SHORT QUESTIONS

Q1 2k16

1. Given the following declaration

```
void arrays( int (*a)[3], int (&b)[3] );
```

call the function `arrays` with the arguments

```
int argA[3], argB[3];
```

Sol:

2. What is printed by the following?

```
int array[][2]{1,2,3,4,5,6};
cout << (*(array+1))[2] << endl;
```

Sol:

3. What is printed by the following?

```
bool bv = true;
short sv = 2;
int iv = 1;
cout << (iv < sv && bv) << endl;
```

Sol:

4. What is printed by the following?

```
unsigned int ua = 4, ub = 2;
cout << (ua ^ ub | 1) << endl;
```

Sol:

5. What is printed by the following?

```
char cA[]{"Hello World"};
*(cA+5) = 0;
cout << cA << endl;
```

Sol:

6. What is printed by the following?

```
char abc[]{"abc"};
for ( auto v : abc ) {
  v++;
}
cout << abc << endl;
for ( auto& v : abc ) {
  v++;
}
abc[3] = 0;
cout << abc << endl;
```

Sol:

7. What is printed by the following?

```
int aA[][2]{1,2,3,4,5,6};
int (*ptrA)[2] = aA;
++ptrA;
cout << (*ptrA)[1] << endl;
```

Sol:

8. What is printed by the following?

```
int i=7,j=2;
auto k = i/j;
auto m = i%j;
cout << k << " and " << m << endl;
```

Sol:

9. What is printed by the following?

```
int i = 2;
int& j = i;
auto k = j;
decltype(j) m = j;
--i;
cout << k << endl;
cout << m << endl;
```

Sol:

Q1 2k17

1. Given the following declaration [1]

```
bool copyWord( const char* in, char* out);
```

call the function `copyWord` with the arguments

```
char in[]{"Hello"};
char* out = new char[128]{};
bool result;
```

Sol:

2. What is printed by the following? [1]

```
std::string s;
s+="1x";
s+='2';
s[1] = '0';
cout << s.c_str() << endl;
```

Sol:

3. What is printed by the following? [1]

```
double d = 3.0;
int i = 2;
char c = 1;
double r = d/i+c;
cout << r << endl;
```

Sol:

5. What is printed by the following? [1]

```
int ras = 8;
int rbs = 2;
int rcs = 3;
int rcd = ras >> --rcs << rbs/2;
cout << rcd << endl;
```

Sol:

6. What is printed by the following? [1]

```
int a[]{2,4,6};
int *pA = &a[0];
int **pB = &pA;
++pA;
cout << **pB << endl;
```

Sol:

7. Rewrite the following definition of **a** using auto to define exactly the same type: [1]

```
int x=0;
int &a = x;
```

Sol:

8. Rewrite the following definition of **b** using auto to define exactly the same type: [1]

```
int x=0;
const int *b = &x;
```

Sol:

M 2k13

1. What is the value of a at the end of the following program

```
unsigned int a = 0xFF, b= 0x0F0F;
a ^= b;
```

sol:

3. What is printed by the following program?

```
union Combi {
  int i;
  short s;
};
...
Combi c;
c.i = 0xFF0001;
std::cout << c.s;
```

sol:

4. What is the value of a at the end of this program?

```
int A[][2] = {10,20,30,40};
int (*ptr)[2] = &A[0];
int a = **(++ptr);
```

sol:

5. Given the function declarations below which one will be called by the code (or will the call be in error)?

```
void func(int& i);
int func(const float* f);
float func(double* d);

float f=5.0f;
float g = func(&f);
```

sol:

What is the value of a at the end?

```
float a=3;
float* b = &a;
*b += 1.0f;
b++;
```

Hint a=/=3

Answer: 4

What is the value of A[1][1] at the end?

```
int A[2][2] = { 0, 1, 2, 3};
for (int i=0; i<2; ++i) {
*(*(A+1)+i) += *(*A+1);
```

Answer: 4

What is the value of a at the end?

```
int B[] = {10, 20};
int *ptr = B;
(*ptr)++ += 1.0f;
--ptr;
int& a = B[0];
```

Answer: 12

Given the function declaration. Which one will be called by the code (or will be called in error)?

```
void foo(int);
void foo(float);
void foo(char);

short s=5;
foo(s);
```

Answer: foo(int)

What is the value of res?

```
int a=3;
double b = 2.0;
short c=1;
int res = a/b + c/b;
```

Hint: Not 1

Answer: 2

What is the value of a?

```
int a=3, b=4;
{
int a = b/3;
}
for (int a =0; a<10; ++a){
b += a;
}
++a;
```

