APCS_A_Sem2022FallFinal_MCQ

1. In the code segment below, assume that the `int` variable `n` has been properly declared and initialized. The code segment is intended to print a value that is `1` more than twice the value of `n`.

   ```
   /* missing code */
   System.out.print(result);
   ```

   Which of the following can be used to replace /* *missing code* */ so that the code segment works as intended?

   ```
    I. int result = 2 * n;
       result = result + 1;
   II. int result = n + 1;
       result = result * 2;
  III. int result = (n + 1) * 2;
   ```

   (A) I only

   (B) II only

   (C) III only

   (D) I and III

   (E) II and III

2. Consider the following code segment.

   ```
   int a = 5;
   int b = 8;
   int c = 3;
   System.out.println(a + b / c * 2);
   ```

   What is printed as a result of executing this code?

   (A) 2

   (B) 6

   (C) 8

   (D) 9

   (E) 14

3. Consider the following code segment.

   ```
   String oldStr = "ABCDEF";
   String newStr = oldStr.substring(1, 3) + oldStr.substring(4);
   System.out.println(newStr);
   ```

   What is printed as a result of executing the code segment?

APCS_A_Sem2022FallFinal_MCQ

    (A) ABCD

    (B) BCDE

    (C) BCEF

    (D) BCDEF

    (E) ABCDEF

4.   Consider the following class.

public class SomeMethods

{
public void one(int first)

{ / * implementation not shown * / }

public void one(int first, int second)

{ / * implementation not shown * / }

public void one(int first, String second)

{ / * implementation not shown * / }

}

Which of the following methods can be added to the SomeMethods class without causing a compile-time error?

    I. public void one(int value)
        { / * implementation not shown * / }

    II. public void one (String first, int second)

        { / * implementation not shown * / }

    III. public void one (int first, int second, int third)

        { / * implementation not shown * / }

    (A)   I only

    (B)   I and II only

    (C)   I and III only

    (D)   II and III only

    (E)   I, II, and III

APCS_A_Sem2022FallFinal_MCQ

5. In the code segment below, assume that the `int` variables `a` and `b` have been properly declared and initialized.

```
int c = a;
int d = b;
c += 3;
d--;
double num = c;
num /= d;
```

Which of the following best describes the behavior of the code segment?

(A) The code segment stores the value of `(a + 3) / b` in the variable `num`.

(B) The code segment stores the value of `(a + 3) / (b - 1)` in the variable `num`.

(C) The code segment stores the value of `(a + 3) / (b - 2)` in the variable `num`.

(D) The code segment stores the value of `(a + 3) / (1 - b)` in the variable `num`.

(E) The code segment causes a runtime error in the last line of code because `num` is type `double` and `d` is type `int`.

6. Consider the following code segment, which is intended to find the average of two positive integers, `x` and `y`.

```
int x;
int y;
int sum = x + y;
double average = (double) (sum / 2);
```

Which of the following best describes the error, if any, in the code segment?

(A) There is no error, and the code works as intended.

(B) In the expression `(double) (sum / 2)`, the cast to `double` is applied too late, so the average will be less than the expected result for even values of `sum`.

(C) In the expression `(double) (sum / 2)`, the cast to `double` is applied too late, so the average will be greater than the expected result for even values of `sum`.

(D) In the expression `(double) (sum / 2)`, the cast to `double` is applied too late, so the average will be less than the expected result for odd values of `sum`.

(E) In the expression `(double) (sum / 2)`, the cast to `double` is applied too late, so the average will be greater than the expected result for odd values of `sum`.

APCS_A_Sem2022FallFinal_MCQ

7. Consider the following methods, which appear in the same class.

```
public void slope(int x1, int y1, int x2, int y2)
{
    int xChange = x2 - x1;
    int yChange = y2 - y1;
    printFraction(yChange, xChange);
}

public void printFraction(int numerator, int denominator)
{
    System.out.print(numerator + "/" + denominator);
}
```

Assume that the method call `slope(1, 2, 5, 10)` appears in a method in the same class. What is printed as a result of the method call?

(A) `8/4`

(B) `5/1`

(C) `4/8`

(D) `2/1`

(E) `1/5`

8. Consider the following method, which is intended to calculate and return the expression $\sqrt{\frac{(x+y)^2}{|a-b|}}$.

```
public double calculate(double x, double y, double a, double b)
{
    return /* missing code */;
}
```

Which of the following can replace /* *missing code* */ so that the method works as intended?

(A) `Math.sqrt(x ^ 2, y ^ 2, a - b)`

(B) `Math.sqrt((x + y) ^ 2) / Math.abs(a, b)`

(C) `Math.sqrt((x + y) ^ 2 / Math.abs(a - b))`

(D) `Math.sqrt(Math.pow(x + y, 2) / Math.abs(a, b))`

(E) `Math.sqrt(Math.pow(x + y, 2) / Math.abs(a - b))`

9. Consider the following static method.

```
public static int calculate(int x)

{

  x = x + x;

  x = x + x;

  x = x + x;


  return x;

}
```

Which of the following can be used to replace the body of calculate so that the modified version of calculate will return the same result as the original version for all x ?
(A) return 3 + x;
(B) return 3 * x;
(C) return 4 * x;
(D) return 6 * x;
(E) return 8 * x;

10. Consider the following static method.

```
public static int calculate(int x)

{

  x = x + x;

  x = x + x;

  x = x + x;

  return x;

}
```

Which of the following can be used to replace the body of calculate so that the modified version of calculate will return the same result as the original version for all x ?

(A)   return 2 * x;

(B)   return 4 * x;

(C)   return 8 * x;

(D)   return 3 * calculate(x);

(E)   return x + calculate(x - 1);

11. Consider the following method.

```
public double myMethod(int a, boolean b)
{  /* implementation not shown */  }
```

Which of the following lines of code, if located in a method in the same class as `myMethod`, will compile without error?

