SPECIAL PROGRAM IN TECHNICAL VOCATIONAL EDUCATION (SPTVE)
COMPUTER SYSTEMS SERVICING 8 Q3-W8

I. Topic: MEMORY CALCULATION

II. Objectives:

1. identify the unit of measurement used in the computer and the appropriate arithmetic operation to be used in performing calculation;
2. analyse the problem and perform calculation using different arithmetic operation in unit conversion based on what is being asked and;
3. value the importance of knowing how to perform memory calculation in computer system.

III. Brief Introduction of the Lesson

Within a computer, information is represented and stored in a digital binary format. The term bit is an abbreviation of binary digit and represents the smallest piece of data. Humans interpret words and pictures; computers interpret only patterns of bits. A bit can have only two possible values, a one digit (1) or a zero digit (0). A bit can be used to represent the state of something that has two states. For example, a light switch can be either On or Off; in binary representation, these states would correspond to 1 and 0, respectively. Computers use binary codes to represent and interpret letters, numbers and special characters with bits. A commonly used code is the American Standard Code for Information Interchange (ASCII). With ASCII, each character is represented by a string of bits. For example: Capital letter: A = 01000001 ; Number: 9 = 00001001 ; Special character: # = 00100011. Each group of eight bits, such as the representations of letters and numbers, is known as a byte. Codes can be used to represent almost any type of information digitally: computer data, graphics, photos, voice, video , and music.

CALCULATING DATA STORAGE

While a bit is the smallest representation of data, the most basic unit of digital storage is the byte. A byte is 8 bits and is the smallest unit of measure (UOM) used to represent data storage capacity. When referring to storage space, we use the terms bytes (B), kilobytes (KB), megabytes (MB), gigabytes (GB), and terabytes (TB).

One kilobyte is a little more than one thousand bytes, specifically 1,024. A megabyte represents more than a million bytes or 1,048,576. A gigabyte is 1,073,741,824 bytes. A terabyte is 1,099,511,627,776. The exact number is gained by taking 2^n power.

Quantities of Bytes			
Name	**Symbol**	**Decimal SI**	**Binary JEDEC**
Kilobyte	KB / kB	10^3	2^{10}
Megabyte	MB	10^6	2^{20}
Gigabyte	GB	10^9	2^{30}
Terabyte	TB	10^{12}	2^{40}
Petabyte	PB	10^{15}	2^{50}
Exabyte	EB	10^{18}	2^{60}
Zettabyte	ZB	10^{21}	2^{70}
Yettabyte	YB	10^{24}	2^{80}

To probe that the statement above is correct let's do a conversion using the table entitled "Quantities of Byte".

Example Conversion #1: One kilobyte is a little more than one thousand bytes, specifically 1,024. Based on the table a kilobyte is represented by 2^{10}. If you compute 2^{10}:

$2^0 = 1$
$2^1 = 2$
$2^2 = 2 \times 2 = 4$
$2^3 = 2 \times 2 \times 2 = 8$
$2^4 = 2 \times 2 \times 2 \times 2 = 16$
$2^5 = 2 \times 2 \times 2 \times 2 \times 2 = 32$
$2^6 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 64$
$2^7 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 128$
$2^8 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 256$
$2^9 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 512$
$\mathbf{2^{10}} = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = \mathbf{1024}$

This computation proves that the statement is true based on what is in the table.

In general, when something is represented digitally, the greater the detail, the greater the number of bits needed to represent it. A low-resolution picture from a digital camera will use around 360KB, and a high-resolution picture could use 2 MB or more. Kilobytes, megabytes, gigabytes, and terabytes are typically used to measure the size or storage capacity of a device. Examples of components and devices that use byte storage include: random access memory (RAM), hard disk drive space, CDs, DVDs, and MP3 players.

CDs have a data storage capacity of approximately 700 MB. DVDs have a data storage capacity of approximately 4.3 GB on a single-layer disc, and approximately 8.5 GB on a dual-layer disc. BDs have a storage capacity of 25 GB on a single-layer disc, and 50 GB on a dual-layer disc. Once we know the size of a file or folder, it is possible to determine the number of bytes being used.

For example: A file is 20 KB in size

1 KB = 1,024 Bytes
20 * 1,024 = 20,480 bytes in a 20 KB file

If a 20 KB file is stored in a 1 MB folder (1 MB = 1,048,576 bytes of space); then approximately a total of 51 files can be stored in that folder (1,048,576 / 20,480 = 51.2).

