


Computer Sciences 302

Midterm Exam 1, 20%

Deb's
Solution
Notes

Thursday 10/18, 2012

Print last name: Deppeler first: Debra

Signature:  CS login: deppeler

Circle Your Lecture Lec 1 Lec 2 Lec 3 Lec 4 Lec 5 Lec 6 Lec 8
Deppeler Deppeler Brown Tress Pollen Miller Hardikar

Don't forget to circle your lecture and record your login

Before you Begin:

- (1) Take a separate answer sheet (i.e., scantron) and *write your UW ID number in the ID field.*
- (2) Turn in your UW student ID.
- (3) **On the separate answer sheet:**
 - Fill in the bubbles corresponding to each digit of your UW student ID number.
 - Write your name and then fill in the bubbles corresponding to each letter.
 - In the "Special Codes" section under letter "A" write your lecture number and fill in the corresponding bubble, and under letter "B" write P but do not fill in a bubble.
- (4) **On this examination booklet:**
 - Print and sign your name above.
 - Write your CS login and circle your lecture above.
- (5) Check that there is a total of 12 pages in this exam.
- (6) You may not use notes, books, calculators (or any other electronic devices), or neighbors on this exam. Turn off and put away your cell phone, pager, pda, etc. now.
- (7) The exam is intended to take 90 minutes, but **we will give you 2 hours to complete the exam.**
- (8) We can't provide hints but if you need an exam question clarified or feel that there is an error, please bring this to our attention. If needed, **corrections will be written on the board.**

When you've Finished:

- (9) Double check that you have correctly marked the bubbles on your answer sheet. Only answers marked on your answer sheet matter. Marks in this examination booklet don't count.
- (10) Turn in this examination booklet and your answer sheet, and make sure we return *your* ID.


Taking the Exam

There are 25 question each worth 3 points with a maximum score of 72 points (there is a bonus question).

For the questions on the following pages, **choose the one best answer after reading all of the choices.** Use a #2 pencil to fill in the bubble on your answer sheet that corresponds to your answer for each question. Note a reference is provided on the next page, which you should review when the exam begins.

Exam Reference Page

Operator Precedence Table:

| level | operator | description | |
|---|------------------------------|--|--|
| higher | (<expression>) | grouping with parentheses | |
|  | + - (<type> ++ -- ! | unary plus/minus type casting dec/increment logical not | |
| | * / % | multiplicative | |
| | + - | additive | |
| | < <= > >= | relational | |
| | == != | equality | |
| | && | logical and | |
| | | logical or | |
| | = += -= *= /= %= | assignment and compound assignments | |
| | lower | | |

Constant and Methods from the `java.lang.Math` class:

```

PI //represents the constant π
double abs (double n) //Returns the absolute value of n.
double pow (double n, double p) //Returns nP.
double sqrt(double n) //Returns the square root of n.

```

Methods from the `java.lang.String` class (*REMEMBER 0-based indexing is used):

```

int length() //Returns # of characters in this String.
char charAt(int index) //Returns the character at the index.
boolean equals(String s) //Returns true if the contents of this String
//is the same as the contents of String s.
boolean equalsIgnoreCase(String s) // Returns true iff the contents of the
// this string is the same as that of the
// string s, ignoring differences in case.
String substring(int beginIndex)
//Returns a new string that is a substring of this string
//starting at beginIndex to the end of the this string.
String substring(int beginIdx, int endIdx)
//Returns a new string that is a substring of this string
//starting at beginIdx up to but not including endIdx.

```

Methods from the `java.util.Random` class:

```

Random() //Creates a new random number generator.
Random(int s) //Creates a new random number generator seeded with s.
int nextInt() //Returns the next pseudo-random integer value.
int nextInt(int n) //Returns the next pseudo-random integer value
//between 0 (inclusive) and n (exclusive).

```

Methods from the `java.util.Scanner` class:

```

Scanner(System.in) //Creates a Scanner object that reads from the keyboard.
boolean hasNextInt() //Returns true if the next input would be an integer.
int nextInt() //Returns the next input as an integer.
String nextLine() //Returns the next input line as a String.

