

KUBO's Coding License

KUBO's Coding License was designed to give students aged four to 10 a strong foundational understanding of TagTile® coding. Split into five sections, it introduces concepts such as sequences, functions, subroutines, and loops. It is beginner-friendly and gets progressively harder as students develop their understanding of programming.

The Coding License was also designed with a holistic outlook. Its sections correspond to four crucial 21st-century skills: communication, collaboration, creativity, and critical thinking. Each skill has a dedicated section with exercises that reflect that.

Estimated time

690 minutes

Lesson One: Introduction

Lesson Type

Normal lesson

Subjects supported in lesson

Math, Science

Grades

Kindergarten through 5th grade

Estimated time

145 minutes

Downloadable materials on KEDU

1. Worksheet 1.1
2. Worksheet 1.2
3. Worksheet 1.4
4. Worksheet 1.8
5. Activity map

Tips

1. Adequate floor space

In exercises 1 and 5, students will explore TagTiles® using their bodies to perform commands and routes, so it's a good idea to make sure you have plenty of floor space before you begin.

2. Understanding robots

It may be helpful to explain to students that robots can *only* perform actions via commands and messages from the person controlling them.

3. Taking care of KUBO

It's a good idea to show students how to handle and store KUBO and the TagTiles® properly. You might also want to stress the importance of taking care of both.



4. Understanding TagTiles®

Consider explaining to students that each straight TagTile® makes KUBO take one step forward only. Explain that KUBO moves one extra step forward after it has turned right or left.

5. Joining the TagTiles®

To make it easier for students to understand, you can allow them to join the TagTiles® in the same direction the arrows point.

6. Let the students decide

In exercise 2, students have to make a route for KUBO to get to school. Consider letting them decide which route to take. The more advanced students can make longer routes if they wish.

7. Let students explore

To deepen engagement, consider letting the students take detours en route to school in exercise 2.

8. Okay to make mistakes

It might be helpful to tell the students that it's okay to make mistakes, so long as they're willing to examine what went wrong and correct it. In this way, they will begin to "debug" their code.

9. Exploring the activity map

In exercise 4, students have to make routes to show KUBO around the school. Consider letting them decide where to go and in what order.

10. Drawing routes on worksheet 1.4

In exercise 4, students are meant to draw their routes on worksheet 1.4. You can decide to skip this step for younger classes if it's too time-consuming.

11. Keep routes intact

In exercises 6 and 7, students will need to use the same routes. If the exercises are done on two separate days, consider asking students to draw their routes on paper and save them.

12. Learning functions

In exercise 7, students will be introduced to functions, which allow you to save routes so KUBO can memorize them and execute them using the play TagTiles®. Watch our video on functions to learn how to make them here.

13. Practice makes perfect

Consider letting students practice by making simple functions with three to five movement TagTiles®. In the beginning, they can lay the routes down on the map to make it easier. You may have to stress that functions are built in a straight line, as some students have a hard time grasping this.

14. Common class map

Consider hanging up one activity map in front of the whole class to use in discussions and while demonstrating something.

15. Ground rules

Before beginning the lessons in the Coding License, it may be helpful to set down some ground rules. Here are some we found helpful:

1. Tell students to sit on their hands when you ask for quiet so they don't get restless.
2. Instruct them to detach KUBO's head and body in between exercises or when you're giving them instructions.
3. Tell them to stay close to their robots and to take good care of KUBO and the TagTiles®.

About

Students will get familiar with KUBO and the TagTiles® by using their own body to act out the commands printed on the movement TagTiles®. They will build an understanding of sequences and algorithms by laying down movement TagTiles® and programming KUBO to do the actions printed on them. In later exercises, they will explore functions.

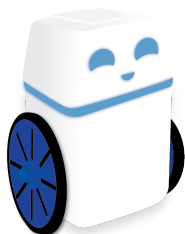
All materials required



Movement TagTiles® (incl.)



Blue function and play TagTiles® (incl.)



KUBOs (incl.)



Activity map (incl.)



Pencils



Worksheets 1.1(downloadable on

KEDU), 1.2(downloadable on KEDU), 1.4 (downloadable on KEDU), and 1.8(downloadable on KEDU)

Teacher set-up and prep

1. Make copies of worksheets 1.1, 1.2, 1.4, 1.5, and 1.8 — one for each student.
2. Make sure all KUBOs have been fully charged before beginning.
3. Find an appropriate place to do the exercises. KUBO can be used on a table or the floor, but the surface must be level and clean.
4. Help students find the TagTiles® and activity map they will need.

Management

We recommend the students be put in groups of two. Circulate through the room and provide help, if necessary. However, to encourage student-centered active learning, instruct students to follow the “ask three, then me” rule, where they consult each other before they consult you.

Goal

By the end of this section, the students should know how to use concrete, visual, and symbolic representations.

Objectives

By the end of this section, students should be able to:

1. Understand how movement TagTiles® work.
2. Make routes for KUBO to follow on the activity map.
3. Explain what a function is.
4. Make a function.

Exercise 1: Be a robot

About

In this exercise, students will use their bodies to understand the movement TagTiles® by moving in the direction the TagTiles® show.

Estimated time

20 minutes

Materials



Movement TagTiles® (incl.)



Worksheet 1.1 (downloadable on KEDU)



Pencils

Steps

1. Say: Before you can begin coding, you have to learn KUBO's language, TagTiles®.
2. Ask: Can you move in the direction the TagTiles® show?
3. Do: Sort students into groups of two.
4. Do: Tell the students to open up lid one and find the movement TagTiles®.
5. Do: Give each student a worksheet.
6. Ask: How do you remember which way is right and which way is left?
7. Ask: Have you ever controlled a robot before?
8. Say: Now one of you will play the part of the robot and the other will control it using the movement TagTiles®.

9. Do: Tell the students to take out three straight, three right, and three left movement TagTiles®.
10. Do: One student from each group picks up one TagTile® at a time and instructs their 'robot' which direction to move. They repeat this until there are no TagTiles® left. Then they switch places.
11. Ask: How did it feel to control a robot? Was it difficult?
12. Ask: How did it feel to be a robot? Was it easy or difficult to follow the commands?
13. Do: Instruct the students to make a route from one end of the classroom to the other. Then one controls their robot and guides them along the route. They make a new route and switch places.
14. Do: Instruct the students to draw their routes on the worksheet.

