Cub Scouts Can Code

Did you ever wonder how computers know what to do? This module is designed to help you explore how people instruct computers and how they affect your everyday life.

1. Choose A or B or C and complete ALL requirements.
    A. Watch an episode or episodes (not less than one hour total) of science-related shows or documentaries that involve computers, programming, and careers that involve computers. You may choose to watch a live performance instead of watching a media production. Then do the following:
        1. Make a list of at least two questions or ideas from each show.
        2. Discuss two of the questions or ideas with your counselor.

    B. Read (not less than one hour total) about computers, coding, and careers that involve computers. Then do the following:
        1. Make a list of at least two questions or ideas from each article.
        2. Discuss two of the questions or ideas with your counselor.

    C. Do a combination of reading and watching (not less than one hour total). Then do the following:
        1. Make a list of at least two questions or ideas from each article or show.
        2. Discuss two of the questions or ideas with your counselor.

2. Complete ONE adventure from the following list for your current rank OR complete option A or B. (If you choose an Adventure, choose one you have not already earned.) Discuss with your counselor what kind of science, technology, engineering, and math was used in the adventure or option.

Wolf Cub Scouts	**Bear Cub Scouts**	**Webelos Scouts**	**AOL Scouts**
Code of the Wolf	Chef Tech	Game Design	Game Design
Computing Wolves		Tech on the Trail	High Tech Outdoors
		Modular Design	

Option A: Do all of the following. (a) Define what a computer is and research how computers have changed over time. (b) Create a timeline of important dates and include images to show the different computer designs. (c) Talk to your parent, counselor, or other adult about the changes they have seen in computers over their lifetime. (d) Record at least 10 devices in your home that use some kind of computer to operate.

Option B: Do all of the following. (a) Research what binary code is, and how computers use it to store information. Find out what an ASCII table is. (b) Write a message to another Scout, your parent, or your counselor in binary code. See if they can decode it. (c) Create a set of binary cards. Take 5 notecards and write a zero on one side of each. Then on the other side write one of the following numbers along with dots of that number: 1, 2, 4, 8, 16. (d) Line the cards up in number order with 16 on the far left and 1 on the far right. Turn them over so that zeros are facing up. So 0 = 00000 in 5-bit binary. (e) Now show how to represent the numbers 1-31 by flipping the correct combination of cards that produce the correct number of dots. Convert each number into a 5-bit binary code by using a zero for each 0 card and a 1 for each dotted card in order. HINT: 20 = 10100

3. Computer Science Unplugged! Choose A or B and complete ALL the requirements:

A. Follow the Algorithm
    1. With grid paper or a checkerboard, select one square as the start space and another to be the finish space. Use a coin or other small object as the token to move between these spaces.
    2. Create flashcards with one direction on each card. For example: Move one space up, Move one space down, Move one space right, Move one space left, etc. You can use the cards multiple times or create copies of them.
    3. Produce the series of instructions that move your token from start to finish on the grid. Make sure that there are at least three steps involved. This is called an algorithm. Write the steps down. Test your algorithm and have another person try it as well. Can you find a different series of steps that move the token between start and finish?
    4. Move the start and finish spaces and create a new set of instructions for this path. Test your algorithm and fix any errors.
    5. Add a few “blackout” squares to the board, that cannot be used, then create a new series of instructions to move without crossing any of them.
    6. Research how computers use algorithms to work. Discuss what you learn with your counselor.

B. Creative Conditionals
    1. Use a deck of playing cards to create a new game based on conditions, or create your own deck with paper and markers. Use four different colors and put the numbers 1-10 on separate cards in each color.
    2. Create and record actions for each number and suit/color. These are called conditions. For example: For a 5, clap your hands over your head. For a heart, hop on one foot, etc.
    3. Mix up your cards and practice playing on your own. What TWO actions do you have to perform for each card? In this example, for a 5 of hearts you would have to clap your hands over your head while hopping on one foot.
    4. Invite others to play your game with you. See if they can add more conditions to your game.
    5. Research how computers use conditional statements to work. Discuss what you learn with your counselor.

4. Be a programmer! With your parent's or guardian's permission and using proper internet safety, explore the world of coding using a tablet or computer. Make sure that your Cyber Chip is up to date. Complete ALL the requirements.

A. Spend at least one hour creating instructions for a computer to execute, then testing and debugging them. There are many free applications for computers, tablets, and smartphones.

B. Discuss with your counselor what you were able to create. Explain what you liked best about it and what was difficult.

5. Discuss with your counselor what you have learned about how computers affect your everyday life, and how they work.

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Counselor Notes
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Requirement 2:
See the binary cards in action! https://classic.csunplugged.org/binary-numbers/
For advanced scouts, you could include a discussion of Unicode.

For option B, an optional exercise could involve using Scouts instead of cards to build a "Cub Scout Computer". Place masking tape on the floor in a long line. Label one side of the line "O" (or "off" if you want to use a light switch metaphor) and the other side of the line "1" (or "on"). Line 5-10 Scouts up on the "0" side of the line. Then begin to count up (by decimal numbers) by having the Scouts move back and forth between “0” and “1” as needed.

A more complex version for Webelos or more advanced scouts would be to have three such lines on top of each other and create a "Binary Scout Calculator" where the first two lines arrange themselves into certain numbers and the third group of Scouts has to perform proper addition or subtraction on the third line without looking at the decimal numbers.

Requirement 4:
Some useful resources include:
Code.org has hundreds of tutorials about programming for all ages.
Hour of Code (https://hourofcode.com/us)
Scratch Jr. is free app for tablets and phone.
Tynker.com has free hour of code activities to try.

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