```

- 1.) What is the final result displayed by running this Java program if the user enters -2 0 F1 3 2 abc 2 in response to repeated prompts for user input?

```
public class WhatHappens {
    public static void main(String[] args) {
        int v = getInput("Enter value: ", 1, 3);
        System.out.println(v);
    }
    private static int getInput(String string, int i, int j) {
        java.util.Scanner stdin = new java.util.Scanner(System.in);
        int n = i - 1;
        while ( n < i || n > j ) {
            System.out.print(string);
            if ( stdin.hasNextInt() ) {
                n = stdin.nextInt();
            } else {
                stdin.next();
            }
        }
        return n;
    }
}
```

To check your answer:

- a. Create a project in Eclipse
- b. Create a new class named WhatHappens
- c. Copy (type) the program
- d. Compile and run
- e. Enter the values in this order
 -2
 0
 F1
 3
 2
 abc
 until the program ends.

Trace execution by hand

String = "Enter Value"
 i = 1
 j = 3
 n =
 v = (return value of getInput());
 (?)

- A. -2
- B. 0
- C. F1
- D. 3
- E. 2

- 2.) Which method call will display JAVAVAVA in the console window? Assume that your program class has this method defined?

```
public static void display(String a, int b, String c, String d) {
    System.out.print( a ); // prints a once
    for ( int i=0 ; i < b ; i++ ) // prints c from 0 to (b-1)
        System.out.print( c );
    System.out.println( d ); // prints d
}
```

- A. display("a", 3, "c", "d");
- B. display("J", 3, "AVA", "");
- C. display("JA", 4, "VA", "");
- D. display("JA", 3, "VA", "A");
- E. display("JAV", 2, "AVA", "");

Replace a, b, c, d and trace to see which one matches

SOLUTION

3.) What is value of this expression, given that w,x,y,z are integers and have been assigned these values w=-1, x=1, y=2, and z=3?

$$\left((x * y) - (\text{Math.pow}(2,3) / y) + (z * (2 * y)) \right) > (z + y)$$

- ① 2
- ② $2^3 = 8$
- ③ $8/2 = 4$
- ④ $2 * 2 = 4$
- ⑤ $3 * 4 = 12$
- ⑥ $2 - 4 = -2$
- ⑦ $-2 + 12 = 10$
- ⑧ $3 + 2 = 5$
- ⑨ $10 > 5 = \text{true}$

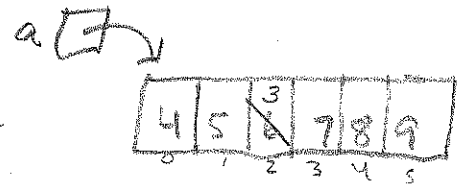
- ① A. true
- ② B. false
- ③ C. 10.0
- ④ D. 5
- ⑤ E. "10.0 > 5"

parenthesis and # show order of execution
Try code in a program to confirm.

must be true or false

4.) Which figure correctly diagrams the related contents of memory after this code fragment executes?

```
int[] a = { 4, 5, 6, 7, 8, 9 };
int i = 1;
if ( i < a.length && a[i] % 3 != 0 )
{
    a[2] = 3;
    a[i + 1] = 3;
    i += 2;
}
```



- A.)
- B.)
- C.)
- D.)
- E.)

SOLUTION

5.) For which values of an integer named choice do these two code fragments produce the same results?

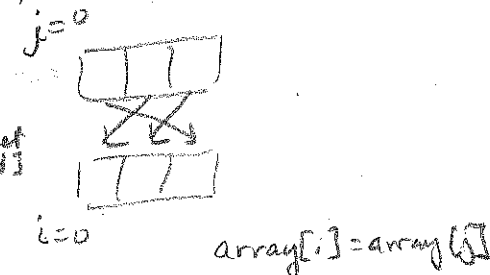
| | |
|--|---|
| <pre>if (choice==1) duel(); else if (choice==2) train(); else forfeit();</pre> | <pre>switch (choice) { case 1: duel(); break; case 2: train(); default: forfeit(); }</pre> <p style="margin-left: 20px;"><i>← no fall through</i></p> |
|--|---|

