

**Instructions:** This homework assignment focuses on enumerated types, arrays and structured variables. Assume any `#include` directives, variable declarations, etc, which are needed to make the given code syntactically correct.

Opscan forms will be passed out in class. Write your name and code your ID number on the opscan form. Turn in your completed opscan at class on Monday Nov 26 or Tuesday Nov 27. Opscans will not be accepted at any other place or time.

For questions 1 through 3, assume the type definition:

```
struct Book {
    string Title;
    string Author;
    string CallNo;
};
```

1. Which of the following is/are valid for creating and initializing a Book variable?

- |   |                  |
|---|------------------|
| 1) Book tSatF;<br>tSatF.Title = "The Sound and the Fury";<br>tSatF.Author = "Faulkner, William";<br>tSatF.CallNO = "PS3511 A86 S8 1946 "; | 4) All of these  |
| 2) Book tSatF;<br>Book.Title = "The Sound and the Fury";<br>Book.Author = "Faulkner, William";<br>Book.CallNO = "PS3511 A86 S8 1946";     | 5) 1 and 2 only  |
| 3) Book tSatF;<br>Title = "The Sound and the Fury";<br>Author = "Faulkner, William";<br>CallNO = "PS3511 A86 S8 1946";                    | 6) 1 and 3 only  |
|   | 7) 2 and 3 only  |
|   | 8) None of these |

2. Given the variable declarations: Book EKAT, OFOtCN;

and assuming the two variables have been properly initialized, which of the following is/are valid expressions or statements involving Book variables?

- |                   |                  |
|-------------------|------------------|
| 1) EKAT = OFOtCN; | 5) 1 and 2 only  |
| 2) EKAT == OFOtCN | 6) 1 and 3 only  |
| 3) cout << EKAT;  | 7) 2 and 3 only  |
| 4) All of these   | 7) None of these |

3. Given the variable declarations: Book EKAT, OFOtCN;

and assuming the two variables have been properly initialized, which of the following is/are valid expressions or statements involving Book variables?

- |                                   |                  |
|-----------------------------------|------------------|
| 1) cout << EKAT.Title;            | 5) 1 and 2 only  |
| 2) OFOtCN.Author = "Keseey, Ken"; | 6) 1 and 3 only  |
| 3) EKAT.Title == OFOtCN.Title     | 7) 2 and 3 only  |
| 4) All of these                   | 8) None of these |

For questions 4 through 7, consider the declarations:

```
const int MaxEmployees = 1000;
struct Personnel {
    string Name;
    int IDNum;
    double HourlyPayRate;
};

string Emp5Name = "Joe Bob Hokie";
string Emp7Name = "Haskell Hoo IV";

Personnel Emp5 = {Emp5Name, 401934242, 19.87},
              Emp7 = {Emp5Name, 803291024, 9.32};

Personnel Staff[MaxEmployees];
```

Assume that the array `Staff[]` has been initialized so that all fields of all the array elements have logically correct values.

4. The name fields of the variables `Emp5` and `Emp7` could be compared by the expression(s):

- |  |                  |
|--|------------------|
| 1) <code>Emp5.Name = Emp7.Name</code>    | 5) 1 and 2 only  |
| 2) <code>Emp5.Name == Emp7.Name</code>   | 6) 1 and 3 only  |
| 3) <code>Emp7[Name] == Emp7[Name]</code> | 7) 2 and 3 only  |
| 4) All of these                          | 8) None of these |

5. The variables `Emp5` and `Emp7` could be compared by the expression(s):

- |                                 |                  |
|---------------------------------|------------------|
| 1) <code>Emp7 = Emp7</code>     | 5) 1 and 2 only  |
| 2) <code>Emp5 == Emp7</code>    | 6) 1 and 3 only  |
| 3) <code>Emp5 &lt;= Emp7</code> | 7) 2 and 3 only  |
| 4) All of the above             | 8) None of these |

6. The statement: `cout << Staff[17].Name;`

- 1) prints the name of the employee with ID number 17
- 2) prints the name of the employee whose `Personnel` record is stored at index 17
- 3) is syntactically illegal since you can't dump a `struct` variable into an output stream
- 4) None of these

7. The statement: `Staff[17] = Emp5;`

- 1) copies the contents of the variable `Emp5` into the `Personnel` record at index 17
- 2) copies the contents of the `Personnel` record at index 17 into the variable `Emp5`
- 3) swaps the contents of the variable `Emp5` and the `Personnel` record at index 17
- 4) is syntactically illegal
- 5) None of these

8. Suppose that a `struct` parameter is to be passed to a function, and that the function does not need to modify either the formal parameter or the actual parameter. What advantage(s) could be gained by passing the parameter by constant reference instead of passing it by value in this situation?