Answer: 4

M 2k15

1. What is printed by the following program?

```
int a{2};
bool b{false};
if (a&&b) {
  int c = a&b;
  cout << c << endl;
} else {
  int c = a|b;
  cout << c << endl;
}
```

3. Consider the following two functions:

```
void makePair( int a, int b, int* p) {
            p[0] = a;
            p[1] = b;
}
void makePair( double a, double b, double* p) {
            p[0] = a;
            p[1] = b;
}
```

Define a function template replacing the functions above which can be instantiated correspondingly. For example:

```
int a, b, p[2];
makePairTemp( a, b, p );
double x, y, z[2];
makePairTemp( x, y, z );
```

4. Create a local array (on the stack) of two pointers to integer and then for each of the pointers allocate dynamically an array of 10 integers (on the heap).

5. Given the function declarations below

```
void func(const float a, const float& b, float *c ) {
  cout << "void func( " << a << ", " << b << ", " << *c  << " )" << endl
}
```

Call the above function such that it prints: `void func(1, 2, 3);`

```
float a{1.},b{2.},c{3.};
```

SHORT PROGRAMMING QUESTION

Q1 2k16

1. Mark the illegal access to union variables and indicate which variable was not supposed to be accessed [2]

```
union ShortLong {
  long lVal;
  short sVal;
};

int main() {
  ShortLong SL;
  SL.lVal = 1024L;
  cout << SL.sVal << endl;
  SL.lVal *= SL.sVal;
  SL.sVal = static_cast<short>(1024);
  SL.sVal = ++SL.lVal;
  return;
}
```

2. Complete the function `printEnum` such that it prints the foreground color, e.g., "Black on Black" or "White on Black". [2]

```
enum class Colors {
  White, Black
};

int main() {
  Colors foreground = Colors::White;
  printEnum( foreground );
  return 0;
}


void printEnum( Colors foreground ) {









    cout << " on Black" << endl;
    return;
}
```

3. Complete the function `checkPairs` below to test if a hand of five cards contains a pair (i.e., 2 cards of the same face). If yes return true, otherwise false. [3]

```
enum class Color { Spades, Clubs, Hearts, Diamonds } ;
enum class Face { Seven, Eight, Nine, Ten, Jack, Queen, King, Ace };

struct Card {
  Color color;
  Face face;
};

bool checkPair(Card (&hand)[5]) {
```

Q1 2k17

2. Consider the following definition of the function matrix and the corresponding main routine:

```
int* matrix( int nRows, int nCols ) {
  int *numbers = new int[nRows*nCols];
  int *element = numbers;
  for(int r=0; r<nRows; ++r) {
      for(int c=0; c<nCols; ++c) {
         *(element++) = r*nCols+c;
      }
  }
  return numbers;
}

int main() {
  int nRows, nCols;
  cout << "Number of rows: "; cin >> nRows; cout << endl;
  cout << "Number of cols: "; cin >> nCols; cout << endl;
  auto numbers = matrix(nRows,nCols);
  for(int r=0; r<nRows; ++r) {
      for(int c=0; c<nCols; ++c) {
        cout << numbers[r*nCols+c] << " ";
      }
      cout << endl;
  }
  return 0;
}
```

a. What is printed by the program if the user enters 2 as “number of rows” and 3 as “number of columns”? [1]

PROGRAMMING QUESTIONS

Q1 2k17

Consider the following main program:

```
#include <iostream>
#include <cmath>

using namespace std;

int main() {
  double a[]{ 2.0, -3.0, 2.0 };
  double b[]{ -1.0, -1.0, 2.0, 1.0 };
  print( a, end(a)-begin(a) );
  print( b, end(b)-begin(b) );
  cout << length(a,end(a)-begin(a)) << endl;
  cout << length(b,end(a)-begin(a)) << endl;
  auto c = append( a, end(a)-begin(a), b, end(b)-begin(b));
  print( c, static_cast<size_t>(end(a)-begin(a)) +
            static_cast<size_t>(end(b)-begin(b)));
  return 0;
}
```

Program Output:

```
2 -3 2
-1 -1 2 1
4.12311
2.44949
2 -3 2 -1 -1 2 1
```

---

1. Implement the function `print` [2].

2. Implement the function `length` that calculates the 2-norm or magnitude/length of a vector. The vector length is defined as $|\vec{x}| = \sqrt{x_1^2 + x_2^2 + \cdots + x_n^2}$ [3].

3. Implement the function `append` [4].