- i. choice less than or equal to 1
 - ii. choice equal to 2
 - iii. choice greater than or equal to 3
- Not same*

- A. i, ii, and iii
- B. i and iii only
- C. i and ii only
- D. ii and iii only
- E. i only

6.) Which replacements complete this method that shifts the values in an array to the left by 1 position?

```
/** shifts the values of an array to the left by 1 and wraps around
 * Ex: shiftLeft({1,2,3}) changes the array to {2,3,1} */
public static void shiftLeft( int [] array ) {
    int i = 0, j = 0, t = array[i]; ← temp value
    while ( i < CODE1 ) {
        j = i + 1; ← original array
        if ( j >= array.length ) j -= array.length; ← reset to 0
        CODE2 ;
        i++; j++;
    }
    array[ CODE3 ] = t;
}
```



- A. CODE1: array.length CODE2: array[i] = array[j] CODE3: 0
- B. CODE1: array.length CODE2: array[j] = array[i] CODE3: j
- C. CODE1: array.length CODE2: array[i] = array[j] CODE3: i
- D. CODE1: array.length-1 CODE2: array[j] = array[i] CODE3: j
- E. CODE1: array.length-1 CODE2: array[i] = array[j] CODE3: i

7.) Given that *t* is of type of double and contains a time in hours and fraction of an hour. Which choice converts that decimal time representation to a String representation showing that same amount of *time* in an hours:minutes format? For example: if *t*=1.75, the String would be "1:45". Do not worry about zero padding minutes when minutes are less than 10.

- A. int h = (int) (t/60) ; String s = h + ":" + (int) (t%60) ;
- B. int h = (int) (t%60) ; String s = h + ":" + (int) (t/60) ;
- C. int h = (int) (t-60) ; String s = h + ":" + (int) (t-60) ;
- D. int h = (int) t ; String s = h + ":" + (int) ((t-h) * 60) ;
- E. int h = (int) t ; String s = h + ":" + (int) ((t-h) % 60) ;

$$\underline{.75 \times 60 = 45}$$

8.) Consider the following method:

```
public static void pattern( int size ) {
    int n = 0;
    for (int r = 0; r < size; r++) {
        for (int c = r; c < size; c++) {
            if ( n % 2 == 0 ) { System.out.print('X'); }
            else { System.out.print('O'); }
            n++;
        }
        System.out.println();
    }
}
```

Which one of the following correctly shows the output of calling pattern(4)?

- A.
 - XOXO
 - XOXO
 - XOXO
 - XOXO
- B.
 - X
 - OX
 - OXO
 - XOXO
- C.
 - XOXO
 - XOX
 - OX
 - O

- D.
 - OXOX
 - XOXO
 - OXOX
 - XOXO
- E.
 - XOXO
 - XOX
 - XO
 - X

Manually trace code then add the method to a program to see if you are correct.

9.) What would be displayed if the following code fragment was executed?

```
int n = 4;
int s = -n;
while ( n > 1 ) {
    n = n - s;
    s = s + n;
    s++;
    n--;
}
System.out.println(s);
```

n > 1 = true
 $n = 4 - (-4) = 8$
 $s = -4 + 8 = 4$
 $n > 1$ false
 $5 + 2 = 7$
 8
 sop(s)
 8

- A. 8
- B. 7
- C. 5
- D. -4
- E. 1

SOLUTION

10.) Suppose that `method10` has the header shown, and it compiles and runs without crashing if called correctly. Which code choice compiles and runs without error? Do not assume other variables or methods have been declared.

