

TEAM INFORMATION FOR ALL-REGION COMPETITION DAY

Text File Information

Answers to all questions and challenges must be submitted in one large plain text file.

Questions: Each question's answer should be on a new line preceded by the number and a period then the answer in upper-case format.

Example:

1. A
2. B
3. C
- ...

Challenges: Each challenge should be separated with the following string of characters: !@#\$%^&* Directions on how to identify each challenge is outlined below.

File Name: The .txt file should be named with the school name and team member abbreviations. Teams may use any text editor they wish to create the .txt file that will be submitted. NOTE: only .txt files will be judged. The judges will only consider solutions submitted in the correct file format.

Example:

- School name: Duck High School
- Team Member Names: Donald Mouse, Wille Fudd, Optimus Flinstone
- File name would be: DuckHighSchoolDMWFOF.txt

NOTE: If a team fails to follow directions on the submission of a plain text file, this may result in ASCII value changes and code that no longer works properly. The judges will run the code as submitted and will NOT try to correct conversion errors that are caused by improper submission.

Questions

Teams should select the best single answer to the following questions from the choices provided. Questions with more than one answer or no answer will be marked as incorrect. Each question is worth 2 points.

Coding Challenges

Program functionality is most important. Your team may get partial points for it being able to complete some of the listed tasks. Points may also be awarded based on teams following good programming practices, including but not limited to, appropriate commenting/documentation, consistent indentation, appropriate code grouping, consistent/appropriate naming, error checking, and efficient code.

Teams may use any development environment that is local to their machine (no online development environments will be allowed) to test their solutions; teams will be required to identify the development environment they used within their submission.

Each challenge should also include the number - name of the challenge, the development environment used by the team to test the program, all team member names, and the school name of the team within the documentation.

The response to all questions and challenges will be submitted via one plain text file that will be transferred from the team's computer to the hosting location via the provided USB data drive.

The solution to each challenge will have to be a singular block of text that is cut and pasted into the plain text file (.txt).

Scores

Teams should attempt to answer as many questions and challenges as possible. There is no penalty for guessing. The lowest score a team may receive for any question or challenge is zero.

Errors Within This Document

If a team locates what is perceived to be an error in the document, the team can feel free to point it out to the hosting location staff; however, no questions will be altered or given further explanation during the competition time.

Rules

Teams should have access to a copy of and are responsible for following the full set of rules.

ATTENTION

DO NOT TURN THIS
PAGE UNTIL
INSTRUCTED BY
HOSTING LOCATION
STAFF TO DO SO

Competition Questions

1. Who created the difference engine that is considered by most as the world's first computer?
 - A. CERN
 - B. Charles Babbage
 - C. Grace Hopper
 - D. Alan Turing

2. What programming language was invented in 1964 by John Kemeny and Thomas Kurtz?
 - A. BASIC
 - B. COBOL
 - C. Fortran
 - D. Pascal

3. The ENIAC computer was designed and programmed for the purpose of calculating what?
 - A. Stock Market Predictions
 - B. Census Data
 - C. Election Polls
 - D. Ballistic Trajectories

4. The ENIAC computer was programmed by whom?
 - A. The engineers that built it
 - B. Alan Turing
 - C. Female Mathematicians
 - D. A team of scientists from MIT

5. BASIC, COBOL, Fortran, and Pascal are examples of what?
 - A. Machine Languages
 - B. Assembly Languages
 - C. High Level Languages
 - D. None of the above

6. HTTP is an initialism for:
 - A. How To Transfer Pictures
 - B. Hyperlink Transfer Protocol
 - C. Home Transfer Topography
 - D. Hypertext Transfer Protocol

7. A shell is a what?
 - A. The computer's case
 - B. A command interpreter
 - C. A memory addressing protocol
 - D. A command interpreter

8. An abstract data type that has two primary operations called push and pop that it performs on a collection of elements is called a(n):
 - A. Array
 - B. Stack
 - C. Variable
 - D. Switch

9. For $(X \wedge \sim Y)$ to be true then:
- A. X must be false and Y must be false
 - B. X must be true and Y must be false
 - C. X must be true and Y must be true
 - D. X can be true or Y can be true
10. For $(P \text{ XOR } Q)$ to be true
- A. P is false and Q is false
 - B. P is true and Q is true
 - C. As long as P is true it doesn't matter what Q is
 - D. P is false and Q is true
11. The binary number 10100100101100010 is equal to:
- A. 84328 in decimal
 - B. 14962 in hexadecimal
 - C. 244542 in octal
 - D. 32425623 in decimal
12. What is the difference between "pass by value" and "pass by reference"?
- A. "Pass by value" creates a copy of the variable in memory. "Pass by reference" creates a pointer that shares the original memory space for all copies of the variable.
 - B. "Pass by value" shares the variable data with the invoked function. "Pass by reference" requires the invoked function to request access to the variable data before it is made accessible to the invoked function.
 - C. "Pass by value" is how variables and memory are accessed in Java. "Pass by reference" is how variables and memory are accessed in Python and C++.
 - D. "Pass by value" is the only way to share primitive data. "Pass by reference" is used to share more complex data such as text or objects.
13. What is Basic Authentication?
- A. A simple technique for authenticating with a web server through the use of an HTTP request parameter.
 - B. A simple technique for authenticating with a web server through the use of an HTTP request header.
 - C. A simple technique for authenticating with a Visual Basic application through an IDE.
 - D. A simple technique for authenticating with any type of application through the use of a hash function.
14. The most appropriate variable type for the number 3,243,263 is:
- A. Short
 - B. Int
 - C. Float
 - D. Long