Exercise 2: KUBO and the TagTiles®

About

In this exercise, students will use KUBO and the movement TagTiles® to see how they work together.

Estimated time

15 minutes

Materials



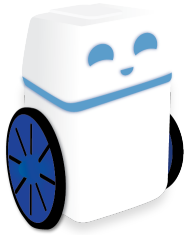
Movement TagTiles® (incl.)



Pencils



Worksheet 1.2 (downloadable on KEDU)



KUBOs (incl.)

Steps:

1. Say: You're almost ready to start playing with KUBO! But first, you have to put it on the TagTiles® to see what they make KUBO do.
2. Do: Sort students into groups of two.
3. Ask: What do you think KUBO can do?
4. Do: Instruct them to take KUBO's head out of the box and attach it to the body. KUBO's lights will flash blue.
5. Ask: What do you think KUBO will do when placed on the TagTiles®?
6. Do: Instruct the students to take out a straight movement TagTile® and place KUBO on it.



7. Do: Instruct the students to take out a right movement TagTile® and place KUBO on it.

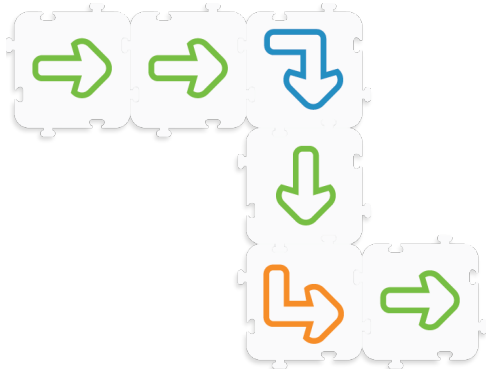


8. Do: Instruct the students to take out a left movement TagTile® and place KUBO on it.



9. Ask: Which direction does KUBO go when placed on the different TagTiles®? Is there an easy way to remember?

10. Do: Instruct the students to join the TagTiles® together to make a route.



11. Ask: Does it matter which way the arrows on the TagTiles® face when they are joined together?

12. Do: Instruct them to put KUBO on the first TagTile®, at the start of their route.

13. Do: Instruct them to make a new route for KUBO to follow on the activity map.

14. Do: Instruct the older classes to answer the questions on the worksheet.

Exercise 3: KUBO's first day

About

In this exercise, students will begin to work with routes. They must build a route to take KUBO from a point on the activity map to the school gates.

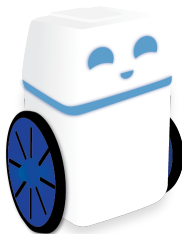
Estimated time

15 minutes

Materials:



Movement TagTiles® (incl.)



KUBOs (incl.)



Activity map (incl.)



Pencils

Steps:

1. Say: Today is KUBO's first day at school Can you make a route for KUBO to the school gates? You decide where KUBO starts.
2. Do: Sort students into groups of two.
3. Do: Instruct them to take out the movement TagTiles®.
4. Ask: How do you get to school every day?
5. Ask: How do you think KUBO gets to school?
6. Do: Instruct students to make a route for KUBO from any part of the map to the school (quadrants A6 or G6). They must use all three types of movement TagTiles®.



7. Ask: How did KUBO get to school? Did you find it hard to make routes? What advice do you have for your classmates?

Exercise 4: Show KUBO around

About

Students will continue to familiarize themselves with routes during this exercise, using movement TagTiles® to help KUBO explore the activity map.

Estimated time

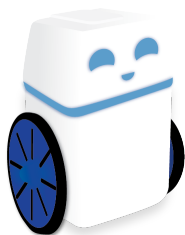
20 minutes

Materials

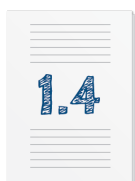




Movement TagTiles® (incl.)



KUBOs (incl.)



Worksheet 1.4 (downloadable on KEDU)



Activity map (incl.)



Pencils

Steps

1. Say: Can you make routes to show KUBO all the different areas in school? Start at the school bell and then decide where to take KUBO.
2. Do: Sort students into groups of two.
3. Do: Instruct them to take out the movement TagTiles®.
4. Ask: Where do you like to play in school? If you visited KUBO's school, where would you go to play?
5. Do: Instruct students to take KUBO to different places on the map by laying movement TagTiles® down. They must all start at the bell (quadrant E1).
6. Ask: How will you take KUBO to different parts of the school?
7. Do: Instruct them to make their first route. Tell them to put KUBO down on the starting TagTile®, facing the right way.
8. Do: Instruct them to draw their routes (the movement TagTiles®) on the worksheet.

9. Do: Tell them to make two other routes. They must draw them on the worksheet.
10. Ask: Where did you take KUBO? What was your longest and shortest route?
11. Do: Instruct the students to form two circles and discuss with each other.

Exercise 5: Remembering routes

About:

Students need to use their bodies to follow routes they have memorized to get a sense of how KUBO "remembers" TagTiles® by reading them.

Estimated time

15 minutes

Materials



Movement TagTiles® (incl.)



Pencils



Paper

Steps

1. Say: Good job showing KUBO around school! However, KUBO needs to remember routes by itself. You need to demonstrate how.
2. Ask: How do you remember directions?
3. Do: Gather students in a circle. Lay down a route with three movement TagTiles®.
4. Ask: Can you memorize the route I've just made?
5. Do: Give students 30 seconds to memorize the route, then cover it up with a piece of paper.
6. Do: Instruct students to walk, following the route
7. Do: If they remember the route correctly, add three additional TagTiles®.
8. Ask: How did you memorize the TagTiles®? Any tips or tricks?

9. Do: Add three additional TagTiles® each time.
10. Ask: How many TagTiles® could you memorize?

Exercise 6: KUBO plays

About:

Students will need to lay a route down from the gym to the football on the activity map for KUBO to follow.

Estimated time

10 minutes

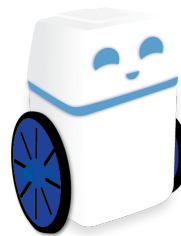
Materials



Movement TagTiles® (incl.)



Activity map (incl.)



KUBOs (incl.)

