Unit 2- Control Statements & Loops

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AP Computer Science A - Java

Department of Curriculum and Instruction

Belleville Public Schools

Curriculum Guide

AP Computer Science A -Java

Unit 2 – Control Statements & Loops

56 Ralph Street

Belleville, NJ 07109

Prepared by: Teacher, Corey Woodring

Dr. Richard Tomko, Ph.D., M.J., Superintendent of Schools

Ms. LucyAnn Demikoff, Director of Curriculum and Instruction K-12

Ms. Nicole Shanklin, Director of Elementary Education K-8

Mr. Joseph Lepo, Director of Secondary Education

Board Approved:

Unit Overview

Unit Overview :

- Control statements and loops provide a program with the ability to select whether to run segments of code based on user input or satisfied conditions

Variables within control statements and loops cannot be used throughout the entire program

Loops are useful for complex or repetitive tasks.

The Java If Statement

What is a **Java if statement**? Well, even though it is possible to write an application that just performs a set of steps, that wouldn't be very interesting or allow us to do very much. Life is full of choices, and the outcome of each choice is conditional on which choice we make. When we encounter an 'if', something may or may not happen. Life's many 'ifs' are a lot like forks in the road, and it's those forks which may or may not be taken that make life interesting.

Computer applications want to be interesting too, so computer languages like Java offer forks in their roads too, which are called conditional statements. So, think of the Java if statement like one of life's forks in the road --a decision must be made because the program can't take both roads.

Enduring Understanding

- How to write all forms of if-else statements
- How to write all forms of for and while loops
- The similarities and difference of for and while loops
- The various types of operators and their purposes

Essential Questions

Essential Questions

(What questions will the student be able to answer as a result of the instruction?)

1. How do arithmetic, relational, and logical operators differ? How are they the same?
2. How can appropriately used control statements and loops control the output of program?
3. How do for and while loops vary?
4. How can selection control be implemented using nested if-else statements?
5. How can using multiple conditions using logic operators in an if-else statement benefit the program?
6. How can various math functions be called to when needed?

Exit Skills

Exit Skills - Assessment

- Complete various written checkpoint exercises that focus on the explanation and description of computer basics.
- Develop a visual representation of the communication processes within a computer using appropriate ter
- Properly document a program using correct indentation, spacing, and comment style.
- Debug programs and determine the types of errors in the program.
- Create programs based on programming exercises that display various types of output using string and n

- Unit 1 Assessment

Formative Evaluations:	**Summati**
Formative Assessment with polling codeIt! Nows Quizzes Long Programs (LP)/Lab Work	Unit 1 Te

Sequence and Scope

Day	***Topic/Activities***	
1	- **Assignment & Increment Operators** - **Relational & Logical Operators** - codeIt! Now	
2	- *Quiz Question #1 & #2* - **The if-else Statement** - codeIt! Now	
3	- **Nested if-else Statement** - codeIt! Now	I
4	- *Quiz Question #3* - **The while Loop** - codeIt! Now	
5	- finish **while Loops** - *Lab Work: Long Program #1 (LP)*	
6	- *Lab Work: LP #1*	
7	- *Quiz Question #4 & #5*	
8	- **The for Loop** - codeIt! Now	Pro
9	- *Lab Work: LP #2*	
10	- *Lab Work: LP #2*	
11	- *Quiz Question #6* - *Lab Work (makeup lab work with remaining time)*	I
12	- **Nest for & while Loops** - codeIt! Now	I
13	- *Lab Work: LP #3*	I
14	- *Lab Work: LP #3*	I
15	- *Lab Work: LP #3*	

16	- Unit 1 Assessment	

New Jersey Student Learning Standards (NJSLS-S)

