Unit 06: Arithmetic, Logic and Control Statements

Content Area: **Template**
Course(s):
Time Period: **Full Year**
Length: **FY**
Status: **Published**

Standards Alignment

New Jersey Student Learning Standards

Capacities of the Literate Individual
Students Who are College and Career Ready in Reading, Writing, Speaking, Listening, & Language

They demonstrate independence.

They build strong content knowledge.

They value evidence.

They use technology and digital media strategically and capably.

LA.K-12.NJSLSA.R10	Read and comprehend complex literary and informational texts independently and proficiently with scaffolding as needed.
LA.RST.11-12	Reading Science and Technical Subjects
LA.K-12.NJSLSA.W	Writing
	Research to Build and Present Knowledge
LA.K-12.NJSLSA.W7	Conduct short as well as more sustained research projects, utilizing an inquiry-based research process, based on focused questions, demonstrating understanding of the subject under investigation.
LA.RST.11-12.10	By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.
LA.K-12.NJSLSA.W9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
LA.WHST.11-12.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
LA.WHST.11-12.9	Draw evidence from informational texts to support analysis, reflection, and research.

Integration of Career Readiness, Life Literacies and Key Skills

12.9.3.IT	Information Technology
12.9.3.IT-PRG	Programming & Software Development
12.9.3.IT-PRG.6	Program a computer application using the appropriate programming language.
12.9.3.IT-PRG.7	Demonstrate software testing procedures to ensure quality products.
CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP3	Attend to personal health and financial well-being.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP9	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP10	Plan education and career paths aligned to personal goals.
CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.

Technology / Integration of Computer Science and Design Thinking

TECH.8.2.12	Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
TECH.8.2.12.E	Computational Thinking: Programming: Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.
TECH.8.2.12.E.1	Demonstrate an understanding of the problem-solving capacity of computers in our world.
TECH.8.2.12.E.3	Use a programming language to solve problems or accomplish a task (e.g., robotic functions, website designs, applications, and games).
TECH.8.2.12.E.4	Use appropriate terms in conversation (e.g., troubleshooting, peripherals, diagnostic software, GUI, abstraction, variables, data types and conditional statements).

Interdisciplinary Connections: NJSLS for ELA, Social Studies, Science and/or Math Section

Integration of Diversity, Equity and Inclusion; Climate Change; Informational and Media LiteracyNew Section

see Crosswalks

21st Century Life and Careers

Stage I: Desired Results

Transfer/Overview/Rationale

Transfer / Overview / Rationale
Unit Rationale The purpose of this unit…

Meaning

Essential Questions

Essential Questions

What is meant by the scope of a variable?

How do control statements allow us to create more robust programs?

What is the importance of being able to use a selection structure in a programming language to make runtime decisions?

Enduring Understanding/Indicators of Understanding

Enduring Understanding/Indicators of Understanding

- Java and other high-level programming languages let programmers refer to a memory location by name.
- Selection Structures allow a program to make decisions while the program is executing.
- An algorithm is a more or less compact, general, and abstract step-by-step recipe that describes how to perform a certain task or solve a certain problem.
- In OOP (Object Oriented Programming), a programmer envisions a software application as a virtual world of interacting objects.

Acquisition (Student Learning Objectives)

Knowledge

Knowledge

Students will know…

Variables are memory locations, named by the programmer, that can hold values.

Fields are variables declared outside of all contructors and methods of the class.

Local variables are temporary variables declared inside a construct or method and only available within the scope of that constructor or method

The general form of a conditional statement

Conditions are written with relational operators and logical operators

Java’s Math class has a library of functions for common mathematical calculations, such as returning the absolute value of a number, calculating the square root, raising a number to a given power, as well as trigonometric functions, logs, exponents, etc.

Two properties from formal logic called De Morgan's Laws.

How to use the if-else structure for branching in multiple ways, and use nested if-else for hierarchical branching.

To use a switch statement when a program must take one of several actions depending on the value of some variable or expression.

Loops or iterative statements tell the program to repeat a fragment of code several times for as long as a certain condition holds.

Enum statements are used when an object’s attribute or state can have only one of a small set of values.

The general properties of algorithms

Pseudocode and flowcharts

Skills

Skills

Student will be skilled at …

- Primitive data types
- How to declare fields and local variables
- Arithmetic operators, compound assignment operators, and increment / decrement operators
- Boolean data type
- Syntax for if-else statements
- Relational and logical operators, De Morgan’s laws, short-circuit evaluation
- When to use nested if-else statements, if-else-if sequences, the switch statement
- Enum data types
- While, for and do-while loops

Stage 3: Learning Plan

Resource and Mentor Texts

Resources and Mentor Texts

Litvin, Maria and Litvin, Gary. Java Methods: Object-Oriented Programming and Data Structures, Third AP Edition. Skylight Publishing, 2015. http://www.skylit.com

College Board. *AP Computer Science Labs, Picture Lab Student Guide*. New York: College Entrance Examination Board, 2014

Elevens Lab from the AP Computer Science Labs

coding.bat

Eclipse IDE

Java Development Kit

Java Runtime Environment

Formative Assessment Strategies

Formative Assessment Strategies

Labs

Programming Projects

Case Studies

Coding Bat (online exercises)

Practice-It (online exercises)

Learning Activities/Unit of Study

Learning Activities/Unit of Study

Read and complete exercises in Chapter 5.