Steps

1. Say: KUBO would like to get out and play during recess. Can you take him to the football?
2. Do: Instruct students to make a route for KUBO from the gym (quadrant G2) to the football (quadrant A4)
3. Ask: Is there more than one way to get there? Choose which route to take.
4. Do: Instruct them to build their chosen route on the map.
5. Ask: Which route did you choose and why? Which TagTiles® did you need to make the route?

Exercise 7: KUBO remembers routes

About:

Students will be introduced to functions for the first time by making KUBO "memorize" the route to the football using the blue function and play TagTiles®. Watch our video on functions to learn how to build them.

Estimated time

25 minutes

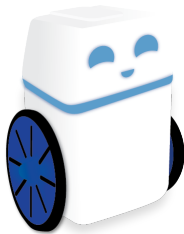
Materials



Movement TagTiles® (incl.)



Blue function and play TagTiles® (incl)



KUBOs (incl.)



Activity map (incl.)

Steps

1. Say: Now that you've shown KUBO how to get to the football, we can make it remember the route using function TagTiles®.
2. Do: Explain the concept of functions. Let students practice
3. Ask: What is a function? How does KUBO remember routes?

4. Do: Instruct students to take the routes from lesson six and put them in between two blue function TagTiles®.
5. Do: Explain that the movement TagTiles® in the route must be in the same order, but it doesn't matter which way the arrows face. Functions must be built in one straight line.
6. Do: Instruct students to put KUBO down on the first function TagTile®. It will drive over the route to memorize it.
7. Ask: What are the differences between how you memorize things and how KUBO memorizes them?
8. Do: Instruct students to take the blue play TagTile® and place it at the start of the route on the map (quadrant G2).
9. Do: Instruct students to place KUBO on the play TagTile®, facing in the direction it needs to move. If they've built the function correctly, KUBO will drive to the football.
10. Ask: Did you build your function correctly?
11. Do: If incorrect, instruct students to go back and correct their functions.
12. Ask: What is important to remember when making functions?
13. Do: Instruct the students to make more functions to practice.
14. Ask: What can robots do that we can't and vice versa? Where are robots found? What kind of work do robots do in factories? How can we use robots in school?..

Exercise 8: KUBO plays again

About:

In this exercise, students will continue working with functions. They must lay down a route to take KUBO from point A to point B on the activity map. They must then use the function and play TagTiles® to make KUBO "memorize" and "execute" a function.

Estimated time

25 minutes

Materials



Movement TagTiles® (incl.)



Pencils



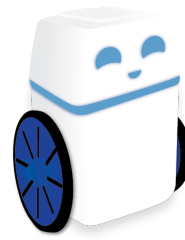
Blue function and play TagTiles® (incl)



Worksheet 1.8 (downloadable on KEDU)



Activity map (incl.)



KUBOs (incl.)

Steps

1. Say: Before returning home, KUBO wants to play with classmates one final time.
2. Ask: Where do you think KUBO should go now?
3. Do: Instruct the students to study the map and choose a route from point A to point B. Ask them to study the TagTiles® and determine which ones they will need to use.
4. Do: Instruct them to lay movement TagTiles® on the map and place KUBO on the first one.
5. Say: Now we're going to make KUBO memorize the route using functions.
6. Ask: How long of a route do you think KUBO can memorize? Discuss.
7. Do: Instruct students to take the first blue function TagTile® and lay it down in front of them. They instruct them to attach the movement TagTiles® to it in the right order and in one straight line. Finally, they must complete the function by attaching the second blue movement TagTile® at the end.
8. Do: Instruct students to put KUBO down on the first function TagTile® so KUBO can memorize the route.
9. Ask: What is the advantage of making KUBO remember things?
10. Do: Next, students must use a blue play TagTile® and place it in the square on the map where KUBO starts. KUBO must be placed right in the center of the TagTile®, facing in the right direction.
11. Ask: After KUBO has completed the route, ask: Did KUBO remember the right route?

12. Do: Instruct them to write or draw their function on the worksheet. Make them practice with other routes.
13. Ask: Do you understand what a function is? What is important to remember when we're making one? What is the advantage of making KUBO remember things?

Lesson Two: Communication

Lesson Type

Normal lesson

Subjects supported in lesson

Math, Science

Grades

Kindergarten through 5th grade

Estimated time

120 minutes

Downloadable materials on KEDU

1. Worksheet 2.3
2. Activity map

Tips

1. Before starting

Exercises 6 and 8 from the last lesson will help you complete the exercises in section 2. It's a good idea to make sure your students have a thorough understanding of those first.

2. Mastering functions

Students will continue making functions in this lesson. It may be a good idea to demonstrate how before starting. Don't forget to mention that functions are built in one straight line. Watch our video on functions to learn how they're built.

3. Routes before functions

Ideally, students should make functions without laying down routes first in this lesson. However, you can choose to let students who are having trouble grasping the concept build routes first.

4. Making the groups

During this lesson, consider pairing up students with similar levels of competency in making functions.

5. Making the rounds

In exercise 3, students need to give each other small tasks to do. It may be a good idea to walk around and observe the kind of assignments being given, so you can tweak them depending on the level of difficulty, if necessary.

6. Explaining functions

Consider asking students to explain how they're making functions during your rounds during exercise 3. This will help them develop and practice their communication skills.

7. Worksheet 2.3

In exercise 3, worksheet 2.3 is intended for use by students in the 2 and 3 grade, but you can choose to have younger students fill it out if time permits.

About

In this section, students will work on their communication skills with lessons that encourage them to discuss their experiences with KUBO. They should be encouraged to practice explaining how they've solved a particular problem, while at the same time remaining open to suggestions from their classmates. Ideally, they should make functions without laying down routes first.

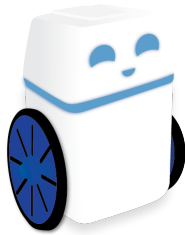
All materials required



Movement TagTiles® (incl.)



Blue function and play TagTiles® (incl.)



KUBOs (incl.)



Activity map (incl.)



Pencils



Worksheet 2.3 (downloadable on KEDU)

Teacher set-up and prep

1. Make one copy of worksheet 2.3 for each student
2. Fully charge all KUBO robots before starting
3. Find an appropriate place to do the exercises. KUBO can be used on a table or the floor, but the surface must be level and clean.
4. Help students find the TagTiles® they will need

Management

We recommend the students be put in groups of two. Circulate through the room and provide help, if necessary. However, to encourage student-centered active learning, instruct students to follow the “ask three, then me” rule, where they consult each other before they consult you.