CS.9-12.8.1.12.CS.1	Describe ways in which integrated systems hide underlying implementation details to simplify user experiences.
CS.9-12.8.1.12.CS.2	Model interactions between application software, system software, and hardware.
CS.9-12.8.1.12.CS.3	Compare the functions of application software, system software, and hardware.
CS.9-12.8.1.12.NI.1	Evaluate the scalability and reliability of networks, by describing the relationship between routers, switches, servers, topology, and addressing.
CS.9-12.CS	Computing Systems
CS.9-12.NI	Networks and the Internet
TECH.9.4.12.CI	Creativity and Innovation
TECH.9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
TECH.9.4.12.CI.2	Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).
TECH.9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).
TECH.9.4.12.CT	Critical Thinking and Problem-solving
TECH.9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
TECH.9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
TECH.9.4.12.CT.3	Enlist input from a variety of stakeholders (e.g., community members, experts in the field) to design a service learning activity that addresses a local or global issue (e.g., environmental justice).
TECH.9.4.12.CT.4	Participate in online strategy and planning sessions for course-based, school-based, or other project and determine the strategies that contribute to effective outcomes.
	Network connectivity and computing capability extended to objects, sensors and everyday

items not normally considered computers allows these devices to generate, exchange, and consume data with minimal human intervention. Technologies such as Artificial Intelligence (AI) and blockchain can help minimize the effect of climate change.

The usability, dependability, security, and accessibility of devices within integrated systems are important considerations in their design as they evolve.

Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.

The scalability and reliability of the Internet are enabled by the hierarchy and redundancy in networks. Network topology is determined by many characteristics.

With a growth mindset, failure is an important part of success.

Interdisciplinary Connections

LA.RL.11-12	Reading Literature
	Key Ideas and Details
LA.RL.11-12.1	Cite strong and thorough textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.
LA.RL.11-12.2	Determine two or more themes or central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to produce a complex account; provide an objective summary of the text.
LA.RL.11-12.3	Analyze the impact of the author's choices regarding how to develop and relate elements of a story or drama (e.g., where a story is set, how the action is ordered, how the characters are introduced and developed).
LA.L.11-12.4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 11–12 reading and content, choosing flexibly from a range of strategies.
LA.L.11-12.4.A	Use context (e.g., the overall meaning of a sentence, paragraph, or text; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.
LA.L.11-12.4.C	Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning, its part of speech, its etymology, or its standard usage.
LA.L.11-12.4.D	Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).

Learning Objectives

- Select and implement operators as conditions within control statements and loops.
- Declare, initialize and organize variables within loops
- Create control statements and loops to provide the ability for varied outcomes within a program by selecting which code segments run.
- Explain the differences between syntax errors, runtime errors, and logic errors
- Analyze and evaluate variables within a loop compared to those outside the loop.
- Write programs to perform simple computations using control statements and loops
- Generate random numbers and use various other Math Library commands

- Understand the similarities and differences between types of loops and how to vary their use.

Suggested Activities & Best Practices

Assignment Ideas

- **CS Unplugged**
- **CS Fundamentals Unplugged** from Code.org
- **CS4K12** Collection of handouts, worksheets and other documents to help teach Computer Science and Engineering concepts. Materials primarily target middle-school students (6th - 8th grade), but most can be used without modification for younger or older students.
- **Code.org YouTube Channel** > Learn about computer science
- **Nifty Assignments** Collection of fun, inspirational, or thought-provoking assignments for CS1 and CS2 shared at the annual SIGCSE conference
- **EngageCSEdu** Collection of activities and programming assignments designed to engage ALL students in CS1- and CS2-level courses. Materials have been reviewed by computer science educators and experts in student engagement and pedagogy.
- **Websheets** A system for creating and solving programming assignments **About Websheets**
- **Stanford CS Education Library** Education CS material from Stanford CS classes
- **Learn Java in N Games** Collection of game-based activities (including POGIL-style activities) for learning about Java programming. Can be used individually or as a complete curriculum. CS2 level.

