  show("f", 3579 % 10);

  const double x = 12 * 12 / 10;
  show("g", x * 100.0);

  show("h", 12 / 10 * 12);

  show("i", 12 / 10 + 3.5);

  show("j", 12 / 10.0 + 3.5);

  show("k", 1234 - 1234 * 10 / 10);

  show("l", 1234 - 1234 / 10 * 10);

  show("m", 1234 - 1234.0 / 10 * 10);

  show("n", 1234.0 - 1234 / 10 * 10);

  show("o", 6 > 4 && 2 * 3 < 5); }
```

2. For this question, only consider positive numbers.

a. Analyse this function

```
void alabama(int a)
{ if (a == 0)
    cout << "\n";
  else
  { cout << a;
    alabama(a / 2); } }
```

State in plain English what the function does - its overall effect, not a description of the individual statements, and show how you arrived at your conclusion.

b. Now do the same for this function

```
void arkansas(int b)
{ if (b > 0)
  { arkansas(b - 2);
    cout << b; }
  else
    cout << "\n"; }
```

c. What does this function compute, and why is it not a very good design?

```
int alberta(int a)
{ if (a <= 1)
    return 1;
  else
  { const int x = alberta(a-1);
    const int y = alberta(a-1);
    return x + y; } }
```

3.

Again, only consider positive numbers.

a. Write a function `sizefour(int N)` that prints the value of `N` in such a way that it occupies at least four characters. That is, if `N` is not a four digit number, it must print a suitable number of spaces before printing `N`.

b. Write a function `row(int N)` which prints the first 12 multiples of `N`, so that each of the 12 numbers occupies at least four characters. For example, `row(11)` should print
```
  11   22   33   44   55   66   77   88   99  110  121  132
```

c. Write a function `timestable()` which prints a traditional grade-school multiplication table with 12 rows and 12 columns, so that all the numbers are neatly aligned in rows.

d. Write a function `backwards(int N)` which prints the number N in decimal, but backwards.
For example `backwards(3197)` should print `7913`

4.

Draw a picture of a hippopotamus who was accidentally enrolled in a calculus class (hippopotamusses are not known for their facility with mathematics, in case you didn't know).