Goal

By the end of this section, students should be able to explain their experiences and results using KUBO.

Objectives

By the end of this section, students should be able to:

1. Explain their functions to classmates
2. Come up with stories to fit their functions

3. Explain how their classmates' functions work

Exercise 1: KUBO takes the bus

About:

In this exercise, students will choose a route and make a function to take KUBO from the school bell to the bus stop. They will then be asked to discuss their choices and functions with each other.

Estimated time

45 minutes

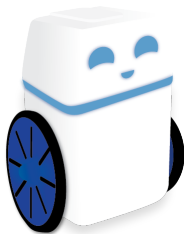
Materials



Movement TagTiles® (incl.)



Blue function and play TagTiles® (incl.)



KUBOs (incl.)



Activity map (incl.)

Steps

1. Say: It's now time for KUBO to go home after a long day at school.
2. Ask: Can you make a function to take KUBO to the bus stop from the school bell?
3. Ask: Do you remember what a function is?
4. Ask: What do the function TagTiles® and play TagTiles® do?
5. Ask: Would one of you like to come to the front and show your classmates how to make a function?
6. Do: Pair students up and ask them to discuss the routes KUBO can take to get from the bell to the bus stop.

7. Do: After they've settled on one route, instruct them to make a function for it. Remind them to use the blue function and play TagTiles®.
8. Do: Instruct them to place the blue play TagTile® in the square below the school bell.
9. Do: Now, one member from each group plays the 'guest' and visits another group, while the other stays back as the 'host' to show their function.
10. Do: The guest now tries to guess the route by tracing it out on the map with their finger. The host then places KUBO on the blue TagTile® to see if the route was guessed correctly.
11. Ask: Did you guess the right route?
12. Say: Discuss where you made a mistake if you guessed wrong.
13. Do: The host and guest must now discuss why the group chose that route.
14. Do: The students then exchange roles and the exercise continues.
15. Ask: Did you make the same routes?
16. Ask: How many routes were there in total?
17. Ask: Why did you choose the route you chose?
18. Ask: How did you guess the routes?

Exercise 2: KUBO has recess

About:

In this exercise, students need to come up with a game for KUBO to play. They have free reign and can decide where to start and what to do. For example, they could make a function so KUBO drives from the bell to the bushes and hides, or a function from the school bell to the football so that KUBO can make some goals.

Estimated time

30 minutes

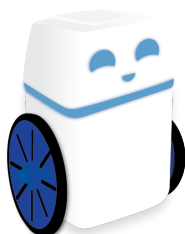
Materials



Movement TagTiles® (incl.)



Blue function and play TagTiles® (incl.)



KUBOs (incl.)



Activity map (incl.)

Steps

1. Say: KUBO wants to go out and play with classmates during recess.
2. Ask: Can you come up with a game for KUBO to play?
3. Do: Instruct students to come up with a game for KUBO and a story to go along with it. They are not allowed to show other groups their functions.
4. Do: After the students have made their functions, two groups get together to do to exercise. They tell each other their stories and put KUBO on the blue play TagTile®. However, they are not allowed to show their functions to each other.
5. Ask: Where did you take KUBO to play?
6. Ask: Which game did you make KUBO play?
7. Ask: What story did you make up for your game?
8. Do: After KUBO has played the game, the groups have to guess which movement TagTiles® were used and try to replicate each other's functions using the red function set. They must then test them to see if they were right and debug if necessary.
9. Ask: Did you guess the other group's function correctly and how?
10. Ask: Was this exercise harder than the previous one, where you had to look at the function and guess the route?

Exercise 3: KUBO's weekend outing

About

In this exercise, students must show KUBO around the map by making small assignments for each other to do. This will help them practice their communication skills.

Estimated time

45 minutes

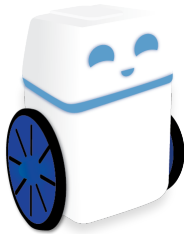
Materials



Movement TagTiles® (incl.)



Blue function and play TagTiles® (incl.)



KUBOs (incl.)



Activity map (incl.)



Worksheet 2.3 (downloadable on KEDU)

Steps

1. Say: It's the weekend, and KUBO is ready for a new adventure! KUBO loves to play in the schoolyard and often goes there on the weekends. Today, KUBO also has some money to buy something delicious from the baker or the food cart.
2. Ask: What do you think KUBO will do during the course of the day?
3. Do: Put students into pairs and instruct them to come up with small exercises for each other involving functions. One student uses the blue function set, and the other, the red.
4. Ask: What makes an assignment difficult or easy?
5. Ask: Can you come up with an example of the kind of assignment you can give your partner?

6. Do: After the students have finished the first round of exercises, they must discuss how they solved them with each other. They continue in this manner for a few rounds.
7. Ask: [What was your favorite exercise and why?](#)
8. Do: Instruct each student to write down their favorite exercise (including the function) on the worksheet.
9. Ask: [What is important to keep in mind when you're making exercises for each other?](#)

Lesson Three: Collaboration

Lesson Type

Normal lesson

Subjects supported in lesson

Math, Science

Grades

2nd through 5th grade

Estimated time

95 minutes

Downloadable materials on KEDU

1. Worksheet 3.2
2. Worksheet 3.3
3. Activity map

Tips

1. Subroutines

In this lesson, students will be introduced to subroutines, i.e., a function within a function. It may be a good idea to demonstrate how to build them before beginning on the exercises. To learn how to build subroutines, watch our video.

2. Debugging

Students could have a hard time grasping the concept of subroutines the first time. If mistakes are made, it is a good idea to explain the importance of 'debugging' their work, where they identify errors in their code and correct them.

3. Space to move

In exercise 2, students will try to understand subroutines by using their bodies to execute one. It may be a good idea to make sure they have adequate floor space to work with beforehand.

4. Worksheet 3.2

The worksheet for exercise 2 contains two columns of functions which need to be cut out. To save time, consider doing this yourself before class.

5. Activity break

Consider saving the functions from worksheet 3.2. They can be used again when you want to give students a quick activity break in between classes.