(A)   `int result = myMethod(2, false);`

(B)   `int result = myMethod(2.5, true);`

(C)   `double result = myMethod(0, false);`

(D)   `double result = myMethod(true, 10);`

(E)   `double result = myMethod(2.5, true);`

12. Consider the following code segment.

```
double num = 9 / 4;
System.out.print(num);
System.out.print(" ");
System.out.print((int) num);
```

What is printed as a result of executing the code segment?

(A)   2 2

(B)   2.0 2

(C)   2.0 2.0

(D)   2.25 2

(E)   2.25 2.0

13. Which of the following expressions evaluate to `3.5` ?

```
  I. (double) 2 / 4 + 3
 II. (double) (2 / 4) + 3
III. (double) (2 / 4 + 3)
```

(A)   I only

(B)   III only

(C)   I and II only

(D)   II and III only

(E)   I, II, and III

APCS_A_Sem2022FallFinal_MCQ

14. Consider the following code segment.

```
double x = (int) (5.5 - 2.5);
double y = (int) 5.5 - 2.5;
System.out.println(x - y);
```

What is printed as a result of executing the code segment?

(A) -1.0

(B) -0.5

(C) 0.0

(D) 0.5

(E) 1.0

15. Consider the following code segment.

```
int w = 1;
int x = w / 2;
double y = 3;
int z = (int) (x + y);
```

Which of the following best describes the results of compiling the code segment?

(A) The code segment compiles without error.

(B) The code segment does not compile, because the `int` variable `x` cannot be assigned the result of the operation `w / 2`.

(C) The code segment does not compile, because the integer value `3` cannot be assigned to the `double` variable `y`.

(D) The code segment does not compile, because the operands of the addition operator cannot be of different types `int` and `double`.

(E) The code segment does not compile because the result of the addition operation is of type `double` and cannot be cast to an `int`.

16. Consider the following code segment.

```
double x = 4.5;
int y = (int) x * 2;
System.out.print(y);
```

What is printed as a result of executing the code segment?

(A) 8

(B) 8.0

(C) 9

(D) 9.0

(E) 10

APCS_A_Sem2022FallFinal_MCQ

17. The code segment below is intended to calculate the circumference `c` of a circle with the diameter `d` of `1.5`. The circumference of a circle is equal to its diameter times `pi`.

```
/* missing declarations */
c = pi * d;
```

Which of the following variable declarations are most appropriate to replace /* *missing declarations* */ in this code segment?

(A)
```
int pi = 3.14159;
int d = 1.5;
final int c;
```

(B)
```
final int pi = 3.14159;
int d = 1.5;
int c;
```

(C)
```
final double pi = 3.14159;
double d = 1.5;
double c;
```

(D)
```
double pi = 3.14159;
double d = 1.5;
final double c = 0.0;
```

(E)
```
final double pi = 3.14159;
final double d = 1.5;
final double c = 0.0;
```

18. Consider the following code segment.

```
String temp = "comp";
System.out.print(temp.substring(0) + " " +
          temp.substring(1) + " " +
          temp.substring(2) + " " +
          temp.substring(3));
```

What is printed when the code segment is executed?

(A) `comp`

(B) `c o m p`

(C) `comp com co c`

(D) `comp omp mp p`

(E) `comp comp comp comp`

APCS_A_Sem2022FallFinal_MCQ

19. The following statement assigns an integer value to x.

```
int x = (int)(Math.random() * 5) + 10;
```

Consider the statement that would result if the positions of 5 and 10 were swapped in the preceding statement and the resulting integer were assigned to y.

```
int y = (int)(Math.random() * 10) + 5;
```

Which of the following are true statements about how the possible values assigned to y differ from the possible values assigned to x ?

    I. There are more possible values of x than there are possible values of y.
    II. There are more possible values of y than there are possible values of x.
    III. The value assigned to x can sometimes be the same as the value assigned to y.

(A) I only

(B) II only

(C) III only

(D) I and III

(E) II and III

20. Consider the following code segment.

```
int a = 5;
int b = 4;
int c = 2;
a *= 3;
b += a;
b /= c;
System.out.print(b);
```

What is printed when the code segment is executed?

(A) 2

(B) 4

(C) 9

(D) 9.5

(E) 19

21. Consider the following code segment.

```
String str = "CompSci";
System.out.println(str.substring(0, 3));
int num = str.length();
```

What is the value of num when the code segment is executed?

APCS_A_Sem2022FallFinal_MCQ

(A) 3

(B) 4

(C) 5

(D) 6

(E) 7

22. Consider the following code segment.

```
String str = "0";
str += str + 0 + 8;
System.out.println(str);
```

What is printed as a result of executing the code segment?

(A) 8

(B) 08

(C) 008

(D) 0008

(E) Nothing is printed, because numerical values cannot be added to a `String` object.

23. Consider the following code segment.

```
int one = 1;
int two = 2;
String zee = "Z";
System.out.println(one + two + zee);
```

What is printed as a result of executing the code segment?

(A) 12Z

(B) 3Z

(C) 12zee

(D) 3zee

(E) onetwozee

APCS_A_Sem2022FallFinal_MCQ

24. Consider the following method, which is intended to return true if at least one of the three strings s1, s2, or s3 contains the substring "art". Otherwise, the method should return false.

```
public static boolean containsArt(String s1, String s2, String s3)
{

  String all = s1 + s2 + s3;

  return (all.indexOf("art") != -1);

}
```

Which of the following method calls demonstrates that the method does not work as intended?

(A) containsArt ("rattrap", "similar", "today")

(B) containsArt ("start", "article", "Bart")

(C) containsArt ("harm", "chortle", "crowbar")

(D) containsArt ("matriculate", "carat", "arbitrary")

(E) containsArt ("darkroom", "cartoon", "articulate")

25. Consider the following code segment.

```
int x = 5;
int y = 6;
/* missing code */
z = (x + y) / 2;
```

Which of the following can be used to replace /* *missing code* */ so that the code segment will compile?

```
  I. int z = 0;
 II. int z;
III. boolean z = false;
```

(A) I only

(B) II only

(C) I and II only

(D) II and III only

(E) I, II, and III

26. A code segment (not shown) is intended to determine the number of players whose average score in a game exceeds 0.5. A player's average score is stored in avgScore, and the number of players who meet the criterion is stored in the variable count.

