Review Questions

1. What term is a problem-solving and cognitive process rooted in principles derived from computer science that involves breaking down complex problems into smaller, more manageable parts and devising systematic approaches to solve them?
    a. abstraction
    b. decomposition
    c. computational thinking
    d. recursion
2. What shape in a flowchart represents a decision point?
    a. oval
    b. parallelogram
    c. rectangle
    d. diamond
3. What does pseudocode spell out in natural language?
    a. an algorithm
    b. a test case to debug
    c. a flowchart
    d. the programming language of choice
4. After a test case fails, what is the next step to determine the cause of the failure?
5. What are the key elements of CT that distinguish CT from other types of problem-solving strategies?
6. What is the primary difference between a heuristic and a pattern?
    a. A heuristic is a general rule used for quick problem-solving when an exact solution is not possible, while a pattern is a repeatable solution to a commonly occurring problem.
    b. A heuristic and a pattern are both specific guidelines used to achieve exact solutions in complex problems.
    c. A heuristic is used for creating new designs, whereas a pattern refers to repeating decorative motifs.

d. There is no difference; both terms refer to specific scientific methods used in research.

7. What level of architecture is described as having a narrower scope, a detailed blueprint, and a lower level of abstraction?

a. system architecture

b. technical architecture

c. enterprise architecture

d. solution architecture

8. What level of architecture is described as having a wider scope, a vague plan for the entire organization, and a higher level of abstraction?

a. system architecture

b. technical architecture

c. enterprise architecture

d. solution architecture

9. What component holds the business logic for the business solution or application?

a. presentation layer

b. data management layer

c. business logic layer

d. business process hierarchy

10. What is the difference between data, information, knowledge, and wisdom?

11. Explain why an information system architecture is considered an architecture view in TOGAF.

12. Once architectural similarities have been identified between the architecture of a new problem and existing architectural solutions, what is required to apply these patterns effectively?

a. a comprehensive understanding of the new problem's requirements and constraints

b. the ability to modify existing patterns to fit the new problem's unique context

c. both a comprehensive understanding of the new problem's requirements and the ability to modify existing patterns

d. approval from a higher authority to use the identified patterns

13. In the Model-View-Controller, what layer is responsible for acting as an intermediary between two layers? a. view

b. model

c. business logic

d. controller

14. What does Web 3.0 provide that Web 2.0 did not?

a. dynamic web pages as opposed to only static web pages

b. represents a vision for the future of the Internet characterized by advanced technologies

c. shifted from HTTP to HTTPS

d. based on JSON as opposed to HTML

15. A smart home with a thermostat, a refrigerator, and lights that all can be controlled remotely is an example of devices that can be described with what terminology?

a. Internet of Things (IoT)

b. machine learning

c. hybrid cloud application

d. solutions continuum

16. Why doesn't TOGAF provide prescriptive methods to create and manage repositories of architectural patterns?

17. What is a responsive web application?

18. What is a cloud mashup?

Conceptual Questions

1. Suppose you plan to meet with your friends at a location you are unfamiliar with. In what ways could you employ computational thinking to efficiently navigate and locate the meeting spot?

2. Explain how the pyramid of knowledge concept helps describe the learning progress you make when reading a textbook.

3. What are specific examples of business architecture similarities between two banks?

4. What are specific examples of technology architecture similarities between two banks?

Practice Exercises

1. Think of a complex problem—one that can be broken into many layers of smaller problems. Explain how computational thinking could help you develop a solution to your complex problem.

2. Look at the following pseudocode that describes an algorithm to make a peanut butter and jelly sandwich: a. Get the peanut butter.

   b. Get the jelly.

   c. Get the bread.

   d. Open the peanut butter jar.

   e. Open the jelly jar.

   f. Open the bread.

   g. Take out slice of bread.

   h. Take out another slice of bread.

   i. Dip the knife into the peanut butter.

   j. Spread the peanut butter on one slice of bread.

   k. Dip the knife into the jelly.

   l. Spread the jelly on the other slice of bread.

   m. Put the two slices of bread together.

Write a new algorithm that utilizes abstraction to simplify the number of steps of the original algorithm and can be used as a pattern to make any sandwich.

3. Research what the Fibonacci number sequence is. Write the pseudocode to compute the nth number in the Fibonacci number sequence. Utilize recursion to model a pattern of computation.

4. Create a model that describes the business of running your daily life. Please note that this is not suggesting that you should run your life as a business. Hint: To answer this question, think about the various players, locations, and processes involved in your daily activities and create simple models that mimic the structure provided for the trading business model in the current chapter section.

5. Draw an application architecture diagram for a business solution that uses smart contracts for payment and transactions logging purposes. Feel free to leverage some of the figures from this chapter, rather than create something new.

