CSC 254
NOTES
Week 06

Name (Print): _____

This assignment contains 9 pages (including this page) and 59 questions. Check to see if any pages are missing.

These pages are indexed to the videos for this course.

Grading

Video 06.010 The Math API

1. What is the API?

2. Why is Math capitalized?

3. What are the two fields in the Math class? Why are they all caps?

4. In practice, what does `static` mean?

5. What are "methods?"

   Comment: (You don't have to answer this.) In the video I mention that Java programmers have to look up methods. One thing I did not mention is that the Java guidelines often mean that the programmer can just guess what the method name will be. Once you understand the pattern of method names, guessing methods is pretty easy.

6. What is the method to calculate an absolute value?

7. What is the return type of abs() (Note that this is a tricky question)

Video 04.020 Random Numbers

8. What are some applications that use random numbers?

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9. What are "pseudorandom" numbers?
10. What method do you call to generate a random number in Java?
11. What is the return type of Math.random()?
12. What is the smallest number that Math.random() can generate?
13. What is the largest number that Math.random() can generate? (This is kind of hard to answer.)
14. Which of the following numbers could be generated by Math.random()?
    - 0.20623453066155573
    - 0.09177047425069951
    - 0.00000000000000000
    - 1.000000000000000000
    - 7.324442222444424243
    - 0.99999999999999999
15. Why is it handy to think of the output of Math.random() as a percentage?
16. The following conditional statement simulates a coin toss. Why is this coin toss not "fair?" Rewrite the conditional statement so that it is has an equal chance of giving heads or tails.

```
String result = (Math.random() < 0.6)?"Heads":"Tails";
```

17. Write a Java expression that generates a random number from 0 through 99.
    *Note that (int)(Math.random()*99) is not the correct answer.*
18. Write a statement that generates a random number from 1 through 100.

06.030 Math Methods

19. Write a math statement that would calculate the absolute value of -33.2 and store the value in a variable. Make sure the variable is of the correct type.

    I am providing the answer to this question so you can see the pattern.

```
double x = Math.abs(-33.2);
```

20. Write a math statement that would calculate $5.0^{8.3}$ and store the value in a variable. Make sure the variable is of the correct type.

21. Write a math statement that would calculate π^e and store the value in a variable. Make sure the variable is of the correct type.

22. Write a math statement that would calculate $\sqrt{y}$ and store the value in a variable. Make sure the variable is of the correct type.

23. Write a math statement that would calculate $\sqrt[5]{\pi}$ and store the value in a variable. Make sure the variable is of the correct type.

24. Write a math statement that would calculate the integer value that "rounds down" by ignoring the fractional part of a real number. Do not convert to type int. Store the value in a double.

25. Write a math statement that would calculate the integer value that would round a real number to the nearest integer. Store the value in an int (be careful!).

26. Write a math statement that would calculate the integer value that "rounds down" by ignoring the fractional part of a real number. Do not convert to type int. Store the value in a double.

27. Write a math statement that would calculate log(x) and store the value in a variable. Make sure the variable is of the correct type.

28. Write a math statement that would calculate $\log_{10} 500$ and store the value in a variable. Make sure the variable is of the correct type.

29. Math.round(double) returns a long. Math.round(float) returns an int. Why would Math.round(double) need to return a long and not an int?

30. What would be the difference between `'a'` and `"a"`?

31. Why would the following statement be an error? Rewrite it so that it is correct.

```
int number = '5';
```

06.035 ASCII and Unicode

32. What two Java data types would use ASCII and Unicode?

33. What is the problem with ASCII codes?

34. Are ASCII codes part of Unicode?

35. Look up the following values in an ASCII table. What is the ASCII value of each symbol?

- 'A'
- 'a'
- '0' (zero)
- ' ' (blank space)
- '?'
- ' '

36. In the video I said that 16-bit Unicode can have 256 alphabets and each alphabet can have up to 256 characters. I never explained why there were 256 alphabets or why each alphabet could have 256 characters. If Unicode uses 16 bits, then why is the restriction based on 256?