Best Practices

- **CS Teaching Tips** Tips to help teachers anticipate students' difficulties and build upon students' strengths. Funded by a National Science Foundation Grant.
- http://www.abovenv.com/wp-content/uploads/2016/08/DroneBlocksLesson3IntroductiontoLoops.pdf
- -Student will be able to identify famous African Americans in the field of computer programming

- Students will also be introduced to the basic energy efficient models in the programming field to help reduce global warming

Assessment Evidence - Checking for Understanding (CFU)

Formative Assessments • Think, pair, share review questions from text. • Practice mini-programs to strengthen concepts as taught.
• Teacher Observation • Utilizing Gliffy.com to flowchart programs
Summative Assessments • Chapter Test • End of Chapter Projects from book.

example: https://quizlet.com/76598385/ap-computer-science-a-flash-cards/

http://www.abovenv.com/wp-content/uploads/2016/08/DroneBlocksLesson3IntroductiontoLoops.pdf

https://runestone.academy/runestone/books/published/csawesome/Unit4-Iteration/topic-4-1-while-loops.html#groupwork-programming-challenge-guessing-game

Alternate Assessment * Written reports

Benchmark Assessment * Create a Multimedia poster

- Admit Tickets
- Anticipation Guide
- Common Benchmarks
- Compare & Contrast
- Create a Multimedia Poster
- DBQ's
- Define
- Describe
- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Fist- to-Five or Thumb-Ometer
- Illustration
- Journals
- KWL Chart
- Learning Center Activities
- Multimedia Reports
- Newspaper Headline
- Outline

- Question Stems
- Quickwrite
- Quizzes
- Red Light, Green Light
- Self- assessments
- Socratic Seminar
- Study Guide
- Surveys
- Teacher Observation Checklist
- Think, Pair, Share
- Think, Write, Pair, Share
- Top 10 List
- Unit review/Test prep
- Unit tests
- Web-Based Assessments
- Written Reports

Primary Resources & Materials

NJCTL Curriculum

Curriculum development Resources/Instructional Materials/Equipment Needed Teacher Resources: • www.gliffy.com • Eclipse IDE • MS DOS Prompt • Computers

Ancillary Resources

Java Resources

- Java Review for the AP CS A Exam - Great review site with lots of practice questions.
- Aplus Compter Science Exam Review Material -Slide, Free Response, and more!
- Introduction to Java - a textbook for a first course in computer science for the next generation of scientists and engineers
- Guru-99 Introduction Java Material
- Oracles (owners of Java) has their own tutorials
- Dick Baldwin - ACC - Introduction and Advanced Java Material
- Introduction to Computer Science using Java - by Bradley Kjell
- Thinking in Java
- Blue Pelican Java
- Java Coding Bat - Lots of good practice problems
- Code Academy - No Java but good practice.