Which of the following pairs of declarations is most appropriate for the code segment described?

(A)
```
double avgScore;
boolean count;
```

(B)
```
double avgScore;
double count;
```

(C)
```
double avgScore;
int count;
```

(D)
```
int avgScore;
boolean count;
```

(E)
```
int avgScore;
int count;
```

27. The `Student` class has been defined to store and manipulate grades for an individual student. The following methods have been defined for the class.

```
/* Returns the sum of all of the student's grades */
public double sumOfGrades()
{  /* implementation not shown */  }
/* Returns the total number of grades the student has received */
public int numberOfGrades()
{  /* implementation not shown */  }
/* Returns the lowest grade the student has received */
public double lowestGrade()
{  /* implementation not shown */  }
```

Which of the following statements, if located in a method in the `Student` class, will determine the average of all of the student's grades except for the lowest grade and store the result in the `double` variable `newAverage` ?

(A) `newAverage = sumOfGrades() / numberOfGrades() - 1;`

(B) `newAverage = sumOfGrades() / (numberOfGrades() - 1);`

(C) `newAverage = sumOfGrades() - lowestGrade() / (numberOfGrades() - 1);`

(D) `newAverage = (sumOfGrades() - lowestGrade()) / numberOfGrades() - 1;`

(E) `newAverage = (sumOfGrades() - lowestGrade()) / (numberOfGrades() - 1);`

28. Consider the following method.

```
public void doSomething()
{
     System.out.println("Something has been done");
}
```

Each of the following statements appears in a method in the same class as `doSomething`. Which of the following statements are valid uses of the method `doSomething` ?

```
  I. doSomething();
 II. String output = doSomething();
III. System.out.println(doSomething());
```

(A) I only

(B) II only

(C) I and II only

(D) I and III only

(E) I, II, and III

29. Consider the following code segment.

```
double d1 = 10.0;
Double d2 = 20.0;
Double d3 = new Double(30.0);
double d4 = new Double(40.0);

System.out.println(d1 + d2 + d3.doubleValue() + d4);
```

What, if anything, is printed when the code segment is executed?

(A) 100.0

(B) 10.050.040.0

(C) 10.020.070.0

(D) 10.020.030.040.0

(E) There is no output due to a compilation error.

30. Consider the following code segment.

```
int a = 5;
int b = 2;
double c = 3.0;
System.out.println(5 + a / b * c - 1);
```

What is printed when the code segment is executed?

(A) 0.666666666666667

(B) 9.0

(C) 10.0

(D) 11.5

(E) 14.0

APCS_A_Sem2022FallFinal_MCQ

31. Consider the following class definition.

```java
public class ExamScore
{
    private String studentId;
    private double score;
    public ExamScore(String sid, double s)
    {
        studentId = sid;
        score = s;
    }
    public double getScore()
    {
        return score;
    }
    public void bonus(int b)
    {
        score += score * b/100.0;
    }
}
```

Assume that the following code segment appears in a class other than `ExamScore`.

```java
ExamScore es = new ExamScore("12345", 80.0);
es.bonus(5);
System.out.println(es.getScore());
```

What is printed as a result of executing the code segment?

(A) 4.0

(B) 5.0

(C) 80.0

(D) 84.0

(E) 85.0

APCS_A_Sem2022FallFinal_MCQ

32. Consider the following methods, which appear in the same class.

```
public int function1(int i, int j)
{
    return i + j;
}

public int function2(int i, int j)
{
    return j - i;
}
```

Which of the following statements, if located in a method in the same class, will initialize the variable `x` to `11`?

(A) `int x = function2(4, 5) + function1(1, 3);`

(B) `int x = function1(4, 5) + function2(1, 3);`

(C) `int x = function1(4, 5) + function2(3, 1);`

(D) `int x = function1(3, 1) + function2(4, 5);`

(E) `int x = function2(3, 1) + function1(4, 5);`

APCS_A_Sem2022FallFinal_MCQ

33. Consider the following class declaration.

```
public class GameClass
{
    private int numPlayers;
    private boolean gameOver;

    public Game()
    {
        numPlayers = 1;
        gameOver = false;
    }

    public void addPlayer()
    {
        numPlayers++;
    }

    public void endGame()
    {
        gameOver = true;
    }
}
```

Assume that the `GameClass` object `game` has been properly declared and initialized in a method in a class other than `GameClass`. Which of the following statements are valid?

   I. `game.numPlayers++;`
  II. `game.addPlayer();`
 III. `game.gameOver();`
 IV. `game.endGame();`

(A) IV only

(B) I and III only

(C) I and IV only

(D) II and IV only

(E) II, III, and IV only

34. A pair of number cubes is used in a game of chance. Each number cube has six sides, numbered from 1 to 6, inclusive, and there is an equal probability for each of the numbers to appear on the top side (indicating the cube's value) when the number cube is rolled. The following incomplete statement appears in a program that computes the sum of the values produced by rolling two number cubes.

int sum = / * *missing code* * / ;

Which of the following replacements for /* *missing code* */ would best simulate the value produced as a result of rolling two number cubes?

APCS_A_Sem2022FallFinal_MCQ

    (A)   2 * (int) (Math.random() * 6)

    (B)   2 * (int) (Math.random() * 7)

    (C)   (int) (Math.random() * 6) + (int) (Math.random() * 6)

    (D)   (int) (Math.random() * 13)

    (E)   2 + (int) (Math.random() * 6) + (int) (Math.random() * 6)

APCS_A_Sem2022FallFinal_MCQ

The following questions refer to the code from the GridWorld case study. A copy of the code is provided below.

