

Part I. (55 points) Solve each of the following problems. For the multiple choice problems, select the correct answer by placing an "X" in the box beside it.

(1^{pt}) 1. Which of the following choices is a legal and legitimate Java variable name?

2bad4you
 calvin&hobbes
 year2000
 #hammertime

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| 1 pt |

(1^{pt}) 2. You would like to set up a variable called ounces that has the value 16. What simple Java statement will accomplish this?

int ounces = 16;
 int 16 = ounces;
 public static int ounces(16)
 ounces(16);

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(1^{pt}) 3. What is the output of the following Java code?

```
System.out.println(19 % 5);
```

3
 0
 4
 1

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(1^{pt}) 4. What is the output of the following Java code?

```
System.out.println(1 / 3);
```

0.3333333333333333
 0
 0.3
 It will give a compile-time error.

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(1^{pt}) 5. What is the correct data type for decimal numbers such as 3.14159?

double
 int
 boolean
 String

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| 1 pt |

(1^{pt}) 6. What is the correct data type for text data such as "hello world"?

double
 int
 boolean
 String

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| 1 pt |

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| 6 pts |

(1^{pt}) 7. What is the value of `amount` after executing the following Java code?

```
String dinner = "Hamburger";  
int amount = dinner.length();
```

- 8
 9
 10
 11

1 pt

(1^{pt}) 8. What is the value of `position` after executing the following Java code?

```
String lunch = "Pizza";  
int position = lunch.indexOf("z");
```

- 0
 1
 2
 3

1 pt

(1^{pt}) 9. What is the value of `first` after executing the following Java code?

```
String breakfast = "Pancakes";  
String first = breakfast.substring(0, 1);
```

- P
 Pan
 cakes
 Pancakes

1 pt

(1^{pt}) 10. Which of the following choices is a Java reserved keyword?

- console
 while
 memory
 result

1 pt

(1^{pt}) 11. Which of the following is a TRUE statement about the `String` data type?

- `String` is a primitive data type.
 The standard Java library has a predefined class called `String`.
 `Strings` can only contain numbers and digits, not punctuation.
 `Strings` are mutable, once they are created they can be changed or altered.

1 pt

(1^{pt}) 12. What is the data type of the following variable: `num = 42;`

- boolean
 double
 `String`
 int

1 pt

6 pts

(1^{pt}) 13. What is the output of the following Java code?

```
for (int i = 3; i <= 12; i++)
{
    System.out.print(i + " ");
}
```

- 5 6 7 8 9
- 4 5 6 7 8 9 10 11 12
- 3 5 7 9 11
- 3 4 5 6 7 8 9 10 11 12

1 pt

(1^{pt}) 14. What is the output of the following Java code?

```
String greetings = "Hello World!";
System.out.println(greetings.substring(6));
```

- Hello World!
- The Java code will not compile.
- World!
- Hello

1 pt

(1^{pt}) 15. What is the output of the following Java code?

```
String weather = "One Fine Day";
String result = weather.substring(4, 8);
System.out.println(result);
```

- Fine
- One Fine
- Fine Day
- Day

1 pt

(1^{pt}) 16. Which of the following choices demonstrates the correct way to concatenate two Strings together?

- String answer = "Good" == "Burger";
- String outcome = "Best" + "Pizza";
- String display = "Fresh" <> "Salad";
- String result = "Ripe" / "Fruit";

1 pt

(1^{pt}) 17. Consider the following Java code:

```
String drink = "sprite";
String beverage = "pepsi";
```

How would you determine if these two Strings are the same, or different?

- Divide one String by the other. If the result is one, then the Strings are equal.
- Use the differential() method in the following manner:
double outcome = drink.differential(beverage);
- Use the equals() method in the following manner:
boolean result = drink.equals(beverage);
- Use the == operator in the following manner:
boolean answer = (drink == beverage);

1 pt

5 pts

- (1^{pt}) **18.** Which of Java's primitive data types would be most suitable to store the square root of 2?

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- (1^{pt}) **19.** Which of Java's primitive data types would be most suitable to store your age?

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- (1^{pt}) **20.** Write a single line of code that will create an integer variable called `num` and store the number 407 in it.

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- (1^{pt}) **21.** Write a single line of code that will increment the previously declared integer variable `num` by 1.

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- (1^{pt}) **22.** What are the two possible values of a `boolean` variable?

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- (1^{pt}) **23.** What is the Java operator for the boolean AND operation?

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- (1^{pt}) **24.** What is the Java operator for the boolean OR operation?

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- (1^{pt}) **25.** Write a single line of code that will create a `String` variable called `name` and store the text "Bob" in it.

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- (1^{pt}) **26.** When comparing two Strings for equality, the assignment operator(==) should not be used. What is the name of the method that *should* be used?

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- (1^{pt}) **27.** Write code using a `for` loop that will print out the numbers: 2 4 6 8 10

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| 10 pts |

(2^{pts}) **28.** Convert the following binary(base-2) numbers to decimal(base-10).

(a) (1 pt) 1011

(b) (1 pt) 10001

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(2^{pts}) **29.** Convert the following hexadecimal(base-16) numbers to decimal(base-10).