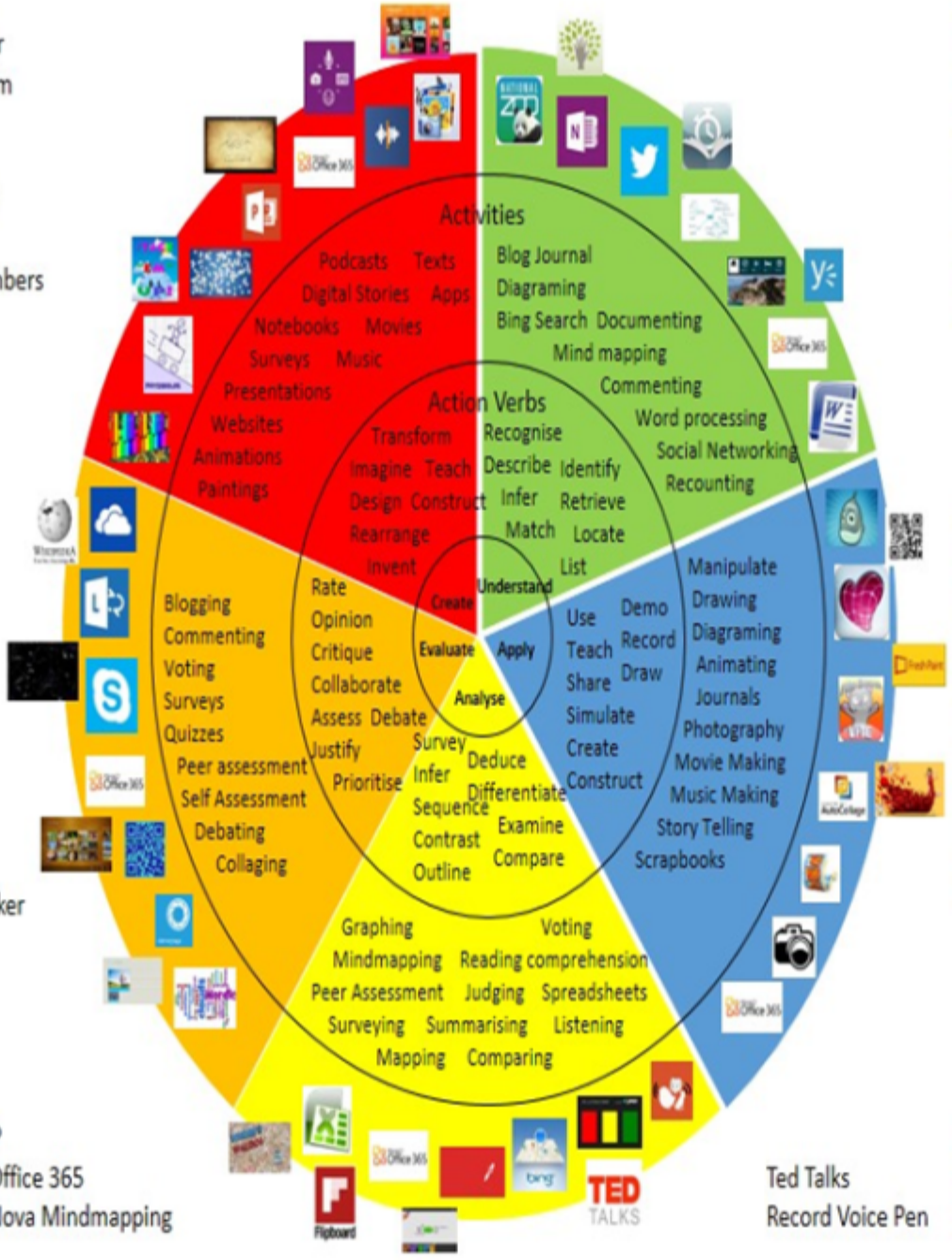
Technology Infusion

Technology Infusion and/or strategies include chromebooks online materials google/powerpoint slides

Win 8.1 Apps/Tools Pedagogy Wheel

Podcasts
Photostory 3
Kid Story Builder
Music Maker Jam
Paint A Story
Office 365
MS PowerPoint
Stack 'Em Up
NqSquared Numbers
Physamajig
Xylophone 8

Wikipedia
Skydrive
Lync
SkyMap
Skype
Office 365
Puzzle Touch
Easy QR
Memorylage
Life Moments
Word Cloud Maker



Where's Waldo?
MS Excel Office 365
Flipboard Nova Mindmapping

Ted Talks
Record Voice Pen

Originally taken from http://www.coetail.com/vzimmer/files/2013/02/iPadagogy-Wheel.001.jpg
And adapted for Windows 8.1 devices by Charlotte Beckhurst @CharBeckhurst

Alignment to 21st Century Skills & Technology

WRK.9.2.12.CAP	Career Awareness and Planning
WRK.9.2.12.CAP.1	Analyze unemployment rates for workers with different levels of education and how the economic, social, and political conditions of a time period are affected by a recession.
WRK.9.2.12.CAP.2	Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs.
WRK.9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth.
WRK.9.2.12.CAP.4	Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them, including educational/training requirements, costs, loans, and debt repayment.
WRK.9.2.12.CAP.5	Assess and modify a personal plan to support current interests and post-secondary plans.
WRK.9.2.12.CAP.6	Identify transferable skills in career choices and design alternative career plans based on those skills.
WRK.9.2.12.CAP.7	Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest.
WRK.9.2.12.CAP.8	Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors.
TECH.9.4.12.CI	Creativity and Innovation
TECH.9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
TECH.9.4.12.CI.2	Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).
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TECH.9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
TECH.9.4.12.CT.3	Enlist input from a variety of stakeholders (e.g., community members, experts in the field) to design a service learning activity that addresses a local or global issue (e.g., environmental justice).
TECH.9.4.12.CT.4	Participate in online strategy and planning sessions for course-based, school-based, or other project and determine the strategies that contribute to effective outcomes.
	With a growth mindset, failure is an important part of success.