Appendix B — Testable API

info.gridworld.grid.Location class (implements Comparable)

public Location(int r, int c)

    constructs a location with given row and column coordinates

public int getRow()

    returns the row of this location

public int getCol()

    returns the column of this location

public Location getAdjacentLocation(int direction)

    returns the adjacent location in the direction that is closest to direction

public int getDirectionToward(Location target)

    returns the closest compass direction from this location toward target

public boolean equals(Object other)

    returns true if other is a Location with the same row and column as this location; false otherwise

---

APCS_A_Sem2022FallFinal_MCQ

public int hashCode()

      returns a hash code for this location

public int compareTo(Object other)

      returns a negative integer if this location is less than other, zero if the two locations are equal, or a positive integer if this location is greater than other. Locations are ordered in row-major order.

      Precondition: other is a Location object.

public String toString()

      returns a string with the row and column of this location, in the format (row, col)

Compass directions:

public static final int NORTH = 0;

public static final int EAST = 90;

public static final int SOUTH = 180;

public static final int WEST = 270;

public static final int NORTHEAST = 45;

public static final int SOUTHEAST = 135;

public static final int SOUTHWEST = 225;

public static final int NORTHWEST = 315;

Turn angles:

public static final int LEFT = -90;

public static final int RIGHT = 90;

public static final int HALF_LEFT = -45;

public static final int HALF_RIGHT = 45;

public static final int FULL_CIRCLE = 360;

public static final int HALF_CIRCLE = 180;

public static final int AHEAD = 0;

info.gridworld.grid.Grid<E> interface

int getNumRows()

> returns the number of rows, or -1 if this grid is unbounded

int getNumCols()

> returns the number of columns, or -1 if this grid is unbounded

boolean isValid(Location loc)

> returns true if loc is valid in this grid, false otherwise

> **Precondition:** loc is not null

E put(Location loc, E obj)

> puts obj at location loc in this grid and returns the object previously at that location (or null if the location was previously unoccupied).

> **Precondition:** (1) loc is valid in this grid (2) obj is not null

E remove(Location loc)

removes the object at location loc from this grid and returns the object that was removed (or null if the location is unoccupied)

Precondition: loc is valid in this grid

E get(Location loc)

returns the object at location loc (or null if the location is unoccupied)

Precondition: loc is valid in this grid

ArrayList<Location> getOccupiedLocations()

returns an array list of all occupied locations in this grid

ArrayList<Location> getValidAdjacentLocations(Location loc)

returns an array list of the valid locations adjacent to loc in this grid

Precondition: loc is valid in this grid

ArrayList<Location> getEmptyAdjacentLocations(Location loc)

returns an array list of the valid empty locations adjacent to loc in this grid

Precondition: loc is valid in this grid

ArrayList<Location> getOccupiedAdjacentLocations(Location loc)

returns an array list of the valid occupied locations adjacent to loc in this grid

Precondition: loc is valid in this grid

ArrayList<E> getNeighbors(Location loc)

returns an array list of the objects in the occupied locations adjacent to loc in this grid

Precondition: loc is valid in this grid

info.gridworld.actor.Actor class

public Actor()

constructs a blue actor that is facing north

public Color getColor()

returns the color of this actor

public void setColor(Color newColor)

sets the color of this actor to newColor

public int getDirection()

returns the direction of this actor, an angle between 0 and 359 degrees

public void setDirection(int newDirection)

sets the direction of this actor to the angle between 0 and 359 degrees that is equivalent to newDirection

public Grid<Actor> getGrid()

returns the grid of this actor, or null if this actor is not contained in a grid

public Location getLocation()

returns the location of this actor, or null if this actor is not contained in a grid

public void putSelfInGrid(Grid<Actor> gr, Location loc)

puts this actor into location loc of grid gr. If there is another actor at loc, it is removed.

Precondition: (1) This actor is not contained in a grid (2) loc is valid in gr

public void removeSelfFromGrid()

removes this actor from its grid.

Precondition: this actor is contained in a grid

public void moveTo(Location newLocation)

moves this actor to newLocation. If there is another actor at newLocation, it is removed.

Precondition: (1) This actor is contained in a grid (2) newLocation is valid in the grid of this actor

public void act()

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APCS_A_Sem2022FallFinal_MCQ

reverses the direction of this actor. Override this method in subclasses of Actor to define types of actors with different behavior

public String toString()

returns a string with the location, direction, and color of this actor

info.gridworld.actor.Rock class (extends Actor)

public Rock()

constructs a black rock

public Rock(Color rockColor)

constructs a rock with color rockColor

public void act()

overrides the act method in the Actor class to do nothing

info.gridworld.actor.Flower class (extends Actor)

public Flower()

constructs a pink flower

APCS_A_Sem2022FallFinal_MCQ

public Flower(Color initialColor)

   constructs a flower with color initialColor

public void act()

  causes the color of this flower to darken

35. Consider the following method that is intended to move the parameter anActor to a different grid that is referred to by the parameter newGrid. The location of anActor in newGrid should be the same as the location that anActor had occupied in its original grid.

    / Moves anActor to newGrid in the same location it occupied in its original grid.**

    * @param anActor the actor to be moved

    * @param newGrid the grid in which the actor is to be placed

    */

    public void moveActorToNewGrid(Actor anActor, Grid<Actor> newGrid)

    {

    Grid<Actor> oldGrid = anActor.getGrid();

    Location loc = anActor.getLocation();

    /* missing code */

    }

    Which of the following can be used to replace /* *missing code* */ so that moveActorToNewGrid will work as intended?

(A)   anActor.putSelfInGrid(newGrid, loc);
      anActor.removeSelfFromGrid();

(B)   oldGrid.remove(loc);
      anActor.putSelfInGrid(newGrid, loc);

(C)   anActor.removeSelfFromGrid();
      anActor.putSelfInGrid(newGrid, loc);

(D)   oldGrid.remove(loc);
      newGrid.put(anActor, loc);

(E)   newGrid.put(anActor, loc);
      oldGrid.remove(loc);

---

36.   Consider the following code segment.

```
System.out.print("Hello System.out.println");
System.out.print("!!!");
```

What is printed as a result of executing the code segment?