37. In both ASCII and Unicode, each symbol is represented as an _____.

38. Look up the unicode value of the "yen" ¥ symbol. Write the yen symbol in ŭotation.

    Note: In the rest of the video I had fun with emoji characters. Watch it if you wish.

06.040 char data type

39. How is a char different than a string?

40. String literals are marked by "double quote" marks. How are char literals marked?

41. What is the escape sequence for each of the following?

    - new line
    - The symbol
    - quote mark
    - tab

42. State whether each statement is true or false. You might want to these in a little program or jshell.

    - 'Z' <'z'
    - 'Z' <'s'
    - 'z' <'6'
    - ' ' <'6'
    - 'Z' <'6'
    - 'Z' == 'z'

43. Write a statement that would determine if a character called `ch` is a digit and store the value in a variable. Make sure the variable is of the correct type.

44. Write a statement that would determine if a character called `ch` is a letter of the alphabet and store the value in a variable. Make sure the variable is of the correct type.

45. Write a statement that would determine if a character called `ch` is upper Case and store the value in a variable. Make sure the variable is of the correct type.

46. Write a statement that would convert a character called `ch` and store the value in a variable. Make sure the variable is of the correct type.

06.050 String Class

47. Write a statement that would determine the length of a String called `s` and store the value in a variable. Make sure the variable is of the correct type.

48. Write a statement that would determine the character at position 0 of a String called `s` and store the value in a variable. Make sure the variable is of the correct type.

49. Write a statement that would convert a String called `s` to all upper case and store the value in a variable. Make sure the variable is of the correct type.

50. Assume there are two integer variables called `apples` and `bananas`. Write a statement that uses the String.format statement to create a String that contains a sentence like "There are 4 apples and 3 bananas." and store it in a String variable.

The following 4 questions are not in the video. See if you can figure them out. The second, third, and forth ones are a bit challenging, but I have confidence you can figure them out.

51. There is a string `s`. Create a statement that stores the *first* character of the string in a variable. You may assume the string has at least 1 character.

52. There is a string `s`. Create a statement that stores the *last* character of the string in a variable. You may assume the string has at least 1 character.

53. There is a string `s`. Create a statement that converts the first character (and only the first character) of the string in a to upper case. You may assume the string has at least 1 character.

54. There is a string `s`. The string may be empty (length of 0) or it may have characters. If the string has at least one character, then make the entire string lower case, then convert the first letter of the string to upper case. Store the new string in a variable `t` that is declare outside the if statement. If the string has length zero, then set `t` to an empty string.

06.070 String Comparison, Part 1

For the remaining questions, assume there are two string variables named `first` and `second`

55. Write a boolean statement that would set a variable `isSame` if `first` and `second` are equal (cases must match exactly).

56. Write a boolean statement that would set a variable `isSame` if `first` and `second` are equal (ingore case).

57. Write a boolean statement that would set a variable `isDifferent` if `first` and `second` are not equal (cases must match exactly).

06.070 String Comparison, Part 2

58. Write an if statement that would print "The first word is less than the second" if `first` is alphabetically before `second`. Don't do anything if the two values are the second, or if the first is greater than the second. (cases must match exactly). Note that you don't have to write an else clause.

59. Write an if statement that would print "The first word is less than the second" if `first` is alphabetically before `second`. Don't do anything if the two values are the second, or if the first is greater than the second. (ignore case). Note that you don't have to write an else clause.

Summary of the Math methods you need to know. (You don't have to write anything here. It is just a list for your reference when studying)

- `abs` Note that the return type varies based on the type of the argument.
- ceil
- floor
- sqrt
- round
- pow
- log
- log10

Summary of char methods you need to know. (You don't have to write anything here. It is just a list for your reference when studying

- isDigit
- isLetter
- isUpperCase
- isLowerCase
- toUpperCase
- toLowerCase

Summary of String methods you need to know. (You don't have to write anything here. It is just a list for your reference when studying

- length
- charAt
- format
- equals
- compareTo
- toUpperCase
- toLowerCase
- equals and equalsIgnoreCase
- compareTo and compareToIgnoreCase