15. The most appropriate variable type for the number 52,243,263.3423 is:
- A. Short
 - B. Int
 - C. Float
 - D. Long
16. If the ASCII value of 'A' is 65 in decimal, what is the ASCII value of 'Z' in hexadecimal?
- A. 90
 - B. 6B
 - C. 5A
 - D. 132
17. If the ASCII value of '0' is 48 in decimal, the ASCII value of 'A' is 65 in decimal, and the ASCII value of 'a' is 97 in decimal, what is the character if the ASCII values of the characters 'B' and '2' were added then converted back to a character?
- A. 'X'
 - B. 23
 - C. 'y'
 - D. 't'
18. The answer to $(25 \bmod 5)$ is:
- A. 5
 - B. 25
 - C. 1
 - D. 0
19. In Java, if a file is improperly named in your code this will more than likely result in a:
- A. Crashed Computer
 - B. Runtime Error
 - C. Compile Time Error
 - D. Failed Hard Drive
20. In C, if the program attempts to divide by zero this will more than likely result in a:
- A. Crashed Computer
 - B. Runtime Error
 - C. Compile Time Error
 - D. A black hole that destroys the universe

21. Consider the following:

```
int a = 3;
int b = 7;
while (a<=b){

    output (“#ARKidsCanCode Rules”);

    a+=3
    b--

};
```

How many times is #ARKidsCanCode outputted?

- A. 1
- B. 2
- C. 3
- D. 4

22. Assume that Array AR has been properly initialized, which of the following would initialize all of the elements of AR to 25?

- A. for(int i=1; i<AR.length; i++) AR[i] = 25;
- B. for(int i=0; i<AR.length; i++) AR[i] = 25;
- C. for(int i=0; i<=AR.length; i++) AR[i] = 25;
- D. for(int i=0; i<AR.length-1; i++) AR[i] = 25;

23. The typical home network is an example of a:

- A. WAN
- B. DNS
- C. Telnet
- D. LAN

24. The Internet is an example of a:

- A. WAN
- B. DNS
- C. Telnet
- D. LAN

25. The mechanism used to bundle data with the functions that manipulate the data is called.

- A. Abstraction
- B. Encapsulation
- C. Data Hiding
- D. Public Processing

26. The hiding of data about an object in order to increase efficiency and reduce complexity is called.

- A. Abstraction
- B. Encapsulation
- C. Data Hiding
- D. Public Processing

27. What data structure that stores elements does not have to have the maximum number of elements established when initialized?

- A. Array
- B. Stack
- C. Linked List
- D. Pointers

28. This defines a relationship between objects that share characteristics (a subclass absorbing characteristics from a superclass)

- A. Abstraction
- B. Inheritance
- C. Compatibility
- D. Cloning

29. Asymmetric Cryptography uses two large numbers that secure data but are not identical; one of the numbers can be shared with everyone while the other is kept secret. This is commonly known as:

- A. Private Key Cryptography
- B. High Level Encryption
- C. Public Key Cryptography
- D. Dual Authentication

30. The data storage method where a user's data is stored on another computer that is accessible via the Internet is referred to as:

- A. A Network
- B. Local Storage
- C. FTP Storage
- D. Cloud Storage

Coding Challenge # 1 - Hello Team

Skill = Low

Points = 6

This challenge will have the team create a program that outputs certain information about the team to the terminal/screen.

Instructions

Write a program that will output all team members' first and last names, the name of the school they are representing, and the name of their sponsor.

Notes

The program should display the information on the terminal/screen until the user prompts the program to terminate.

Coding Challenge # 2 – ESREVER

Skill = Low

Points = 6

This challenge will have the team create a program that reverses an input.

Instructions

Write a program that prompt the user to input a string of characters then it will output the reverse of the string to the terminal/screen.

Notes

The program should display the information on the terminal/screen until the user prompts the program to terminate.

Coding Challenge # 3 Temperature Conversion

Skill = Moderate

Points = 14

This challenge will have the team create a temperature conversion program. The program will convert among the Fahrenheit, Celsius, Kelvin, Réaumur, and Rankine temperature scales. The program should convert a temperature in any of the above-mentioned scales and then output the original along with the temperature converted properly in the other four temperature scales.

Instructions

Write a program that will prompt the user for the temperature scale being input and the temperature to be converted.

The program will then output and identify each properly to the terminal/screen the original temperature along with that temperature converted properly in the other four temperature scales.

The program will then ask the user if he/she would like to convert another temperature and respond accordingly.

