9

SELF-LEARNING PACKAGE IN

ICT 9

Quarter 1 | Week 1

Computational Thinking

Learning Competency:

Describe how computational thinking supports the development of computer applications and problem solving across al disciplines. **(SSP_TLE-CT8CP-IIa-c-1.1)**

MARICAR R. PORNEL, *Oton NHS*
ZALDY M. TONDO, Division Science Coordinator
WRITERS

Ready to Launch!

Do y you know that we use computational thinking daily? Just take a look at your daily activities and you will see that life is a set of issues and questions. How do you solve your assignment in Algebra? How do you download games in your mobile phone? How would you start blogging? Most of our daily activities are implemented step by step and according to your priorities. Computational thinking allows us to do this.

Computational thinking allows us to take a complex problem, understand what the problem is and develop possible solutions. We can then present these solutions in a way that a computer, a human, or both, can understand.

In this lesson, you'll understand the concept of computational thinking.

Aim at the Target!

At the end of this module you are expected to:

1. *Explain what is computational thinking.*
2. Examine and breakdown day to day problems to provide solutions.

Try This!

Activity 1. Below is a logic puzzle where you draw a conclusion from particular kinds of purported facts you are given and those facts alone. Given the following facts, identify and select the letter that best completes the statement.

1. All gems in the game are expensive in-game purchases.
   All rubies in the game are gems.

Therefore we can conclude:

A. some rubies in the game are expensive in-game purchases.
B. all rubies in the game are expensive in-game purchases.
C. some gems in the game are expensive in-game purchases.
D. None of the above.

2. No robots are evil.
   All mobile phones are robots.
   Therefore we can conclude:

A. All mobile phones are evil.
B. All robots are mobile phones.
C. Some mobile phones are evil.
D. None of the above.

3. All bugs are poor computer software.
   Some rounding errors are bugs.
   Therefore we can conclude:

A. All mobile phones are evil
B. All robots are mobile phones
C. Some mobile phones are evil
D. None of the above

4. All educational things are useful.
   Some websites are not useful.
   Therefore we can conclude that:

A. Some websites are not educational.
B. All websites are educational.
C. All educational things are not websites
D. None of the above

Keep This in Mind!

Activity 2. Word search

Direction. Find and encircle the following famous computer scientists' names in the word search grid. Spaces in names are not included.

ALAN TURING, ADA LOVELACE, FRAN ALLEN, JEANNETTE WING, JOHN VON NEUMANN , NIKLAUS WIRTH

A	E	A	G	J	E	A	N	N	E	T	T	E	W	I	N	G
W	L	D	T	H	Y	J	Q	G	M	O	W	T	C	N	I	W
G	R	A	C	E	H	O	P	R	E	P	D	Y	D	H	K	S
K	G	L	N	N	U	K	W	H	W	Q	F	U	E	Y	L	X
I	H	O	E	T	O	L	E	J	E	S	N	I	V	M	A	E
E	J	V	T	M	U	Q	R	K	R	D	E	O	F	J	U	D
T	I	A	R	A	P	R	T	L	T	C	L	P	R	U	S	C
Y	O	C	P	S	L	A	I	A	D	V	L	Q	B	K	W	T
V	P	E	O	D	J	R	Y	N	F	Z	A	A	G	I	I	G
A	L	C	I	F	K	T	U	X	G	A	N	Z	T	L	R	H
J	O	H	N	V	O	N	N	E	U	M	A	N	N	O	T	N
Z	W	V	Y	W	Q	E	O	Z	G	T	R	X	N	P	H	M
D	S	Q	T	P	T	W	I	C	H	Y	F	S	H	Z	Q	I

Analysis.

1. Explain in detail how you searched for the names in the search grid?
2. What technique did you developed in searching for many names?

Abstraction and Generalization

What is Computational Thinking?

Computers can be used to help us solve problems. However, before a problem can be tackled, the problem itself and the ways in which it could be solved need to be understood. Computational thinking techniques help with these tasks.

Computational thinking involves taking that complex problem and breaking it down into a series of small, more manageable problems (**decomposition**). Each of these smaller problems can then be looked at individually, considering how similar problems have been solved previously (**pattern recognition**) and focusing only on the important details, while ignoring irrelevant information (**abstraction**). Next, simple steps or rules to solve each of the smaller problems can be designed (**algorithms**). A complex problem is one that, at first glance, we don't know how to solve easily.