(A)   `Hello!!!`

(B)   `Hello System.out.println!!!`

(C)   `Hello`
      `!!!`

(D)   `Hello System.out.println`
      `!!!`

(E)   Nothing is printed because the text `"System.out.println"` cannot appear inside a print statement.

37. Consider the method `getHours,` which is intended to calculate the number of hours that a vehicle takes to travel between two *mile markers* on a highway if the vehicle travels at a constant speed of 60 miles per hour. A mile marker is a sign showing the number of miles along a road between some fixed location (for example, the beginning of a highway) and the current location.

The following table shows two examples of the intended behavior of `getHours,` based on the `int` parameters `marker1` and `marker2`.

marker1	marker2	**Return Value**
100	220	2.0
100	70	0.5

Consider the following implementation of `getHours`.

```
public static double getHours(int marker1, int marker2)
{
    /* missing statement */
    return hours;
}
```

Which of the following statements can replace /* *missing statement* */ so `getHours` works as intended?

(A) `double hours = (Math.abs(marker1) - Math.abs(marker2)) / 60.0;`

(B) `double hours = Math.abs(marker1 - marker2 / 60.0);`

(C) `double hours = Math.abs(marker1 - marker2) / 60.0;`

(D) `double hours = Math.abs((marker1 - marker2) / 60);`

(E) `double hours = (double) (Math.abs(marker1 - marker2) / 60);`

APCS_A_Sem2022FallFinal_MCQ

38. Consider the following class declaration.

```
public class Student
{
  private String myName;
  private int myAge;

  public Student()
  {  /* implementation not shown */  }

  public Student(String name, int age)
  {  /* implementation not shown */  }

  // No other constructors
}
```

Which of the following declarations will compile without error?

    I. Student a = new Student();

    II. Student b = new Student("Juan", 15);

    III. Student c = new Student("Juan", "15");

  (A) I only
  (B) II only
  (C) I and II only
  (D) I and III only
  (E) I, II, and III

39. Consider the following code segment.

```
double firstDouble = 2.5;
int firstInt = 30;
int secondInt = 5;
double secondDouble = firstInt - secondInt / firstDouble + 2.5;
```

What value will be assigned to `secondDouble` when the code segment is executed?

APCS_A_Sem2022FallFinal_MCQ

(A)   5.0

(B) 12.5

(C) 25.5

(D) 29.0

(E) 30.5

40. The following code segment is intended to interchange the values of the `int` variables `x` and `y`. Assume that `x` and `y` have been properly declared and initialized.

```
int temp = x;
/* missing code */
```

Which of the following can be used to replace `/* missing code */` so that the code segment works as intended?

(A) ```
x = y;
x = temp;
```

(B)  ```
x = y;
y = temp;
```

(C) ```
y = x;
x = temp;
```

(D)  ```
y = x;
temp = y;
```

(E) ```
y = x;
temp = x;
```

**41.** Consider the following class definition.

```
public class Bird
{
    private String species;
    private String color;
    private boolean canFly;
    public Bird(String str, String col, boolean cf)
    {
        species = str;
        color = col;
        canFly = cf;
    }
}
```

Which of the following constructors, if added to the `Bird` class, will cause a compilation error?

APCS_A_Sem2022FallFinal_MCQ

(A)
```
public Bird()
{
     species = "unknown";
     color = "unknown";
     canFly = false;
}
```

(B)
```
public Bird(boolean cf)
{
     species = "unknown";
     color = "unknown";
     canFly = cf;
}
```

(C)
```
public Bird(String col, String str)
{
     species = str;
     color = col;
     canFly = false;
}
```

(D)
```
public Bird(boolean cf, String str, String col)
{
     species = str;
     color = col;
     canFly = cf;
}
```

(E)
```
public Bird(String col, String str, boolean cf)
{
     species = str;
     color = col;
     canFly = cf;
}
```

42. A student has created a `Car` class. The class contains variables to represent the following.

A `String` variable called `color` to represent the color of the car
An `int` variable called `year` to represent the year the car was made
A `String` variable called `make` to represent the manufacturer of the car
A `String` variable called `model` to represent the model of the car

The object `vehicle` will be declared as type `Car`.

Which of the following descriptions is accurate?

(A) An instance of the `vehicle` class is `Car`.

(B) An instance of the `Car` object is `vehicle`.

(C) An attribute of the `year` object is `int`.

(D) An attribute of the `vehicle` object is `color`.

(E) An attribute of the `Car` instance is `vehicle`.

APCS_A_Sem2022FallFinal_MCQ

43. Consider the following code segment.

```
num += num;
num *= num;
```

Assume that `num` has been previously declared and initialized to contain an integer value. Which of the following best describes the behavior of the code segment?

(A) The value of `num` is two times its original value.

(B) The value of `num` is the square its original value.

(C) The value of `num` is two times the square of its original value.

(D) The value of `num` is the square of twice its original value.

(E) It cannot be determined without knowing the initial value of `num`.

44. Consider the code segment below.

```
int a = 1988;
int b = 1990;

String claim = " that the world's athletes " +
          "competed in Olympic Games in ";

String s = "It is " + true + claim + a +
       " but " + false + claim + b + ".";

System.out.println(s);
```

What, if anything, is printed when the code segment is executed?

(A) `It is trueclaima but falseclaimb.`

(B) `It is trueclaim1998 but falseclaim1990.`

(C) `It is true that the world's athletes competed in Olympic Games in a but false that the world's athletes competed in Olympic Games in b.`

(D) `It is true that the world's athletes competed in Olympic Games in 1988 but false that the world's athletes competed in Olympic Games in 1990.`

(E) Nothing is printed because the code segment does not compile.

45. Consider the following code segment, which is intended to print the digits of the two-digit `int` number `num` in reverse order. For example, if `num` has the value `75`, the code segment should print `57`. Assume that `num` has been properly declared and initialized.

