



QUIZ

1. What will be the output of the following C application when the development environment uses LITTLE ENDIAN format to store data?

```
#include <stdio.h>

unsigned short int fct(unsigned short int x)
{
    unsigned char * px;
    px = (unsigned char*)&x;

    px[0] = px[0] | 0x02;

    return x;
}

int main()
{
    unsigned short int n = 0x01;

    n = fct(n);
    printf("result = %hu\n", n);

    return 0;
}
```

- a. result = -1
- b. result = 3
- c. result = 4
- d. result = 1

2. What will be the output when the below C application will run?

```
#include <stdio.h>

int main()
{
    char a[] = { 'A', 'B', 'C' };
    char* pa = NULL, * p2a = NULL;

    pa = a;
    p2a = a + (sizeof(a) - 1);
}
```



```
if (p2a == (a + 2))
{
    printf("%c, %c\n", *p2a, a[2]);
}
else
{
    printf("%c, %c\n", *pa, a[0]);
}

return 0;
}
```

- a. C, C
- b. B, A
- c. A, A
- d. C, B

3. What will be the output of the below C application?

```
#include <stdio.h>
#include <string.h>

int main()
{
    char a[] = { 'A', 'B', 0x00, 'C', '\0' };
    char* pa = NULL;

    pa = a;

    printf("array size = %u, string length = %u\n",
           (unsigned int)sizeof(a),
           (unsigned int)strlen((const char*)(pa + 2)));

    return 0;
}
```

- a. array size = 4, string length = 2
- b. array size = 4, string length = 4
- c. array size = 5, string length = 0
- d. array size = 2, string length = 4



4. What will be the output of the below C application?

```
#include <stdio.h>
```

```
int main()
```

```
{
```

```
    char a[] = { 'A', 'B', 'C', '\0', 0x00};
```

```
    int* pa = NULL;
```

```
    pa = (int*)a;
```

```
    printf("%s\n", (char*)pa);
```

```
    return 0;
```

```
}
```

- a. ABC
- b. ABC0
- c. BC
- d. C

5. What will be the output when the below C application will run?

```
#include <stdio.h>
```

```
#include <stdlib.h>
```

```
#include <string.h>
```

```
int main()
```

```
{
```

```
    const char* pa = "-120.34";
```

```
    printf("%.2f\n", (float)atof((const char*)(pa + (strlen(pa) - 3))));
```

```
    return 0;
```

```
}
```

- a. 0.34
- b. 20.34
- c. 0.00
- d. -120.00

6. What will be the output when the below C application will run?

```
#include <stdio.h>
```

```
#include <malloc.h>
```



```
int* f(char x)
{
    int* pa = (int*)&x;
    *pa = x + 10;

    pa = (int*)malloc(sizeof(int));

    return pa;
}

int main()
{
    char a = 65;

    int* pa = f(a);
    *pa = 0;
    if (pa != NULL) free(pa);

    pa = (int*)malloc(sizeof(int));
    *pa = a + 10;

    printf("a = %d\n", (int)a);

    free(pa);

    return 0;
}
```

- a. a = 0
- b. a = 10
- c. a = 75
- d. a = 65

7. What will be the output of the following C application?

```
#include <stdio.h>
#include <string.h>
#include <malloc.h>

void fct(char* s1, char* s2, unsigned int idx)
{
    if (idx > 0)
    {
        fct(s1, s2, idx - 1);
        s1[idx - 1] = s2[idx - 1];
    }
}
```



```
int main()
{
    char string1[] = "string_1";
    const char* str_temp = "string_2";

    char* string2 = (char*)malloc(strlen(str_temp) + 1);
    strcpy(string2, str_temp);

    unsigned int length = (strlen(string1) < strlen(string2)) ?
                          strlen(string1) : sizeof(string2);

    fct(string2, string1, length);

    printf("string1 = %s, string2 = %s\n", string1, string2);

    return 0;
}
```

- a. string1 = string_1, string2 = string_2
- b. string1 = string_1, string2 = string_1
- c. string1 = string_2, string2 = string_2
- d. string1 = string_2, string2 = string_1

8. What will be the output when the below C application will run?

```
#include <stdio.h>

#define COMP(A, B, F) \
    int F(int A, int B) \
    { \
        return (A == B ? A : (B) - (A)); \
    }

COMP(a, b, fct)

int main()
{
    int x = 3, y = 3, z = 10, t = 5;

    printf("result = %d\n", fct(x + y, z + t));

    return 0;
}
```



- a. result = 6
- b. result = 15
- c. result = 18
- d. result = 9

9. What will be the output when the below C application will run?

```
#include <stdio.h>
#include <malloc.h>

int main()
{
    unsigned int x = 2, y = 1;
    int* px = NULL, * py = NULL;

    px = (int*)malloc(x * sizeof(int));
    px[0] = 3;
    px[y] = 5;
    py = px + 1;

    int m = (y * (py - px) * *px) > (x * (*py << 1)) ? x : y;

    printf("\'m = %d\'\'n", m);

    free(px);

    return 0;
}
```

- a. 'm = 1'
- b. 'm = 5'
- c. m = 5
- d. m = 1

10. Consider the following content saved into a file named `Points.txt`:

```
-3, -2, 5, 2
4, 4, -1, -4
```

What will be the output of the following C application?

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
```



```
#define BUFFER_SIZE 256

int main()
{
    FILE* pf = fopen("Points.txt", "r");
    int x1, x2, y1, y2;
    char buffer[BUFFER_SIZE];
    long size = 0;
    unsigned int lines = 0, i;

    memset(buffer, 0x00, BUFFER_SIZE);

    fseek(pf, 0, SEEK_END);
    size = ftell(pf);

    if (size < BUFFER_SIZE)
    {
        fseek(pf, 0, SEEK_SET);
        while (fgets(buffer, BUFFER_SIZE, pf))
        {
            lines += 1;
        }

        fseek(pf, 0, SEEK_SET);
        fread(buffer, size, 1, pf);
        char* token, sep_list[] = "\n";
        token = strtok(buffer, sep_list);

        for (i = 0; i < lines; i++)
        {
            sscanf(token, "%d,%d,%d,%d\n", &x1, &y1, &x2, &y2);

            printf("(x1 + x2) = %d, (y1 + y2) = %d\n",
                (x1 + x2), (y1 + y2));

            token = strtok(NULL, sep_list);
        }
    }

    return 0;
}
```



- a.
 $(x_1 + x_2) = 2, (y_1 + y_2) = 0$
 $(x_1 + x_2) = 3, (y_1 + y_2) = 0$
- b.
 $(x_1 + x_2) = 2, (y_1 + y_2) = 2$
 $(x_1 + x_2) = 3, (y_1 + y_2) = 3$
- c.
 $(x_1 + x_2) = 0, (y_1 + y_2) = 2$
 $(x_1 + x_2) = 0, (y_1 + y_2) = 3$
- d.
 $(x_1 + x_2) = 2, (y_1 + y_2) = 0$
 $(x_1 + x_2) = 0, (y_1 + y_2) = 3$

11. Taking into consideration the following C++ code, what will be the message printed to the console?

```
#include <iostream>

class X
{
    int a; char b; void f() {}
};
class Y {
    int a; virtual void f() {}
};

int main()
{
    X* px = NULL;
    Y* py = NULL;

    std::cout << (sizeof(px) < sizeof(py) ? "Yes" : "No");

    return 0;
}
```

- a. Yes
b. No
c. YesNo
d. 0

12. What will be the output of the following C++ program?

```
#include <iostream>
#include <string>
```



```
using namespace std;

class Student
{
public:
    string name = "John";
};

int main()
{
    Student s;
    Student* ps = &s;
    ps->name[0] = 'X';

    cout << s.name;

    return 0;
}
```

- a. John
- b. Xohn
- c. It will generate compile error(s).
- d. It will generate a runtime error.

13. What will the following C++ code print?

```
#include <iostream>
using namespace std;

class Base
{
public:
    virtual void show() {
        cout << "Base" << endl;
    }
};

class Derived : public Base
{
public:
    void show() {
        cout << "Derived" << endl;
    }
};
```



```
int main()
{
    Base* x = new Base();
    Derived* y = new Derived();

    if(x)
        delete x;

    x = y;
    x->show();

    delete y;
    return 0;
}
```

- a. Base
- b. Derived
- c. BaseDerived
- d. It will generate a runtime error

14. Giving the C++ class S from below, what will be the output of the main function?

```
#include <iostream>
using namespace std;

class S
{
protected:
    string name;
public:
    char operator[](int i) {
        return name[i];
    }
};

int main()
{
    S s;
    s.name = "ABC";
    s[0] = 'C';
    cout << s[1];

    return 0;
}
```



- a. C
- b. B
- c. It will generate compile error(s).
- d. A

15. What method(s) and/or operator(s) will be called to create object named as **b**?

```
#include <iostream>
using namespace std;

class A
{
public:
    void show() {
        cout << "Base" << endl;
    }
};

class B : public A
{
public:
    void show() {
        cout << "Derived" << endl;
    }
};

int main()
{
    B a, b = a;

    return 0;
}
```

- a. Copy constructor from B and implicit cast from A
- b. Copy constructor from A
- c. Copy constructor from B
- d. Operator =

16. What will be the output when the main function is executed?

```
#include <iostream>
using namespace std;

class Base
{
public:
    Base() {
```



```
        cout << "A";
    }
    virtual ~Base() {
        cout << "B";
    }
};

class Derived : public Base
{
public:
    Derived() {
        cout << "X";
    }

    ~Derived() {
        cout << "Y";
    }
};

int main()
{
    Base* b = new Derived();

    return 0;
}
```

- a. AXYB
- b. ABXY
- c. AX
- d. XAYB

17. What will be the output of the following C++ program?

```
#include <iostream>
using namespace std;

class Foo
{
public:
    Foo() { }

    Foo(const Foo& f) {
        cout << "#";
    }

    Foo operator=(Foo f) {
        cout << "@";
    }
}
```



```
        return *this;
    }
};

int main()
{
    Foo f1, f3;
    f3 = f1;

    Foo f2;
    f2 = f3;

    return 0;
}
```

- a. ##@#
- b. #@#
- c. @##@
- d. #@##@#

18. What will be the output of the next C++ program?

```
#include <iostream>
using namespace std;

class Foo
{
public:
    virtual int f() { return 1; }
    virtual int g() { return 5; }
};

class Boo : public Foo
{
public:
    int f() { return 2; }
    int g() { return 6; }
};

int main()
{
    Foo* x = new Foo();
    Boo* y = new Boo();

    if(x) delete x;
    x = y;
}
```



```
cout << x->f() << x->g();
```

```
delete x;
```

```
return 0;
```

```
}
```

a. 16

b. 15

c. 26

d. 25

19. What will be the output of the following C++ implementation?

```
#include <iostream>
using namespace std;
```

```
class Foo
```

```
{
```

```
public:
```

```
    int x = 123;
```

```
};
```

```
int main()
```

```
{
```

```
    Foo f;
```

```
    Foo* pf = &f;
```

```
    (*pf).x = 456;
```

```
    if (f.x == (*pf).x)
```

```
    {
```

```
        cout << "True";
```

```
    }
```

```
    else
```

```
    {
```

```
        cout << "False";
```

```
    }
```

```
    return 0;
```

```
}
```

a. False

b. True

c. It will generate compile error(s).

d. It will generate a runtime error.



20. What feature of Object-Oriented Programming model is not used by the following C++ code?

```
class A
{
    int x;
public:
    void print()
    {
        cout << "Print" << endl;
    }

    virtual void set_y(int in) = 0;
};

class B : public A
{
    int y;
public:
    void set_y(int in)
    {
        y = in;
    }
};
```

- a. Encapsulation
- b. Abstraction
- c. Inheritance
- d. Polymorphism

21. Taking into consideration the following Java sequence, which of the following answers best describe the reason that prevents the code from compiling?

```
class Vehicle {
    private int speed;

    public Vehicle(int speed) {
        this.speed = speed;
    }
    //...
}

class Car extends Vehicle {
    private float price;

    public Car() {
        price = 0;
    }
}
```



```
}  
}
```

- a. Vehicle doesn't have a default constructor
- b. Car shouldn't declare any explicit constructor
- c. the constructor from Car should call this(0) as the first instruction
- d. the constructor from Car should call super(0) as the last instruction

22. What will be the output of the following Java program?

