9

SELF-LEARNING PACKAGE I

ICT 9

Quarter 1 | Week 3

Decomposition

Learning Competency:

Decompose a problem to create a sub-solution for each part.

SSP_TLE-CT8CP - IIa-c-2.2

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Ready to Launch!

We do many tasks on a daily basis without even thinking about – or decomposing – them, such as brushing our teeth.

Sometimes the problem is so big or complex that we don't know where to start. Decomposition is when we break a problem down into smaller parts to make it easier to tackle. You break down problems all the time to help you solve them.
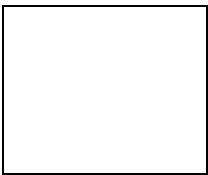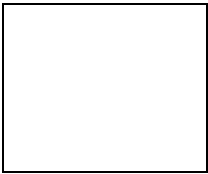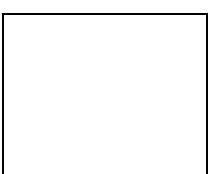
Aim at the Target!

At the end of this module you are expected to:

1. *Explain why decomposition is important.*
2. Demonstrate   the skills in solving problems using decomposition.

Try This!

Direction. Divide each square into 2 equal parts and identify what are the shapes being formed.

Decomposition is the process of taking a complex problem and breaking it into more manageable sub-problems. Although solving the complex problem as a whole may seem very difficult, the solution to each sub-problem may be much simpler by putting together the solutions to the sub-problems. We can then arrive at a solution to the original, complex problem.

Activity.   Decompose the problem in organizing DVDs

Imagine you want to organise all your DVDs alphabetically and you have a lot of them! Where would you start?

Arrange the following by the order of execution from first to last.

STEPS:

Repeat for the rest of the alphabet.

Start with the 'A' pile. Organise this group into alphabetical order by second and third letters.

Sort the DVDs into piles based on the first letter of the title.

Place them on the shelf.

Take all the DVDs off your shelf.

Analysis.

1. Describe how do you find the solution of the problem in this activity?
2. What technique did you developed from answering the activity?

Abstraction and Generalization

Decomposition takes a complex problem and breaks it into more manageable sub-problems. By solving each potentially simpler sub-problem, we can put the solutions together to arrive at a solution to the original complex problem. You probably already do this in solving everyday problems like writing a paper by breaking it into sections, that can be individually written and put together.

Decomposition

Smaller subproblem + Smaller subproblem + Smaller subproblem = **Big Complex Problem**

Ways on how do we decompose a problem

Smaller subproblem

## Analysis

Smaller subproblem   Smaller subproblem

Analysis is the process of breaking the problem into smaller parts in order to gain a better understanding of it.

Smaller subproblem + Smaller subproblem + Smaller subproblem = **Big Complex Problem**

Synthesis

Synthesis – This is the putting together of parts to form a new whole. Rebuilding or focusing on how the parts to comeback together is called synthesis.

Big Complex Problem
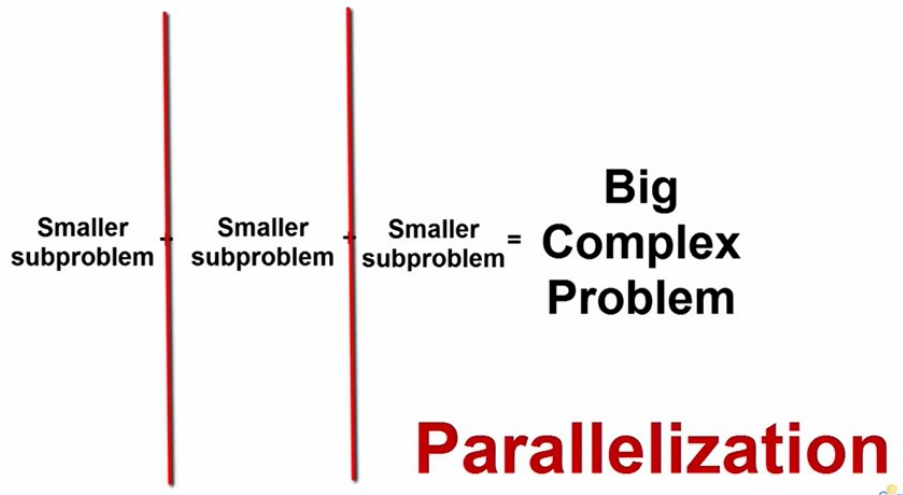
Parallelization

Parallelization – when the problem is broken down into parts, this parts may be address simultaneously or in parallel. Parallelization is a type of computation where many calculations or the execution of processes are carried out simultaneously. Large problems can often be divided into smaller ones, which can then be solved at the same time.

