Programming Merit Badge

Welcome!

main.c

```c
const float HIGH_TEMP_F_WARNING=100.;
const int MAX_LOOP=5.;

float temp_F_to_C( float tF ) {
    return (tF - 32)/1.8; // Math formula to convert Fahrenheit to Celsius
}

int main() // Declaration of program
{

  float temp_f; // Declaration of variables that the program will use
  float temp_c;
  int i;
  for(i=0; i<MAX_LOOP; i++){    // loop
    printf("\nEnter the temperature in degrees F : ");     // Input the temperature to convert
    scanf("%f",&temp_f);      // Reads the user input

    temp_c = (temp_f- 32)/1.8; // Math formula to convert Fahrenheit to Celsius

    printf("The temperature in Celsius (C) is  %f\n",temp_c); // Output the Celsius result

    printf("The temperature in Celsius (C) is  %f\n", temp_F_to_C( temp_f ));

    if(temp_f > HIGH_TEMP_F_WARNING){ // Check for high temperature
      printf("Remember to hydrate\n");
    }

    if(temp_f < LOW_TEMP_F_WARNING ){ // Check for low temperature
      printf("Remember to pack Long underwear\n");
    }
  }
```

Run

Output

```
/tmp/iF0Gg1ZYqV.o
Enter the temperature in degrees F : 120
The temperature in Celsius (C) is  48.888889
The temperature in Celsius (C) is  48.888889
Remember to hydrate

Enter the temperature in degrees F : 100
The temperature in Celsius (C) is  37.777779
The temperature in Celsius (C) is  37.777779

Enter the temperature in degrees F :
```

First Things First: Cyber Chip

Having a valid Cyber Chip is a prerequist for this merit badge. Do you have one? If not please get one before proceeding with this merit badge. To get the Cyber Chip visit this link with your parents:

https://www.scouting.org/training/youth-protection/cyber-chip/

Required Tools and Resources

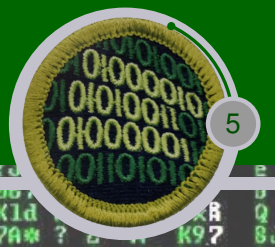
- Valid Cyber Chip to perform research and web based programming
- Programming Merit Badge Workbook http://usscouts.org/mb/worksheets/programming.pdf
- Computer (Chromebook, Laptop, Desktop) with internet connection[a]

[a] Talk to me if you don't have a computer that can be used.

Safety Resources

- Computer-related injuries https://www.betterhealth.vic.gov.au/health/healthyliving/computer-related-injuries
- Ergonomics & Computer Use https://uhs.princeton.edu/health-resources/ergonomics-computer-use

Programming Historical Resources



- History of programming languages https://en.wikipedia.org/wiki/History_of_programming_languages
- Evolution of programming languageshttps://en.wikipedia.org/wiki/Programming_language_generations
- Ask a parent for their option on the history or programming or computers.

General Knowledge Resources

- Valid Cyber Chip to perform research and web based programming
- Popular Languages https://www.northeastern.edu/graduate/blog/most-popular-programming-languages/
- Evolution of Languages https://www.geeksforgeeks.org/the-evolution-of-programming-languages/
- TIOBE Index https://www.tiobe.com/tiobe-index/

Intellectual Property (I.P.) Resources

Merit Badge Requirements for I.P.

The merit badge is looking for 4 methods to protect intellectual property (IP).
One of these methods will not protect a "program". However this method is used to protect certain forms of I.P. and therefore is included on this topic of the merit badge.
Can you figure out which of the 4 can't be used to protect the I.P. of a software program?

I.P. Resources

- `4 forms of Software Intellectual Property`
  `https://cpl.thalesgroup.com/software-monetization/protecting-software-intellectual-property`

Software License Resources

License Resources

- Software Licenses
  https://en.wikipedia.org/wiki/Software_license
- Open Source License
  https://en.wikipedia.org/wiki/Open-source_software
- Freeware License
  https://en.wikipedia.org/wiki/Freeware
- Proprietary software
  https://en.wikipedia.org/wiki/Proprietary_software[a]

[a] I belive the BSA intended to use the term ‘proprietary’, not ‘commercial’. Today some commercial software is open or free or is converted from proprietary to open source.