21st Century Skills/Interdisciplinary Themes

21st century themes: The unit will integrate the 21st Century Life and career standard 9.1 strands A-D. These strands include: critical thinking and problem solving, creativity and innovation, collaboration, teamwork, and leadership, and cross cultural understanding and interpersonal communication

21st Century/Interdisciplinary Themes that will be incorporated into this unit.

- Communication and Collaboration
- Creativity and Innovation
- Critical thinking and Problem Solving
- ICT (Information, Communications and Technology) Literacy
- Information Literacy
- Life and Career Skills
- Media Literacy

The set of inputs to a function is called its domain. We often infer the domain to be all inputs for which the expression defining a function has a value, or for which the function makes sense in a given context.

Functions presented as expressions can model many important phenomena. Two important families of functions characterized by laws of growth are linear functions, which grow at a constant rate, and exponential functions, which grow at a constant percent rate. Linear functions with a constant term of zero describe proportional relationships.

A function can be described in various ways, such as by a graph (e.g., the trace of a seismograph); by a verbal rule, as in, "I'll give you a state, you give me the capital city;" by an algebraic expression like f(x) = a + bx; or by a recursive rule. The graph of a function is often a useful way of visualizing the relationship of the function models, and manipulating a mathematical expression for a function can throw light on the function's properties.

21st Century Skills

21st Century Skills that will be incorporated into this unit.

- Civic Literacy
- Environmental Literacy
- Financial, Economic, Business and Entrepreneurial Literacy
- Global Awareness
- Health Literacy

TECH.K-12.1.1	Empowered Learner
TECH.K-12.1.2	Digital Citizen
TECH.K-12.1.5	Computational Thinker
TECH.K-12.1.5.a	formulate problem definitions suited for technology-assisted methods such as data analysis, abstract models and algorithmic thinking in exploring and finding solutions.
TECH.K-12.1.5.b	collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making.
TECH.K-12.1.5.c	break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.
TECH.K-12.1.5.d	understand how automation works and use algorithmic thinking to develop a sequence of

steps to create and test automated solutions.

Differentiation

• Technology Resources • Teacher Tutoring • Peer Tutoring • Cooperative Learning Groups • Differentiated Instruction • Follow all IEP Modifications/504 Plan

Think-pair share is a great way of differentiating instruction

These are the 12 best differentiated instruction strategies to help you better meet the needs of all of your students:

1. Group students based on knowledge
2. Create pods with student captains
3. Create tiered lessons
4. Create handouts for common questions
5. Include hands-on activities and projects
6. Provide study guides, worksheets, and notes
7. Flip your classroom
8. Leverage your students' strengths
9. Practice flexible grouping
10. Offer more choices for learning
11. Think-pair-share
12. Try digital curriculum

Differentiation in a lesson lies within content, process, and/or product.

Differentiations:

- Extra time to complete assignments
- Pairing oral instruction with visuals
- Study guides
- Preview vocabulary
- Preview content & concepts
- Student(s) work with assigned partner
- Visual presentation
- Assistive technology
- Auditory presentations
- Large print edition
- Dictation to scribe
- Small group setting

Hi-Prep Differentiations:

- Alternative formative and summative assessments
- Mini workshops to re-teach or extend skills

Special Education Learning (IEP's & 504's)

Adapting existing materials, simplifying or supplementing materials

Breaking tasks into smaller subtasks is a an accomodation I have had success with.

- **Adjust** the method of presentation or content.
- **Develop** supplemental material.

- printed copy of board work/notes provided
- additional time for skill mastery
- assistive technology
- behavior management plan
- Center-Based Instruction
- check work frequently for understanding
- computer or electronic device utilizes
- extended time on tests/ quizzes
- have student repeat directions to check for understanding
- highlighted text visual presentation
- modified assignment format
- modified test content
- modified test format
- modified test length
- multi-sensory presentation
- multiple test sessions
- preferential seating
- preview of content, concepts, and vocabulary
- Provide modifications as dictated in the student's IEP/504 plan
- reduced/shortened reading assignments
- Reduced/shortened written assignments
- secure attention before giving instruction/directions
- shortened assignments
- student working with an assigned partner
- teacher initiated weekly assignment sheet
- Use open book, study guides, test prototypes

English Language Learning (ELL)

Advance Notes

One way that we can make things easier is by preparing and distributing advance notes. This gives ELLs the opportunity to preview what will be taught and, in turn, aids in comprehension of the material.