```
public class Main {  
    public static void interchange(String s1, String s2) {  
        String aux = new String(s1);  
        s1 = new String(s2);  
        s2 = aux;  
    }  
  
    public static void main(String[] args) {  
        String a = "Ana";  
        String b = "Bob";  
        interchange(a, b);  
        System.out.print(a + b);  
    }  
}
```

- a. AnaBob
- b. BobAna
- c. compile error
- d. AnaAna

23. Having into consideration the following Java code, which line of code from the main method will return a compile error?

```
class University {  
    public final String name = "ASE";  
    //...  
}  
  
public class Main {  
    public static void main(String[] args) {  
        University university = new University();  
        university.name = "UES"; // (1)  
        university.name = new String("UES"); // (2)  
        university.name = null; // (3)  
    }  
}
```



- a. (1)
- b. (2)
- c. (3)
- d. all three of them

24. Which of the following statements is true considering the following Java program?

```
public class Main {  
    public static void main(String[] args) {  
        int[][] m = {{1, 2}, {3, 4, 5}, {6}};  
        for(int i = 0; i < m.length; i++) {  
            for(int j = 0; j < m[i].length; j++) {  
                System.out.print(m[i][j] + " ");  
            }  
        }  
    }  
}
```

- a. it throws a checked exception
- b. it prints 1 2 3 4 5 6
- c. it throws an unchecked exception
- d. it prints 1 2 3 4 6

25. Being given the following Java code, what will be the console output assuming that all the classes are correctly imported?

```
public class Main {  
    public static int sum(int value1, int value2) {  
        return value1 + value2;  
    }  
  
    public static void main(String[] args) {  
        List<Integer> x = List.of(1, 2, 3, 4);  
        System.out.println(x.stream().reduce(Main::sum).get());  
    }  
}
```

- a. compile error
- b. runtime error
- c. 3
- d. 10



26. Which of the following best describes the concept of functional interfaces in Java?

- a. interfaces that have at most one abstract method
- b. interfaces that have at least one abstract method
- c. interfaces that have exactly one abstract method and any number of default methods
- d. interfaces that have exactly one abstract method and no default methods

27. Given the following Java code, and assuming that all the classes are correctly imported, what will be the actual data type of the variable named day?

```
public class Main {  
    public static void main(String[] args) {  
        Callable c = () -> {  
            List<String> list = List.of("Monday",  
                                       "Tuesday", "Wednesday");  
            return list.get(new Random().nextInt(3));  
        };  
  
        ExecutorService e = Executors.newSingleThreadExecutor();  
        var day = e.submit(c);  
    }  
}
```

- a. it doesn't matter because the code will crash at runtime
- b. String
- c. void
- d. Future<String>

28. What will be the output of the following Java program, assuming that we are using JDK 21 and all the imports are correctly specified?

```
public class Main {  
    public static void main(String[] args) {  
        List<String> names = List.of("Amy", "Bob",  
                                       "Charles", "Daniel");  
        var result = names.stream().filter(x -> x.contains("a"))  
                           .sorted((x, y) -> -x.compareTo(y))  
                           .findFirst().orElse(null);  
        System.out.print(result);  
    }  
}
```



- a. Charles
- b. Daniel
- c. null
- d. Amy

29. What will be the output of the next Java program?

```
public class Main {  
    public static void function() {  
        try {  
            System.out.print("try");  
        } catch (Exception e) {  
            System.out.print("catch");  
        } finally {  
            System.out.print("finally");  
        }  
    }  
  
    public static void main(String[] args) {  
        function();  
    }  
}
```

- a. trycatchfinally
- b. tryfinally
- c. try
- d. trycatch

30. What will be the output of the following Java program (JDK 21)?

```
class Foo implements Closeable {  
    public Foo() {  
        System.out.print("cyber");  
    }  
  
    public void f() {  
        System.out.print("ISM");  
    }  
  
    public void close() {  
        System.out.print("security");  
    }  
}
```



```
public class Main {  
  
    public static void main(String[] args) {  
        try(Foo f = new Foo()) {  
            f.f();  
        } catch (Exception e) {  
            e.printStackTrace();  
        }  
    }  
}
```

- a. ISM
- b. cybersecurityISM
- c. cyberISM
- d. cyberISMsecurity

* Observation: Each question has same number of points.



QUIZ

1. Consider the following content saved into a file named `Points.txt`:

```
-3, -2, 5, 2  
4, 4, -1, -4
```

What will be the output of the following C application?

```
#include <stdio.h>  
#include <stdlib.h>  
#include <string.h>  
  
#define BUFFER_SIZE 256  
  
int main()  
{  
    FILE* pf = fopen("Points.txt", "r");  
    int x1, x2, y1, y2;  
    char buffer[BUFFER_SIZE];  
    long size = 0;  
    unsigned int lines = 0, i;  
  
    memset(buffer, 0x00, BUFFER_SIZE);  
  
    fseek(pf, 0, SEEK_END);  
    size = ftell(pf);  
  
    if (size < BUFFER_SIZE)  
    {  
        fseek(pf, 0, SEEK_SET);  
        while (fgets(buffer, BUFFER_SIZE, pf))  
        {  
            lines += 1;  
        }  
  
        fseek(pf, 0, SEEK_SET);  
        fread(buffer, size, 1, pf);  
        char* token, sep_list[] = "\n";  
        token = strtok(buffer, sep_list);  
  
        for (i = 0; i < lines; i++)  
        {  
            sscanf(token, "%d,%d,%d,%d\n", &x1, &y1, &x2, &y2);
```



```
        printf("(x1 + x2) = %d, (y1 + y2) = %d\n",
               (x1 + x2), (y1 + y2));

        token = strtok(NULL, sep_list);
    }
}

return 0;
}
```

a.

 $(x1 + x2) = 0, (y1 + y2) = 2$ $(x1 + x2) = 0, (y1 + y2) = 3$

b.

 $(x1 + x2) = 2, (y1 + y2) = 2$ $(x1 + x2) = 3, (y1 + y2) = 3$

c.

 $(x1 + x2) = 2, (y1 + y2) = 0$ $(x1 + x2) = 3, (y1 + y2) = 0$

d.

 $(x1 + x2) = 2, (y1 + y2) = 0$ $(x1 + x2) = 0, (y1 + y2) = 3$

2. What will be the output of the following C application?

```
#include <stdio.h>
#include <string.h>
#include <malloc.h>
```

```
void fct(char* s1, char* s2, unsigned int idx)
{
    if (idx > 0)
    {
        fct(s1, s2, idx - 1);
        s1[idx - 1] = s2[idx - 1];
    }
}
```

```
int main()
{
    char string1[] = "string_1";
    const char* str_temp = "string_2";

    char* string2 = (char*)malloc(strlen(str_temp) + 1);
    strcpy(string2, str_temp);
}
```



```
    unsigned int length = (strlen(string1) < strlen(string2)) ?
                          strlen(string1) : sizeof(string2);

    fct(string2, string1, length);

    printf("string1 = %s, string2 = %s\n", string1, string2);

    return 0;
}
```

- a. string1 = string_1, string2 = string_1
- b. string1 = string_1, string2 = string_2
- c. string1 = string_2, string2 = string_2
- d. string1 = string_2, string2 = string_1

3. What will be the output when the below C application will run?

```
#include <stdio.h>

int main()
{
    char a[] = { 'A', 'B', 'C' };
    char* pa = NULL, * p2a = NULL;

    pa = a;
    p2a = a + (sizeof(a) - 1);

    if (p2a == (a + 2))
    {
        printf("%c, %c\n", *p2a, a[2]);
    }
    else
    {
        printf("%c, %c\n", *pa, a[0]);
    }

    return 0;
}
```

- a. C, B
- b. B, A
- c. A, A
- d. C, C



4. What will be the output of the below C application?

```
#include <stdio.h>
#include <string.h>

int main()
{
    char a[] = { 'A', 'B', 0x00, 'C', '\0' };
    char* pa = NULL;

    pa = a;

    printf("array size = %u, string length = %u\n",
           (unsigned int)sizeof(a),
           (unsigned int)strlen((const char*)(pa + 2)));

    return 0;
}
```

- a. array size = 5, string length = 0
- b. array size = 4, string length = 4
- c. array size = 4, string length = 2
- d. array size = 2, string length = 4

5. What will be the output when the below C application will run?

```
#include <stdio.h>
#include <malloc.h>

int main()
{
    unsigned int x = 2, y = 1;
    int* px = NULL, * py = NULL;

    px = (int*)malloc(x * sizeof(int));
    px[0] = 3;
    px[y] = 5;
    py = px + 1;

    int m = (y * (py - px) * *px) > (x * (*py << 1)) ? x : y;

    printf("\'m = %d\'\\n", m);

    free(px);

    return 0;
}
```



- a. 'm = 5'
- b. 'm = 1'
- c. m = 5
- d. m = 1

6. What will be the output of the following C application when the development environment uses LITTLE ENDIAN format to store data?

```
#include <stdio.h>

unsigned short int fct(unsigned short int x)
{
    unsigned char * px;
    px = (unsigned char*)&x;

    px[0] = px[0] | 0x02;

    return x;
}

int main()
{
    unsigned short int n = 0x01;

    n = fct(n);
    printf("result = %hu\n", n);

    return 0;
}
```

- a. result = 3
- b. result = -1
- c. result = 4
- d. result = 1

7. What will be the output when the below C application will run?

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>

int main()
{
    const char* pa = "-120.34";
```



```
printf("%.2f\n", (float)atof((const char*)(pa + (strlen(pa) - 3))));  
return 0;  
}
```

- a. 0.00
- b. 20.34
- c. 0.34
- d. -120.00

8. What will be the output when the below C application will run?

```
#include <stdio.h>  
  
#define COMP(A, B, F) \  
    int F(int A, int B) \  
    { \  
        return (A == B ? A : (B) - (A)); \  
    }  
  
COMP(a, b, fct)  
  
int main()  
{  
    int x = 3, y = 3, z = 10, t = 5;  
  
    printf("result = %d\n", fct(x + y, z + t));  
  
    return 0;  
}
```

- a. result = 6
- b. result = 9
- c. result = 18
- d. result = 15

9. What will be the output when the below C application will run?

```
#include <stdio.h>  
#include <malloc.h>  
  
int* f(char x)  
{  
    int* pa = (int*)&x;
```



```
*pa = x + 10;

pa = (int*)malloc(sizeof(int));

return pa;
}

int main()
{
    char a = 65;

    int* pa = f(a);
    *pa = 0;
    if (pa != NULL) free(pa);

    pa = (int*)malloc(sizeof(int));
    *pa = a + 10;

    printf("a = %d\n", (int)a);

    free(pa);

    return 0;
}
```

- a. a = 65
- b. a = 10
- c. a = 75
- d. a = 0

10. What will be the output of the below C application?

```
#include <stdio.h>
```

```
int main()
{
    char a[] = { 'A', 'B', 'C', '0', 0x00 };
    int* pa = NULL;

    pa = (int*)a;

    printf("%s\n", (char*)pa);

    return 0;
}
```



- a. ABC0
- b. ABC
- c. BC
- d. C

11. What will be the output of the following C++ program?

```
#include <iostream>
#include <string>
using namespace std;

class Student
{
public:
    string name = "John";
};

int main()
{
    Student s;
    Student* ps = &s;
    ps->name[0] = 'X';

    cout << s.name;

    return 0;
}
```

- a. John
- b. It will generate a runtime error.
- c. It will generate compile error(s).
- d. Xohn

12. What will be the output when the main function is executed?

```
#include <iostream>
using namespace std;

class Base
{
public:
    Base() {
        cout << "A";
    }
}
```



```
        virtual ~Base() {
            cout << "B";
        }
};

class Derived : public Base
{
public:
    Derived() {
        cout << "X";
    }

    ~Derived() {
        cout << "Y";
    }
};

int main()
{
    Base* b = new Derived();

    return 0;
}
```