Partial Example – *output does not necessarily have to look the same as the example, but should function as indicated above:*

<output>

Using the following abbreviations:

F – Fahrenheit

C – Celsius

K – Kelvin

Re – Réaumur

Ra – Rankine

Please indicate what temperature scale you will be inputting: _____

<user inputs “C”>

<output>

Please input the Celsius temperature you want converted: _____

<user inputs “100”>

<output>

100 degrees Celsius is equal to:

212 degrees Fahrenheit

373.15 Kelvin

80 degrees Réaumur

671.67 degrees Rankine

Notes

These notes will only provide the conversion formulas from the other scales to Fahrenheit; it is part of the challenge for the team members to derive the conversion formulas for other necessary conversions.

Conversion Formulas

- Celsius (C) to Fahrenheit (F)
 - $F = 1.8C + 32$
- Kelvin (K) to Fahrenheit (F)
 - $F = 1.8(K - 273) + 32$
- Réaumur (Re) to Fahrenheit (F)
 - $F = 2.25Re + 32$
- Rankine (Ra) to Fahrenheit (F)
 - $F = Ra - 459.67$

Other information that you may find useful

- Absolute zero, which is the lowest temperature that is theoretically possible, is negative 459.67 (-459.67) degrees Fahrenheit.
- The hottest temperature ever reached on Earth is approximately 3.6 billion (3,600,000,000) degrees

Coding Challenge # 4 – Calculator

Skill – Moderate

Points - 14

This challenge will have the team create a program that asks the user to input a series of numbers separated by operators then perform accurate calculations on that series of numbers.

Instructions

Write a program that will prompt the user to enter a series of numbers separated by operators then calculates the series properly.

The program should:

- accept any 16 bit numbers as input
- perform the following operations using the indicated operator
 - addition “+”
 - subtraction “-”
 - multiplication “*”
 - division “/”
- allow for parentheses to indicate precedence
- exponents will not be part of the input
- calculate using the order of operations
 - Parentheses
 - Multiplication & Division (left to right)
 - Addition and Subtraction (left to right)

The program will output the result and ask the user if he/she would like to calculate another expression and respond accordingly.

Coding Challenge # 5 – Add Them Up

Skill – Moderate

Points - 14

This challenge will have the team create a program that identifies the contiguous subset within a list that has the largest sum.

Instructions

Write a program that will prompt the user to input a list of up to 10 integers separated by commas then finds the contiguous subset within the list that has the largest sum.

Notes

The program should display the information on the terminal/screen until the user prompts the program to run again or terminate.

Coding Challenge # 6 – Pyramids, Cylinders, and Prisms, Oh My!

Skill – High
Points - 23

This challenge will have the team create a program prompts the user for certain attributes about different 2D and 3D shapes and returns certain geometric information.

Instructions

Write a program that will prompt the user to indicate what figure the user would like to have geometric information calculated.

The user then inputs the indicated required information about the shape then outputs to the terminal/screen the information indicated about the shape.

The program will ask the user if he/she would like to calculate information about another shape.

| Shape | Required Input | Output {with formulas for team} |
|----------------------------------|--------------------------------|--|
| Circle | Radius (r) | Circumference $\{2\pi r\}$ Area $\{\pi r^2\}$ |
| Equiangular Triangle | Height (H) Base Length (B) | Perimeter Area $\{(H*B)/2\}$ |
| Regular Hexagon | Side Length (a) | Perimeter Area $\{\frac{3\sqrt{3}}{2}a^2\}$ |
| Regular Triangular based pyramid | Base Side Length Height (H) | Surface Area Volume $\{1/3*(\text{area of base})*H\}$ |
| Cylinder | Diameter of Base Height | Surface Area Volume |
| Sphere | Radius (r) | Surface Area $\{4\pi r^2\}$ Volume $\{\frac{4}{3}\pi r^3\}$ |
| Right Circular Cone | Radius of Base (r) Height | Surface Area $\{\pi r(r + \sqrt{h^2 + r^2})\}$ |

Notes

Pi may be estimated to be 3.1415926536

Coding Challenge # 7 - Statistical Information

Skill – High

Points - 23

This challenge will have the team create a program that outputs basic statistical information about a series of numbers.

Instructions

Write a program that will prompt the user to input a string of up to 1,000 comma-delimited numbers; the program should be able to account for whitespace.

The program then should prompt the user to select one of the following tasks and be able to correctly perform the requested task (outputs to go to the terminal/screen).

- Output the original un-altered list (without the delimiters or whitespace)
- Output the list sorted from least to greatest
- Output the list sorted from greatest to least
- Output and properly identify the mean, median, and mode
- Output and properly identify the range, first quartile, third quartile, and interquartile range
- Output and properly identify the variance and standard deviation

The program should continue to output tasks on the original list until the user opts to quit.

Notes

These notes only provide certain calculation formulas; others were omitted on purpose.

- The first quartile is the median of the lower half of the data set.
- The third quartile is the median of the upper half of the data set.
- The variance is found by:
 - Finding difference between each value in the list and the mean of the list (value – mean)
 - Squaring the result of each of the values found in the step above (value – mean)* (value – mean)
 - Finding the mean of the list of values found in the steps above
- The standard deviation is the square root of the variance

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