Big Complex Problem
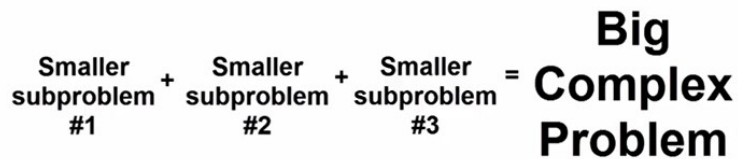
Sequentially

Sequentially – addressing a problem in order or sequentially set of instructions put in the right order.

Why is decomposition important?

If a problem is not decomposed, it is much harder to solve. Dealing with many different stages all at once is much more difficult than breaking a problem down into a number of smaller problems and solving each one, one at a time. Breaking the problem down into smaller parts means that each smaller problem can be examined in more detail.
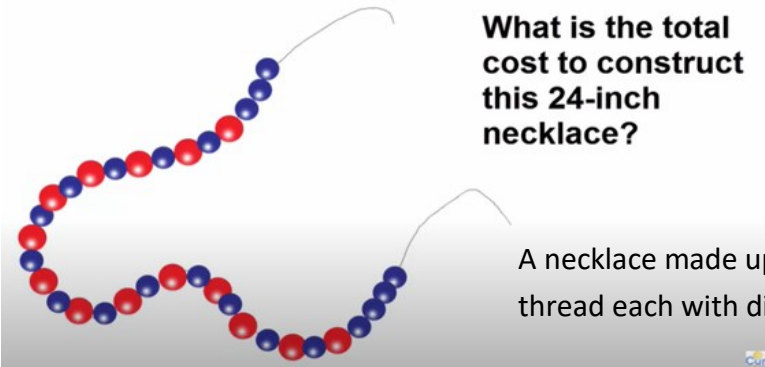
Similarly, trying to understand how a complex system works is easier using decomposition. For example, understanding how a bicycle works is more straightforward if the whole bike is separated into smaller parts and each part is examined to see how it works in more detail.

5

Example 1:

Problem:

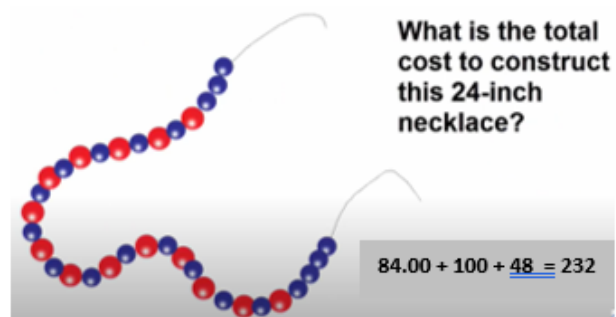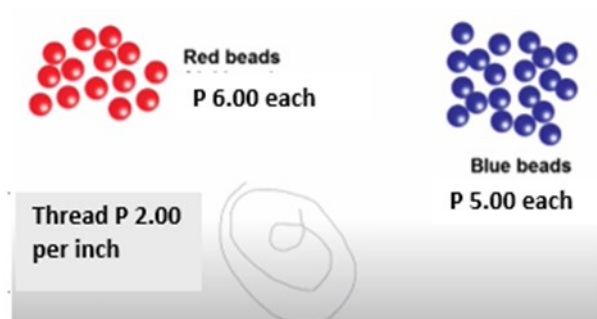**What is the total cost to construct this 24-inch necklace?**

A necklace made up of blue beads, red beads and thread each with different cost.

How do we set up the problem?

What information do we need?

With this we already decompose the problem into sub problems.

Since the materials all have different cost and are use in different amounts, an **analysis** of the problem, leads us into conclusion that calculating the cost for each type of material and then adding those answers together is the logical way to approach the problem. Solving each of those sub-problems is an example of **parallelization**.

Red beads
P 6.00 each

Blue beads
P 5.00 each

Thread P 2.00 per inch

Red beads
P6.00 each
14 x 6 = P84.00

Blue beads
P5.00 each
20 x 5 = P100.00

Red beads
P6.00 each
24 x P2.00 = P48.00

What is the total cost to construct this 24-inch necklace?

84.00 + 100 + 48 = 232
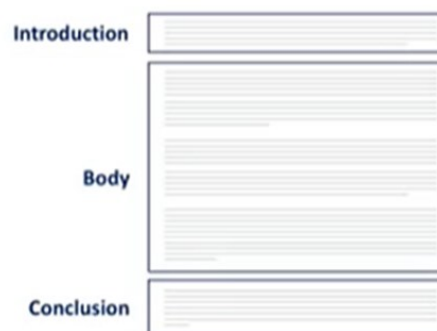
Example 2.

Problem: Writing an essay paper

You have probably experienced this when given the assignment of writing a paper. Rather than just sitting down at your keyboard and writing from start to finish, you probably start by developing an outline of the essay.

Subproblems:

- What to write in the introduction?
- What will be the content or the main idea of the paper?
- What will be the conclusion?

Say, an introduction, a body containing sections developing each of several main ideas, and a conclusion. You then write each section in turn, starting with the main ideas and ending with the introduction and conclusion to create the paper.