- a. AXYB
- b. ABXY
- c. XAYB
- d. AX

13. What method(s) and/or operator(s) will be called to create object named as **b**?

```
#include <iostream>
using namespace std;

class A
{
public:
    void show() {
        cout << "Base" << endl;
    }
};

class B : public A
{
public:
    void show() {
```



```
        cout << "Derived" << endl;
    }
};

int main()
{
    B a, b = a;

    return 0;
}
```

- a. Copy constructor from B and implicit cast from A
- b. Copy constructor from B
- c. Copy constructor from A
- d. Operator =

14. What will be the output of the following C++ program?

```
#include <iostream>
using namespace std;

class Foo
{
public:
    Foo() { }

    Foo(const Foo& f) {
        cout << "#";
    }

    Foo operator=(Foo f) {
        cout << "@";
        return *this;
    }
};

int main()
{
    Foo f1, f3;
    f3 = f1;

    Foo f2;
    f2 = f3;

    return 0;
}
```



- a. ##@#
- b. #@##@#
- c. @##@
- d. #@#

15. Giving the C++ class S from below, what will be the output of the main function?

```
#include <iostream>
using namespace std;

class S
{
protected:
    string name;
public:
    char operator[](int i) {
        return name[i];
    }
};

int main()
{
    S s;
    s.name = "ABC";
    s[0] = 'C';
    cout << s[1];

    return 0;
}
```

- a. C
- b. It will generate compile error(s).
- c. B
- d. A

16. What will be the output of the following C++ implementation?

```
#include <iostream>
using namespace std;

class Foo
{
public:
    int x = 123;
};
```



```
int main()
{
    Foo f;
    Foo* pf = &f;
    (*pf).x = 456;

    if (f.x == (*pf).x)
    {
        cout << "True";
    }
    else
    {
        cout << "False";
    }

    return 0;
}
```

- a. False
- b. It will generate a runtime error.
- c. It will generate compile error(s).
- d. True

17. What will be the output of the next C++ program?

```
#include <iostream>
using namespace std;

class Foo
{
public:
    virtual int f() { return 1; }
    virtual int g() { return 5; }
};

class Boo : public Foo
{
public:
    int f() { return 2; }
    int g() { return 6; }
};

int main()
{
    Foo* x = new Foo();
    Boo* y = new Boo();
}
```



```
        if(x) delete x;
        x = y;

        cout << x->f() << x->g();

        delete x;
        return 0;
}
```

- a. 16
- b. 15
- c. 25
- d. 26

18. What feature of Object-Oriented Programming model is not used by the following C++ code?

```
class A
{
    int x;
public:
    void print()
    {
        cout << "Print" << endl;
    }

    virtual void set_y(int in) = 0;
};

class B : public A
{
    int y;
public:
    void set_y(int in)
    {
        y = in;
    }
};
```

- a. Encapsulation
- b. Abstraction
- c. Polymorphism
- d. Inheritance



19. What will the following C++ code print?

```
#include <iostream>
using namespace std;

class Base
{
public:
    virtual void show() {
        cout << "Base" << endl;
    }
};

class Derived : public Base
{
public:
    void show() {
        cout << "Derived" << endl;
    }
};

int main()
{
    Base* x = new Base();
    Derived* y = new Derived();

    if(x)
        delete x;

    x = y;
    x->show();

    delete y;
    return 0;
}
```

- a. Base
- b. It will generate a runtime error
- c. BaseDerived
- d. Derived

20. Taking into consideration the following C++ code, what will be the message printed to the console?

```
#include <iostream>
```



```
class X
{
    int a; char b; void f() {}
};
class Y {
    int a; virtual void f() {}
};

int main()
{
    X* px = NULL;
    Y* py = NULL;

    std::cout << (sizeof(px) < sizeof(py) ? "Yes" : "No");

    return 0;
}
```

- a. Yes
- b. YesNo
- c. No
- d. 0

21. Being given the following Java code, what will be the console output assuming that all the classes are correctly imported?

```
public class Main {
    public static int sum(int value1, int value2) {
        return value1 + value2;
    }

    public static void main(String[] args) {
        List<Integer> x = List.of(1, 2, 3, 4);
        System.out.println(x.stream().reduce(Main::sum).get());
    }
}
```

- a. compile error
- b. 10
- c. 3
- d. runtime error

22. Taking into consideration the following Java sequence, which of the following answers best describe the reason that prevents the code from compiling?



```
class Vehicle {  
    private int speed;  
  
    public Vehicle(int speed) {  
        this.speed = speed;  
    }  
    //...  
}
```

```
class Car extends Vehicle {  
    private float price;  
  
    public Car() {  
        price = 0;  
    }  
}
```

- a. Car shouldn't declare any explicit constructor
- b. the constructor from Car should call this(0) as the first instruction
- c. Vehicle doesn't have a default constructor
- d. the constructor from Car should call super(0) as the last instruction

23. Given the following Java code, and assuming that all the classes are correctly imported, what will be the actual data type of the variable named day?

```
public class Main {  
    public static void main(String[] args) {  
        Callable c = () -> {  
            List<String> list = List.of("Monday",  
                                       "Tuesday", "Wednesday");  
            return list.get(new Random().nextInt(3));  
        };  
  
        ExecutorService e = Executors.newSingleThreadExecutor();  
        var day = e.submit(c);  
    }  
}
```

- a. String
- b. void
- c. Future<String>
- d. it doesn't matter because the code will crash at runtime



24. Which of the following statements is true considering the following Java program?

```
public class Main {  
    public static void main(String[] args) {  
        int[][] m = {{1, 2}, {3, 4, 5}, {6}};  
        for(int i = 0; i < m.length; i++) {  
            for(int j = 0; j < m[i].length; j++) {  
                System.out.print(m[i][j] + " ");  
            }  
        }  
    }  
}
```

- a. it prints 1 2 3 4 6
- b. it throws a checked exception
- c. it prints 1 2 3 4 5 6
- d. it throws an unchecked exception

25. What will be the output of the following Java program?

```
public class Main {  
    public static void interchange(String s1, String s2) {  
        String aux = new String(s1);  
        s1 = new String(s2);  
        s2 = aux;  
    }  
  
    public static void main(String[] args) {  
        String a = "Ana";  
        String b = "Bob";  
        interchange(a, b);  
        System.out.print(a + b);  
    }  
}
```

- a. BobAna
- b. AnaAna
- c. AnaBob
- d. compile error

26. Which of the following best describes the concept of functional interfaces in Java?

- a. interfaces that have at most one abstract method
- b. interfaces that have exactly one abstract method and no default methods
- c. interfaces that have at least one abstract method
- d. interfaces that have exactly one abstract method and any number of default methods



27. What will be the output of the following Java program, assuming that we are using JDK 21 and all the imports are correctly specified?

```
public class Main {  
    public static void main(String[] args) {  
        List<String> names = List.of("Amy", "Bob",  
                                     "Charles", "Daniel");  
        var result = names.stream().filter(x -> x.contains("a"))  
                           .sorted((x, y) -> -x.compareTo(y))  
                           .findFirst().orElse(null);  
        System.out.print(result);  
    }  
}
```

- a. Daniel
- b. Charles
- c. null
- d. Amy

28. What will be the output of the next Java program?

```
public class Main {  
    public static void function() {  
        try {  
            System.out.print("try");  
        } catch (Exception e) {  
            System.out.print("catch");  
        } finally {  
            System.out.print("finally");  
        }  
    }  
  
    public static void main(String[] args) {  
        function();  
    }  
}
```

- a. trycatchfinally
- b. try
- c. trycatch
- d. tryfinally



29. What will be the output of the following Java program (JDK 21)?

```
class Foo implements Closeable {
    public Foo() {
        System.out.print("cyber");
    }
    public void f() {
        System.out.print("ISM");
    }
    public void close() {
        System.out.print("security");
    }
}

public class Main {

    public static void main(String[] args) {
        try(Foo f = new Foo()) {
            f.f();
        } catch (Exception e) {
            e.printStackTrace();
        }
    }
}
```

- a. cybersecurityISM
- b. ISM
- c. cyberISMsecurity
- d. cyberISM

30. Having into consideration the following Java code, which line of code from the main method will return a compile error?

```
class University {
    public final String name = "ASE";
    //...
}

public class Main {
    public static void main(String[] args) {
        University university = new University();
        university.name = "UES"; // (1)
        university.name = new String("UES"); // (2)
        university.name = null; // (3)
    }
}
```



-
- a. all three of them
 - b. (3)
 - c. (1)
 - d. (2)

*** Observation: Each question has same number of points.**



QUIZ

1. What will be the output when the below C application will run?

```
#include <stdio.h>
#include <malloc.h>

int main()
{
    unsigned int x = 2, y = 1;
    int* px = NULL, * py = NULL;

    px = (int*)malloc(x * sizeof(int));
    px[0] = 3;
    px[y] = 5;
    py = px + 1;

    int m = (y * (py - px) * *px) > (x * (*py << 1)) ? x : y;

    printf("\'m = %d\'\\n", m);

    free(px);

    return 0;
}
```

- a. m = 5
- b. 'm = 5'
- c. 'm = 1'
- d. m = 1

2. What will be the output of the following C application?

```
#include <stdio.h>
#include <string.h>
#include <malloc.h>

void fct(char* s1, char* s2, unsigned int idx)
{
    if (idx > 0)
    {
        fct(s1, s2, idx - 1);
        s1[idx - 1] = s2[idx - 1];
    }
}
```



```
}

int main()
{
    char string1[] = "string_1";
    const char* str_temp = "string_2";

    char* string2 = (char*)malloc(strlen(str_temp) + 1);
    strcpy(string2, str_temp);

    unsigned int length = (strlen(string1) < strlen(string2)) ?
                          strlen(string1) : sizeof(string2);

    fct(string2, string1, length);

    printf("string1 = %s, string2 = %s\n", string1, string2);

    return 0;
}
```

- a. string1 = string_2, string2 = string_2
- b. string1 = string_1, string2 = string_1
- c. string1 = string_1, string2 = string_2
- d. string1 = string_2, string2 = string_1

3. What will be the output of the below C application?

```
#include <stdio.h>
#include <string.h>

int main()
{
    char a[] = { 'A', 'B', 0x00, 'C', '\0' };
    char* pa = NULL;

    pa = a;

    printf("array size = %u, string length = %u\n",
          (unsigned int)sizeof(a),
          (unsigned int)strlen((const char*)(pa + 2)));

    return 0;
}
```



- a. array size = 5, string length = 0
- b. array size = 4, string length = 4
- c. array size = 4, string length = 2
- d. array size = 2, string length = 4

4. Consider the following content saved into a file named `Points.txt`:

```
-3,-2,5,2
4,4,-1,-4
```

What will be the output of the following C application?

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>

#define BUFFER_SIZE 256

int main()
{
    FILE* pf = fopen("Points.txt", "r");
    int x1, x2, y1, y2;
    char buffer[BUFFER_SIZE];
    long size = 0;
    unsigned int lines = 0, i;

    memset(buffer, 0x00, BUFFER_SIZE);

    fseek(pf, 0, SEEK_END);
    size = ftell(pf);

    if (size < BUFFER_SIZE)
    {
        fseek(pf, 0, SEEK_SET);
        while (fgets(buffer, BUFFER_SIZE, pf))
        {
            lines += 1;
        }

        fseek(pf, 0, SEEK_SET);
        fread(buffer, size, 1, pf);
        char* token, sep_list[] = "\n";
        token = strtok(buffer, sep_list);

        for (i = 0; i < lines; i++)
```



```
{
    sscanf(token, "%d,%d,%d,%d\n", &x1, &y1, &x2, &y2);

    printf("(x1 + x2) = %d, (y1 + y2) = %d\n",
           (x1 + x2), (y1 + y2));

    token = strtok(NULL, sep_list);
}

return 0;
}
```

a.

$(x1 + x2) = 0, (y1 + y2) = 2$

$(x1 + x2) = 0, (y1 + y2) = 3$

b.

$(x1 + x2) = 2, (y1 + y2) = 2$

$(x1 + x2) = 3, (y1 + y2) = 3$

c.

$(x1 + x2) = 2, (y1 + y2) = 0$

$(x1 + x2) = 3, (y1 + y2) = 0$

d.

$(x1 + x2) = 2, (y1 + y2) = 0$

$(x1 + x2) = 0, (y1 + y2) = 3$

5. What will be the output of the below C application?