- |  |                  |
|--|------------------|
| 1) This would require less space in memory.          | 5) 1 and 2 only  |
| 2) This would probably require less execution time.  | 6) 1 and 3 only  |
| 3) The syntax of the function call would be simpler. | 7) 2 and 3 only  |
| 4) All of these                                      | 8) None of these |

9. Passing a `struct` parameter by constant reference instead of by reference:

- |  |                  |
|--|------------------|
| 1) increases the amount of memory needed             | 5) 1 and 3 only  |
| 2) reduces the time required for the function call   | 6) 2 and 4 only  |
| 3) increases the time required for the function call | 7) None of these |
| 4) reduces the amount of memory needed               |                  |

For questions 10 through 13, consider the declarations and function:

```
struct Bar {
    int  Foo[5];
    int  Size;
};
```

```
Bar X = {{2, 4, 9, 11, 17}, 5}, // These are legal initializations.
      Y = {{0, 3, 6}, 3};
```

```
Bar AddBar(const Bar& A, const Bar& B) {
    Bar NewBar;
    if (A.Size <= B.Size)
        NewBar.Size = A.Size;
    else
        NewBar.Size = B.Size;

    for (int Idx = 0; Idx < NewBar.Size; Idx++)
        NewBar.Foo[Idx] = A.Foo[Idx] + B.Foo[Idx];

    return NewBar;
}
```

10. The statement: `Y = X;`

- 1) is syntactically illegal because you can't assign an array to an array
- 2) is syntactically legal, but has a different effect than 1)
- 3) would copy the contents of the `Bar` variable `X` into the `Bar` variable `Y`
- 4) None of these

11. The statement: `Y.Foo = X.Foo;`

- 1) is syntactically illegal because you can't assign an array to an array
- 2) is syntactically legal, but has a different effect than 1)
- 3) would copy the contents of the `Foo` field of `X` into the `Foo` field of `Y`
- 4) None of these

12. Suppose the following statement is executed: `Bar Z = AddBar(X, Y);`
- Then the value of `Z.Foo[2]` would be:
- 1) 0
  - 2) 2
  - 3) 8
  - 4) 9
  - 5) 15
  - 6) None of these
13. Again, suppose the following statement is executed: `Bar Z = AddBar(X, Y);`
- Then the value of `Z.Size` would be:
- 1) 0
  - 2) 1
  - 3) 2
  - 4) 3
  - 5) 4
  - 6) 5
  - 7) None of these
- 

For questions 14 and 15 assume the following declarations:

```
enum WoodKind {ASH, CEDAR, OAK, PINE, POPLAR, WALNUT};

struct Size {
    int Length;
    int Width;
    int Thickness;
};

struct Board {
    Size Dimensions;
    WoodKind Kind;
    int smoothSurfaces;
};

Board oneBoard = {{2, 4, 8}, PINE, 4}; // Legal initialization.
```

14. The number of smooth surfaces of `oneBoard` could be printed by the statement(s):
- 1) `cout << smoothSurfaces;`
  - 2) `cout << Wood.smoothSurfaces;`
  - 3) `cout << oneBoard.smoothSurfaces;`
  - 4) All of these
  - 5) 1 and 2 only
  - 6) 1 and 3 only
  - 7) 2 and 3 only
  - 8) None of these
15. The width of `oneBoard` could be printed by the statement(s):
- 1) `cout << oneBoard.Size.Width;`
  - 2) `cout << oneBoard.Dimensions.Width;`
  - 3) `cout << oneBoard.Width;`
  - 4) All of the above
  - 5) 1 and 2 only
  - 6) 1 and 3 only
  - 7) 2 and 3 only
  - 8) None of these

For questions 16 and 17 assume the declarations given for questions 14 and 15, and also the declarations:

```
const int MAXBOARDS = 1000;
Board Lumber[MAXBOARDS];
```

Consider implementing a loop to print the dimensions of all OAK boards that occur in the array `Lumber[ ]`, assuming the array has been initialized to hold data about `numBoards` boards:

```
for (int Idx = 0; Idx < numBoards; Idx++) {
    if ( _____ == _____ ) {
        cout << "Length:    " << Lumber[Idx].Dimensions.Length << endl
            << "Width:      " << Lumber[Idx].Dimensions.Width << endl
            << "Thickness:  " << Lumber[Idx].Dimensions.Thickness << endl;
    }
}
```