Write an expression that calculates the day of the week for any given value of *day.*

Write and test the class Inflatable Balloon as a subclass of Balloon. Create a method that inflates the balloon appropriately when its volume changes by a given percentage.

Rewrite a gas mileage class to prompt the user to enter gas mileage and number of miles and then display the amount of gas spent in that trip.

Write a class with a method that calculates the minutes until lunch based on given parameters (current time - hours and minutes)

Lab: Pie Chart - students will complete the Poll Display Panel class.

Lab: Rainbow - students will complete a program in which a rainbow is displayed in a new window.

Case Study: Craps

Lab: Die and CrapsGame classes for Craps

Coding Bat

Practice-It

Modifications and/or Accommodations

Suggested Modifications (ELL, Sp. Ed, GIfted, At-risk of Failure)

English Language Learners

Native language support: The teacher provides auditory or written content to students in their native language.

Adjusted Speech: The teacher changes speech patterns to increase student comprehension. This could include facing the students, paraphrasing, clearly indicating the most important ideas, and speaking more slowly.

Visuals: The teacher uses graphics, pictures, visuals, and manipulatives. This helps ELL students better understand and comprehend the subjects at hand.

Front-Loading Vocabulary: The teacher front loads vocabulary. This means providing students with a list of important vocabulary words they will need to know for a book, lesson, etc. prior to the lesson being taught. Including pictures to go with the vocabulary words is also very beneficial for the students.

Special Education Students

Chunking: The teacher presents information in a way that makes it easy for students to understand and remember. Chunking is based on the presumption that our working memory is easily overloaded by excessive detail. The best way to deliver information is to organize it into meaningful units. Because students with special needs get overloaded easily, chunking is an effective strategy to use with them.

Checking for Understanding: It is important to constantly check for understanding, especially for students who have accommodations. Teachers want to make sure students understand the concepts being covered in a way that makes sense to them.

Extra time: The teacher provides students with special needs extra time to complete work or answer questions. It is important to give students enough time to process their thoughts.

Oral Reading: The teacher will read work orally to students. Class work such as tests and literature circles may need to be read aloud to the student.

Timers: The teacher will use timers as an instructional tool. The use of timers is beneficial for students who have trouble completing tasks. Timers can be helpful so the student is aware of how much time they have to complete an assignment.

Students with 504 Plans

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Gifted & Talented Strategies

Extensions/Enrichments: Teachers will provide gifted and talented students with extension/enrichment projects. Students will be challenged to further their understanding, to apply acquired knowledge, and/or to produce something in reference to acquired knowledge.

Modify/Change Activities: Teachers will monitor and modify activities to accommodate those students who need to be challenged further. Additional reading, problem-solving, writing, or project work is necessary for those students who are ready to move on at a rate more accelerated than their peers. In this way, G & T students are provided the same opportunity for support as special needs students.

Students at Risk of School Failure

Directions or Instructions: Make sure directions and/or instructions are given in limited numbers. Give directions/instructions verbally and in simple written format. Ask students to repeat the instructions or directions to ensure understanding occurs. Check back with the student to ensure he/she hasn't forgotten.

Peer Support: Peers can help build confidence in other students by assisting in peer learning. Many teachers use the 'ask 3 before me' approach. This is fine, however, a student at risk may have to have a specific student or two to ask. Set this up for the student so he/she knows who to ask for clarification before going to you.

Alternate or Modified Assignments: Always ask yourself, "How can I modify this assignment to ensure the students at risk are able to complete it?" Sometimes you'll simplify the task, reduce the

length of the assignment or allow for a different mode of delivery. For instance, many students may hand something in, the at-risk student may jot notes and give you the information verbally. Or, it just may be that you will need to assign an alternate assignment.

Increase One to One Time: When other students are working, always touch base with your students at risk and find out if they're on track or needing some additional support. A few minutes here and there will go a long way to intervene as the need presents itself.

Contracts: It helps to have a working contract between you and your students at risk. This helps prioritize the tasks that need to be done and ensure completion happens. Each day write down what needs to be completed, as the tasks are done, provide a checkmark or happy face. The goal of using contracts is to eventually have the student come to you for completion sign-offs.

Hands On: As much as possible, think in concrete terms and provide hands-on tasks. This means a child doing math may require a calculator or counters. The child may need to tape record comprehension activities instead of writing them. A child may have to listen to a story being read instead of reading it him/herself.

Tests/Assessments: Tests can be done orally if need be. Break tests down in smaller increments by having a portion of the test in the morning, another portion after lunch and the final part the next day.

Seating: Seat students near a helping peer or with quick access to the teacher. Those with hearing or sight issues need to be close to the instruction which often means near the front.