```
#include <stdio.h>
```

```
int main()
```

```
{
```

```
    char a[] = { 'A', 'B', 'C', '\0', 0x00};
```

```
    int* pa = NULL;
```

```
    pa = (int*)a;
```

```
    printf("%s\n", (char*)pa);
```

```
    return 0;
```

```
}
```

a. ABC

b. C

c. BC

d. ABC0



6. What will be the output when the below C application will run?

```
#include <stdio.h>

#define COMP(A, B, F) \
    int F(int A, int B) \
    { \
        return (A == B ? A : (B) - (A)); \
    }

COMP(a, b, fct)

int main()
{
    int x = 3, y = 3, z = 10, t = 5;

    printf("result = %d\n", fct(x + y, z + t));

    return 0;
}
```

- a. result = 6
- b. result = 9
- c. result = 18
- d. result = 15

7. What will be the output when the below C application will run?

```
#include <stdio.h>
#include <malloc.h>

int* f(char x)
{
    int* pa = (int*)&x;
    *pa = x + 10;

    pa = (int*)malloc(sizeof(int));

    return pa;
}

int main()
{
    char a = 65;
```



```
int* pa = f(a);
*pa = 0;
if (pa != NULL) free(pa);

pa = (int*)malloc(sizeof(int));
*pa = a + 10;

printf("a = %d\n", (int)a);

free(pa);

return 0;
}
```

- a. a = 0
- b. a = 65
- c. a = 75
- d. a = 10

8. What will be the output when the below C application will run?

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>

int main()
{
    const char* pa = "-120.34";

    printf("%.2f\n", (float)atof((const char*)(pa + (strlen(pa) - 3))));

    return 0;
}
```

- a. 0.34
- b. 20.34
- c. 0.00
- d. -120.00

9. What will be the output when the below C application will run?

```
#include <stdio.h>

int main()
{
```



```
char a[] = { 'A', 'B', 'C' };
char* pa = NULL, * p2a = NULL;

pa = a;
p2a = a + (sizeof(a) - 1);

if (p2a == (a + 2))
{
    printf("%c, %c\n", *p2a, a[2]);
}
else
{
    printf("%c, %c\n", *pa, a[0]);
}

return 0;
}
```

- a. B, A
- b. C, C
- c. A, A
- d. C, B

10. What will be the output of the following C application when the development environment uses LITTLE ENDIAN format to store data?

```
#include <stdio.h>

unsigned short int fct(unsigned short int x)
{
    unsigned char * px;
    px = (unsigned char*)&x;

    px[0] = px[0] | 0x02;

    return x;
}

int main()
{
    unsigned short int n = 0x01;

    n = fct(n);
    printf("result = %hu\n", n);

    return 0;
}
```



- a. result = 3
- b. result = -1
- c. result = 4
- d. result = 1

11. What will be the output of the following C++ program?

```
#include <iostream>
using namespace std;

class Foo
{
public:
    Foo() { }

    Foo(const Foo& f) {
        cout << "#";
    }

    Foo operator=(Foo f) {
        cout << "@";
        return *this;
    }
};

int main()
{
    Foo f1, f3;
    f3 = f1;

    Foo f2;
    f2 = f3;

    return 0;
}
```

- a. #@##@#
- b. #@#
- c. @##@
- d. ##@#



12. What method(s) and/or operator(s) will be called to create object named as **b**?

```
#include <iostream>
using namespace std;

class A
{
public:
    void show() {
        cout << "Base" << endl;
    }
};

class B : public A
{
public:
    void show() {
        cout << "Derived" << endl;
    }
};

int main()
{
    B a, b = a;

    return 0;
}
```

- a. Copy constructor from B and implicit cast from A
- b. Copy constructor from A
- c. Operator =
- d. Copy constructor from B

13. Taking into consideration the following C++ code, what will be the message printed to the console?

```
#include <iostream>

class X
{
    int a; char b; void f() {}
};

class Y {
    int a; virtual void f() {}
};
```



```
int main()
{
    X* px = NULL;
    Y* py = NULL;

    std::cout << (sizeof(px) < sizeof(py) ? "Yes" : "No");

    return 0;
}
```

- a. No
- b. Yes
- c. YesNo
- d. 0

14. Giving the C++ class S from below, what will be the output of the main function?

```
#include <iostream>
using namespace std;

class S
{
protected:
    string name;
public:
    char operator[](int i) {
        return name[i];
    }
};

int main()
{
    S s;
    s.name = "ABC";
    s[0] = 'C';
    cout << s[1];

    return 0;
}
```

- a. C
- b. B
- c. A
- d. It will generate compile error(s).



15. What will be the output of the following C++ implementation?

```
#include <iostream>
using namespace std;

class Foo
{
public:
    int x = 123;
};

int main()
{
    Foo f;
    Foo* pf = &f;
    (*pf).x = 456;

    if (f.x == (*pf).x)
    {
        cout << "True";
    }
    else
    {
        cout << "False";
    }

    return 0;
}
```

- a. True
- b. False
- c. It will generate compile error(s).
- d. It will generate a runtime error.

16. What will the following C++ code print?

```
#include <iostream>
using namespace std;

class Base
{
public:
    virtual void show() {
        cout << "Base" << endl;
    }
};
```



```
class Derived : public Base
{
public:
    void show() {
        cout << "Derived" << endl;
    }
};

int main()
{
    Base* x = new Base();
    Derived* y = new Derived();

    if(x)
        delete x;

    x = y;
    x->show();

    delete y;
    return 0;
}
```

- a. Base
- b. BaseDerived
- c. Derived
- d. It will generate a runtime error

17. What feature of Object-Oriented Programming model is not used by the following C++ code?

```
class A
{
    int x;
public:
    void print()
    {
        cout << "Print" << endl;
    }

    virtual void set_y(int in) = 0;
};
```



```
class B : public A
{
    int y;
public:
    void set_y(int in)
    {
        y = in;
    }
};
```

- a. Encapsulation
- b. Abstraction
- c. Polymorphism
- d. Inheritance

18. What will be the output of the next C++ program?

```
#include <iostream>
using namespace std;

class Foo
{
public:
    virtual int f() { return 1; }
    virtual int g() { return 5; }
};

class Boo : public Foo
{
public:
    int f() { return 2; }
    int g() { return 6; }
};

int main()
{
    Foo* x = new Foo();
    Boo* y = new Boo();

    if(x) delete x;
    x = y;

    cout << x->f() << x->g();

    delete x;
    return 0;
}
```



- a. 16
- b. 26
- c. 15
- d. 25

19. What will be the output of the following C++ program?

```
#include <iostream>
#include <string>
using namespace std;

class Student
{
public:
    string name = "John";
};

int main()
{
    Student s;
    Student* ps = &s;
    ps->name[0] = 'X';

    cout << s.name;

    return 0;
}
```

- a. John
- b. It will generate compile error(s).
- c. Xohn
- d. It will generate a runtime error.

20. What will be the output when the main function is executed?

```
#include <iostream>
using namespace std;

class Base
{
public:
    Base() {
        cout << "A";
    }
}
```



```
virtual ~Base() {
    cout << "B";
}

};

class Derived : public Base
{
public:
    Derived() {
        cout << "X";
    }

    ~Derived() {
        cout << "Y";
    }
};

int main()
{
    Base* b = new Derived();

    return 0;
}
```

- a. AXYB
- b. AX
- c. ABXY
- d. XAYB

21. Which of the following statements is true considering the following Java program?

```
public class Main {
    public static void main(String[] args) {
        int[][] m = {{1, 2}, {3, 4, 5}, {6}};
        for(int i = 0; i < m.length; i++) {
            for(int j = 0; j < m[i].length; j++) {
                System.out.print(m[i][j] + " ");
            }
        }
    }
}
```

- a. it throws a checked exception
- b. it throws an unchecked exception
- c. it prints 1 2 3 4 5 6
- d. it prints 1 2 3 4 6



22. What will be the output of the next Java program?

```
public class Main {  
    public static void function() {  
        try {  
            System.out.print("try");  
        } catch (Exception e) {  
            System.out.print("catch");  
        } finally {  
            System.out.print("finally");  
        }  
    }  
  
    public static void main(String[] args) {  
        function();  
    }  
}
```

- a. try
- b. tryfinally
- c. trycatchfinally
- d. trycatch

23. Taking into consideration the following Java sequence, which of the following answers best describe the reason that prevents the code from compiling?

```
class Vehicle {  
    private int speed;  
  
    public Vehicle(int speed) {  
        this.speed = speed;  
    }  
    //...  
}  
  
class Car extends Vehicle {  
    private float price;  
  
    public Car() {  
        price = 0;  
    }  
}
```



- a. Vehicle doesn't have a default constructor
- b. Car shouldn't declare any explicit constructor
- c. the constructor from Car should call this(0) as the first instruction
- d. the constructor from Car should call super(0) as the last instruction

24. Being given the following Java code, what will be the console output assuming that all the classes are correctly imported?

```
public class Main {  
    public static int sum(int value1, int value2) {  
        return value1 + value2;  
    }  
  
    public static void main(String[] args) {  
        List<Integer> x = List.of(1, 2, 3, 4);  
        System.out.println(x.stream().reduce(Main::sum).get());  
    }  
}
```

- a. compile error
- b. 3
- c. runtime error
- d. 10

25. What will be the output of the following Java program (JDK 21)?

```
class Foo implements Closeable {  
    public Foo() {  
        System.out.print("cyber");  
    }  
  
    public void f() {  
        System.out.print("ISM");  
    }  
  
    public void close() {  
        System.out.print("security");  
    }  
}  
  
public class Main {  
  
    public static void main(String[] args) {  
        try(Foo f = new Foo()) {  
            f.f();  
        } catch (Exception e) {  
            e.printStackTrace();  
        }  
    }  
}
```



```
    }  
  }  
}
```

- a. cyberISM
- b. ISM
- c. cybersecurityISM
- d. cyberISMsecurity

26. What will be the output of the following Java program?

```
public class Main {  
    public static void interchange(String s1, String s2) {  
        String aux = new String(s1);  
        s1 = new String(s2);  
        s2 = aux;  
    }  
  
    public static void main(String[] args) {  
        String a = "Ana";  
        String b = "Bob";  
        interchange(a, b);  
        System.out.print(a + b);  
    }  
}
```

- a. AnaBob
- b. AnaAna
- c. BobAna
- d. compile error

27. Having into consideration the following Java code, which line of code from the main method will return a compile error?

```
class University {  
    public final String name = "ASE";  
    //...  
}  
  
public class Main {  
    public static void main(String[] args) {  
        University university = new University();  
        university.name = "UES"; // (1)  
        university.name = new String("UES"); // (2)  
        university.name = null; // (3)  
    }  
}
```



```
}  
}
```

- a. all three of them
- b. (2)
- c. (1)
- d. (3)

28. Which of the following best describes the concept of functional interfaces in Java?

- a. interfaces that have at most one abstract method
- b. interfaces that have exactly one abstract method and any number of default methods
- c. interfaces that have at least one abstract method
- d. interfaces that have exactly one abstract method and no default methods

29. Given the following Java code, and assuming that all the classes are correctly imported, what will be the actual data type of the variable named day?

```
public class Main {  
    public static void main(String[] args) {  
        Callable c = () -> {  
            List<String> list = List.of("Monday",  
                                       "Tuesday", "Wednesday");  
            return list.get(new Random().nextInt(3));  
        };  
  
        ExecutorService e = Executors.newSingleThreadExecutor();  
        var day = e.submit(c);  
    }  
}
```

- a. it doesn't matter because the code will crash at runtime
- b. void
- c. String
- d. Future<String>

30. What will be the output of the following Java program, assuming that we are using JDK 21 and all the imports are correctly specified?

```
public class Main {  
    public static void main(String[] args) {  
        List<String> names = List.of("Amy", "Bob",  
                                     "Charles", "Daniel");  
    }  
}
```



```
var result = names.stream().filter(x -> x.contains("a"))
                        .sorted((x, y) -> -x.compareTo(y))
                        .findFirst().orElse(null);

System.out.print(result);
    }
}
```

- a. null
- b. Charles
- c. Daniel
- d. Amy

* Observation: Each question has same number of points.



