PART 1: Write the letter that corresponds to the correct answer in the space provided. You will ONLY be graded on the letter written and not on the circles made on the question. Each question is worth 1 point.

_____ 1. Which of the following statements is not true about computing systems?
   A. An operating system is a special kind of software that enables other software to run
   B. Software is typically written in a language that computers can understand
   C. Recent computing advances are solely due to Moore's law
   D. The chip (i.e., central processing unit) is a part of computer responsible for executing operations

_____ 2. Which of the following statements is true about programming?
   A. High level programming languages can only be understood by one operating system
   B. Assembly language can be used on different computer architecture
   C. It is difficult for humans to program in machine code
   D. Snap is an example of an assembly language

_____ 3. Which of the following statements is true about classifiers?
   A. The quality of a classifier is influenced by the training data
   B. The quality of a classifier is influenced by the test data
   C. The data must always be split 50 – 50 for training and test data to avoid bias.
   D. It is easy to create unbiased classifiers for unambiguous tasks

_____ 4. When building a classifier, if the training data is biased in some way then
   A. The test data is biased in the opposite way
   B. The test data is biased in the same way
   C. The test data is unbiased
   D. The biasing of the test data and the training data is not related

_____ 5. Suppose you are sending an email, which is broken into packets for transmission over the internet. Which of the following statements is not true?
   A. Each packet can take a different route
   B. The packets may arrive out of order.
   C. Some packets may not arrive at all.
   D. None of the above

_____ 6. Which option best describes the color represented by the hexadecimal code: #A11F9F?
   A. A shade of red
   B. A shade of blue
   C. A shade of green
   D. A shade of purple

1

7. What is 43_{10} in binary?
   A. 100101
   B. 101101
   C. 101101
   D. 101011
   E. None of the above

8. What is $2A_{16}$ in decimal?
   A. 210
   B. 42
   C. 12
   D. 34
   E. None of the above

9. What is 10101_2 in decimal?
   A. 11
   B. 17
   C. 13
   D. 21
   E. None of the above

10. The accuracy of a decision tree is determined by
    A. the number of branches in the decision tree
    B. the number of nodes in the decision tree
    C. the correctness of the classification of new instances
    D. the correctness of the classification of the training data

11. Which of the following regular expressions does not match the British postal code format i.e. A99 9AA where A represents an uppercase letter and 9 represents a number between 0 and 9

    ```
    A. [A-Z]\d\d\s\d[A-Z][A-Z]
    B. \u\d\d\s\d\u\u
    C. \w\d\d\s\d\w\w
    D. [A-Z]\d{2}\s\d[A-Z]{2}
    ```
    E. None of the above

12. Which of the following does not match the regular expression `\w+.\s\d{4}`

    A. Jan 1914
    B. May 1914
    C. October 1973
    D. Apr. 1914
    E. None of the above

_____ 13. What is the most likely explanation for the following graph?

Internet Explorer vs Murder Rate

◇ Murders in US   ■ Internet Explorer Market Share
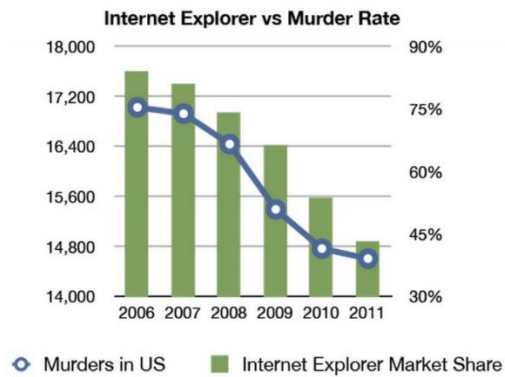
    A. Internet Explorer users are very easily frustrated.

    B. Americans are violent people.

    C. The data is wrong.

    D. Pure coincidence.

_____ 14. Which of the following visual representations is not based on position on an axis?

    A. Bar chart

    B. Parallel Coordinates

    C. Network Graph

    D. Radar Chart

_____ 15. Which of the following is not a Gestalt Principle?

    A. Proximity

    B. Similarity

    C. Enclosure

    D. Adjacency

    E. Symmetry

_____ 16. Which of the following is not a strategy for designing infographics?

    A. Refine Idea

    B. Select Data

    C. Analyze Data

    D. Choose Graphics

_____ 17. In visual representations when comparing items, shading is more accurate than which of the following

    A. Length

    B. Angle

    C. Area

    D. Color saturation

_____ 18. How do neurons in ANN work?
  A. They use neural electrons to solve translation problems
  B. They solve one tiny function and pass the result on to another neuron
  C. They duplicate the functionality of biological neurons exactly.
  D. All of the above

_____ 19. What shape is formed when the following code is run?
  A. Square
  B. Circle
  C. Pentagon
  D. Hexagon
  E. None of the above

```
pen down
repeat 6
    move 30 steps
    turn ↻ 60 degrees
```

_____ 20. How many times will the sprite say "I'm rich"?
  A. Never
  B. Once
  C. Twice
  D. Six times
  E. Forever

```
set money to 3
repeat until  money < 3
    say I'm rich! for 2 secs
    change money by 1
```

PART 2: Write the answer in the space provided. Each question is worth 2 points.