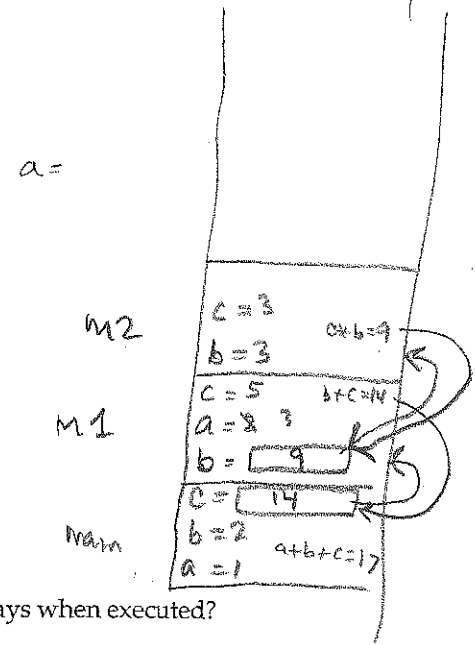
```
public static boolean method10( double x, int i, char c, String s )
```

- A. `System.out.println(" " + method10(10.0, 2, 'A', 'hello'));`
- B. `boolean b = method10(double d=2.0, int i=1, char c = 'c', String s="hi");`
- C. `int z = method10(0.3, 2, '3', "4");`
- D. `int t=45; while(method10(3.1, (int)(t/9.2), "CS302".charAt(6), "abc")) t--;`
- E.** `if (method10(2.5, 30/4, '\n', "e")) { System.out.println("hello"); }`

OK

11.) Consider the following program:

```
public class Q11 {
    public static void main(String[] args) {
        int a = 1, b = 2;
        int c = method1(a, b);
        System.out.println(a + b + c);
    }
    public static int method1(int b, int a) {
        int c = 5;
        a++;
        b = method2(a);
        return b + c;
    }
    public static int method2(int b) {
        int c = 3;
        return c*b;
    }
}
```



Which one of the following shows what the `Q11` program displays when executed?

- A. 14
- B. 17**
- C. 20
- D. 1211
- E. 1214

12.) Assume the following variables exist:

```
int i = 3;
double d = 3.0;
```

$(3.0)^{(3)}$
 $3 \% 5 = 3$

The result of the following Java expression: `Math.pow(d, i % 5)` would be which one of the following (note that 3 is type `int` whereas 3.0 is type `double`)?

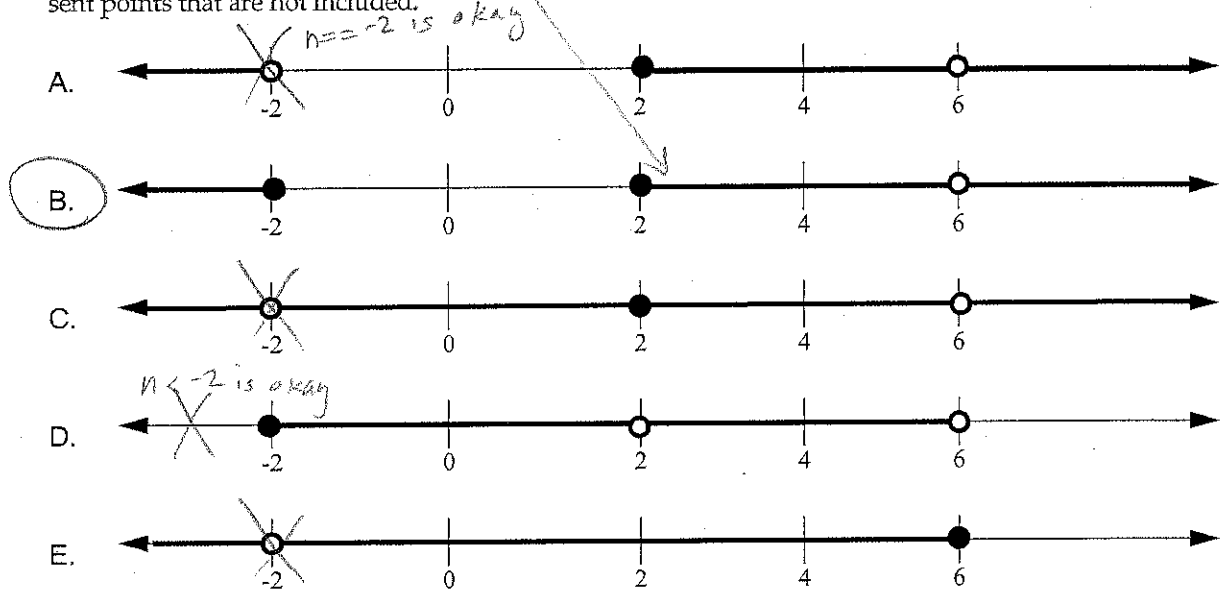
- A. 1
- B. 8.0
- C. 9.0
- D. 27.0**
- E. 81.0