Problem Set A

1. Create an algorithm to explain to a robot how to cross a street. Use computational thinking to break down the problem into smaller parts. Use the following information to guide your thinking.

Task Decomposition	Pattern Recognition	Abstraction	Algorithm
Identify the different Vehicles, actions, group together to form a decision pattern.	Act out crossing the considerations you can something either the road of what needs to be done.	Write your road. Do you do differently from someone else?	instructions in pseudocode or as a flowchart.

Crossing

2. Create an algorithm to explain how to bake a four-tiered wedding cake.

3. Reflect on what happens when you try to figure out driving directions from point A to point B.

4. Create an enterprise architecture business model for an insurance company that specializes in insuring home and car owners.

5. Create two alternative enterprise technology architecture models for the insurance company business model created in the previous question.

6. Draw an application architecture diagram for the Web 2.0 responsive website of a fictitious insurance company that focuses on home and car insurance and assume that the company also provides native apps to its customers in addition to the website.

Problem Set B

1. Create an algorithm to explain to a robot how to play a game of rock paper scissors. Use computational thinking to break down the problem into smaller parts. Use the following information to guide your thinking.

Task Decomposition	Pattern Recognition	Abstraction	Algorithm
Identify the different Actions,	Play the game.		Write your

Rock, choices, instructions in

considerations you can group Think of the

paper, timings, either

together to form a pattern of actions you scissors winning pseudocode or a

what needs to be done. perform. conditions flowchart.

2. Create an algorithm to show a robot how to play a game of tic-tac-toe. Use computational thinking to break down the problem into smaller parts. Use the following information to guide your thinking.

Task Decomposition Pattern Recognition Abstraction Algorithm

Write your

Moves that Identify the different Play against

Tic- instructions in

can be made, considerations you can group someone. What

tac- either

winning together to form a pattern of strategies do you

toe pseudocode or a conditionswhat needs to be done. use in order to win?

flowchart.

3. Perform some research on the Internet to piece together enterprise architectures for as many industries as you can think of.

4. Draw a cloud-native application architecture diagram for the trading business and technical model documented in the previous section of this chapter.

5. A company wants to develop a business solution that takes pictures of the license plates of cars that drive too fast through intersections in a given city, sends tickets to the drivers, and manages ticket payments. Draw an innovative cloud mashup application architecture diagram for such a solution. Please note that IoT, machine learning, and blockchain PaaS services should be used as part of your design.

6. Document the architecture of a pattern catalog that could be used to provide access to solution architecture diagrams that would help accelerate the creation of mainstream business solutions.

 Thought Provokers

1. Consider TechWorks, which is 100% committed to leveraging innovative technologies as a business growth facilitator. Describe how it can best use computational thinking to create products or services that can generate business. Give precise examples and explain how the start-up would be able to scale the resulting business (i.e., keep sustaining the cost of doing business while increasing its number of customers). Hint: Some companies leverage an incubation arm to come up with innovative ideas and then accelerate the process of developing these ideas into practical solutions via a solution accelerator.

2. Consider our start-up company that is 100% committed to leveraging innovative technologies as a business growth facilitator. Describe how it can best use adaptive design reuse to create products or services that can generate business. Give precise examples and explain how the start-up would be able to scale the resulting business (i.e., keep sustaining the cost of doing business while increasing its number of customers)? Hint: The company may decide to sell reusable design models and their implementation from a proprietary catalog; it may also focus on providing consulting services to derive complete solutions from its proprietary models.

3. Consider our start-up company that is 100% committed to leveraging innovative technologies as a business growth facilitator. Describe how it can best leverage evolving architectures into usable products to create products or services that can generate business. Give precise examples and explain how the start-up would be able to scale the resulting business (i.e., keep sustaining the cost of doing business while increasing its number of customers).


Labs

1. Perform some research on the Internet to find examples of problem scenarios that computational thinking may help solve and create a catalog of problem scenarios. Then, elaborate and show practically how this catalog may be used to compare the scenarios and classify them so they may be used as part of your pattern discovery as you apply computational thinking to new problem scenarios.

2. Create an enterprise architecture capability model for a company of your choice using your research from problem set B. Then, expand one of the capabilities and provide business and technology architecture models for it; identify a project within the capability you expanded upon and provide a complete solution architecture for it.

3. Perform some research on the Internet to piece together additional solutions architecture diagrams for the various categories of mainstream solutions covered in this chapter section. This should include application, data, and technology diagrams.

4. Catalog additional types of solution architectures that may be used to accelerate the creation of mainstream business solutions.

5. Apply critical thinking strategies to develop a study plan for your current semester's courses, aiming to achieve an A or pass each course.