

科目：程式設計(以 C 和 C++ 為主) 適用：資工系二

編號：311

考生注意：

1. 依次序作答，只要標明題號，不必抄題。
2. 答案必須寫在答案卷上，否則不予計分。
3. 限用藍、黑色筆作答；試題須隨卷繳回。

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第 1 頁

程式題 (每題 10%)

1. Determine whether the following code has syntax errors or not. If it is correct, predict its output. If it is incorrect, point out the mistake(s).

```
// Overflow
#include <iostream>
using std::cin;
using std::cout;
using std::endl;

int main()
{
    unsigned short n = 11;
    unsigned short a = 1;
    for (unsigned short i = 1; i < n; i++)
    {
        a = a * i;
        if (i >= 7) cout << a << endl;
    }
    return 0;
}
```

2. Determine whether the following code has syntax errors or not. If it is correct, predict its output. If it is incorrect, point out the mistake(s).

```
// Pointer to Character
#include <iostream>
using std::cout;
using std::endl;

int main()
{
    char name[] = "Robb Stark";
    char* p = name;
    std::cout << name[5] << std::endl;
    std::cout << p+5 << std::endl;
    std::cout << *(p+5) << std::endl;
    return 0;
}
```

3. Determine whether the following code has syntax errors or not. If it is correct, predict its output. If it is incorrect, point out the mistake(s).

```
// Default Value of a Parameter
#include <iostream>
using std::cout;
using std::endl;

int f(int a, int b=5, int c)
{ return a+b+c; }

int main()
{
    cout << f(4,6) << endl;
    return 0;
}
```

4. Determine whether the following code has syntax errors or not. If it is correct, predict its output. If it is incorrect, point out the mistake(s).

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```
// Pointer to Class, Array of Objects, Initialization List
#include <iostream>
#include <cstring>

class Node
{
public:
    char ch;
    Node* next;

    Node(char c=' ', Node* p=NULL): ch(c), next(p) {}

    void Print()
    {
        for (Node* p=this; p!=NULL; p=p->next)
            std::cout << p->ch;
        std::cout << std::endl;
    }
};

int main()
{
    char msg[] = "ZOOTOPIA";
    const int n = strlen(msg);
    Node m[n];
    m[0] = Node(msg[0], NULL);
    for (int i=1; i<n-1; i++)
    {
        m[i].ch = msg[i];
        m[i].next = &m[i-1];
    }
    m[5].Print();
    return 0;
}
```

5. Determine whether the following code has syntax errors or not. If it is correct, predict its output. If it is incorrect, point out the mistake(s).

```
// Tree height
#include <iostream>
struct TREE
{
    TREE* left;
    char ch;
    TREE* right;
};

unsigned min(unsigned a, unsigned b)
{ return (a>b)?b:a; }

unsigned h(TREE* p)
{
    if (p == NULL)
        return 0;
    else
        return min(h(p->left), h(p->right)) + 1;
}

TREE* createTree()
{
    TREE* e = new TREE; e->left = NULL; e->ch='E'; e->right = NULL;
```

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```

TREE* d = new TREE; d->left = e; d->ch='D'; d->right = NULL;
TREE* b = new TREE; b->left = d; b->ch='B'; b->right = NULL;
TREE* c = new TREE; c->left = NULL; c->ch='C'; c->right = NULL;
TREE* a = new TREE; a->left = b; a->ch='A'; a->right = c;
return a;
}

int main()
{
    TREE* p = NULL;
    p = createTree();
    std::cout << h(p) << std::endl;
    return 0;
}

```

6. What will the following code display?

```

// swap()
#include <iostream>

class CNumber
{
public:
    int value;

    CNumber(int n) { value = n; }

    void print() { std::cout << value << std::endl; }
    void swap(CNumber N)
    {
        int temp = N.value;
        N.value = value;
        value = temp;
    }
};

int main()
{
    CNumber a(6);
    CNumber b(21);
    a.swap(b);
    a.print();
    b.print();
    return 0;
}

```

7. What will the following code display?

```

// swap()
#include <iostream>

class CNumber
{
public:
    int value;

    CNumber(int n) { value = n; }

    void print() { std::cout << value << std::endl; }
    void swap(CNumber& N)
    {
        int temp = N.value;
        N.value = value;
        value = temp;
    }
};

int main()

```

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```

{
    CNumber a(6);
    CNumber b(21);
    a.swap(b);
    a.print();
    b.print();
    return 0;
}

```

8. What will the following code display?