$(3.0 \times 3.0) \times 3.0$
 (9.0×3.0)
 27

13.) Consider the following condition where n is an integer variable:

$$n < -2 \ || \ n \geq 2 \ \&\& \ n \neq 6 \ || \ n == -2$$

Which one of the following number lines correctly shows in bold the range of n where the condition evaluates to true? Note filled circles represent points that are included in the range and hollow circles represent points that are not included.



14.) Consider the following code fragment. Which location for incrementing count, will count all even integers that are not between 9 and 101 that were entered before the user typed something other than an integer? Given: stdin is a properly initialized Scanner.

```

boolean done = false;
int count = 0;
while ( !done ) {
    System.out.print("Enter an integer: ");
    if ( stdin.hasNextInt() ) {
        int n = stdin.nextInt();
        //location A - counts all integers
        if ( n % 2 == 0 ) { //even
            //location B
            if ( !( n <= 9 ) && !( n >= 101 ) ) //
                //location C
            else
                //location D ← correct
        }
    }
    else done = true;
    //location E ← counts not integer
}
    
```

$!(n \leq 9) \Leftrightarrow n > 9$
 $!(n \geq 101) \Leftrightarrow n < 101$
 $n > 9 \ \&\& \ n < 101 \leftarrow \text{b/w } 9 \ 101$

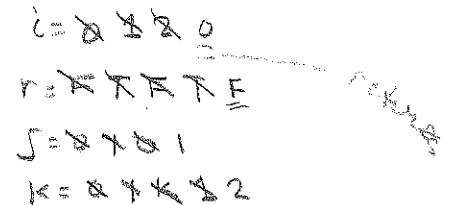
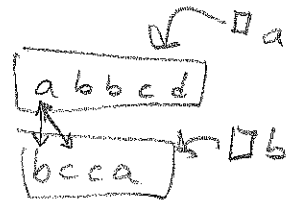
- A. location A
- B. location B
- C. location C
- D. location D
- E. location E

15.) Which statement is false?

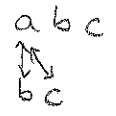
- A. The Java Runtime Environment (JRE) is used to ^{run} ~~compile~~ a Java program. FALSE
- B. Runtime errors can be discovered by hand-tracing code fragments. true
- C. Variables may not be used in expressions until they have been declared and assigned values. true
- D. Debugging requires careful analysis of both the grammar and result of each instruction. true
- E. Compiler errors are found when an attempt is made to convert source code to a form that can be executed by the computer. true

16.) Which of the choices best describes what this method does?

```
public static int notDescriptive ( char[] a, char[] b ) {
    int i=0;
    boolean r = false;
    for ( i=0 ; !r && i <= ( a.length - b.length ); i++ ) {
        r = true;
        int j = 0, k = i;
        while ( r && j < b.length ) {
            if ( a[k] != b[j] ) {
                r = false;
            }
            j++;
            k++;
        }
        if ( r==false ) { i = 0; }
        return i;
    }
}
```



- A. It returns 0, or the position (index+1) of the first character where characters in b match characters in a.
- B. It returns 0, or the number (count) of characters in b that match characters in a.
- C. It returns 0, or the number (count) of characters in b that do not match characters in a.
- D. It returns 0, or 1 if any one of the characters in b are found in a.
- E. It returns 0, or the number (count) of times the sequence of characters in b are found in a.



17.) Which one of the following statements about method calls is true?