Computational Thinking Examples

Example 1.

Let's say you've been tasked to buy cup cakes for the teachers during the Teacher's Day celebration. You take everyone's order and have a sizable list of 100 doughnuts you intend to purchase, and you want to calculate the total cost before going to the shop. In order to do so, we can use computational thinking to make this problem more easily solvable. Here's how.

We start by defining the problem:
We want to calculate the total cost of the 100 cup cakes.

Your honest reaction when seeing this problem statement is to grab your phone and start adding the cost doughnut by doughnut. And yes, that could work, but it's an inefficient and unnecessary approach to take. Computational thinking offers us a far better, less laborious, and joint-saving way.

We can *decompose* the problem into smaller steps.

1) We need to know the price of each type of cup cake.

2) We need to know how many of each cup cake type we are buying. Once we know this, we can calculate the total cost.

Price List:

Muffin Marble	P25.00 each
Ube Macapuno	P12.50 each
Yema Delight	P20.00 each
Strawberry Filled	P22.50 each
White Choco	P18.50 each

Number of cup cakes by Type:

25 Muffin Marble	P25.00 each
30 Ube Macapuno	P12.50 each
10 Yema Delight	P20.00 each
15 Strawberry Filled	P22.50 each
20 White Choco	P18.50 each

Now, with an organized list of the number of cup cakes and cost per type, we recognize that each item on the list **follows the same pattern**, which allows us to construct an equation to calculate the total cost for each cup cake type.

Exhibit A: 25 Muffin Marble x P 25.00 = P625

With the patterned data type, this equation easily repeats down the list:

25 Muffin Marble x P25.00 each = P625
30 Ube Macapuno x P12.50 each = P375
10 Yema Delight x P20.00 = P200
15 Strawberry Filled x 22.50 = P337.50
20 White Choco x 18.50 = P370

Finally, we can then add the costs for each doughnut type to calculate the total:

P625 + P375 + P200 + P337.50+ P370 = P1,907.50

With the equations used to solve the problem, **we can abstract** a template with two formulas for calculating the total cost.

Number of Items by Type x Price Per Unit = Cost per Item Type

Cost Per Item Type + Cost Per Item Type + Cost Per Item Type = Total Cost

We can then further solve this problem by using another method wherein we create an algorithm, a step by step process to ensure a reliable output.

Here are the steps:

Step 1: Add up the items by type or flavor.
Step 2: Assign the price per each item type.
Step 3: Multiply the number of items by type with its cost per unit.
Step 4: Add the total cost for each type together.

Example 2. Select and Describe an Everyday Object

1. Choose a common, useful, functional everyday object. (Some examples are provided in the table below.) Your challenge is to imagine that this object no longer exists and to describe in written language:

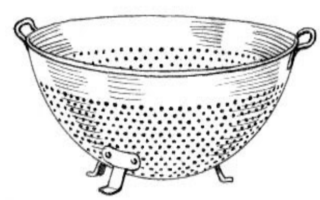
a. the mechanical function of your object
b. what need is fulfilled by this object
c. the physical attributes and characteristics of your object.

Example Objects:

clothspin	can opener	stapler	colander
zipper	scissor	umbrella	can opener

2. Describe the object's function, the need it will fulfil and its attributes in clear, non-technical language which any user could understand. Your description must be specific enough so that someone who had never seen the object could recognize it, understand how it works and understand what benefits it provides.
For example, if your object is a "colander"
you might *begin* to describe it as:

"a circular object, approximately 12 inches in diameter and 9 inches in height, made of metal or heat-resistant plastic, which is used in cooking to drain pasta after cooking or to hold food for washing or steaming. Its holes are large enough for water and other liquids to drain but small enough so that food will not leak through. A base or foot enables it to sit on a counter or in a sink and handles allow it to be easily moved or suspended over a cooking pot for steaming ..."