```

// STL vector
#include <iostream>
#include <vector>
using std::cout;
using std::endl;
using std::vector;

int main()
{
    int data[] = {1, 2, 3, 4, 5, 6, 7, 8, 9};
    vector<int> mydata(data+1, data+8);
    vector<int> hisdata(mydata.begin()+1, mydata.end()-1);
    for (size_t i=0; i<hisdata.size(); i++)
        cout << hisdata.at(i);
    cout << endl;
    return 0;
}

```

9. Determine whether the following code has syntax errors or not. If it is correct, predict its output. If it is incorrect, point out the mistake(s).

```

// STL map
#include <iostream>
#include <map>
#include <string>
using std::cout;
using std::endl;
using std::map;
using std::string;
using std::pair;

int main()
{
    map<char, short> count;
    string vowels = "AEIOU";
    string movie = "COURAGE UNDER FIRE";
    char c;
    for (size_t i=0; i<vowels.length(); i++)
        count.insert( pair<char, short>(vowels[i], 0) );
    for (size_t i=0; i<movie.length(); i++) {
        c = movie[i];
        if (count.find(c) != count.end())
            count[c]++;
        // else
        //     count[c] = 1;
    }

    for (map<char, short>::iterator i = count.begin();
         i != count.end(); i++)
        cout << i->first << '\t' << i->second << endl;

    return 0;
}

```

10. Determine whether the following code has syntax errors or not. If it is correct, predict its output. If it is incorrect, point out the mistake(s).

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```

/*
 * This class generates prime numbers up to a user specified
 * maximum. The algorithm used is the Sieve of Eratosthenes.
 * Given an array of integers starting at 2:
 * Find the first uncrossed integer, then cross out all its
 * multiples. Repeat until there are no more multiples
 * in the array.
 */

#include <iostream>
#include <cmath>
#include <vector>

using std::cout;
using std::endl;
using std::vector;

class PrimeGenerator
{
private:
    vector<bool> crossedOut;
    vector<int> result;

public:
    vector<int> generatePrimes(int maxValue)
    {
        if (maxValue > 2)
        {
            uncrossIntegersUpTo(maxValue);
            crossOutMultiples();
            putUncrossedIntegersIntoResult();
        }
        return result;
    }

    int show()
    {
        for (int i=0; i<result.size(); i++)
            cout << result.at(i)
                << (i==result.size()-1?'\\n':' ');
        return result.size();
    }

private:
    void uncrossIntegersUpTo(int maxValue)
    {
        crossedOut.clear(); // If I remark this line
        for (int i=0; i<maxValue+1; i++)
            crossedOut.push_back(false);
    }

    void crossOutMultiples()
    {
        int limit = determineIterationLimit();
        for (int i=2; i<=limit; i++)
            if (notCrossed(i))
                crossOutMultiplesOf(i);
    }

```



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```
int determineIterationLimit()
{
    // Every multiple in the array has a prime factor that
    // is less than or equal to the root of the array size,
    // so we don't have to cross out multiples of numbers
    // larger than that root.

    double iterationLimit = sqrt(crossedOut.size());
    return static_cast<int>( iterationLimit );
}

void crossOutMultiplesOf(int i)
{
    for (int multiple = 2*i; multiple < crossedOut.size(); multiple += i)
        crossedOut.at(multiple) = true;
}

bool notCrossed(int i)
{
    return crossedOut.at(i) == false;
}

void putUncrossedIntegersIntoResult()
{
    result.resize( numberOfUncrossedIntegers() );
    for (int j=0, i=2; i<crossedOut.size(); i++)
        if ( notCrossed(i) )
            result.at(j++) = i;
}

int numberOfUncrossedIntegers()
{
    int count = 0;
    for (int i=2; i<crossedOut.size(); i++)
        if ( notCrossed(i) )
            count++;

    return count;
}

};

int main()
{
    PrimeGenerator p, q;
    p.generatePrimes(10);
    p.show();
    q.generatePrimes(15);
    q.show();
    p.generatePrimes(20);
    p.show();

    return 0;
}
```