```
/* missing code */
System.out.print(onesDigit);
System.out.print(tensDigit);
```

Which of the following can be used to replace /* *missing code* */ so that the code segment works as intended?

APCS_A_Sem2022FallFinal_MCQ

(A)
```
int onesDigit = num % 10;
int tensDigit = num / 10;
```

(B)
```
int onesDigit = num / 10;
int tensDigit = num % 10;
```

(C)
```
int onesDigit = 10 / num;
int tensDigit = 10 % num;
```

(D)
```
int onesDigit = num % 100;
int tensDigit = num / 100;
```

(E)
```
int onesDigit = num / 100;
int tensDigit = num % 100;
```

46. Consider the following code segment.

```
int a = 3 + 2 * 3;
int b = 4 + 3 / 2;
int c = 7 % 4 + 3;
double d = a + b + c;
```

What is the value of `d` after the code segment is executed?

(A) 14.0

(B) 18.0

(C) 20.0

(D) 20.5

(E) 26.0

47. Which of the following expressions evaluate to `7` ?

```
  I.  9 + 10 % 12
 II.  (9 + 10) % 12
III.  9 - 2 % 12
```

(A) I only

(B) II only

(C) I and III

(D) II and III

(E) I, II, and III

48. A student has created an `OrderedPair` class to represent points on an xy-plane. The class contains the following.

An `int` variable called `x` to represent an x-coordinate.
An `int` variable called `y` to represent a y-coordinate.
A method called `printXY` that will print the values of `x` and `y`.

The object `origin` will be declared as type `OrderedPair`.

Which of the following descriptions is accurate?

APCS_A_Sem2022FallFinal_MCQ

(A) `origin` is an instance of the `printXY` method.

(B) `origin` is an instance of the `OrderedPair` class.

(C) `origin` is an instance of two `int` objects.

(D) `OrderedPair` is an instance of the `origin` object.

(E) `printXY` is an instance of the `OrderedPair` class.

APCS_A_Sem2022FallFinal_MCQ

49. Consider the following attempts at method overloading.

I.
```
public class Overload
{
     public int average(int x, int y)
     { /* implementation not shown */ }

     public int average(int value1, int value2)
     { /* implementation not shown */ }

     // There may be instance variables, constructors,
     // and methods that are not shown.
}
```

II.
```
public class Overload
{
     public int average(int x, int y)
     { /* implementation not shown */ }

     public int average(int x, int y, int z)
     { /* implementation not shown */ }

     // There may be instance variables, constructors
     // and methods that are not shown.
}
```

III.
```
public class Overload
{
     public int average(int x, int y)
     { /* implementation not shown */ }

     public int average(double x, double y)
     { /* implementation not shown */ }

     // There may be instance variables, constructors,
     // and methods that are not shown.
}
```

Which of the attempts at method overloading will compile without error?

(A) I only

(B) II only

(C) III only

(D) II and III only

(E) I, II, and III

50. Consider the following class declaration.

```
public class Person
{
  private String myName;
  private int myYearOfBirth;

  public Person(String name, int yearOfBirth)
  {
    myName = name;
    myYearOfBirth = yearOfBirth;
  }

  public String getName()
  {   return myName;   }

  public void setName(String name)
  {   myName = name;   }

  // There may be instance variables, constructors, and methods that are not shown.
}
```

Assume that the following declaration has been made.
Person student = new Person ("Thomas", 1995);
Which of the following statements is the most appropriate for changing the name of student from "Thomas" to "Tom" ?

(A) student = new Person ("Tom", 1995);

(B) student.myName = "Tom";

(C) student.getName ("Tom");

(D) student.setName ("Tom");

(E) Person.setName ("Tom");

51. Consider the following code segment.

```
int x = 5;
x += 6 * 2;
x -= 3 / 2;
```

What value is stored in x after the code segment executes?

(A) -1.5

(B) 1

(C) 9

(D) 15.5

(E) 16

52. Consider the following code segment, where `k` and `count` are properly declared and initialized `int` variables.

```
k++;
k++;
count++;
k--;
count++;
k--;
```

Which of the following best describes the behavior of the code segment?

(A) The code segment leaves both `k` and `count` unchanged.

(B) The code segment increases both `k` and `count` by 2.

(C) The code segment increases `k` by 4 and `count` by 2.

(D) The code segment leaves `k` unchanged and increases `count` by 2.

(E) The code segment increases `k` by 2 and leaves `count` unchanged.

53. Consider the following `Point2D` class.

```
public class Point2D
{
    private double xCoord;
    private double yCoord;

    public Point2D(double x, double y)
    {
        xCoord = x;
        yCoord = y;
    }
}
```

Which of the following code segments, appearing in a class other than `Point2D,` will correctly create an instance of a `Point2D` object?

(A) `Point2D p = (3.0, 4.0);`

(B) `Point2D p = Point2D(3.0, 4.0);`

(C) `new p = Point2D(3.0, 4.0);`

(D) `new Point2D = p(3.0, 4.0);`

(E) `Point2D p = new Point2D(3.0, 4.0);`

APCS_A_Sem2022FallFinal_MCQ

54. Consider the following code segment.

```
int a = 4;
int b = 5;
a++;
b++;
int c = a + b;
a -= 1;
System.out.println(a + c);
```

What is printed when the code segment is executed?

(A) 9

(B) 10

(C) 14

(D) 15

(E) 25

55. Consider the following code segment.

```
System.out.print("AP");
System.out.println();
System.out.println("CS");
System.out.print("A");
```

What is printed as a result of executing the code segment?

(A) APCSA

(B) APCS
     A

(C) AP
     CSA

(D) AP
     CS
     A

(E) AP
     CS
     A

APCS_A_Sem2022FallFinal_MCQ

56. Consider the following code segment.