Resources related to Programming

Resources

- Scout Life: Programming merit badge https://scoutlife.org/merit-badges/programming-merit-badge/
- BSA - VEX Robotic Arm Video https://www.youtube.com/watch?v=BbKn5G7-gGY
- BSA - Arduino Example Video[a] https://www.youtube.com/watch?v=YZrclRnf3Ho

[a] This requires an Arduino.

Actual Programming

Resources Part 1

- Programiz - resources and examples for the popular https://www.programiz.com/
- Coding Ground - several offerings https://www.tutorialspoint.com/codingground.htm
- Arduino for Beginners Video[a] https://www.youtube.com/watch?v=fJWR7dBuc18
- Learn Pyhton https://www.learnpython.org/
- Learn HTML https://www.codecademy.com/learn/learn-html
- Scratch https://scratch.mit.edu/ or https://inventwithscratch.com/

[a] This requires an Arduino.

Actual Programming

Resources Part 2

- PyGame (Games written using Python)
  https://www.pygame.org/news or
  http://inventwithpython.com/pygame/
- Learn JavaScript https:
  //www.codecademy.com/learn/introduction-to-javascript
- Build a Mobile App (Scratch like environment)
  https://appinventor.mit.edu/
- CoderDojo
  https://projects.raspberrypi.org/en/coderdojo
- Tons of Projects using a RaspberryPi and other inexpensive hardware
  https://projects.raspberrypi.org/en/projects

Tips to Programming

- Start Small
- Veteran programmers generally don't start from scratch. They build on something already started. I would encourage you to do the same.
- Test often - VERY often!!!
- Don't give in. Errors can be very hard to decipher. If you can't figure it out, comment stuff out until it works again to narrow down the issue. This is why we test OFTEN!

Tips to completing the requirements

Part 1

This merit badge requires you to use 3 languages, the first task is to modify a existing program. The second and third tasks require you to create your own program. Modifing an existing program is one of the best ways to learn how to create a program and would encourage you to modify several different programs from 3 or more languages. Develop a program of your own from two of programming languages you like the best of the ones you tried. Use the third language to complete the first requirement.

- Try several different languages to see which ones you like the best.
- Scratch, HTML, Python are the ‘easier’ languages.
- C, C++, Java are ‘harder’ because they are more syntax strict.

Tips to completing the requirements

Part 2

- One of the best ways to learn a new programming language is to find an example and modify it to see how the language works. Try it on Scratch, Python and HTML to see which of these two you want to use for requirements 5b and 5c.
- Remember build on something already started. Professioanl prgrammers do the same. They hardly ever start from stratch.
- Plan out the project first, not after.
- Start small then build new features into an already working project. Shooting for the moon on day 1 will result in failure. Learn to lift one leg first.