6. Advanced subroutines

In exercise 3, students have to come up with stories for KUBO using at least one subroutine. Students who are comfortable with the concept can build more than one subroutine if they wish to. For example, they can be asked to build a blue function and then insert both blue play TagTiles® in their red function to make KUBO execute the blue function twice. They should also be encouraged to explore different ways of building two subroutines into a function.

7. Class interaction

For exercise 3, students will have to turn their stories into comics and draw them on worksheet 3.3. Consider letting students show each other their comics and explain how they used subroutines in their stories if time permits.

About

In this section, students will continue to work on functions. Subroutines, i.e., a function within another function, will also be introduced. All the exercises involve elements of collaborative play.

All materials required



Movement TagTiles® (incl.)



Blue function and play TagTiles® (incl.)



KUBOs (incl.)



Red function and play TagTiles® (incl.)



Activity map (incl.)



Pencils



Worksheets 3.2 (downloadable on KEDU) and 3.3

(downloadable on KEDU)

Teacher set-up and prep

1. Make one copy of worksheet 3.2 and 3.3 for each student
2. Fully charge all KUBO robots before starting
3. Find an appropriate place to do the exercises. KUBO can be used on a table or the floor, but the surface must be level and clean
4. Help students find the TagTiles® they will need

Management

We recommend the students be put in groups of two. Circulate through the room and provide help, if necessary. However, to encourage student-centered active learning, instruct students to

follow the “ask three, then me” rule, where they consult each other before they consult you.

Goals

By the end of this section, students should be able to:

1. Use concrete, visual and symbolic representations
2. Talk about their results and experiences
3. Say and write down simple terms and concepts in coding

Objectives

By the end of this section, students should be able to:

1. Explain what a function is
2. Build subroutines within their functions

Exercise 1: KUBO takes a trip

About

In this exercise, students will be introduced to subroutines, which are functions with a function. They will need to pick three areas on the map for KUBO to visit, and then make two functions to complete the route. They will then be asked to put the two together to make a subroutine. To see how subroutines are built, watch our video.

Estimated time

25 minutes

Materials



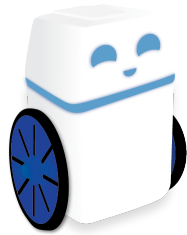
Movement TagTiles® (incl.)



Blue function and play TagTiles® (incl.)



Pencils



KUBOs (incl.)



Activity map (incl.)



Red function and play TagTiles® (incl.)

Steps

1. Say: KUBO is ready to go on an excursion! It needs to meet the rest of the class by the swing set in front of the school building. First, help KUBO from the bonfire to the swing set. Then, help it move from the swing set to another place on the map. You decide where.
2. Ask: Will all groups solve the problem in the same way? Why not?
3. Ask: What do we need to remember when making subroutines?
4. Do: Instruct the students to make a blue function to take KUBO from the bonfire to the swing set.
5. Do: Instruct students to make a red function to take KUBO from the swing set to a place on the map of their choosing.
6. Do: Instruct the students to make a subroutine by placing a blue play TagTile® right after the first red function TagTile®. Make sure they make KUBO memorize this new red function with the blue subroutine.
7. Do: Instruct students to place the red play TagTile® at the bonfire and watch as KUBO moves the whole way to the place of their choosing.
8. Ask: Did KUBO go where you wanted it to go or do you need to debug your functions?
9. Do: Instruct them to debug their code if necessary.

10. Do: Instruct them to make another subroutine by picking a new area for KUBO to make its way to, starting at the bonfire and moving to the swing set first.
11. Do: Instruct students to choose a new route and split it up into two sections. Each group member makes a function for their section and then the functions are combined using a subroutine.
12. Do: Let them practice subroutines by repeating step 11 as necessary.
13. Ask: How do you make KUBO execute the blue function?
14. Ask: Why is it always a smart idea to put a blue function within a red function?
15. Ask: When do you think we can make use of subroutines and for what?

Exercise 2: Your turn to be a robot

About

In this exercise, students will need to execute blue and red functions themselves. Using their bodies to execute functions will make it easier for them to grasp the concept of subroutines.

Estimated time

25 minutes

Materials



Worksheet 3.2 (downloadable on KEDU)



Pencils



Paper

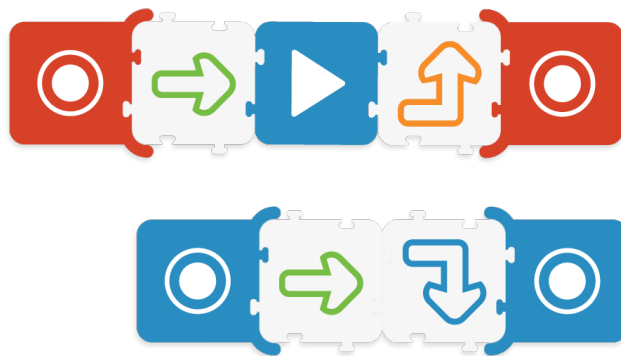


Scissors

Steps

1. Say: In this exercise, you and your partner will become robots and execute blue and red functions.

2. Do: Instruct students to cut out the red and blue functions and sort them into two piles.
3. Do: Instruct students to choose four functions from each pile and discuss how they're going to execute them.
4. Do: Once they have discussed what they will do, one student acts out the blue function and the other, the red. It should look something like this:



Robot Instructions:

- RED:** One step forward and then it's you.
- BLUE:** One step forward.
- BLUE:** Turn to the right. Now it's you again.
- RED:** Turn to the left.

5. Do: Next, the students should make their own subroutines using the pencils and paper you provide.

6. Ask: How did you execute subroutines using your own bodies?

Exercise 3: KUBO goes to the baker

About

In this exercise, the focus is on getting the students to work together to come up with stories to match the actions they program KUBO to do on the activity map. They must use at least one subroutine.

Estimated time

45 minutes

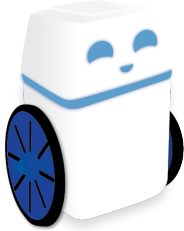
Materials



Movement TagTiles® (incl.)



Blue function and play TagTiles® (incl.)



KUBOs (incl.)



Red function and play TagTiles® (incl.)



Activity map (incl.)