- A. A method call may have ~~more~~ arguments than the parameters listed in its method header. False
- B. If a Java program must run as an application, the application starts execution at the: `public static void Main method.` False (main) method
- C. If a method requires a parameter of type double, a method call for that method may pass an argument of type int without casting it first. true
- D. Methods with a return type of void return the null value. False, they return nothing
- E. Method definitions are written inside of the main method. False, they are written outside of main method.

The questions on this page are based on the following shown code:

```

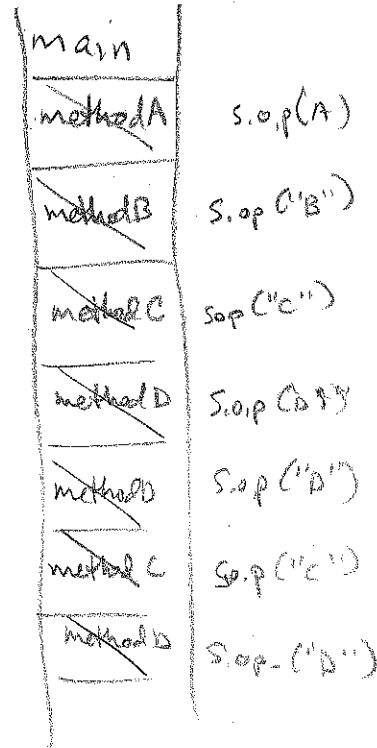
public class MethodCalls {
    public static void main(String[] args){
        methodA(); ←
        //methodB(); ← LINE A
        methodC(); ←
    }

    public static void methodA() {
        System.out.print("A"); ←
        methodB(); ←
    }

    public static void methodB() {
        methodC(); ←
        System.out.print("B"); ←
        methodD(); ←
    }

    public static void methodC() {
        methodD(); ←
        System.out.print("C"); ←
    }

    public static void methodD() {
        System.out.print("D");
    }
}
    
```



18.) What is output by the MethodCalls program is run?

- A. ~~ACDDB~~
- B. ~~ACABDCD~~
- C. ~~ACCBCDCDD~~
- D. ~~ADCBADC~~
- E. ADCBDDC

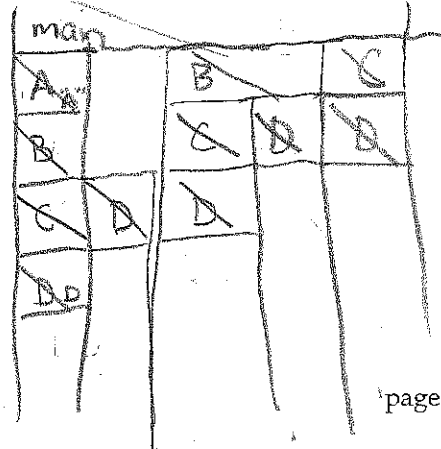
19.) Which choice represents the call stack at the point of execution when there are the greatest number of methods on the call stack during a run of the program MethodCalls?

- A. ~~main->methodA->methodB->methodC->methodD->methodD~~
- B. ~~main->methodA->methodD->methodC->methodB->methodD->methodA~~
- C. ~~main->methodA->methodD->methodC->methodB->methodD~~
- D. main->methodA->methodB->methodC->methodD
- E. ~~main->methodA->methodB->methodC->methodD->methodC->methodD~~

20.) What is output by this program when executed if the method call on LINE A is uncommented?

- A. ~~ADCBDDC~~
- B. ~~ADCBDDC~~
- C. ~~ADCBDDC~~
- D. ~~ADCBDDCCBDDC~~
- E. ADCBDDCBDDC

ADCBDDCBDDC



- 21.) How many times will the body of this loop repeat if all expressions and statements concerning i are shown in the fragment?

```
int i=5;
do {
    // loop body
    i++;
} while ( i < 3 );
```

$i = 5$ 6

How many times will the body of this loop execute?

- A. 0
 B. 1
 C. 2
 D. 3
 E. more than 3
- 22.) Which choice correctly places a new data value in a partially filled array (if there's room remaining)? The variable next indicates the next empty location in the array. The correct choice increments the next counter if the value is added to the array. Assume that next and the array have been correctly declared and initialized as the desired type and that the array is partially filled.

