

# Unit 4: Introduction to Programming with Karel the Dog

Content Area: **Technology**  
Course(s):  
Time Period: **Marking Period 2**  
Length: **12 blocks**  
Status: **Published**

## Course Description & Instructional Notes

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Karel is a dog that only knows how to move, turn left, and place tennis balls in his world. You can give Karel these commands to instruct him to do certain things. We use Karel to show you what it means to program, and allow you to focus on problem solving.

**Prior Knowledge**  
none

### Instructional Notes

The course utilizes a blended classroom approach. The content is fully web-based, with students writing and running code in the browser. Teachers utilize tools and resources provided by CodeHS to leverage time in the classroom and give focused 1-on-1 attention to students. Each unit of the course is broken down into lessons. Lessons consist of video tutorials, short quizzes, example programs to explore, and written programming exercises.

### Technology Integration

Computer Science naturally integrates technology on a daily basis.

## Enduring Understandings

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Using top-down or bottom-up design, programmers break problems into smaller, more manageable pieces.

Programming languages use different commands and formats to accomplish tasks.

## Essential Questions

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How do programmers solve large scale problems?

Why is syntax important?

## **Student Learning Objectives**

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Students will be able to:

- Recognize, explain, and use the commands that Karel can be given. These commands are: move(), putBall(), takeBall() and turnLeft().
- Debug and rework their code as well as someone else's code
- Define and call functions and explain how they are used to improve programs
- Design and implement their own functions to solve problems
- Explain the importance of writing readable code
- Analyze and compare the readability of different programs
- Write functions that solve simpler sub-problems, and use them as building blocks to solve the larger problem
- Compare programs and identify good vs. poor decomposition
- Explain the preconditions and postconditions of a function
- Create clear and readable comments in their code that help the reader understand the code
- Utilize the new toolbox of commands that SuperKarel provides over Karel
- Create for loops to repeat code a fixed number of times
- Explain when a for loop would be a useful tool
- Utilize for loops to write programs that would be difficult/impossible without loops
- Create if statements to only execute code if a certain condition is true
- Explain the purpose of an If/Else statement
- Create If/Else statements to solve new types of problems
- Identify when an If/Else statement is appropriate to be used
- Explain the purpose of a while loop
- Create while loops to repeat code while a condition is true
- Utilize while loops to solve new types of problems
- Choose and combine control structures to solve complicated problems
- Analyze a solution to a problem and explain why it works
- Explain why it is important to indent code
- Write programs with proper indentation
- Define a problem in their own words and plan out a solution to the problem

## **Vocabulary & Learning Experiences**

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### **Vocabulary**

lowerCamelCase, World, Karel, Command, Define a Function, Call a Function, Indentation, Curly Bracket, Parentheses, Function body, Read Like a Story, Programming Style, Start Function, Break Down (Decompose), Decomposition, Top Down Design, Algorithm, Precondition, Postcondition, Comment, SuperKarel, Loop, For Loop, Condition, Control Structure, Iterate, Boolean, If Statement, If Else Statement,

While Loop, Fencepost Problem, Pseudocode

### **Planned Learning Experiences**

Challenge: Karel Problems

Students will synthesize all of the skills and concepts learned in the Karel unit to solve increasingly challenging Karel puzzles.

### **Resources**

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CodeHS

Code.org

Blown to Bits

### **Assessments**

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#### **Formative**

Think like a Computer Scientist Journal:

Students complete at least five journal entries based on teacher provided prompts that could include major topics, key points, vocabulary, syntax, and/or flowcharts/programming planning.

Quizzes embedded in CodeHS Modules and Code Review

#### **Summative**

Unit Quizzes (multiple choice only)

Student Choice Unit Project

### **NJSLS Standards**

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*NJSLS Standards Copied and Pasted as well as linked.*

#### **[NJSLS Computer Science and Design Thinking](#)**

8.2.12.ED.1: Use research to design and create a product or system that addresses a problem and make modifications based on input from potential consumers.

8.2.12.ED.3: Evaluate several models of the same type of product and make recommendations for a new design based on a cost benefit analysis.

8.2.12.ED.4: Design a product or system that addresses a global problem and document decisions made based on research, constraints, trade-offs, and aesthetic and ethical considerations and share this information with an appropriate audience.

8.2.12.ED.5: Evaluate the effectiveness of a product or system based on factors that are related to its requirements, specifications, and constraints (e.g., safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, ergonomics).

8.2.12.NT.2: Redesign an existing product to improve form or function.

### **Additional NJSLS Standards**

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*NJSLS Standards Copied and Pasted as well as linked.*

### **Interdisciplinary Connections**

### **NJSLS Career Readiness, Life Literacies, and Key Skills**

### **NJSLS Companion Standards Grades 9-12 (Reading & Writing in Science & Technical Subjects)**

9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas

9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice

9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving

9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task

### **Modifications/Accommodations**

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#### GENERAL CONSIDERATIONS FOR DIVERSE LEARNERS

English Language  
Learners

Students Receiving Special Education Services

Advanced Learners

- Small group/One to one
- Additional time
- Review of directions
- Student restates information
- Space for movement or breaks
- Extra visual and verbal cues and prompts
- Preferential seating
- Follow a routine/schedule
- Rest breaks
- Verbal and visual cues regarding directions and staying on task
- Checklists
- Immediate feedback
- Use of high level academic vocabulary/texts
- Problem-based learning
- Pre assess to condense curriculum
- Interest-based research
- Authentic problem-solving
- Homogeneous grouping opportunities

[WIDA Can Do Descriptors for Grade 9-12](#)

[WIDA Essential Actions Handbook](#)

[FABRIC Paradigm](#)

[Wall Township ESL Grading Protocol](#)

\*Use WIDA Can Do Descriptors in coordination with Student Language Portraits (SLPs).

Students receiving Special Education programming have specific goals and objectives, as well as accommodations and modifications outlined within their Individualized Education Plans (IEP) due to an identified disability and/or diagnosis. In addition to exposure to the general education curriculum, instruction is differentiated based upon the student's needs. The IEP acts as a supplemental curriculum guide inclusive of instructional strategies that support each learner.

[Considerations for Special Education Students 6-12](#)

[National Center on Universal Design for Learning - About UDL](#)

[UDL Checklist](#)

[UDL Key Terms](#)

[Knowledge and Skill Standards in Gifted Education for All Teachers](#)

[Pre-K-Grade 12 Gifted Programming Standards](#)

[Gifted Programming Glossary of Terms](#)

Students with 504 Plan

Teachers are responsible for implementing designated services and strategies identified on a student's 504 Plan.

Alternative Assessments	Independent Research & Projects	Jigsaw
Choice Boards	Multiple Intelligence Options	Think-Tac-Toe
Games and Tournaments	Project-Based Learning	Cubing Activities
Group Investigations	Varied Supplemental Activities	Exploration by Interest
Learning Contracts	Varied Journal Prompts	Flexible Grouping
Leveled Rubrics	Tiered Activities/Assignments	Goal-Setting with Students
Literature Circles	Tiered Products	Homework Options
Multiple Texts	Graphic Organizers	Open-Ended Activities
Personal Agendas	Choice of Activities	Varied Product Choices
Homogeneous Grouping	Mini-Workshops to Reteach or Extend	Stations/Centers
	Think-Pair-Share by readiness or interest	Work Alone/Together
	Use of Collaboration of Various Activities	