Worksheet 3.3 (downloadable on KEDU)

Steps

1. Say: KUBO has some money to buy a cake at the baker's shop! KUBO needs your help to cross the road safely and drive to the baker's shop.
2. Ask: After KUBO has purchased the cake, will you help it get back to school again?
3. Ask: What is a subroutine? How do you make one?
4. Ask: Can you come up with a small story where KUBO starts at one spot, moves to a second and then on to a third?
5. Do: Instruct the pairs to split their story into two sections, with each responsible for building a function for one.
6. Do: Instruct them to put the two functions together to create a subroutine.
7. Say: Try your new function with the subroutine out on the map. Did KUBO go where you wanted it to?
8. Do: Instruct the students to identify and debug any mistakes.
9. Do: Instruct students to turn their story into a comic and draw it on worksheet 3.3. They must draw their functions as well.

10. Do: Instruct students to come up with more stories and repeat the exercise until they are comfortable with the concept of subroutines.

Lesson Four: Creativity

Lesson Type

Normal lesson

Subjects supported in lesson

Math, Science

Grades

2nd through 5th grade

Estimated time

150 minutes

Downloadable materials on KEDU

1. Worksheet 4.1
2. Worksheet 4.4
3. Activity map
4. Blank map

Tips

1. Loops

Students will be introduced to loops and parameters in this lesson. Loops allow you to repeat a sequence of actions more than once using the parameter TagTiles® from 1-10. Consider demonstrating how to build loops to your class before beginning. To learn how, watch our video.

2. Routes before loops

Loops can be challenging to understand the first time. To make it easier for students, consider letting them lay down their routes on the activity map first. Go around the classroom and help them understand which parts of the route can be repeated using loops and parameters until they

are comfortable with the concept.

3. Making the groups

Since loops are a difficult concept, some students may require more guidance than others. Consider pairing up students with similar levels of proficiency.

4. Combining loops and subroutines

Consider letting the more advanced students combine loops and subroutines for more of a challenge.

5. The blank map

Students will work with the blank map for the first time during exercise 3. They will have to design their own maps for KUBO to explore. To use the blank map, one long edge of it must be cut so that the two grids (one on the school map and the other on the blank map) can be placed really close together. A good way to attach them is using some sticky tack.

6. Choose your adventure

Consider letting students decide their moves during exercise 3. They can choose where they attach their maps, what elements the maps contain, and what story goes along with them. Since it can be a time-consuming activity, they don't have to make very detailed maps. They should, however, draw lots of interesting things for KUBO to do.

7. Writing a script

In exercise 4, students need to write a script that stars KUBO exploring the maps they've designed. You can choose to suggest themes like "friends", "the bell rings", "the police", "football", "watch out!", and "dangerous" to inspire students that are having trouble coming up with a script.

8. Putting on plays

After students have written their scripts and practiced with KUBO, you can choose to have them put on their plays for the whole class if time permits.

About

Students will be introduced to loops. Watch our video on how to make them before beginning. They must design their own map for KUBO to drive on using copies of the blank map.

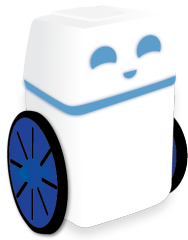
All materials required



Movement TagTiles® (incl.)



Blue function and play TagTiles® (incl.)



KUBOs (incl.)



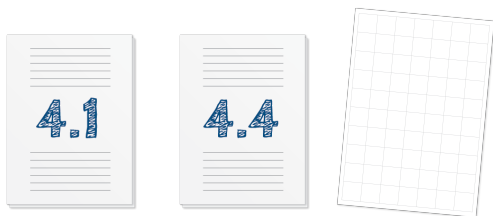
Red function and play TagTiles® (incl.)



loops and parameters (incl.)



Pencils



Worksheets 4.1 (downloadable on KEDU),
4.4(downloadable on KEDU), blank map(downloadable on KEDU)



Activity map (incl.)

Teacher set-up and prep

1. Make one copy of worksheet 4.1 and 4.4 for each student
2. Fully charge all KUBO robots before starting
3. Find an appropriate place to do the exercises. KUBO can be used on a table or the floor, but the surface must be level and clean
4. Help students find the TagTiles® they will need

Management

We recommend the students be put in groups of two. Circulate through the room and provide help, if necessary. However, to encourage student-centered active learning, instruct students to follow the “ask three, then me” rule, where they consult each other before they consult you.

Goals

By the end of this section, students should be able to:

1. Describe their own results and experiences
2. Use subject-specific terms and concepts — both orally and in writing
3. Write simple texts with a title, a start, middle, and a conclusion
4. Dramatize texts and themes together with others
5. Describe systems in numeric and figure-based patterns

Objectives

By the end of this section, students should be able to:

1. Explain what a loop is
2. Make a function that includes a loop
3. Design a new map for KUBO
4. Write a story
5. Program KUBO to do what the story describes

Exercise 1: Around the campfire

About

In this exercise, students will be introduced to loops, which allow you to repeat a sequence of movement TagTiles® more than once. They will first have to lay a route down for KUBO around the campfire. They will then have to turn this route into a function with a loop by identifying which part of the sequence repeats more than once.

Estimated time

30 minutes

Materials



Movement TagTiles® (incl.)



Blue function and play TagTiles® (incl.)



KUBOs (incl.)



Red function and play TagTiles® (incl.)



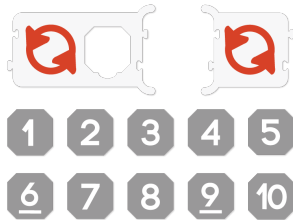
Activity map (incl.)



Pencils



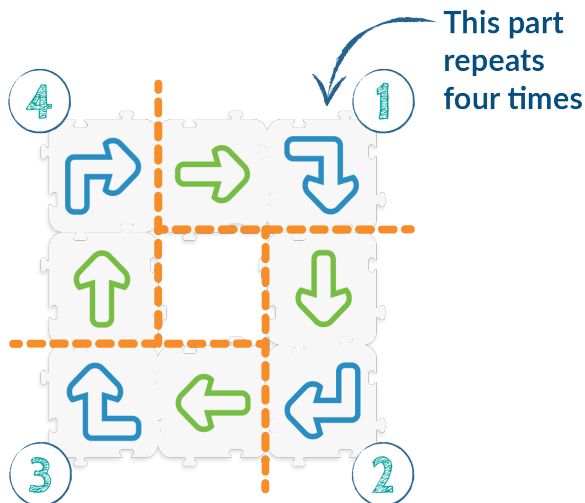
Worksheet 4.1 (downloadable on KEDU)



Loops and parameters (incl.)