21. _____ requires inferring parts of speech and sentence structure using a lexicon and grammar.

22. _____ is used in defining patterns, generalizing from instances, and parameterization. It is used to let one object stand for many.

23. _____store information about your web browsing.

24. What is the name of this type of visual representation? _____
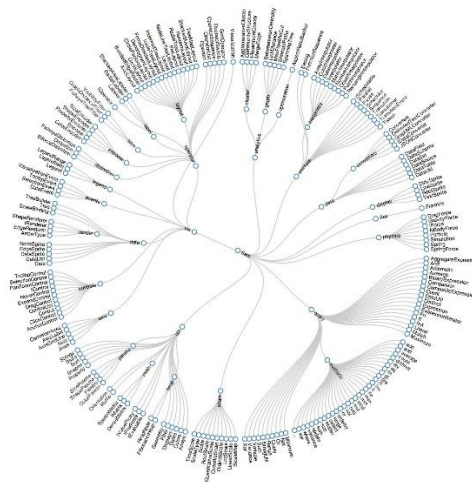
25. _____ requires inferring meaning using syntax and semantic rules.

26. What is the name of this type of visual representation? _____
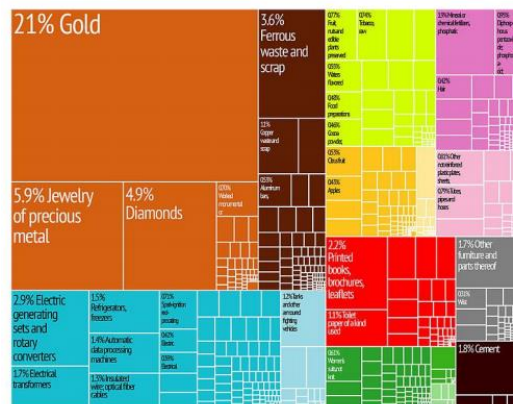
27. _____ is the thought processes involved in formulating problems and their solutions so that the solutions are in a form that can be effectively carried out by an information-processing agent.

28. In the context of image representation, _____ images are good at storing things with hard edges but can be computationally costly for blurring.

29. What is the name of this type of visual representation? _____
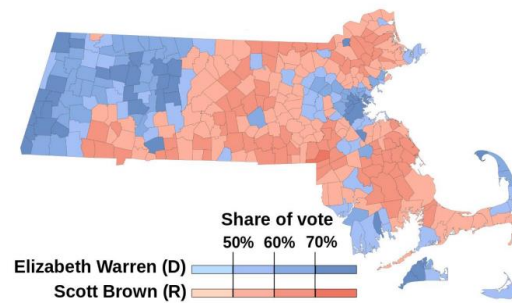
30. _____ requires inferring meaning from contextual information.

PART 3: Short Answer Questions

Write the answer in the space provided.

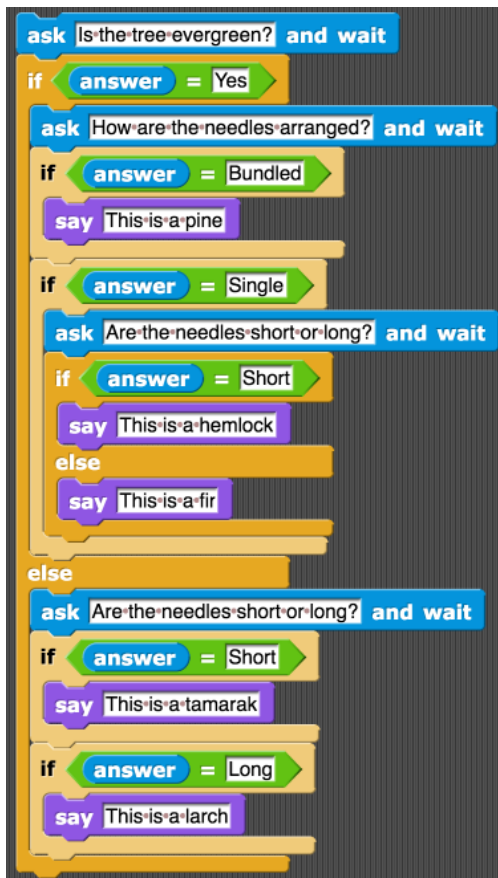31. [6pts] List three ways that we evaluated algorithms over the course of the term.