Some Programming Ideas

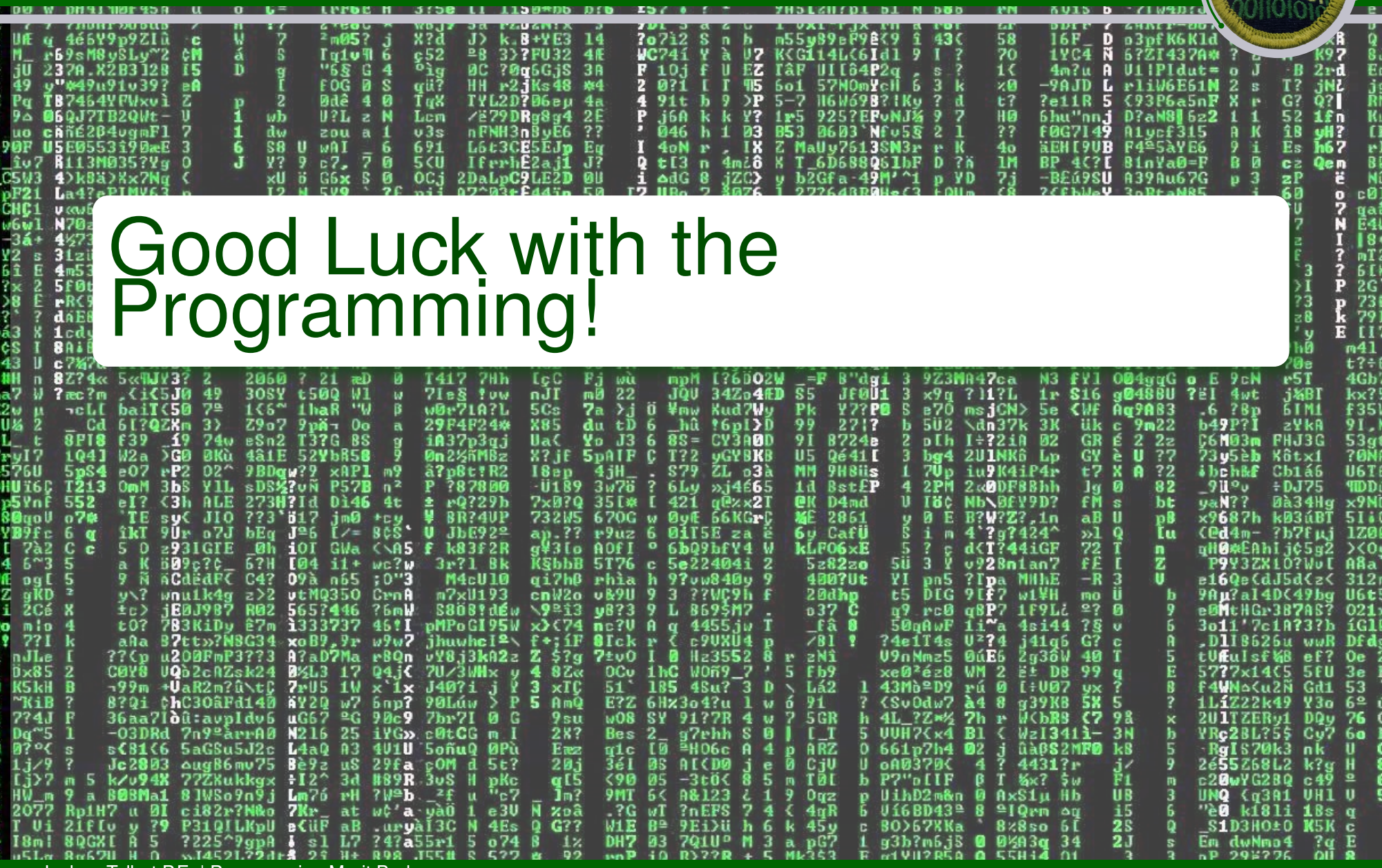
- Traffic light controller (red, green and yellow lights, switch states when car is present).
- Rock, Paper, Scissors Game.
- Odd or Even Game.
- Entry detection system: monitor input and sound an alarm if broken.
- Family web page - Family page + your personal page.
- Unit conversion (gallons to cups, feet to miles)
- Hiking Time estimator (input distance, pace and elevation to determine total trek time).
-

Contact

Below is my contact information. I prefer email over a phone call, however in an emergency please call. When emailing always be sure to ‘CC’ your parent or one of the other adult leaders on all emails. If you call my phone, please have your parent present with you.

Name: Josh Talbot
Email: talbot.j@gmail.com
Phone: 585-794-1708

I know the following languages - do not let this deter you from learning others, but I can provide help with the following: Arduino (C/C++), C, C++, Javascript, Labview, Ladder Logic, Matlab (Octave), PHP, Python, Scratch, Simulink, SQL, Visual Basic, VBA, VB.Net. Many languages are very similar and should be able to help/guide almost any other common language.



Good Luck with the Programming!