Steps

1. Say: Today, KUBO's class is going on a school excursion! They start the day by eating breakfast around the campfire. KUBO wants to go around the campfire to find a good place to sit.
2. Ask: How do we make KUBO go around the campfire?
3. Do: Instruct students to lay a route around the campfire and make KUBO follow it.
4. Do: Next, explain to students that KUBO does not need to use eight TagTiles® to go around the campfire. It can use two TagTiles® repeated four times using loops.
5. Do: Draw the route on the board and split it up into four repeatable parts. It should look something like this:



6. Do: Now, demonstrate how a function with a loop would be made for this route. Encourage your students to follow along using their own TagTiles®. The function should look like this:



7. Do: After KUBO has memorized the function, place a red play TagTile® on an appropriate quadrant and place KUBO on it. It can be hard for students to figure out which quadrant to place KUBO and facing in what direction, so make sure they practice this by making different loops.
8. Ask: *Is there a trick to figuring out which part of the function has to repeat?*
9. Do: Instruct the students to try and make a loop for KUBO to go around the swing set and sandbox. Ask them to first draw the function on worksheet 4.1 (download) by dividing up the route and deciding what has to be repeated.
10. Do: Instruct the students to place a red play TagTile® on the quadrant KUBO needs to start in and remind them to pay close attention to the direction KUBO faces.
11. Ask: *Did KUBO do what it was supposed to?*
12. Say: *Debug your code and try again if you made a mistake.*
13. Do: Make students practice by finding more ways to use loops. They could, for example, make KUBO go around the wall with the picture of a rainbow on it or around bushes.
14. Ask: *When is a good time to use loops?*

Exercise 2: KUBO runs

About

Students must identify a long stretch on the map without many turns for KUBO to run on. They must make a function with a loop to use as few movement TagTiles® as possible.

Estimated time

30 minutes

Materials



Movement TagTiles® (incl.)



Blue function and play TagTiles® (incl.)



KUBOs (incl.)



Red function and play TagTiles® (incl.)



loops and parameters (incl.)



Activity map (incl.)

Steps:

1. Say: KUBO's class must train for this year's school run!
2. Ask: Can you make a long route for KUBO without many turns so it doesn't lose speed?
KUBO can also run outside school areas.
3. Ask: Where on the map should KUBO run if it has to run straight ahead?
4. Do: Instruct students to find the longest route on the map where KUBO can run straight ahead and make a function.
5. Ask: What are loops and how can we use them?

6. Do: Instruct students to count the number of straight TagTiles® they will need and find the corresponding parameter to make a loop with only one straight movement TagTile®.
7. Ask: What can we do if we don't have enough straight movement TagTiles®?
8. Do: Instruct students to make KUBO memorize the loop and place it on a play TagTile®.
9. Ask: Did KUBO run far enough or do you have to debug your code?
10. Do: Instruct students to make another route for KUBO where it has to turn at least once and try it on the map.
11. Ask: Where on the map should KUBO run if it's good at jumping over high things?
12. Do: Continue practicing with more long routes.

Extra assignment

This assignment is more challenging and can be given to those students who have a good understanding of both loops and subroutines.

Steps

1. Do: Instruct students to disregard any obstacles on the map and create a route to take KUBO from one end to the other and back again.
2. Ask: How will you make this long route without enough straight movement TagTiles®?
3. Do: Instruct the students to first make a blue function using one straight movement TagTile® and the parameter 8. Make KUBO memorize it. It should look like this:



4. Do: Next, instruct the students to build a red function including both blue play TagTiles® as subroutines. It should look like this:



5. Do: Once they have made KUBO memorize the red function, have them place a red TagTile® on any quadrant in column A to test it out.
6. Ask: Did it work? Debug if necessary.
7. Say: Show each other your routes and explain to your classmates how you used loops.

Exercise 3: On an excursion

About

In this exercise, students will use a copy of the blank map you provide to design their own maps. In the following exercise, they will have to write a script that features KUBO exploring their map.

Estimated time

30 minutes

Materials



Pencils



Paper



Scissors

Steps

1. Say: KUBO is very excited to play a part in your play, but it doesn't know what the play is about! You get to decide. Use your imagination and make your own map. Use your map as the surroundings in which you set your play.
2. Ask: Which places would be good settings for your play?
3. Do: Instruct students to cut one long edge off their blank map and stick it to the school map with sticky tack. They should make sure the grids line up.
4. Ask: Choose a place and decide all the elements you want to include. Draw them on your map.
5. Do: After the class is done with their maps, let them mingle amongst themselves and discuss their designs.
6. Ask: What does it take to make a good map?
7. Ask: Where does your play take place and what have you drawn on your map?

Exercise 4: KUBO stars in your play

About

In this exercise, students will need to write a script featuring KUBO in the starring role. They must set the play in their new maps.

Estimated time

60 minutes

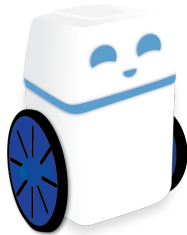
Materials



Movement TagTiles® (incl.)



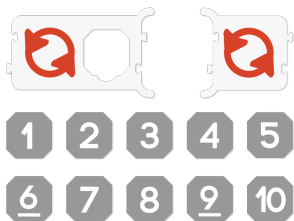
Blue function and play TagTiles® (incl.)



KUBOs (incl.)



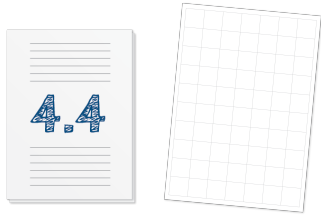
Red function and play TagTiles® (incl.)



Loops and parameters (incl.)



Pencils



Worksheets 4.4 (downloadable on KEDU), blank map

(Downloadable on KEDU)

Steps

1. Say: KUBO is very excited to be starring in the leading role in your play! KUBO hopes that many new exciting things will happen, but is a little nervous because it has never tried acting before! KUBO hopes that you will write a good role for it and help it with what it has to say and do.
2. Ask: How do you write a good script?
3. Do: Instruct students to write a script set in their maps with KUBO in the starring role.
4. Ask: How will you include KUBO in your play? What role will KUBO play and what will it do?
5. Do: Remind students to use at least one loop.
6. Do: Instruct students to write their script down on worksheet 4.4. They must also draw their functions.
7. Say: Rehearse your play and then stage it for your classmates.