_____

_____

_____

32. [8pts] List four theories as to why there are few women in computer science.

_____

_____

_____

_____

```
ask Is the tree evergreen? and wait
if  answer = Yes
    ask How are the needles arranged? and wait
    if  answer = Bundled
        say This is a pine

    if  answer = Single
        ask Are the needles short or long? and wait
        if  answer = Short
            say This is a hemlock
        else
            say This is a fir

else
    ask Are the needles short or long? and wait
    if  answer = Short
        say This is a tamarak

    if  answer = Long
        say This is a larch
```

Use the snap program shown above to answer questions 33 - 35

[2pts each] Use the data shown in the table below for the input for each problem. In the fourth column (i.e., Output) write the output of the program for the specified input. Each row of the table represents a separate run of the program. **Note**: Not all the data provided may be necessary for each problem.

Q #	Evergreen ?	Needle length?	Needle arrangement?	Output
33	No	Short	Tufted	33_____
34	Yes	Short	Bundled	34_____
35	Yes	Long	Single	35_____

36. [3 pts] The following nine numbers are the blue RBG values for a picture. Based on the horizontal edge algorithm learned in the Image Representation lab, is there a blue horizontal edge? Why or why not?

26	32	40
23	35	38
29	41	38

_____

_____

_____

37. [2 pts] What does it mean to say that the k-means clustering algorithm *stabilizes*?

_____

_____

_____

38. [2 pts] What is the *maximum* number of clusters that the k-means algorithm can produce, when the input is a dataset with 100 points and k = 5? Explain your answer briefly.

_____

_____

_____

39. [2 pts] What is the *minimum* number of clusters that the k-means algorithm can produce, when the input is a dataset with 1000 points and k = 4? Explain your answer briefly.

_____

_____

_____

40. [2 pts] What is the Turing test?

_____

_____

_____

41. [3 pts] Can computers pass the Turing test? Explain your answer.

_____

_____

_____

42. [6 pts] Write a regular expression that only matches mathematical expressions for adding, multiplying, dividing, or subtracting two numbers. The structure of the numbers is as follows. The first number can have up to three digits, while the second number is a single digit. Valid patterns that should be matched include the following. *Note - the list below just shows a sample, not every possible option.*

    123*3
    45-4
    111/2
    4+3

_____

_____

43. [6 pts] This is a 3-part question (1) In the context of data representation and privacy, is the acronym/phrase WYSIWYG true? (2) Why or Why Not? (3) Give one real-world example.
WYSIWYG – What you see is what you get

_____

_____

_____

_____

_____

_____

9

44. [4 pts] In the context of Artificial Intelligence, what are two limitations of using structured rules/logic for real-world problems?

_____

_____

_____

_____

45. [4 pts] Describe a difference that you observed in the responses of Eliza and Cleverbot. Be as concrete as possible.

_____

_____

_____

_____

46. [2 pts] Give an instance in which using a line chart is better than using an area chart.

_____

_____

_____

47. [4 pts] List four tips for creating infographics.

_____

_____

_____

_____

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Note that any work that you do on this page will NOT be graded. If you want to do work here you MUST transfer it to the appropriate spot in the rest of the exam. The same holds for the page on the back of the cover sheet.

The binary conversion tables and regular expressions are on the next page

Information you may find useful. This sheet will NOT be graded.

Powers of two

2 raised to the power of	
0	1
1	2
2	4
3	8
4	16
5	32
6	64
7	128
8	256
9	512

Hexadecimal digits

Binary Representation	Hexadecimal representation
0000	0
0001	1
0010	2
0011	3
0100	4
0101	5
0110	6
0111	7
1000	8
1001	9
1010	A
1011	B
1100	C
1101	D
1110	E
1111	F

REGULAR EXPRESSIONS

Non-specific characters.
\d   for any digit from 0 – 9
\D   for any non-digit character
\w   for any word character (alphanumeric)
\W   for any non-word character (non alphanumeric)
\l   for any lower case letter
\u   for any upper case letter
\s   for any space
.   used to match any single character
[ ]   match one of the characters in the [ ]
[^xyz] exclude x, y and z (any character except the listed characters)
[# - #]: where # represents any alphanumeric character.
#{max} exact number of repetitions
#{min, max}
Matching an arbitrary number of characters
         * 0 or more repetitions
         + 1 or more repetitions
? used when a character is optional
 (…) a part of the regular expression
(str|str)   alternative choices.

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Note that any work that you do on this page will NOT be graded. If you want to do work here you MUST transfer it to the appropriate spot in the rest of the exam. The same holds for the page on the back of the cover sheet.