16. How should the first blank in the `if` condition be filled?

- |                                      |                          |
|--------------------------------------|--------------------------|
| 1) <code>Lumber[Idx].Kind</code>     | 4) <code>WoodKind</code> |
| 2) <code>Lumber[Idx].WoodKind</code> | 5) None of these         |
| 3) <code>Kind</code>                 |                          |

17. How should the second blank in the `if` condition be filled?

- |                                |                  |
|--------------------------------|------------------|
| 1) <code>"OAK"    "oak"</code> | 4) Either 1 or 2 |
| 2) <code>OAK</code>            | 5) None of these |
| 3) <code>"OAK"</code>          |                  |

For questions 18 through 20 assume the following enumerated type declaration:

```
enum Status {NEGATIVE, OK, UNUSED, TOOBIG};
```

The function `checkIndex()` is intended to validate an array index, as you did in Project 8, and indicate to the caller what is determined:

```
_____ checkIndex(int Idx,           // index to be checked
                  int Used,         // # of used cells in array
                  int Dimension) {  // dimension of array

    if (Idx < 0)
        return _____; // line 1
    if (Idx < Used)
        return OK;
    if (Idx < Dimension)
        return UNUSED;
    return _____; // line 2
}
```

18. What should the return type of the function be?

- |                        |                        |
|------------------------|------------------------|
| 1) <code>void</code>   | 4) <code>UNUSED</code> |
| 2) <code>int</code>    | 5) None of these       |
| 3) <code>Status</code> |                        |

19. How should the blank in line 1 be filled?

- |           |                  |
|-----------|------------------|
| 1) Status | 4) NEGATIVE      |
| 2) -1     | 5) None of these |
| 3) 0      |                  |

20. How should the blank in line 2 be filled?

- |                             |                  |
|-----------------------------|------------------|
| 1) OK                       | 4) TOOBIG        |
| 2) Status                   | 5) None of these |
| 3) It should be left blank. |                  |

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For questions 21 through 25, assume the type definition:

```
struct Trip {
    string Origin;
    string Destination;
    int Mileage;
    int Time;
    double avgMPH;
};
```

For questions 21 and 22, consider the function definition:

```
// Resets the Time field of a Trip variable, if the given parameter
// is nonnegative.
//
void setTime(_____ T, int Time) { // Line 1
    if (Time >= 0) {
        _____ = Time; // Line 2
    }
}
```

21) How should the blank in Line 1 be filled?

- |                         |                  |
|-------------------------|------------------|
| 1) Trip&                | 5) 1 or 2 only   |
| 2) Trip                 | 6) 1 or 3 only   |
| 3) const Trip&          | 7) 2 or 3 only   |
| 4) Any of these will do | 8) None of these |

22) How should the blank in Line 2 be filled?

- |                         |                  |
|-------------------------|------------------|
| 1) Trip.Time            | 5) 1 or 2 only   |
| 2) T.Time               | 6) 1 or 3 only   |
| 3) Time                 | 7) 2 or 3 only   |
| 4) Any of these will do | 8) None of these |

For questions 23 through 25, consider the function definition:

```
// If the destination of Leg1 is the same as the origin of Leg2, set
// Merged to represent a trip from the origin of Leg1 to the destination
// of Leg2, with the correct total mileage and time.
//
// Return true if the merge succeeds and false otherwise.
//
bool mergeTrips(_____ Leg1, _____ Leg2, _____ Merged) {
    if (_____ ) {
        Merged.Origin = Leg1.Origin;
        Merged.Destination = Leg2.Destination;
        Merged.Mileage = Leg1.Mileage + Leg2.Mileage;
        Merged.Time = Leg1.Time + Leg2.Time;
        return true;
    }
    return false;
}
```

23) How should the first blank in the formal parameter list be filled?

- |                         |                  |
|-------------------------|------------------|
| 1) Trip&                | 5) 1 or 2 only   |
| 2) Trip                 | 6) 1 or 3 only   |
| 3) const Trip&          | 7) 2 or 3 only   |
| 4) Any of these will do | 8) None of these |

24) How should the third blank in the formal parameter list be filled?

- |                         |                  |
|-------------------------|------------------|
| 1) Trip&                | 5) 1 or 2 only   |
| 2) Trip                 | 6) 1 or 3 only   |
| 3) const Trip&          | 7) 2 or 3 only   |
| 4) Any of these will do | 8) None of these |

25) How should the blank in the if-condition be filled?

- 1) Leg1.Destination == Leg2.Origin
- 2) Origin == Destination
- 3) Leg1 == Leg2
- 4) Leg1.Origin == Leg2.Destination
- 5) None of these