Extended Time

It's obvious that response time for ELLs is significantly greater than it is for students proficient in English. Given this, we know that ELLs may require more time to process and communicate information on assessments. To support your students in this area, give them additional time on tests to help. Extra time will also help to decrease anxiety, which often has a significant impact on test performance.

English Language Learning adaptations that will be employed in the unit, using the ones identified below.

- teaching key aspects of a topic. Eliminate nonessential information
- using videos, illustrations, pictures, and drawings to explain or clarif
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning;
- allowing students to correct errors (looking for understanding)
- allowing the use of note cards or open-book during testing
- decreasing the amount of workpresented or required
- having peers take notes or providing a copy of the teacher's notes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using computer word processing spell check and grammar check features
- using true/false, matching, or fill in the blank tests in lieu of essay tests

At Risk

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. It is a rare event for students at risk to be able to remember more than 3 things at once. Chunk your information, when 2 things are done, move to the next two.

Peer Support

Sometimes, all you have to do is assign a peer to help keep a student at risk on task. 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.

- allowing students to correct errors (looking for understanding)
- teaching key aspects of a topic. Eliminate nonessential information
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning
- allowing students to select from given choices
- allowing the use of note cards or open-book during testing
- collaborating (general education teacher and specialist) to modify vocabulary, omit or modify items to reflect objectives for the student, eliminate sections of the test, and determine how the grade will be determined prior to giving the test.
- decreasing the amount of workpresented or required
- having peers take notes or providing a copy of the teacher's notes
- marking students' correct and acceptable work, not the mistakes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using authentic assessments with real-life problem-solving
- using true/false, matching, or fill in the blank tests in lieu of essay tests
- using videos, illustrations, pictures, and drawings to explain or clarify

Talented and Gifted Learning (T&G)

http://www.grandviewlibrary.org/CurriculumAdaptations/General_Gifted.pdf

Grouping • Group gifted students with other gifted students or higher-level learners. • Refrain from grouping gifted students with lower-level students for remediation.

Talented and Gifted adaptations that will be employed in the unit, using the ones identified below.

- Above grade level placement option for qualified students

- Advanced problem-solving
- Allow students to work at a faster pace
- Cluster grouping
- Complete activities aligned with above grade level text using Benchmark results
- Create a blog or social media page about their unit
- Create a plan to solve an issue presented in the class or in a text
- Debate issues with research to support arguments
- Flexible skill grouping within a class or across grade level for rigor
- Higher order, critical & creative thinking skills, and discovery
- Multi-disciplinary unit and/or project
- Teacher-selected instructional strategies that are focused to provide challenge, engagement, and growth opportunities
- Utilize exploratory connections to higher-grade concepts
- Utilize project-based learning for greater depth of knowledge

Sample Lesson

Lesson Plan – Control Statements & Loops

Teacher: Corey Woodring

Grade: 9-12 School: Belleville High School

Subject: AP Computer Science A

AP Essential Knowledge

(Referenced from CollegeBoard AP CS A Course & Exam Description)

- Evaluate what is stored in a variable as a result of an expression with an assignment statement.
- Compound assignment operators (+=, −=, *=, /=, %=) can be used in place of the assignment operator
- The increment operator (++) and decrement operator (−−) are used to add 1 or subtract 1 from the stored value of a variable or an array element. The new value is assigned to the variable or array element.
- Evaluate Boolean expressions that use relational operators in program code.
- Primitive values and reference values can be compared using relational operators (i.e., == and !=).
- Arithmetic expression values can be compared using relational operators (i.e., , <=, >=).
- An expression involving relational operators evaluates to a Boolean value.
- Evaluate compound Boolean expressions in program code.
- Logical operators !(not), &&(and), and ||(or) are used with Boolean values. This represents the order

these operators will be evaluated.