QUIZ

1. What will be the output when the below C application will run?

```
#include <stdio.h>

#define COMP(A, B, F) \
    int F(int A, int B) \
    { \
        return (A == B ? A : (B) - (A)); \
    }

COMP(a, b, fct)

int main()
{
    int x = 3, y = 3, z = 10, t = 5;

    printf("result = %d\n", fct(x + y, z + t));

    return 0;
}
```

- a. result = 9
- b. result = 15
- c. result = 18
- d. result = 6

2. What will be the output of the below C application?

```
#include <stdio.h>

int main()
{
    char a[] = { 'A', 'B', 'C', '0', 0x00 };
    int* pa = NULL;

    pa = (int*)a;

    printf("%s\n", (char*)pa);

    return 0;
}
```



- a. ABC
- b. C
- c. BC
- d. ABC0

3. What will be the output of the following C application?

```
#include <stdio.h>
#include <string.h>
#include <malloc.h>

void fct(char* s1, char* s2, unsigned int idx)
{
    if (idx > 0)
    {
        fct(s1, s2, idx - 1);
        s1[idx - 1] = s2[idx - 1];
    }
}

int main()
{
    char string1[] = "string_1";
    const char* str_temp = "string_2";

    char* string2 = (char*)malloc(strlen(str_temp) + 1);
    strcpy(string2, str_temp);

    unsigned int length = (strlen(string1) < strlen(string2)) ?
                          strlen(string1) : sizeof(string2);

    fct(string2, string1, length);

    printf("string1 = %s, string2 = %s\n", string1, string2);

    return 0;
}
```

- a. string1 = string_2, string2 = string_1
- b. string1 = string_1, string2 = string_1
- c. string1 = string_2, string2 = string_2
- d. string1 = string_1, string2 = string_2



4. What will be the output of the below C application?

```
#include <stdio.h>
#include <string.h>

int main()
{
    char a[] = { 'A', 'B', 0x00, 'C', '\0' };
    char* pa = NULL;

    pa = a;

    printf("array size = %u, string length = %u\n",
           (unsigned int)sizeof(a),
           (unsigned int)strlen((const char*)(pa + 2)));

    return 0;
}
```

- a. array size = 4, string length = 2
- b. array size = 4, string length = 4
- c. array size = 2, string length = 4
- d. array size = 5, string length = 0

5. What will be the output when the below C application will run?

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>

int main()
{
    const char* pa = "-120.34";

    printf("%.2f\n", (float)atof((const char*)(pa + (strlen(pa) - 3))));

    return 0;
}
```

- a. 0.00
- b. 20.34
- c. 0.34
- d. -120.00



6. What will be the output when the below C application will run?

```
#include <stdio.h>
#include <malloc.h>

int main()
{
    unsigned int x = 2, y = 1;
    int* px = NULL, * py = NULL;

    px = (int*)malloc(x * sizeof(int));
    px[0] = 3;
    px[y] = 5;
    py = px + 1;

    int m = (y * (py - px) * *px) > (x * (*py << 1)) ? x : y;

    printf("\'m = %d\\'\\n", m);

    free(px);

    return 0;
}
```

- a. m = 1
- b. 'm = 5'
- c. m = 5
- d. 'm = 1'

7. What will be the output when the below C application will run?

```
#include <stdio.h>

int main()
{
    char a[] = { 'A', 'B', 'C' };
    char* pa = NULL, * p2a = NULL;

    pa = a;
    p2a = a + (sizeof(a) - 1);

    if (p2a == (a + 2))
    {
        printf("%c, %c\\n", *p2a, a[2]);
    }
    else
```



```
{  
    printf("%c, %c\n", *pa, a[0]);  
}  
  
return 0;  
}
```

- a. B, A
- b. C, C
- c. A, A
- d. C, B

8. What will be the output when the below C application will run?

```
#include <stdio.h>  
#include <malloc.h>  
  
int* f(char x)  
{  
    int* pa = (int*)&x;  
    *pa = x + 10;  
  
    pa = (int*)malloc(sizeof(int));  
  
    return pa;  
}  
  
int main()  
{  
    char a = 65;  
  
    int* pa = f(a);  
    *pa = 0;  
    if (pa != NULL) free(pa);  
  
    pa = (int*)malloc(sizeof(int));  
    *pa = a + 10;  
  
    printf("a = %d\n", (int)a);  
  
    free(pa);  
  
    return 0;  
}
```



- a. a = 0
- b. a = 65
- c. a = 75
- d. a = 10

9. What will be the output of the following C application when the development environment uses LITTLE ENDIAN format to store data?

```
#include <stdio.h>

unsigned short int fct(unsigned short int x)
{
    unsigned char * px;
    px = (unsigned char*)&x;

    px[0] = px[0] | 0x02;

    return x;
}

int main()
{
    unsigned short int n = 0x01;

    n = fct(n);
    printf("result = %hu\n", n);

    return 0;
}
```

- a. result = 3
- b. result = -1
- c. result = 4
- d. result = 1

10. Consider the following content saved into a file named `Points.txt`:

```
-3, -2, 5, 2
4, 4, -1, -4
```

What will be the output of the following C application?

```
#include <stdio.h>
#include <stdlib.h>
```



```
#include <string.h>

#define BUFFER_SIZE 256

int main()
{
    FILE* pf = fopen("Points.txt", "r");
    int x1, x2, y1, y2;
    char buffer[BUFFER_SIZE];
    long size = 0;
    unsigned int lines = 0, i;

    memset(buffer, 0x00, BUFFER_SIZE);

    fseek(pf, 0, SEEK_END);
    size = ftell(pf);

    if (size < BUFFER_SIZE)
    {
        fseek(pf, 0, SEEK_SET);
        while (fgets(buffer, BUFFER_SIZE, pf))
        {
            lines += 1;
        }

        fseek(pf, 0, SEEK_SET);
        fread(buffer, size, 1, pf);
        char* token, sep_list[] = "\n";
        token = strtok(buffer, sep_list);

        for (i = 0; i < lines; i++)
        {
            sscanf(token, "%d,%d,%d,%d\n", &x1, &y1, &x2, &y2);

            printf("(x1 + x2) = %d, (y1 + y2) = %d\n",
                (x1 + x2), (y1 + y2));

            token = strtok(NULL, sep_list);
        }
    }

    return 0;
}
```



a.

$$(x_1 + x_2) = 2, (y_1 + y_2) = 0$$

$$(x_1 + x_2) = 0, (y_1 + y_2) = 3$$

b.

$$(x_1 + x_2) = 2, (y_1 + y_2) = 2$$

$$(x_1 + x_2) = 3, (y_1 + y_2) = 3$$

c.

$$(x_1 + x_2) = 0, (y_1 + y_2) = 2$$

$$(x_1 + x_2) = 0, (y_1 + y_2) = 3$$

d.

$$(x_1 + x_2) = 2, (y_1 + y_2) = 0$$

$$(x_1 + x_2) = 3, (y_1 + y_2) = 0$$

11. Taking into consideration the following C++ code, what will be the message printed to the console?

```
#include <iostream>
```

```
class X
```

```
{
```

```
    int a; char b; void f() {}
```

```
};
```

```
class Y {
```

```
    int a; virtual void f() {}
```

```
};
```

```
int main()
```

```
{
```

```
    X* px = NULL;
```

```
    Y* py = NULL;
```

```
    std::cout << (sizeof(px) < sizeof(py) ? "Yes" : "No");
```

```
    return 0;
```

```
}
```

a. Yes

b. 0

c. YesNo

d. No

12. What will the following C++ code print?

```
#include <iostream>
```

```
using namespace std;
```



```
class Base
{
public:
    virtual void show() {
        cout << "Base" << endl;
    }
};

class Derived : public Base
{
public:
    void show() {
        cout << "Derived" << endl;
    }
};

int main()
{
    Base* x = new Base();
    Derived* y = new Derived();

    if(x)
        delete x;

    x = y;
    x->show();

    delete y;
    return 0;
}
```

- a. Derived
- b. Base
- c. BaseDerived
- d. It will generate a runtime error

13. What will be the output when the main function is executed?

```
#include <iostream>
using namespace std;

class Base
{
public:
    Base() {
        cout << "A";
    }
};
```



```
    }
    virtual ~Base() {
        cout << "B";
    }
};

class Derived : public Base
{
public:
    Derived() {
        cout << "X";
    }

    ~Derived() {
        cout << "Y";
    }
};

int main()
{
    Base* b = new Derived();

    return 0;
}
```

- a. AXYB
- b. ABXY
- c. XAYB
- d. AX

14. Giving the C++ class S from below, what will be the output of the main function?

```
#include <iostream>
using namespace std;

class S
{
protected:
    string name;
public:
    char operator[](int i) {
        return name[i];
    }
};
```



```
int main()
{
    S s;
    s.name = "ABC";
    s[0] = 'C';
    cout << s[1];

    return 0;
}
```

- a. It will generate compile error(s).
- b. B
- c. C
- d. A

15. What feature of Object-Oriented Programming model is not used by the following C++ code?

```
class A
{
    int x;
public:
    void print()
    {
        cout << "Print" << endl;
    }

    virtual void set_y(int in) = 0;
};

class B : public A
{
    int y;
public:
    void set_y(int in)
    {
        y = in;
    }
};
```

- a. Encapsulation
- b. Polymorphism
- c. Inheritance
- d. Abstraction



16. What will be the output of the following C++ implementation?

```
#include <iostream>
using namespace std;

class Foo
{
public:
    int x = 123;
};

int main()
{
    Foo f;
    Foo* pf = &f;
    (*pf).x = 456;

    if (f.x == (*pf).x)
    {
        cout << "True";
    }
    else
    {
        cout << "False";
    }

    return 0;
}
```

- a. False
- b. It will generate compile error(s).
- c. True
- d. It will generate a runtime error.

17. What will be the output of the following C++ program?

```
#include <iostream>
#include <string>
using namespace std;

class Student
{
public:
    string name = "John";
};
```



```
int main()
{
    Student s;
    Student* ps = &s;
    ps->name[0] = 'X';

    cout << s.name;

    return 0;
}
```

- a. John
- b. It will generate a runtime error.
- c. It will generate compile error(s).
- d. Xohn

18. What method(s) and/or operator(s) will be called to create object named as **b**?

```
#include <iostream>
using namespace std;

class A
{
public:
    void show() {
        cout << "Base" << endl;
    }
};

class B : public A
{
public:
    void show() {
        cout << "Derived" << endl;
    }
};

int main()
{
    B a, b = a;

    return 0;
}
```



- a. Copy constructor from B and implicit cast from A
- b. Copy constructor from B
- c. Copy constructor from A
- d. Operator =

19. What will be the output of the next C++ program?

```
#include <iostream>
using namespace std;

class Foo
{
public:
    virtual int f() { return 1; }
    virtual int g() { return 5; }
};

class Boo : public Foo
{
public:
    int f() { return 2; }
    int g() { return 6; }
};

int main()
{
    Foo* x = new Foo();
    Boo* y = new Boo();

    if(x) delete x;
    x = y;

    cout << x->f() << x->g();

    delete x;
    return 0;
}
```

- a. 16
- b. 15
- c. 25
- d. 26



20. What will be the output of the following C++ program?

```
#include <iostream>
using namespace std;

class Foo
{
public:
    Foo() { }

    Foo(const Foo& f) {
        cout << "#";
    }

    Foo operator=(Foo f) {
        cout << "@";
        return *this;
    }
};

int main()
{
    Foo f1, f3;
    f3 = f1;

    Foo f2;
    f2 = f3;

    return 0;
}
```

- a. ##@#
- b. #@##@#
- c. @##@
- d. #@#

21. Having into consideration the following Java code, which line of code from the main method will return a compile error?

```
class University {
    public final String name = "ASE";
    //...
}
```



```
public class Main {  
    public static void main(String[] args) {  
        University university = new University();  
        university.name = "UES"; // (1)  
        university.name = new String("UES"); // (2)  
        university.name = null; // (3)  
    }  
}
```

- a. all three of them
- b. (1)
- c. (3)
- d. (2)

22. Taking into consideration the following Java sequence, which of the following answers best describe the reason that prevents the code from compiling?