Decomposition: Outlining a Paper

| Introduction	
Body	
Conclusion	

Example 3.

Problem: How would you decompose the task of creating an app?

To decompose this task, you would need to know the answer to a series of smaller problems:

- what kind of app you want to create?
- what your app will look like?
- who the target audience for your app is?
- what your graphics will look like?
- what audio you will include?
- what software you will use to build your app?
- how the user will navigate your app?
- how you will test your app?
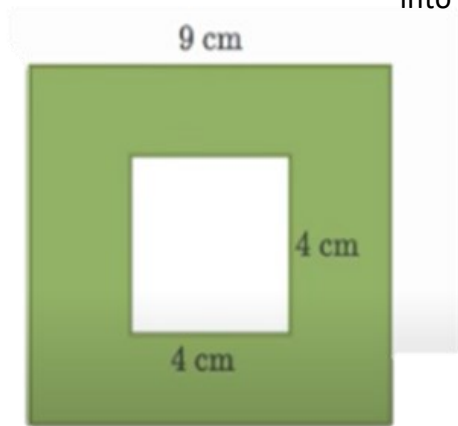- where you will sell your app?
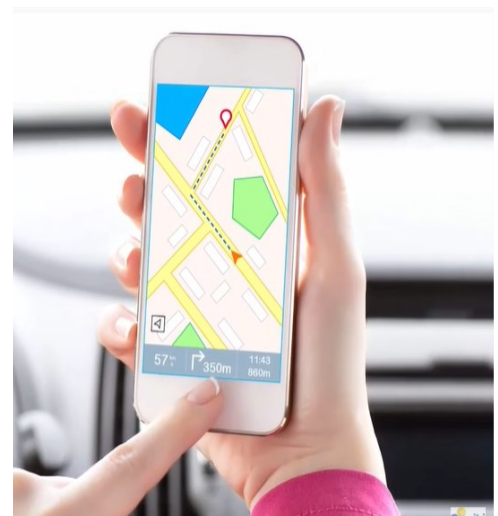
Application.

Activity: Decomposing shapes to find area

What is the area of the shaded figure?

Lindsay finds the area of an irregular shape by decomposing it into 2 rectangles and subtracting the area of the rectangles.

9 cm

4 cm

4 cm

Use this link to guide you in answering the question.

https://www.khanacademy.org/math/cc-third-grade-math/imp-geometry/imp-decompose-figures-to-find-area/v/decomposing-shapes-to-find-area-subtract-math-3rd-grade-khan-academy

🔍 **Reflect**

1. Did you find decomposing the problem difficult? Why or Why not?

2. How do this activity help you understand the ways on how we decompose a problem?

🧠 **Reinforcement & Enrichment**

Decomposition is something we inherently do in our daily lives, even if we don't realize it.

Direction: Give one example of a day-to-day problem and try to decompose the problem into subproblems in order to arrive at a given solution.

Multiple Choice. Read each question carefully and select the correct answer. Chose the letter of your choice.

1. What is decomposition?
   A. Breaking down a complex problem or system into smaller, more manageable parts
   B. Adding detail to make a problem more complex
   C. When you ignore the unnecessary detail in a problem

2. Why do we decompose a complex problem?
   A. To make it more difficult to solve
   B. To change the problem we have
   C. To make it easier to solve

3. Which of these is an example of decomposition?
   A. Watching a mechanic repair a bicycle
   B. Looking at different bicycles for similarities between them
   C. Finding out how a bicycle works by looking in detail at the different parts that make up the bicycle

4. Which of these is an example of decomposition?
   A. Breaking the problem of organizing a cake sale into smaller parts, such as who will bake the cakes and when to hold the cake sale
   B. Taking the problem of baking a cake and thinking about how we can make it the best cake possible
   C. Looking at what different kinds of cake can be made

5. How often do we decompose problems?
   A. We never decompose them, computers do this for us
   B. On a daily basis, often without thinking about it
   C. Occasionally, but we don't really need to

6. Which of these would **NOT** be involved in decomposing a problem?
   A. Thinking about how the problem could be divided into smaller parts
   B. Working out who could help you solve a part of the problem
   C. Adding more parts to the problem so it becomes more complex

7. Which of these is an example of decomposition?
   A. Guessing who has solved a crime from looking at patterns that have happened before
   B. Solving the complex problem of a crime by breaking it down into when the crime was committed and were there any witnesses
   C. Looking at what different crimes could be committed

8. The process of breaking down the problems into smaller parts is called_____?
   A. synthesis   C. Parallelization
   B. Analysis   D. Sequentially

9. Putting together of parts to form a new whole is called?

    A. Analysis   C. Sequentially

    B. Synthesis   D. Parallelization

10. Large problems can often be divided into smaller ones, which can then be solved at the same time is called?

    A. synthesis   C. Parallelization

    B. Analysis   D. Sequentially

References & Photo Credits

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