- An expression involving logical operators evaluates to a Boolean value.
- When the result of a logical expression using && or || can be determined by evaluating only the first Boolean operand, the second is not evaluated. This is known as short-circuited evaluation.
- Represent branching logical processes by using conditional statements.
- Conditional statements interrupt the sequential execution of statements.
- if statements affect the flow of control by executing different statements based on the value of a Boolean expression.
- A one-way selection (if statement) is written when there is a set of statements to execute under a certain condition. In this case, the body is executed only when the Boolean condition is true.
- A two-way selection is written when there are two sets of statements— one to be executed when the Boolean condition is true, and another set for when the Boolean condition is false. In this case, the body of the “if” is executed when the Boolean condition is true, and the body of the “else” is executed when the Boolean condition is false.
- A multi-way selection is written when there are a series of conditions with different statements for each condition. Multi-way selection is performed using if-else-if statements such that exactly one section of code is executed based on the first condition that evaluates to true.
- Represent branching logical processes by using nested conditional statements.
- Nested if statements consist of if statements within if statements.
- Represent iterative processes using a while loop.
- Iteration statements change the flow of control by repeating a set of statements zero or more times until a condition is met.
- In loops, the Boolean expression is evaluated before each iteration of the loop body, including the first. When the expression evaluates to true, the loop body is executed. This continues until the expression evaluates to false, whereupon the iteration ceases.
- A loop is an infinite loop when the Boolean expression always evaluates to true.
- If the Boolean expression evaluates to false initially, the loop body is not executed at all.
- Executing a return statement inside an iteration statement will halt the loop and exit the method or constructor.
- For algorithms in the context of a particular specification that does not require the use of traversals: Identify standard algorithms, Modify standard algorithms, Develop an algorithm.
- There are standard algorithms to: Identify if an integer is or is not evenly divisible by another integer, Identify the individual digits in an integer, Determine the frequency with which a specific criterion is met

- There are standard algorithms to: Determine a minimum or maximum value, Compute a sum, average, or mode.
- Represent iterative processes using a for loop.
- There are three parts in a for loop header: the initialization, the Boolean expression, and the increment. The increment statement can also be a decrement statement.
- In a for loop, the initialization statement is only executed once before the first Boolean expression evaluation. The variable being initialized is referred to as a loop control variable.
- In each iteration of a for loop, the increment statement is executed after the entire loop body is executed and before the Boolean expression is evaluated again.
- A for loop can be rewritten into an equivalent while loop and vice versa.
- "Off by one" errors occur when the iteration statement loops one time too many or one time too few.
- For algorithms in the context of a particular specification that involves String objects: Identify standard algorithms, Modify standard algorithms, Develop an algorithm.
- There are standard algorithms that utilize String traversals to: Find if one or more substrings has a particular property, Determine the number of substrings that meet specific criteria, Create a new string with the characters reversed
- Represent nested iterative processes.
- Nested iteration statements are iteration statements that appear in the body of another iteration statement.
- When a loop is nested inside another loop, the inner loop must complete all its iterations before the outer loop can continue.
- Compute statement execution counts and informal run-time comparison of iterative statements.
- A statement execution count indicates the number of times a statement is executed by the program.

Enduring Understanding & CTP Skills

(Referenced from CollegeBoard AP CS A Course & Exam Description)

- CON-1 The way variables and operators are sequenced and combined in an expression determines the computed result.
- CON-2 Programmers incorporate iteration and selection into code as a way of providing instructions for the computer to process each of the many possible input values.
- 1.B Determine code that would be used to complete code segments.
- 2.B Determine the result or output based on statement execution order in a code segment without method calls (other than output).
- 2.C Determine the result or output based on the statement execution order in a code segment containing

method calls.

- 2.D Determine the number of times a code segment will execute.
- 3.C Write program code to satisfy method specifications using expressions, conditional statements, and iterative statements.
- 4.C Determine if two or more code segments yield equivalent results.
- 5.C Explain how the result of program code changes, given a change to the initial code.