```
class Vehicle {  
    private int speed;  
  
    public Vehicle(int speed) {  
        this.speed = speed;  
    }  
    //...  
}
```

```
class Car extends Vehicle {  
    private float price;  
  
    public Car() {  
        price = 0;  
    }  
}
```

- a. Vehicle doesn't have a default constructor
- b. the constructor from Car should call super(0) as the last instruction
- c. Car shouldn't declare any explicit constructor
- d. the constructor from Car should call this(0) as the first instruction

23. Given the following Java code, and assuming that all the classes are correctly imported, what will be the actual data type of the variable named day?

```
public class Main {  
    public static void main(String[] args) {  
        Callable c = () -> {  
            List<String> list = List.of("Monday",  
                                       "Tuesday", "Wednesday");  
        }  
    }  
}
```



```
        return list.get(new Random().nextInt(3));
    };

    ExecutorService e = Executors.newSingleThreadExecutor();
    var day = e.submit(c);
}
}
```

- a. void
- b. it doesn't matter because the code will crash at runtime
- c. String
- d. Future<String>

24. What will be the output of the next Java program?

```
public class Main {
    public static void function() {
        try {
            System.out.print("try");
        } catch (Exception e) {
            System.out.print("catch");
        } finally {
            System.out.print("finally");
        }
    }

    public static void main(String[] args) {
        function();
    }
}
```

- a. tryfinally
- b. trycatchfinally
- c. try
- d. trycatch

25. What will be the output of the following Java program?

```
public class Main {
    public static void interchange(String s1, String s2) {
        String aux = new String(s1);
        s1 = new String(s2);
        s2 = aux;
    }
}
```



```
public static void main(String[] args) {  
    String a = "Ana";  
    String b = "Bob";  
    interchange(a, b);  
    System.out.print(a + b);  
}  
}
```

- a. BobAna
- b. AnaBob
- c. compile error
- d. AnaAna

26. Which of the following statements is true considering the following Java program?

```
public class Main {  
    public static void main(String[] args) {  
        int[][] m = {{1, 2}, {3, 4, 5}, {6}};  
        for(int i = 0; i < m.length; i++) {  
            for(int j = 0; j < m[i].length; j++) {  
                System.out.print(m[i][j] + " ");  
            }  
        }  
    }  
}
```

- a. it throws an unchecked exception
- b. it prints 1 2 3 4 6
- c. it prints 1 2 3 4 5 6
- d. it throws a checked exception

27. What will be the output of the following Java program (JDK 21)?

```
class Foo implements Closeable {  
    public Foo() {  
        System.out.print("cyber");  
    }  
  
    public void f() {  
        System.out.print("ISM");  
    }  
  
    public void close() {  
        System.out.print("security");  
    }  
}
```



```
public class Main {  
    public static void main(String[] args) {  
        try(Foo f = new Foo()) {  
            f.f();  
        } catch (Exception e) {  
            e.printStackTrace();  
        }  
    }  
}
```

- a. cybersecurityISM
- b. cyberISMsecurity
- c. cyberISM
- d. ISM

28. Being given the following Java code, what will be the console output assuming that all the classes are correctly imported?

```
public class Main {  
    public static int sum(int value1, int value2) {  
        return value1 + value2;  
    }  
  
    public static void main(String[] args) {  
        List<Integer> x = List.of(1, 2, 3, 4);  
        System.out.println(x.stream().reduce(Main::sum).get());  
    }  
}
```

- a. 3
- b. compile error
- c. runtime error
- d. 10

29. Which of the following best describes the concept of functional interfaces in Java?

- a. interfaces that have at most one abstract method
- b. interfaces that have at least one abstract method
- c. interfaces that have exactly one abstract method and no default methods
- d. interfaces that have exactly one abstract method and any number of default methods



30. What will be the output of the following Java program, assuming that we are using JDK 21 and all the imports are correctly specified?

```
public class Main {  
    public static void main(String[] args) {  
        List<String> names = List.of("Amy", "Bob",  
                                     "Charles", "Daniel");  
        var result = names.stream().filter(x -> x.contains("a"))  
                           .sorted((x, y) -> -x.compareTo(y))  
                           .findFirst().orElse(null);  
        System.out.print(result);  
    }  
}
```

- a. Daniel
- b. null
- c. Amy
- d. Charles

* Observation: Each question has same number of points.



QUIZ

1. What will be the output of the following C application when the development environment uses LITTLE ENDIAN format to store data?

```
#include <stdio.h>

unsigned short int fct(unsigned short int x)
{
    unsigned char * px;
    px = (unsigned char*)&x;

    px[0] = px[0] | 0x02;

    return x;
}

int main()
{
    unsigned short int n = 0x01;

    n = fct(n);
    printf("result = %hu\n", n);

    return 0;
}
```

- a. result = -1
- b. result = 4
- c. result = 3
- d. result = 1

2. What will be the output of the below C application?

```
#include <stdio.h>

int main()
{
    char a[] = { 'A', 'B', 'C', '\0', 0x00 };
    int* pa = NULL;

    pa = (int*)a;
```



```
printf("%s\n", (char*)pa);
```

```
return 0;
```

```
}
```

- a. ABC
- b. BC
- c. ABCO
- d. C

3. What will be the output of the following C application?

```
#include <stdio.h>
#include <string.h>
#include <malloc.h>
```

```
void fct(char* s1, char* s2, unsigned int idx)
{
    if (idx > 0)
    {
        fct(s1, s2, idx - 1);
        s1[idx - 1] = s2[idx - 1];
    }
}
```

```
int main()
{
    char string1[] = "string_1";
    const char* str_temp = "string_2";

    char* string2 = (char*)malloc(strlen(str_temp) + 1);
    strcpy(string2, str_temp);

    unsigned int length = (strlen(string1) < strlen(string2)) ?
                           strlen(string1) : sizeof(string2);

    fct(string2, string1, length);

    printf("string1 = %s, string2 = %s\n", string1, string2);

    return 0;
}
```

- a. string1 = string_1, string2 = string_1
- b. string1 = string_1, string2 = string_2
- c. string1 = string_2, string2 = string_2
- d. string1 = string_2, string2 = string_1



4. What will be the output when the below C application will run?

```
#include <stdio.h>
#include <malloc.h>

int main()
{
    unsigned int x = 2, y = 1;
    int* px = NULL, * py = NULL;

    px = (int*)malloc(x * sizeof(int));
    px[0] = 3;
    px[y] = 5;
    py = px + 1;

    int m = (y * (py - px) * *px) > (x * (*py << 1)) ? x : y;

    printf("\'m = %d\'\\n", m);

    free(px);

    return 0;
}
```

- a. 'm = 5'
- b. 'm = 1'
- c. m = 5
- d. m = 1

5. What will be the output of the below C application?

```
#include <stdio.h>
#include <string.h>

int main()
{
    char a[] = { 'A', 'B', 0x00, 'C', '\\0' };
    char* pa = NULL;

    pa = a;

    printf("array size = %u, string length = %u\\n",
           (unsigned int)sizeof(a),
           (unsigned int)strlen((const char*)(pa + 2)));

    return 0;
}
```



}

- a. array size = 4, string length = 2
- b. array size = 4, string length = 4
- c. array size = 2, string length = 4
- d. array size = 5, string length = 0

6. What will be the output when the below C application will run?

```
#include <stdio.h>

#define COMP(A, B, F) \
    int F(int A, int B) \
    { \
        return (A == B ? A : (B) - (A)); \
    }

COMP(a, b, fct)

int main()
{
    int x = 3, y = 3, z = 10, t = 5;

    printf("result = %d\n", fct(x + y, z + t));

    return 0;
}
```

- a. result = 6
- b. result = 15
- c. result = 18
- d. result = 9

7. Consider the following content saved into a file named `Points.txt`:

```
-3, -2, 5, 2
4, 4, -1, -4
```

What will be the output of the following C application?

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>

#define BUFFER_SIZE 256
```



```
int main()
{
    FILE* pf = fopen("Points.txt", "r");
    int x1, x2, y1, y2;
    char buffer[BUFFER_SIZE];
    long size = 0;
    unsigned int lines = 0, i;

    memset(buffer, 0x00, BUFFER_SIZE);

    fseek(pf, 0, SEEK_END);
    size = ftell(pf);

    if (size < BUFFER_SIZE)
    {
        fseek(pf, 0, SEEK_SET);
        while (fgets(buffer, BUFFER_SIZE, pf))
        {
            lines += 1;
        }

        fseek(pf, 0, SEEK_SET);
        fread(buffer, size, 1, pf);
        char* token, sep_list[] = "\n";
        token = strtok(buffer, sep_list);

        for (i = 0; i < lines; i++)
        {
            sscanf(token, "%d,%d,%d,%d\n", &x1, &y1, &x2, &y2);

            printf("(x1 + x2) = %d, (y1 + y2) = %d\n",
                (x1 + x2), (y1 + y2));

            token = strtok(NULL, sep_list);
        }
    }

    return 0;
}
```

a.

$(x1 + x2) = 2, (y1 + y2) = 0$

$(x1 + x2) = 0, (y1 + y2) = 3$

b.

$(x1 + x2) = 2, (y1 + y2) = 2$

$(x1 + x2) = 3, (y1 + y2) = 3$



c.

$$(x_1 + x_2) = 0, (y_1 + y_2) = 2$$

$$(x_1 + x_2) = 0, (y_1 + y_2) = 3$$

d.

$$(x_1 + x_2) = 2, (y_1 + y_2) = 0$$

$$(x_1 + x_2) = 3, (y_1 + y_2) = 0$$

8. What will be the output when the below C application will run?

```
#include <stdio.h>

int main()
{
    char a[] = { 'A', 'B', 'C' };
    char* pa = NULL, * p2a = NULL;

    pa = a;
    p2a = a + (sizeof(a) - 1);

    if (p2a == (a + 2))
    {
        printf("%c, %c\n", *p2a, a[2]);
    }
    else
    {
        printf("%c, %c\n", *pa, a[0]);
    }

    return 0;
}
```

- a. C, C
- b. B, A
- c. A, A
- d. C, B

9. What will be the output when the below C application will run?

```
#include <stdio.h>
#include <malloc.h>

int* f(char x)
{
    int* pa = (int*)&x;
```



```
*pa = x + 10;

pa = (int*)malloc(sizeof(int));

return pa;
}

int main()
{
    char a = 65;

    int* pa = f(a);
    *pa = 0;
    if (pa != NULL) free(pa);

    pa = (int*)malloc(sizeof(int));
    *pa = a + 10;

    printf("a = %d\n", (int)a);

    free(pa);

    return 0;
}
```

- a. a = 65
- b. a = 10
- c. a = 75
- d. a = 0

10. What will be the output when the below C application will run?

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>

int main()
{
    const char* pa = "-120.34";

    printf("%.2f\n", (float)atof((const char*)(pa + (strlen(pa) - 3))));

    return 0;
}
```



- a. 0.34
- b. 20.34
- c. 0.00
- d. -120.00

11. What method(s) and/or operator(s) will be called to create object named as **b**?

```
#include <iostream>
using namespace std;

class A
{
public:
    void show() {
        cout << "Base" << endl;
    }
};

class B : public A
{
public:
    void show() {
        cout << "Derived" << endl;
    }
};

int main()
{
    B a, b = a;

    return 0;
}
```

- a. Copy constructor from B and implicit cast from A
- b. Copy constructor from A
- c. Operator =
- d. Copy constructor from B

12. What will be the output of the next C++ program?

```
#include <iostream>
using namespace std;
```



```
class Foo
{
public:
    virtual int f() { return 1; }
    virtual int g() { return 5; }
};

class Boo : public Foo
{
public:
    int f() { return 2; }
    int g() { return 6; }
};

int main()
{
    Foo* x = new Foo();
    Boo* y = new Boo();

    if(x) delete x;
    x = y;

    cout << x->f() << x->g();

    delete x;
    return 0;
}
```

- a. 26
- b. 15
- c. 16
- d. 25

13. What will be the output of the following C++ implementation?