```
System.out.print(I do not fear computers. );    // Line 1
System.out.println(I fear the lack of them.);   // Line 2
System.out.println(--Isaac Asimov);             // Line 3
```

The code segment is intended to produce the following output but may not work as intended.

```
I do not fear computers. I fear the lack of them.
--Isaac Asimov
```

Which change, if any, can be made so that the code segment produces the intended output?

(A) In line 1, `print` should be changed to `println`.

(B) In lines 2 and 3, `println` should be changed to `print`.

(C) The statement `System.out.println()` should be inserted between lines 2 and 3.

(D) In lines 1, 2, and 3, the text that appears in parentheses should be enclosed in quotation marks.

(E) No change is needed; the code segment works correctly as is.

57. Consider the following code segment.

```
System.out.print(*);      // Line 1
System.out.print("*");    // Line 2
System.out.println();     // Line 3
System.out.println("*");  // Line 4
```

The code segment is intended to produce the following output, but may not work as intended.

```
**
*
```

Which line of code, if any, causes an error?

(A) Line 1

(B) Line 2

(C) Line 3

(D) Line 4

(E) The code segment works as intended.

58. Consider the following code segment.

```
System.out.print("*");
System.out.println("**");
System.out.println("***");
System.out.print("****");
```

What is printed as a result of executing the code segment?

APCS_A_Sem2022FallFinal_MCQ

(A)
```
   *
  **
 ***
****
```

(B)
```
*
**
*******
```

(C)
```
*
*****
****
```

(D)
```
***
***
****
```

(E)
```
***
*******
```

59. Consider the following code segment.

```
System.out.print("One");    // Line 1
System.out.print("Two");    // Line 2
System.out.print("Three"); // Line 3
System.out.print("Four");   // Line 4
```

The code segment is intended to produce the following output, but does not work as intended.

```
OneTwo
ThreeFour
```

Which of the following changes can be made so that the code segment produces the intended output?

(A) Changing `print` to `println` in line 1 only

(B) Changing `print` to `println` in line 2 only

(C) Changing `print` to `println` in line 3 only

(D) Changing `print` to `println` in lines 2 and 3 only

(E) Changing `print` to `println` in lines 1, 2, 3, and 4

60. What is printed as a result of executing the following statement?

```
System.out.println(404 / 10 * 10 + 1);
```

(A) 4

(B) 5

(C) 41

(D) 401

(E) 405

61. Consider the following methods, which appear in the same class.

```
public void printSum(int x, double y)
{
    System.out.println(x + y);
}

public void printProduct(double x, int y)
{
    System.out.println(x * y);
}
```

Consider the following code segment, which appears in a method in the same class as `printSum` and `printProduct`.

```
int num1 = 5;
double num2 = 10.0;
printSum(num1, num2);
printProduct(num1, num2);
```

What, if anything, is printed as a result of executing the code segment?

(A) 15
     50

(B) 15
     50.0

(C) 15.0
     50

(D) 15.0
     50.0

(E) Nothing is printed because the code does not compile.

62. Consider the `processWords` method. Assume that each of its two parameters is a `String` of length two or more.

```
public void processWords(String word1, String word2)
{
    String str1 = word1.substring(0, 2);
    String str2 = word2.substring(word2.length() - 1);
    String result = str2 + str1;
    System.out.println(result.indexOf(str2));
}
```

Which of the following best describes the value printed when `processWords` is called?

APCS_A_Sem2022FallFinal_MCQ

(A) The value `0` is always printed.

(B) The value `1` is always printed.

(C) The value `result.length() - 1` is printed.

(D) A substring containing the last character of `word2` is printed.

(E) A substring containing the last two characters of `word2` is printed.

63. Consider the following method.

```
public double puzzle(int x)
{
    Double y = x / 2.0;
    y /= 2;

    return y.doubleValue();
}
```

Assume that the method call `puzzle(3)` appears in a method in the same class as `puzzle`. What value is returned as a result of the method call?

(A) `0.0`

(B) `0.5`

(C) `0.75`

(D) `1.0`

(E) `1.5`

64. Which of the following statements assigns a random integer between 25 and 60, inclusive, to `rn` ?

(A) `int rn = (int) (Math.random() * 25) + 36;`

(B) `int rn = (int) (Math.random() * 25) + 60;`

(C) `int rn = (int) (Math.random() * 26) + 60;`

(D) `int rn = (int) (Math.random() * 36) + 25;`

(E) `int rn = (int) (Math.random() * 60) + 25;`

65. Which of the following statements assigns a random integer between `1` and `10`, inclusive, to `rn` ?

(A) `int rn = (int) (Math.random()) * 10;`

(B) `int rn = (int) (Math.random()) * 10 + 1;`

(C) `int rn = (int) (Math.random() * 10);`

(D) `int rn = (int) (Math.random() * 10) + 1;`

(E) `int rn = (int) (Math.random() + 1) * 10;`

66. Consider the following code segment, which is intended to assign to `num` a random integer value between `min` and `max`, inclusive. Assume that `min` and `max` are integer variables and that the value of `max` is greater than the value of `min`.

```
double rn = Math.random();
int num = /* missing code */;
```

Which of the following could be used to replace `/* missing code */` so that the code segment works as intended?

(A) `(int) (rn * max) + min`

(B) `(int) (rn * max) + min - 1`

(C) `(int) (rn * (max - min)) + min`

(D) `(int) (rn * (max - min)) + 1`

(E) `(int) (rn * (max - min + 1)) + min`

67. Consider the following code segment. Assume that `a` is greater than zero.

```
int a = /* value not shown */;
int b = a + (int) (Math.random() * a);
```

Which of the following best describes the value assigned to `b` when the code segment is executed?

(A) `a`

(B) `2 * a`

(C) A random integer between `0` and `a - 1`, inclusive

(D) A random integer between `a` and `2 * a`, inclusive

(E) A random integer between `a` and `2 * a - 1`, inclusive

68. Assume that the following variable declarations have been made.

double d = Math.random();

double r;

Which of the following assigns a value to r from the uniform distribution over the range $0.5 \leq r < 5.5$?

(A) r = d + 0.5;

(B) r = d + 0.5 * 5.0;

(C) r = d * 5.0;

(D) r = d * 5.0 + 0.5;

(E) r = d * 5.5;

69. The following code segment is intended to round `val` to the nearest integer and print the result.