3. As you are describing this object include the following:
   a. The mechanical function(s) /use(s) of the object .
      e.g. A hammer is used to drive nails into wood or other materials
   b. What need(s) the object fulfills
      e.g. Instead of using a brick to drive nails, a hammer can crush rock
   c. The physical attributes and physical characteristics of the object:
      i. components or parts
         Example . "A hammer has a handle and a head. The head may have a curved claw like end so that nails can be removed."

      ii. shape or materials
         Example. "The head is metal. The handle may be wood or metal."

      iii. general dimensions
         Example. "The hammer may range in length from... to...."

      iv. connections between parts
         Example. Describe positions of parts such as inside *or* outside *or relationships between parts, such as* fixed, fitted, detaches, swivels, *etc.*

Example 3.
How do we apply computational thinking in writing computer programs? A programmer before writing the code in the computer make a step a step process (algorithm) on how the program will run.

Suppose, we are task to compute your total test scores in your Science subject.

Test scores: 34, 23 18, 10

First, we have determine what is required in the problem. Since it requires to get the total score, obviously, we use the sum operation. Second, we have to assign a name that will hold the value of sum. We can name it as SUM. Since SUM will not hold any value at the start of the program, we set the value of SUM to zero (SUM = 0).

Now, Let us try to simulate how will the computer process this task by using the following step by step process:

Step 1: Set SUM= 0	0
Step 2: Get the first test score	34
Step 3: Add first test score to SUM	0 + 34 = 34
Step 4: Get the second test score	23
Step 5: Add to SUM	34+ 23 = 57
Step 6: Get the third test score	18
Step 7: Add to SUM	57 + 18 = 75
Step 8: Get the fourth test score	10
Step 9: Add to SUM	75 + 10
Step 10: Output the SUM	85

Application:

Activity 3. Select and Describe an Object. Write your answer on the space provided below.

Your description should start with the name of the object and have a minimum of 100 words. You should have a minimum of 6 attributes for your object. Keep in mind that attributes should involve all of your senses. (E.g. Is it smooth? Does it make a noise?)



Reflect

Complete the statements below.

I understand ____
____
I don't understand ____
____
I need more information about ____
____

Reinforcement & Enrichment

Activity 4. You are task to compute your FINAL GRADE in English with the following data:

Quarter	Grade
1st Qtr	**87**
2nd Qtr	92
3rd qtr	95
4th Qtr	91

With your knowledge in computational thinking, demonstrate how will you solve the problem.

Assess Your Learning

Direction. Read each item very carefully. Select the letter of your choice.

1. Which of the following describes Computational Thinking (CT)?
   A. CT can be applied in our daily life.
   B. CT provides a set of strategies in solving problems.
   C. It involves by breaking down problems into smaller and manageable one.
   D. All of the above

2. Computational thinking refers only to solving problems by using a computer?
   A. TRUE B. FALSE

3. In a guessing game name that object, which of the following describe(s) the object correctly?
    A. The physical attributes and characteristics of your object.
    B.   The mechanical function of your object
    C. All of the above
    D. None of the above

4. What is the first step in solving a problem?
    A. Create the steps in solving the problem.
    B. breakdown the problem.
    C. Define a problem.
    D. None of the above.

5. Complex problems mean________?
    A. Problems that can be easily solve.
    B. Problems that are not complicated.
    C. Problems that at first glance, we don't know how to solve the problem.
    D. None of the above

References & Photo Credits

https://docs.google.com/document/d/1aiIXl6M9t9Gq0rtOtcKknxqT4mU9b6q7UbYP-3xlKqk/edit#

https://cs4fndownloads.files.wordpress.com/2016/02/cs4fnpuzzlebook11.p

https://www.bbc.co.uk/bitesize/guides/zqqfyrd/revision/

Picture of mobile phone. https://sites.google.com/a/tipsandshare.com/blogs/disadvantages-and-advantages-of-using-a-mobile-phone?overridemobile=true

Picture of Television. https://www.indiamart.com/proddetail/electronics-led-television-13310416655.html

Picture of Laptop. https://www.stuff.tv/news/samsung-pulling-out-laptop-market-in-europe

PROGRAM TEXT. . https://www.dreamstime.com/handwriting-text-writing-how-to-program-concept-meaning-instruction-computer-programming-technology-knowledge-keyboard-key-image139658591

CAMERA. https://www.thoughtco.com/history-of-the-digital-camera-4070938

COMPUTER. http://www.earthtimes.org/green-blogs/eco-friendly-gadgets/free-energy-saving-pc-software-the-earth-times-16-Mar-12

MS OFFICE TOOLS. https://www.eventfinda.co.nz/2020/microsoft-office-beginners/auckland/te-atatu-peninsula