```
#include <iostream>
using namespace std;

class Foo
{
public:
    int x = 123;
};

int main()
{
```



```
Foo f;
Foo* pf = &f;
(*pf).x = 456;

if (f.x == (*pf).x)
{
    cout << "True";
}
else
{
    cout << "False";
}

return 0;
}
```

- a. False
- b. It will generate compile error(s).
- c. True
- d. It will generate a runtime error.

14. What will be the output of the following C++ program?

```
#include <iostream>
using namespace std;

class Foo
{
public:
    Foo() { }

    Foo(const Foo& f) {
        cout << "#";
    }

    Foo operator=(Foo f) {
        cout << "@";
        return *this;
    }
};

int main()
{
    Foo f1, f3;
    f3 = f1;
```



```
    Foo f2;  
    f2 = f3;  
  
    return 0;  
}
```

- a. ##@#
- b. #@#
- c. #@##@#
- d. @##@

15. Taking into consideration the following C++ code, what will be the message printed to the console?

```
#include <iostream>  
  
class X  
{  
    int a; char b; void f() {}  
};  
class Y {  
    int a; virtual void f() {}  
};  
  
int main()  
{  
    X* px = NULL;  
    Y* py = NULL;  
  
    std::cout << (sizeof(px) < sizeof(py) ? "Yes" : "No");  
  
    return 0;  
}
```

- a. Yes
- b. YesNo
- c. No
- d. 0

16. What will be the output when the main function is executed?

```
#include <iostream>  
using namespace std;
```



```
class Base
{
public:
    Base() {
        cout << "A";
    }
    virtual ~Base() {
        cout << "B";
    }
};

class Derived : public Base
{
public:
    Derived() {
        cout << "X";
    }

    ~Derived() {
        cout << "Y";
    }
};

int main()
{
    Base* b = new Derived();

    return 0;
}
```

- a. AXYB
- b. ABXY
- c. XAYB
- d. AX

17. What will the following C++ code print?

```
#include <iostream>
using namespace std;

class Base
{
public:
    virtual void show() {
        cout << "Base" << endl;
    }
}
```



```
};

class Derived : public Base
{
public:
    void show() {
        cout << "Derived" << endl;
    }
};

int main()
{
    Base* x = new Base();
    Derived* y = new Derived();

    if(x)
        delete x;

    x = y;
    x->show();

    delete y;
    return 0;
}
```

- a. Base
- b. BaseDerived
- c. Derived
- d. It will generate a runtime error

18. What will be the output of the following C++ program?

```
#include <iostream>
#include <string>
using namespace std;

class Student
{
public:
    string name = "John";
};

int main()
{
    Student s;
    Student* ps = &s;
    ps->name[0] = 'X';
```



```
    cout << s.name;

    return 0;
}
```

- a. John
- b. It will generate compile error(s).
- c. Xohn
- d. It will generate a runtime error.

19. Giving the C++ class S from below, what will be the output of the main function?

```
#include <iostream>
using namespace std;

class S
{
protected:
    string name;
public:
    char operator[](int i) {
        return name[i];
    }
};

int main()
{
    S s;
    s.name = "ABC";
    s[0] = 'C';
    cout << s[1];

    return 0;
}
```

- a. C
- b. B
- c. A
- d. It will generate compile error(s).



20. What feature of Object-Oriented Programming model is not used by the following C++ code?

```
class A
{
    int x;
public:
    void print()
    {
        cout << "Print" << endl;
    }

    virtual void set_y(int in) = 0;
};

class B : public A
{
    int y;
public:
    void set_y(int in)
    {
        y = in;
    }
};
```

- a. Polymorphism
- b. Abstraction
- c. Inheritance
- d. Encapsulation

21. Taking into consideration the following Java sequence, which of the following answers best describe the reason that prevents the code from compiling?

```
class Vehicle {
    private int speed;

    public Vehicle(int speed) {
        this.speed = speed;
    }
    //...
}

class Car extends Vehicle {
    private float price;

    public Car() {
        price = 0;
    }
}
```



```
}  
}
```

- a. Car shouldn't declare any explicit constructor
- b. Vehicle doesn't have a default constructor
- c. the constructor from Car should call this(0) as the first instruction
- d. the constructor from Car should call super(0) as the last instruction

22. Which of the following statements is true considering the following Java program?

```
public class Main {  
    public static void main(String[] args) {  
        int[][] m = {{1, 2}, {3, 4, 5}, {6}};  
        for(int i = 0; i < m.length; i++) {  
            for(int j = 0; j < m[i].length; j++) {  
                System.out.print(m[i][j] + " ");  
            }  
        }  
    }  
}
```

- a. it prints 1 2 3 4 6
- b. it throws a checked exception
- c. it prints 1 2 3 4 5 6
- d. it throws an unchecked exception

23. What will be the output of the following Java program?

```
public class Main {  
    public static void interchange(String s1, String s2) {  
        String aux = new String(s1);  
        s1 = new String(s2);  
        s2 = aux;  
    }  
  
    public static void main(String[] args) {  
        String a = "Ana";  
        String b = "Bob";  
        interchange(a, b);  
        System.out.print(a + b);  
    }  
}
```



- a. compile error
- b. BobAna
- c. AnaBob
- d. AnaAna

24. Given the following Java code, and assuming that all the classes are correctly imported, what will be the actual data type of the variable named day?

```
public class Main {  
    public static void main(String[] args) {  
        Callable c = () -> {  
            List<String> list = List.of("Monday",  
                                       "Tuesday", "Wednesday");  
            return list.get(new Random().nextInt(3));  
        };  
  
        ExecutorService e = Executors.newSingleThreadExecutor();  
        var day = e.submit(c);  
    }  
}
```

- a. it doesn't matter because the code will crash at runtime
- b. Future<String>
- c. String
- d. void

25. Which of the following best describes the concept of functional interfaces in Java?

- a. interfaces that have at most one abstract method
- b. interfaces that have at least one abstract method
- c. interfaces that have exactly one abstract method and no default methods
- d. interfaces that have exactly one abstract method and any number of default methods

26. Having into consideration the following Java code, which line of code from the main method will return a compile error?

```
class University {  
    public final String name = "ASE";  
    //...  
}  
  
public class Main {  
    public static void main(String[] args) {
```



```
University university = new University();
university.name = "UES"; // (1)
university.name = new String("UES"); // (2)
university.name = null; // (3)
    }
}
```

- a. (3)
- b. (1)
- c. all three of them
- d. (2)

27. Being given the following Java code, what will be the console output assuming that all the classes are correctly imported?

```
public class Main {
    public static int sum(int value1, int value2) {
        return value1 + value2;
    }

    public static void main(String[] args) {
        List<Integer> x = List.of(1, 2, 3, 4);
        System.out.println(x.stream().reduce(Main::sum).get());
    }
}
```

- a. 3
- b. 10
- c. runtime error
- d. compile error

28. What will be the output of the following Java program (JDK 21)?

```
class Foo implements Closeable {
    public Foo() {
        System.out.print("cyber");
    }
    public void f() {
        System.out.print("ISM");
    }
    public void close() {
        System.out.print("security");
    }
}
```



```
public class Main {  
  
    public static void main(String[] args) {  
        try(Foo f = new Foo()) {  
            f.f();  
        } catch (Exception e) {  
            e.printStackTrace();  
        }  
    }  
}
```

- a. cybersecurityISM
- b. cyberISMsecurity
- c. cyberISM
- d. ISM

29. What will be the output of the following Java program, assuming that we are using JDK 21 and all the imports are correctly specified?

```
public class Main {  
    public static void main(String[] args) {  
        List<String> names = List.of("Amy", "Bob",  
                                     "Charles", "Daniel");  
        var result = names.stream().filter(x -> x.contains("a"))  
                           .sorted((x, y) -> -x.compareTo(y))  
                           .findFirst().orElse(null);  
        System.out.print(result);  
    }  
}
```

- a. null
- b. Charles
- c. Daniel
- d. Amy

30. What will be the output of the next Java program?

```
public class Main {  
    public static void function() {  
        try {  
            System.out.print("try");  
        } catch (Exception e) {  
            System.out.print("catch");  
        } finally {  
            System.out.print("finally");  
        }  
    }  
}
```



```
public static void main(String[] args) {  
    function();  
}
```

- a. tryfinally
- b. trycatchfinally
- c. try
- d. trycatch

* Observation: Each question has same number of points.



QUIZ

1. What will be the output of the below C application?

```
#include <stdio.h>
#include <string.h>

int main()
{
    char a[] = { 'A', 'B', 0x00, 'C', '\0'};
    char* pa = NULL;

    pa = a;

    printf("array size = %u, string length = %u\n",
           (unsigned int)sizeof(a),
           (unsigned int)strlen((const char*)(pa + 2)));

    return 0;
}
```

- a. array size = 4, string length = 2
- b. array size = 5, string length = 0
- c. array size = 4, string length = 4
- d. array size = 2, string length = 4

2. What will be the output when the below C application will run?

```
#include <stdio.h>
#include <malloc.h>

int main()
{
    unsigned int x = 2, y = 1;
    int* px = NULL, * py = NULL;

    px = (int*)malloc(x * sizeof(int));
    px[0] = 3;
    px[y] = 5;
    py = px + 1;

    int m = (y * (py - px) * *px) > (x * (*py << 1)) ? x : y;
```



```
printf("\'m = %d\'\\n", m);

free(px);

return 0;
}
```

- a. m = 1
- b. 'm = 5'
- c. m = 5
- d. 'm = 1'

3. What will be the output when the below C application will run?

```
#include <stdio.h>

#define COMP(A, B, F) \
    int F(int A, int B) \
    { \
        return (A == B ? A : (B) - (A)); \
    }

COMP(a, b, fct)

int main()
{
    int x = 3, y = 3, z = 10, t = 5;

    printf("result = %d\\n", fct(x + y, z + t));

    return 0;
}
```

- a. result = 6
- b. result = 15
- c. result = 9
- d. result = 18

4. What will be the output when the below C application will run?

```
#include <stdio.h>
#include <malloc.h>

int* f(char x)
{
```



```
int* pa = (int*)&x;
*pa = x + 10;

pa = (int*)malloc(sizeof(int));

return pa;
}

int main()
{
    char a = 65;

    int* pa = f(a);
    *pa = 0;
    if (pa != NULL) free(pa);

    pa = (int*)malloc(sizeof(int));
    *pa = a + 10;

    printf("a = %d\n", (int)a);

    free(pa);

    return 0;
}
```

- a. a = 0
- b. a = 10
- c. a = 65
- d. a = 75

5. What will be the output of the following C application when the development environment uses LITTLE ENDIAN format to store data?

```
#include <stdio.h>

unsigned short int fct(unsigned short int x)
{
    unsigned char * px;
    px = (unsigned char*)&x;

    px[0] = px[0] | 0x02;

    return x;
}
```



```
int main()
{
    unsigned short int n = 0x01;

    n = fct(n);
    printf("result = %hu\n", n);

    return 0;
}
```

- a. result = -1
- b. result = 3
- c. result = 4
- d. result = 1

6. Consider the following content saved into a file named `Points.txt`:

```
-3, -2, 5, 2
4, 4, -1, -4
```

What will be the output of the following C application?

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>

#define BUFFER_SIZE 256

int main()
{
    FILE* pf = fopen("Points.txt", "r");
    int x1, x2, y1, y2;
    char buffer[BUFFER_SIZE];
    long size = 0;
    unsigned int lines = 0, i;

    memset(buffer, 0x00, BUFFER_SIZE);

    fseek(pf, 0, SEEK_END);
    size = ftell(pf);

    if (size < BUFFER_SIZE)
    {
        fseek(pf, 0, SEEK_SET);
        while (fgets(buffer, BUFFER_SIZE, pf))
```



```
{
    lines += 1;
}

fseek(pf, 0, SEEK_SET);
fread(buffer, size, 1, pf);
char* token, sep_list[] = "\n";
token = strtok(buffer, sep_list);

for (i = 0; i < lines; i++)
{
    sscanf(token, "%d,%d,%d,%d\n", &x1, &y1, &x2, &y2);

    printf("(x1 + x2) = %d, (y1 + y2) = %d\n",
           (x1 + x2), (y1 + y2));

    token = strtok(NULL, sep_list);
}
}

return 0;
}
```

a.