(a) (1 pt) A7

(b) (1 pt) 2E

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| 2 pts |
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(2^{pts}) **30.** Convert the following binary(base-2) numbers to hexadecimal(base-16).

(a) (1 pt) 10010011

(b) (1 pt) 110010100001

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(2^{pts}) **31.** Convert the following hexadecimal(base-16) numbers to binary(base-2).

(a) (1 pt) B4

(b) (1 pt) 9C

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| 8 pts |
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(1^{pt}) **32.** What is the output of the following `while` loop?

```
int num = 0;
while (num < 3)
{
    System.out.println(num);
    num++;
}
```

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(1^{pt}) **33.** What is the output of the following `while` loop?

```
int num = 5;
while (num < 10)
{
    System.out.println(num);
    num += 2;
}
```

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(1^{pt}) **34.** What is the output of the following `for` loop?

```
for (int i = 0; i <= 8; i += 2)
{
    System.out.println(i);
}
```

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(1^{pt}) **35.** What is the output of the following `for` loop?

```
for (int i = 5; i >= 1; i--)
{
    System.out.println(i);
}
```

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- (2pts) **36.** Write a Java function that converts a Fahrenheit temperature to a Celsius temperature using the following equation:

$$\text{Celsius} = \frac{5.0}{9.0} * (\text{Fahrenheit} - 32.0)$$

Your function should be called `public static double temperature(double fahrenheit)`, which takes in a single parameter, `fahrenheit`. The function should return a `double` which is the Celsius conversion of `fahrenheit`.

- The output of your program should be 30.0 if the following statements are executed:

```
double result = temperature(86.0);
System.out.println(result);
```

2 pts

- (2pts) **37.** Write a Java function that computes the length of the hypotenuse of a triangle by using the Pythagorean theorem:

$$c = \sqrt{a^2 + b^2}$$

Your function should be called `public static double pythagoras(double a, double b)`, which takes in two parameters, `a` and `b`. The function should return a `double` which is the length of the hypotenuse of the triangle. *Hint:* You may need to use the `Math` functions `pow()` and `sqrt()`.

- The output of your program should be 5.4671747731346585 if the following statements are executed:

```
double result = pythagoras(3.5, 4.2);
System.out.println(result);
```

2 pts

4 pts

(4pts) **38.** In this question, you will write a Java function that generates the Hailstone sequence of integers. This is a sequence of numbers that goes up and down repeatedly, but eventually the sequence comes down to end in one. The algorithm for the Hailstone sequence can be expressed as follows:

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| 4 pts |

- Pick some positive integer and call it `num`.
- If `num` is even, divide it by two.
- If `num` is odd, multiply it by three and add one.
- Print out this new value of `num`.
- Continue this process until `num` is equal to one.

Write a Java function that takes in a starting value `num` as a parameter, and generates the Hailstone sequence from that value. Your function should be called:

```
public static void hailstone(int num)
```

Note that this function does not return a value. Instead, you must use: `System.out.println()` to display your values as they are being generated.

- If the following statement is executed:

```
hailstone(5);
```

Then the output of your program should be:

```
16
8
4
2
1
```

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| 4 pts |

(4^{pts}) **39.** In this question, you will write a Java function that performs the multiplication operation, but with a technique that the Ancient Egyptians used. The algorithm for Ancient Egyptian Multiplication can be expressed as follows. Assume that `grow` and `shrink` are the numbers to be multiplied together:

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| 4 pts |

- Create an integer variable called `product` to hold the solution.
- Check to see if `shrink` is an odd number.
- If `shrink` is odd, then add the number `grow` to the variable `product`.
- Multiply the number `grow` by 2.
- Divide the number `shrink` by 2 (*Note*: Use integer division).
- Continue until the number `shrink` becomes zero.

Write a Java function that takes in two integer values, `grow` and `shrink`, as parameters, and calculates their multiplicative product using the Ancient Egyptian Multiplication algorithm. Your function should be called:

```
public static int multiply(int grow, int shrink)
```

Note that this function returns an integer value.

- If the following statements are executed:

```
int result = multiply(23, 58);  
System.out.println(result);
```

Then the output of your program should be: 1334

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| 4 pts |

(4^{pts}) **40.** Pig Latin is a type of slang language that is easy to learn and understand. An English word can be translated into Pig Latin by following these two simple rules:

- If the English word begins with a vowel, then the corresponding Pig Latin word is generated by appending the letters "hay" to the end of the word. For example, "orange" becomes "orangehay".
- If the English word begins with a consonant, then the corresponding Pig Latin word is generated by moving the first letter to the end of the word, then appending the letters "ay". For example, "peach" becomes "eachpay".

Write a Java function that takes in an English word as a parameter, and translates that word to Pig Latin. Your function should be called `public static String pigLatin(String word)`, which takes in a single parameter, `word`. The function should return a `String` which is the Pig Latin translation of `word`.

- The output of your program should be `orangehay` if the following statements are executed:

```
String result = pigLatin("orange");  
System.out.println(result);
```

- The output of your program should be `eachpay` if the following statements are executed:

```
String result = pigLatin("peach");  
System.out.println(result);
```

4 pts

4 pts