

Name(s) _____ Period _____ Date _____

Activity Guide - Writing Algorithms with Arrays



Algorithms and the Problem-Solving Process

The **Problem Solving Process** is useful when planning and writing algorithms. This process will help you clarify and break down a problem into manageable steps so you can easily identify the code you need to write for each step.

Define

- Read the instructions carefully to make sure you understand the goals.
- Rephrase the problem in your own words.
- Identify any new skills you are being asked to apply.
- If there is starter code, read it to understand what it does.

Prepare

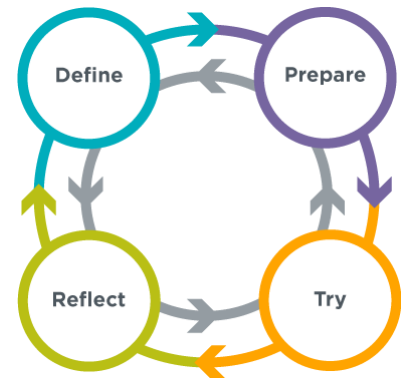
- Write out or draw the steps you need to take to solve the problem.
- List what you already know how to do and what you don't yet.
- Explain your algorithm to a classmate.
- Review similar programs that you've written in the past.

Try

- Write one small piece at a time.
- Test your program often.
- Use comments to document what your code does.
- Go back to a previous step if you get stuck or don't know whether you've solved the problem.

Reflect

- Compare your program to the defined problem to make sure you've solved all aspects of the problem.
- Ask a classmate to try your program and note places where they struggle or show confusion.
- Ask a classmate to read your code to make sure that your documentation is clear and accurate.
- Try to "break" your program to find types of interaction or input that you could handle better.
- Identify changes or improvements you can make next to your program.



Algorithm Planning

For your chosen problem, apply the Problem Solving Process to make sure you understand its requirements, identify similar problems, and plan and refine your algorithm.

Define

Read the instructions carefully to ensure you understand the goals. Rephrase the problem in your own words and identify the **precondition(s)** and **postcondition(s)** of the problem.

Prepare

Write out the steps you need to take to solve the problem.

Questions to Consider:

- Which steps do you already know how to do? Which don't you know how to do yet?
- Explain your steps to a classmate. Was there anything your classmate found confusing? Did they have suggestions that could help improve your algorithm?
- Look at similar programs that you've written in the past. What did you do before that would be helpful in solving this problem?

Try

Write one small piece at a time.

Test your program often!

Use comments to document what your code does.

Go back to the previous steps if you get stuck or aren't sure whether you've solved the problem.

Reflect

Compare your finished program to the defined problem to make sure you've solved all aspects of the problem.

Questions to Consider:

- Ask a classmate to try your program. Are there any parts of your code where they were confused?
- Ask a classmate to read your code to make sure that your documentation is clear and accurate. Do they understand what your code is supposed to do?
- What are some changes or improvements you could make to your program?

What have you accomplished?

What do you need to do next?

Choice A: AP Computer Science Exams

The AP Computer Science Exams dataset includes the number of exams taken in each state in 2021. The number of exams taken in each state is stored in an `int` array called `csExams`.

Write the `calcTotalExams()` method to calculate and return the **total** number of AP Computer Science exams taken in all states.

Precondition(s) _____

Postcondition(s) _____

Write the `calcAverageExams()` method to calculate and return the **average** number of AP Computer Science exams taken in each state.

Precondition(s) _____

Postcondition(s) _____

Choice B: Song Plays

The Song Plays dataset includes the number of times a song was played on a streaming music service each day in a month. The number of times a song was played is stored in an `int` array called `songPlays`.

Write the `calcTotalPlays()` method to calculate and return the **total** number times the song was played on the streaming music service in the month.

Precondition(s) _____

Postcondition(s) _____

Write the `calcAveragePlays()` method to calculate and return the **average** number of times the song was played on the streaming music service each day of the month.

Precondition(s) _____

Postcondition(s) _____

Choice C: Profits

The Store Profits dataset includes the profits a store made each day of a month. The profits made each day are stored in a double array called `storeProfits`.

Write the `calcTotalProfits()` method to calculate and return the **total** profits made by the store in the month.

Precondition(s) _____

Postcondition(s) _____

Write the `calcAverageProfits()` method to calculate and return the **average** profits made by the store each day in the month.

Precondition(s) _____

Postcondition(s) _____

Choice D: TV Episodes Length

The TV Episodes dataset includes the number of minutes for each TV episode in a season. The number of minutes for each episode is stored in an `int` array called `episodeLengths`.

Write the `calcTotalLength()` method to calculate and return the **total** number of minutes for all TV episodes in a season.

Precondition(s) _____

Postcondition(s) _____

Write the `calcAverageLength()` method to calculate and return the **average** number of minutes of each TV episode in a season.

Precondition(s) _____

Postcondition(s) _____