```
double val = -0.7;
int roundedVal = (int) (val + 0.5);
System.out.println(roundedVal);
```

Which of the following best describes the behavior of the code segment?

(A) The code segment works as intended.

(B) The code segment does not work as intended because `val` and `roundedVal` should be declared as the same data type.

(C) The code segment does not work as intended because the expression `(val + 0.5)` should be cast to a `double` instead of an `int`.

(D) The code segment does not work as intended because `val` should be cast to an `int` before `0.5` is added to it.

(E) The code segment does not work as intended because the expression `(int) (val + 0.5)` rounds to the nearest integer only when `val` is positive.

70. Consider the following method.

```
public static String scramble(String word, int howFar)
{
  return word.substring(howFar + 1, word.length()) +
         word.substring(0, howFar);
}
```

What value is returned as a result of the call scramble("compiler", 3)?

(A) "compiler"
(B) "pilercom"
(C) "ilercom"
(D) "ilercomp"
(E) No value is returned because an IndexOutOfBoundsException will be thrown.

APCS_A_Sem2022FallFinal_MCQ

Directions: Select the choice that best fits each statement. The following question(s) refer to the following information.

Consider the following partial class declaration.

```
public class SomeClass
{
  private int myA;
  private int myB;
  private int myC;

  // Constructor(s) not shown

  public int getA()
  {   return myA;   }

  public void setB(int value)
  {   myB = value;   }
}
```

71.   The following declaration appears in another class.
SomeClass obj = new SomeClass ( );
Which of the following code segments will compile without error?

(A)   int x = obj.getA ( );

(B)   int x;
      obj.getA (x);

(C)   int x = obj.myA;

(D)   int x = SomeClass.getA ( );

(E)   int x = getA(obj);

72.   A student has created a `Song` class. The class contains the following variables.

A `String` variable called `artist` to represent the artist name
A `String` variable called `title` to represent the song title
A `String` variable called `album` to represent the album title

The object `happyBirthday` will be declared as type `Song`.

Which of the following statements is true?

APCS_A_Sem2022FallFinal_MCQ

(A) `artist`, `title`, and `album` are instances of the `Song` class.

(B) `happyBirthday` is an instance of three `String` objects.

(C) `happyBirthday` is an instance of the `Song` class.

(D) `Song` is an instance of the `happyBirthday` object.

(E) `Song` is an instance of three `String` objects.

73. Which of the following statements stores the value `3` in `x` ?

(A) `int x = 4 / 7;`

(B) `int x = 7 / 3;`

(C) `int x = 7 / 4;`

(D) `int x = 5 % 8;`

(E) `int x = 8 % 5;`

74. Consider the following class definition.

```
public class Student
{
      private int studentID;
      private int gradeLevel;
      private boolean honorRoll;

      public Student(int s, int g)
      {
          studentID = s;
          gradeLevel = g;
          honorRoll = false;
      }

      public Student(int s)
      {
          studentID = s;
          gradeLevel = 9;
          honorRoll = false;
      }
}
```

Which of the following code segments would successfully create a new `Student` object?

```
  I. Student one = new Student(328564, 11);
 II. Student two = new Student(238783);
III. int id = 392349;
     int grade = 11;
     Student three = new Student(id, grade);
```

    (A)   I only

    (B)   II only

    (C)   III only

    (D)   I and II only

    (E)   I, II, and III

75. Consider the following class definition.

```
public class Thing
{
    public void talk()
    {
        System.out.print("Hello ");
    }

    public void name()
    {
        System.out.print("my friend");
    }

    public void greet()
    {
        talk();
        name();
    }
    /* Constructors not shown */
}
```

Which of the following code segments, if located in a method in a class other than `Thing`, will cause the message `"Hello my friend"` to be printed?

(A)
```
Thing a = new Thing();
Thing.talk();
Thing.name();
```

(B)
```
Thing a = new Thing();
Thing.greet();
```

(C)
```
Thing a = new Thing();
a.talk();
```

(D)
```
Thing a = new Thing();
a.greet();
```

(E)
```
Thing a = new Thing();
a.name();
a.talk();
```

APCS_A_Sem2022FallFinal_MCQ

76. Consider the following method.

```
public int timesTwo (int n)
{
    return n * 2;
}
```

The following code segment appears in a method in the same class as the `timesTwo` method.

```
Integer val = 10;
int result1 = timesTwo(val);
Integer result2 = result1;
System.out.print(result2);
```

What, if anything, is printed as a result of executing the code segment?

(A) 10

(B) 20

(C) Nothing; the code segment will not compile because `timesTwo` cannot accept an `Integer` parameter.

(D) Nothing; the code segment will not compile because the value returned by `timesTwo` cannot be assigned to `result1`.

(E) Nothing; the code segment will not compile because the `int` variable `result1` cannot be assigned to the `Integer` variable `result2`.

77. Consider the following class.

```
public class WindTurbine
{
    private double efficiencyRating;
    public WindTurbine()
    {
        efficiencyRating = 0.0;
    }
    public WindTurbine(double e)
    {
        efficiencyRating = e;
    }
}
```

Which of the following code segments, when placed in a method in a class other than `WindTurbine`, will construct a `WindTurbine` object `wt` with an `efficiencyRating` of `0.25` ?

APCS_A_Sem2022FallFinal_MCQ

(A) `WindTurbine wt = new WindTurbine(0.25);`

(B) `WindTurbine wt = 0.25;`

(C) `WindTurbine wt = new WindTurbine();`
`wt = 0.25;`

(D) `WindTurbine wt = new WindTurbine();`
`wt.efficiencyRating = 0.25;`

(E) `new WindTurbine wt = 0.25;`