- A. `if (next > array.length) { next--; array[next] = value; }`
 B. `if (next <= array.length) { next++; array[next] = value; }`
 C. `if (next < array.length) { next++; array[next] = value; }`
 D. `if (next <= array.length) { array[next] = value; next++; }`
 E. `if (next < array.length) { array[next] = value; next++; }`
place value increment next

- 23.) Which list of inputs would best test the input validation and main menu execution paths for a program with a main menu that has five options and requires an integer 1-5 from the user to choose an action?

- A. 1, 2, 3, 4, 5 - doesn't test any other cases
 B. abc, 1, 2, 3, 4, 5, 6 - doesn't test 0 or neg.
 C. abc, 1, a, 2, b, 3, 4, 5 - doesn't test > 5 or < 1
 D. abc, 0, 1, a, 2, 3, 4, 5, 6 - Best list of values to test
 E. abc, -1, 0, 1, a, 5, 6 - doesn't test all menu options

Use the following for the next two questions:

Your program 1 was required to determine the winner of duels between the player and Voldemort. Given this table showing the winner of each duel (not the same as given in P1 assignment), the player's choice is in the first column, Voldemort's choice is in the other columns, and the winner of that specific duel is shown at the intersection. Possible duel results are: 'P' means player wins, 'V' if Voldemort wins, or 'T' if it was a tie. There are no damage values to consider for these problems.

| | | Voldemort's Spells | | | | |
|----------------|------------------|--------------------|---|---|---|---|
| | | S | I | F | E | P |
| Player's Spell | Stupefy (S) | T | P | V | P | V |
| | Impedimenta (I) | V | T | P | V | V |
| | Furnunculus (F) | P | V | T | P | V |
| | Expelliarmus (E) | V | P | V | T | V |
| | Protego (P) | P | P | P | P | T |

24.) Which choice will randomly choose a spell for Voldemort and store the corresponding letter as a character 'S', 'I', 'F', 'E', or 'P' in `vSpell`? Assume `rng` is a `java.util.Random` object and an array of characters has been previously constructed as:

```
final char [] spell = { 'S', 'I', 'F', 'E', 'P' };
```

- A. char vSpell = spell[rng.nextInt(5)]; // want an index from 0-4
- B. char vSpell = spell[rng.nextInt(5) - 1];
- C. char vSpell = spell[rng.nextInt(5) + 1];
- D. char vSpell = spell[rng.nextInt(6) - 1];
- E. char vSpell = spell[rng.nextInt(6) + 1];

25.) Which code choice correctly completes this code fragment which handles all possible duel results if the player chose *Furnunculus*? Assume the player's spell choice has been read and converted to an upper case character, 'S', 'I', 'F', 'E', 'P', and is stored in a variable named `pSpell`, Voldemort's spell has been chosen randomly and the corresponding character letter is in `vSpell`. The correct choice assigns a 'T' (tie), 'P' (player win), or 'V' (Voldemort win) to the previously declared variable named `duelResult`.

```
if ( pSpell==vSpell ) duelResult = 'T';
else if ( COND1 )      duelResult = 'V'; - when p==F & V==I or P
else if ( COND2 )      duelResult = 'P'; - when p==F & V==S or E
```

- A. COND1: ~~vSpell=='F' && (pSpell=='I' || pSpell=='P')~~
COND2: ~~vSpell=='F' && (pSpell=='S' || pSpell=='E')~~
- B. COND1: ~~vSpell=='F' || (pSpell=='I' && pSpell=='P')~~
COND2: ~~vSpell=='F' || (pSpell=='S' && pSpell=='E')~~
- C. COND1: pSpell=='F' && (vSpell=='I' || vSpell=='P') ✓
COND2: pSpell=='F' && (vSpell=='S' || vSpell=='E') ✓
- D. COND1: pSpell=='F' || (vSpell=='I' && vSpell=='P')
COND2: pSpell=='F' || (vSpell=='S' && vSpell=='E')
- E. COND1: pSpell=='F' ✗
COND2: vSpell=='I' || vSpell=='P'