(x1 + x2) = 2, (y1 + y2) = 2

(x1 + x2) = 3, (y1 + y2) = 3

b.

(x1 + x2) = 2, (y1 + y2) = 0

(x1 + x2) = 3, (y1 + y2) = 0

c.

(x1 + x2) = 0, (y1 + y2) = 2

(x1 + x2) = 0, (y1 + y2) = 3

d.

(x1 + x2) = 2, (y1 + y2) = 0

(x1 + x2) = 0, (y1 + y2) = 3

7. What will be the output of the below C application?

```
#include <stdio.h>
```

```
int main()
```

```
{
```

```
    char a[] = { 'A', 'B', 'C', '0', 0x00};
```

```
    int* pa = NULL;
```

```
    pa = (int*)a;
```



```
printf("%s\n", (char*)pa);

return 0;
}
```

- a. ABC
- b. ABC0
- c. BC
- d. C

8. What will be the output of the following C application?

```
#include <stdio.h>
#include <string.h>
#include <malloc.h>

void fct(char* s1, char* s2, unsigned int idx)
{
    if (idx > 0)
    {
        fct(s1, s2, idx - 1);
        s1[idx - 1] = s2[idx - 1];
    }
}

int main()
{
    char string1[] = "string_1";
    const char* str_temp = "string_2";

    char* string2 = (char*)malloc(strlen(str_temp) + 1);
    strcpy(string2, str_temp);

    unsigned int length = (strlen(string1) < strlen(string2)) ?
                          strlen(string1) : sizeof(string2);

    fct(string2, string1, length);

    printf("string1 = %s, string2 = %s\n", string1, string2);

    return 0;
}
```



- a. string1 = string_1, string2 = string_1
- b. string1 = string_1, string2 = string_2
- c. string1 = string_2, string2 = string_2
- d. string1 = string_2, string2 = string_1

9. What will be the output when the below C application will run?

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>

int main()
{
    const char* pa = "-120.34";

    printf("%.2f\n", (float)atof((const char*)(pa + (strlen(pa) - 3))));

    return 0;
}
```

- a. 20.34
- b. 0.34
- c. 0.00
- d. -120.00

10. What will be the output when the below C application will run?

```
#include <stdio.h>

int main()
{
    char a[] = { 'A', 'B', 'C' };
    char* pa = NULL, * p2a = NULL;

    pa = a;
    p2a = a + (sizeof(a) - 1);

    if (p2a == (a + 2))
    {
        printf("%c, %c\n", *p2a, a[2]);
    }
    else
    {
        printf("%c, %c\n", *pa, a[0]);
    }
}
```



```
        return 0;
    }
```

- a. C, B
- b. B, A
- c. A, A
- d. C, C

11. What will be the output of the following C++ program?

```
#include <iostream>
#include <string>
using namespace std;

class Student
{
public:
    string name = "John";
};

int main()
{
    Student s;
    Student* ps = &s;
    ps->name[0] = 'X';

    cout << s.name;

    return 0;
}
```

- a. Xohn
- b. John
- c. It will generate compile error(s).
- d. It will generate a runtime error.

12. What will the following C++ code print?

```
#include <iostream>
using namespace std;

class Base
{
public:
```



```
        virtual void show() {
            cout << "Base" << endl;
        }
};

class Derived : public Base
{
public:
    void show() {
        cout << "Derived" << endl;
    }
};

int main()
{
    Base* x = new Base();
    Derived* y = new Derived();

    if(x)
        delete x;

    x = y;
    x->show();

    delete y;
    return 0;
}
```

- a. Derived
- b. Base
- c. BaseDerived
- d. It will generate a runtime error

13. What feature of Object-Oriented Programming model is not used by the following C++ code?

```
class A
{
    int x;
public:
    void print()
    {
        cout << "Print" << endl;
    }

    virtual void set_y(int in) = 0;
};
```



```
class B : public A
{
    int y;
public:
    void set_y(int in)
    {
        y = in;
    }
};
```

- a. Encapsulation
- b. Polymorphism
- c. Inheritance
- d. Abstraction

14. What method(s) and/or operator(s) will be called to create object named as **b**?

```
#include <iostream>
using namespace std;

class A
{
public:
    void show() {
        cout << "Base" << endl;
    }
};

class B : public A
{
public:
    void show() {
        cout << "Derived" << endl;
    }
};

int main()
{
    B a, b = a;

    return 0;
}
```



- a. Copy constructor from B
- b. Copy constructor from A
- c. Copy constructor from B and implicit cast from A
- d. Operator =

15. What will be the output of the following C++ implementation?

```
#include <iostream>
using namespace std;

class Foo
{
public:
    int x = 123;
};

int main()
{
    Foo f;
    Foo* pf = &f;
    (*pf).x = 456;

    if (f.x == (*pf).x)
    {
        cout << "True";
    }
    else
    {
        cout << "False";
    }

    return 0;
}
```

- a. True
- b. False
- c. It will generate compile error(s).
- d. It will generate a runtime error.

16. What will be the output of the next C++ program?

```
#include <iostream>
using namespace std;
```



```
class Foo
{
public:
    virtual int f() { return 1; }
    virtual int g() { return 5; }
};

class Boo : public Foo
{
public:
    int f() { return 2; }
    int g() { return 6; }
};

int main()
{
    Foo* x = new Foo();
    Boo* y = new Boo();

    if(x) delete x;
    x = y;

    cout << x->f() << x->g();

    delete x;
    return 0;
}
```

- a. 16
- b. 15
- c. 26
- d. 25

17. What will be the output of the following C++ program?

```
#include <iostream>
using namespace std;

class Foo
{
public:
    Foo() { }

    Foo(const Foo& f) {
        cout << "#";
    }
}
```



```
    Foo operator=(Foo f) {
        cout << "@";
        return *this;
    }
};

int main()
{
    Foo f1, f3;
    f3 = f1;

    Foo f2;
    f2 = f3;

    return 0;
}
```

- a. ##@#
- b. #@#
- c. #@##@#
- d. @##@

18. Taking into consideration the following C++ code, what will be the message printed to the console?

```
#include <iostream>

class X
{
    int a; char b; void f() {}
};
class Y {
    int a; virtual void f() {}
};

int main()
{
    X* px = NULL;
    Y* py = NULL;

    std::cout << (sizeof(px) < sizeof(py) ? "Yes" : "No");

    return 0;
}
```



- a. No
- b. Yes
- c. YesNo
- d. 0

19. What will be the output when the main function is executed?

```
#include <iostream>
using namespace std;

class Base
{
public:
    Base() {
        cout << "A";
    }
    virtual ~Base() {
        cout << "B";
    }
};

class Derived : public Base
{
public:
    Derived() {
        cout << "X";
    }

    ~Derived() {
        cout << "Y";
    }
};

int main()
{
    Base* b = new Derived();

    return 0;
}
```

- a. AXYB
- b. AX
- c. ABXY
- d. XAYB



20. Giving the C++ class S from below, what will be the output of the main function?

```
#include <iostream>
using namespace std;

class S
{
protected:
    string name;
public:
    char operator[](int i) {
        return name[i];
    }
};

int main()
{
    S s;
    s.name = "ABC";
    s[0] = 'C';
    cout << s[1];

    return 0;
}
```

- a. C
- b. It will generate compile error(s).
- c. B
- d. A

21. What will be the output of the following Java program (JDK 21)?

```
class Foo implements Closeable {
    public Foo() {
        System.out.print("cyber");
    }

    public void f() {
        System.out.print("ISM");
    }

    public void close() {
        System.out.print("security");
    }
}
```



```
public class Main {  
    public static void main(String[] args) {  
        try(Foo f = new Foo()) {  
            f.f();  
        } catch (Exception e) {  
            e.printStackTrace();  
        }  
    }  
}
```

- a. cyberISMsecurity
- b. ISM
- c. cybersecurityISM
- d. cyberISM

22. Taking into consideration the following Java sequence, which of the following answers best describe the reason that prevents the code from compiling?

```
class Vehicle {  
    private int speed;  
  
    public Vehicle(int speed) {  
        this.speed = speed;  
    }  
    //...  
}
```

```
class Car extends Vehicle {  
    private float price;  
  
    public Car() {  
        price = 0;  
    }  
}
```

- a. Car shouldn't declare any explicit constructor
- b. the constructor from Car should call this(0) as the first instruction
- c. Vehicle doesn't have a default constructor
- d. the constructor from Car should call super(0) as the last instruction



23. Being given the following Java code, what will be the console output assuming that all the classes are correctly imported?

```
public class Main {  
    public static int sum(int value1, int value2) {  
        return value1 + value2;  
    }  
  
    public static void main(String[] args) {  
        List<Integer> x = List.of(1, 2, 3, 4);  
        System.out.println(x.stream().reduce(Main::sum).get());  
    }  
}
```

- a. runtime error
- b. 10
- c. compile error
- d. 3

24. What will be the output of the following Java program?

```
public class Main {  
    public static void interchange(String s1, String s2) {  
        String aux = new String(s1);  
        s1 = new String(s2);  
        s2 = aux;  
    }  
  
    public static void main(String[] args) {  
        String a = "Ana";  
        String b = "Bob";  
        interchange(a, b);  
        System.out.print(a + b);  
    }  
}
```

- a. compile error
- b. AnaAna
- c. BobAna
- d. AnaBob



25. What will be the output of the following Java program, assuming that we are using JDK 21 and all the imports are correctly specified?

```
public class Main {  
    public static void main(String[] args) {  
        List<String> names = List.of("Amy", "Bob",  
                                     "Charles", "Daniel");  
        var result = names.stream().filter(x -> x.contains("a"))  
                           .sorted((x, y) -> -x.compareTo(y))  
                           .findFirst().orElse(null);  
        System.out.print(result);  
    }  
}
```

- a. null
- b. Charles
- c. Daniel
- d. Amy

26. Having into consideration the following Java code, which line of code from the main method will return a compile error?

```
class University {  
    public final String name = "ASE";  
    //...  
}  
  
public class Main {  
    public static void main(String[] args) {  
        University university = new University();  
        university.name = "UES"; // (1)  
        university.name = new String("UES"); // (2)  
        university.name = null; // (3)  
    }  
}
```

- a. (3)
- b. (1)
- c. (2)
- d. all three of them

27. Which of the following statements is true considering the following Java program?

```
public class Main {  
    public static void main(String[] args) {
```



```
int[][] m = {{1, 2}, {3, 4, 5}, {6}};
for(int i = 0; i < m.length; i++) {
    for(int j = 0; j < m[i].length; j++) {
        System.out.print(m[i][j] + " ");
    }
}
```

- a. it throws a checked exception
- b. it prints 1 2 3 4 6
- c. it throws an unchecked exception
- d. it prints 1 2 3 4 5 6

28. Which of the following best describes the concept of functional interfaces in Java?

- a. interfaces that have at least one abstract method
- b. interfaces that have exactly one abstract method and no default methods
- c. interfaces that have at most one abstract method
- d. interfaces that have exactly one abstract method and any number of default methods

29. Given the following Java code, and assuming that all the classes are correctly imported, what will be the actual data type of the variable named day?

```
public class Main {
    public static void main(String[] args) {
        Callable c = () -> {
            List<String> list = List.of("Monday",
                                      "Tuesday", "Wednesday");
            return list.get(new Random().nextInt(3));
        };

        ExecutorService e = Executors.newSingleThreadExecutor();
        var day = e.submit(c);
    }
}
```

- a. it doesn't matter because the code will crash at runtime
- b. String
- c. Future<String>
- d. void



30. What will be the output of the next Java program?

```
public class Main {  
    public static void function() {  
        try {  
            System.out.print("try");  
        } catch (Exception e) {  
            System.out.print("catch");  
        } finally {  
            System.out.print("finally");  
        }  
    }  
  
    public static void main(String[] args) {  
        function();  
    }  
}
```

- a. trycatchfinally
- b. try
- c. tryfinally
- d. trycatch

* Observation: Each question has same number of points.