Essential Questions

(Some referenced from CollegeBoard AP CS A Course & Exam Description)
(What questions will the student be able to answer as a result of the instruction?)

1. How can you use different conditional statements to write a pick-your-own-path interactive story?
2. Why is selection a necessary part of programming languages?
3. How can selection control be implemented using nested if-else statements?
4. How does iteration improve programs and reduce the amount of program code necessary to complete a task?
5. What situations would warrant the use of one type of loop over another?

Assessment

(What is acceptable evidence to show desired results (rubrics, exam, etc.)? Attach Copy

- Complete various written checkpoint exercises that focus on the explanation and description of computer hardware and Java basics.
- Develop a visual representation of the communication processes within a computer using appropriate terminology.
- Properly document a program using correct indentation, spacing, and comment style.
- Debug programs and determine the types of errors in the program.
- Create programs based on programming exercises that display various types of output using string and numeric expressions.
- Unit 2 Assessment

Formative Evaluations: Summative Evaluations:

Formative Assessment with polling

codeIt! Nows

Quizzes

AP Classroom AP Computer Science A Topic Questions

Unit 2 Test/ReTest

AP Classroom AP Computer Science A Progress Checks

Long Programs (LP)/Lab Work

Sequence and Scope

Day	Topic/Activities	CW-HW
1	• Assignment & Increment Operators • Relational & Logical Operators • codeIt! Now	Problems #1 – 7
2	• Quiz Question #1 & #2 • The if-else Statement • codeIt! Now	Problems #8 – 13, AP Classroom Topic Questions 3.1 - 3.4
3	• Nested if-else Statement • codeIt! Now	Problems #14 – 19, AP Classroom Topic Questions 3.5 – 3.7
4	• Quiz Question #3 • The while Loop • codeIt! Now	Problems #20
5	• finish while Loops • Lab Work: Long Program #2 (LP)	Problems #22, AP Classroom Topic Questions 4.1
6	• Lab Work: LP #2	Finish LP #2
7	• Quiz Question #4 & #5	None
8	• The for Loop • codeIt! Now	Problems #21 all & #23
9	• Lab Work: LP #1	Problems # 24, AP Classroom Topic Questions 4.2
10	• Lab Work: LP #1	Finish LP #1

	• Quiz Question #6	
11	• Lab Work (makeup lab work with remaining time)	Problems #25 – 27
12	• Nest for & while Loops • codeIt! Now	Problems #28 – 29, AP Classroom Topic Questions 4.3 – 4.5
13	• Lab Work: LP #3	Problems #30 – 32
14	• Lab Work: LP #3	Problems #33 – 35
15	• Lab Work: LP #3	Finish LP #3 Study for Test
16	• Unit 2 Assessment	None

CS.9-12.8.1.12.CS.1	Describe ways in which integrated systems hide underlying implementation details to simplify user experiences.
CS.9-12.8.1.12.CS.2	Model interactions between application software, system software, and hardware.
CS.9-12.8.1.12.CS.3	Compare the functions of application software, system software, and hardware.
CS.9-12.8.1.12.CS.4	Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors.
CS.9-12.8.1.12.NI.1	Evaluate the scalability and reliability of networks, by describing the relationship between routers, switches, servers, topology, and addressing.
CS.9-12.CS	Computing Systems
CS.9-12.NI	Networks and the Internet
TECH.9.4.12.CI	Creativity and Innovation
TECH.9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
TECH.9.4.12.CI.2	Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).
TECH.9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).
TECH.9.4.12.CT	Critical Thinking and Problem-solving
TECH.9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
TECH.9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
TECH.9.4.12.CT.3	Enlist input from a variety of stakeholders (e.g., community members, experts in

	the field) to design a service learning activity that addresses a local or global issue (e.g., environmental justice).
TECH.9.4.12.CT.4	Participate in online strategy and planning sessions for course-based, school-based, or other project and determine the strategies that contribute to effective outcomes.
	Innovative ideas or innovation can lead to career opportunities.
	With a growth mindset, failure is an important part of success.
	Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.