Sample #1: Converting higher unit to smaller unit

Convert 12 Gb into Kb. (12 Gb = _____Kb)

$$12\ \cancel{Gb} \times \frac{1024\ Mb}{1\ \cancel{Gb}} \times \frac{1024\ Kb}{1\ \cancel{Mb}} = 12{,}582{,}912\ Kb$$

Another way in computing sample #1:

1. In order to cancel unit, you have to use division method. You also have to remember that in every:
   1 Kb = 1024 bytes 1 Gb = 1024 Mb
   1 Mb = 1024 Kb 1 Tb = 1024 Gb
2. To convert gigabyte (Gb) into kilobyte (Kb), you have to convert first gigabyte into megabyte. In every 1 Gb there is 1024 Mb of data.

$$12\ \text{Gb} \times \frac{1024\ \text{Mb}}{1\ \text{Gb}} = 12{,}288\ \text{Mb} \quad \text{OR} \quad \frac{12\ \text{Gb} \times 1024\ \text{Mb}}{1\ \text{Gb}} = 12{,}288\ \text{Mb}$$

3. After converting gigabyte to megabyte, the answer should be converted into kilobyte.In every 1 Mb there is 1024 Kb.

$$12{,}288\ \text{Mb} \times \frac{1024\ \text{Kb}}{1\ \text{Mb}} = 12{,}582912\ \text{Kb} \quad \text{OR} \quad \frac{12{,}288\ \text{Mb} \times 1024\ \text{Kb}}{1\ \text{Mb}} = 12{,}582912\ \text{Kb}$$

Sample #2: Converting smaller unit to higher unit

Convert 30,000 Mb into Tb. (30,000 Mb = _____Tb)

$$30{,}000\ \text{Mb} \times \frac{1\ \text{Gb}}{1024\ \text{Mb}} \times \frac{1\ \text{Tb}}{1024\ \text{Gb}} = 0.03\ \text{Tb}$$

Another way in computing sample #2:

1. You also have to remember that in every:
   1 Kb = 1024 bytes 1 Gb = 1024 Mb
   1 Mb = 1024 Kb 1 Tb = 1024 Gb
2. To convert megabyte (Mb) into terabyte (Tb), you have to convert first megabyte into gigabyte. In every 1 Gb there is 1024 Mb of data.

$$30{,}000\ \text{Mb} \times \frac{1\ \text{Gb}}{1024\ \text{Mb}} = 29.297\ \text{Gb} \quad \text{OR} \quad \frac{30{,}000\ \text{Mb} \times 1\ \text{Gb}}{1024\ \text{Mb}} = 29.297\ \text{Gb}$$

3. After converting megabyte to gigabyte, the answer should be converted into terabyte. In every 1 Tb there is 1024 Gb.

$$29.297\ \text{Gb} \times \frac{1\ \text{Tb}}{1024\ \text{Gb}} = 0.029 \text{ or } 0.03\ \text{Tb} \quad \text{OR} \quad \frac{29.297\ \text{Gb} \times 1\ \text{Tb}}{1024\ \text{Gb}} = 0.029 \text{ or } 0.03\ \text{Tb}$$

IV. Activities:

Activity 1
Unit Conversion

Directions: Calculate the capacities base on the required unit being asked.

1. 827,914 bytes = _____ Mb
2. 46 Mb = _____ bytes
3. 1 Tb = _____ Mb
4. 17.8 Gb = _____ Kb
5. 1,687,345 Kb = _____ Gb

Activity 2
Problem Solving involving Memory Calculation

Directions: Analyse the problem then identify what is being asked. Calculate the memory capacity using the appropriate arithmetic operation. Show your solution and answer on a separate sheet of paper.

Problem #1: Kyrie wants to install a Windows XP on his system. He used a hard drive with a capacity of 54 Gb. He decided to create a partition, the first partition has 20 Gb and the second partition has 17 Gb.

Questions:

a. What is the equivalent of the 1st partition in megabytes?
b. What is the equivalent of the 2nd partition in megabytes?
c. How many megabytes is the available space of Kyrie's hard drive that can be use for another partition?

Problem #2: Ashley has a flash drive with 4 Gb storage capacity. She stores a document with 39800 Kb of data, a picture with 308 Mb of storage capacity and a video with 2 Gb of storage capacity.

Questions:

a. How many gigabytes of data is the total capacity of all the files stored in her flash drive?
b. How many gigabytes is the available space in her flash drive?
c. If you have to store a video file with 1 gigabyte of storage capacity, will you able to store it in your flash drive? Why?

V. Assessment:

Directions: Write the letter of the correct answer on a separate sheet of paper.

1. It is the smallest representation of data in the computer.
   A. bit B. byte C. kilobyte D. megabyte
2. Bit is an abbreviation for the word _____.
   A. binary data B. binary digit C. bilingual data D. bilingual digit
3. A byte is composed of how many bits?
   A. 6 B. 7 C. 8 D. 9
4. It is the smallest unit of measure used in representing data storage capacity in computer.
   A. bit B. byte C. kilobyte D. Megabyte
5. If there is 1024 bytes of data in every 1 kilobyte, how many bytes do we have in 2 kilobytes?
   A. 2000 bytes B. 2014 bytes C. 2040 bytes D. 2048 bytes

VI. Reflection:

Directions: Answer the following questions briefly on a separate sheet of paper in paragraph form.

1. What is the most interesting or important things you have learned today and why?
2. What will be the benefits of this lesson in relation to computer or in your daily life?
3. What do you want to learn more about memory calculation?
4. What problems did you encounter in answering the activities?

References:

- K to 12 Basic Education Curriculum Technological and Livelihood Education Learning Module Computer Hardware Servicing Exploratory Course Grade 7 and 8 pages 42-44 - *https://www.slideshare.net/kenjoyb/k-to-12-pc-hardware-servicing-learning-module retrieved on 09/22/2020*

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