Lesson Five: Critical Thinking

Lesson Type

Normal lesson

Subjects supported in lesson

Math, Science

Grades

2nd through 5th grade

Estimated time

180 minutes

Downloadable materials on KEDU

1. Worksheet 5.2
2. Worksheet 5.3
3. Worksheet 5.4
4. Activity map
5. Blank map

Tips

1. Using post-its

In exercise 1, students need to choose quadrants to put down "treasures" and then compete to see who can collect the most. Post-its are a handy thing to use as a stand-in for these treasures because they stay stuck to the activity map.

2. Reaching an agreement

Since the teams are competing in exercise 1, it is a good idea for them to make an agreement with each other about what to do during certain situations. For example, if they see that their KUBOs are on a collision course with each other during the game, they can decide beforehand which team has first rights or to quickly redirect their KUBOs to avoid a crash.

3. Time limit

To make exercise 1 more challenging, you can choose to set a time limit on how long teams have to make their functions, loops, and subroutines.

4. Construction materials

During exercise 2, the teams must construct a device that helps KUBO transport cakes (dice) from the baker's shop to the school. They will need access to materials such as glue, toilet paper rolls, straws, scissors, elastic and other construction materials of your choosing. It is a good idea to source and gather all of these before starting on the exercise.

5. Taking care of KUBO

Before beginning exercise 2, it is a good idea to stress to students that they must not attach anything to KUBO that will later be very difficult to take off. They should refrain from gluing things directly on to KUBO's body. Instead, consider using sticky tack.

6. Blueprint

After constructing their devices during exercise 2, students should make a blueprint of what they build in worksheet 5.2. Consider saving these to discuss improvements after the session.

7. Multimedia

In exercise 3, students will need to use the blank map to design surroundings where robots would be found in real life. To inspire them, you can show them video clips of robots in action. There are many such clips available online.

8. Suggesting themes for map making

In exercise 4, students need to give each other tasks. To do so, they will have to design maps. You can suggest themes for inspiration if you wish. Some suggestions being:

1. Age of Vikings
2. Journey to the center of the earth
3. Inside the human body

About

Students need to use their knowledge of programming to draw parallels to our society. They must show that they can use the concepts they've learned to solve different activities.

All materials required



Movement TagTiles® (incl.)



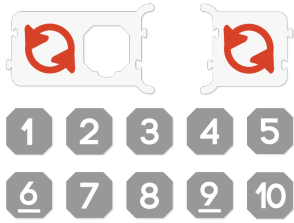
Blue function and play TagTiles® (incl.)



KUBOs (incl.)



Red function and play TagTiles® (incl.)



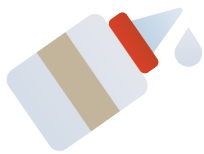
Loops and parameters (incl.)



Worksheets 5.2(downloadable on

KEDU), 5.3(downloadable on KEDU), 5.4(downloadable on KEDU), blank map

(downloadable on KEDU)



Glue



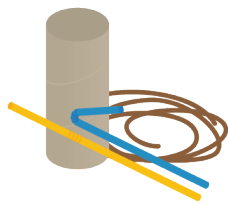
Pencils



Dice (three per group)



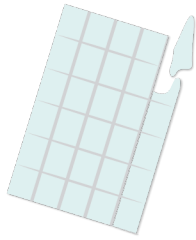
Scissors



Construction materials



Paper



Sticky tack



Activity map (incl.)

Teacher set-up and prep

1. Make one copy of the blank map for each group.
2. Fully charge all KUBO robots before starting
3. Find an appropriate place to do the exercises. KUBO can be used on a table or the floor, but the surface must be level and clean
4. Help students find the TagTiles® they will need

Management

We recommend the students be put in groups of two. Circulate through the room and provide help, if necessary. However, to encourage student-centered active learning, instruct students to follow the “ask three, then me” rule, where they consult each other before they consult you.

Goals

By the end of this section, students should be able to:

1. Talk about resources from everyday life
2. Use simple models to talk about both generalizations and details
3. Communicate their data verbally — both orally and in writing
4. Use concrete, visual and simple symbolic representations
5. Actively listen to others and ask follow up questions

Objectives

By the end of this section, students should be able to:

1. Develop a construction that can move things on the map
2. Explain how robots can help us in everyday life
3. Make a model that demonstrates one kind of robot's work
4. Design maps and assignments for peers
5. Use loops and subroutines when they can
6. Make constructions that solve assignments
7. Make maps and stories with activities for their classmates to do
8. Explain their strategy for solving assignments

Exercise 1: Coordinate wars

About

In this exercise, two teams will be pitted against each other as their KUBOs race to collect as many treasures as possible. Students must choose coordinates on the map to put down these “treasures” (consider using post-it notes) and then program their KUBOs to collect as many as possible. To be truly effective, their programs will need to contain both subroutines and loops. The team with the most treasures at the end of the session wins.

Estimated time

30 minutes

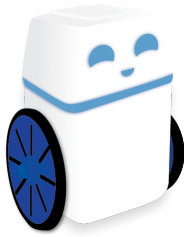
Materials



Movement TagTiles® (incl.)



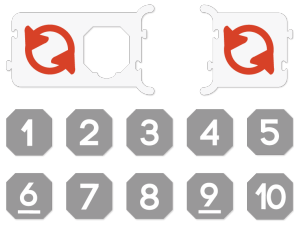
Blue function and play TagTiles® (incl.)



KUBOs (incl.)



Red function and play TagTiles® (incl.)



Loops and parameters (incl.)



Activity map (incl.)



Paper or post-its

Steps

1. Say: You must now fight it out with another team to collect as many treasures as possible. Place nine post-it notes on the activity map in quadrants of your choosing. Then, both teams must program their KUBO to collect as many as possible. The team that collects the most treasures wins!
2. Ask: Which strategy will you choose?
3. Ask: What do you plan to do if both KUBOs are on a collision course with each other?
4. Do: Instruct students to place nine post-it notes down on the activity map.
5. Do: Give students time to program their KUBOs. They should be encouraged to use both loops and subroutines.
6. Say: Team A starts their KUBO in quadrant A3 and Team B starts theirs in quadrant A8. Make sure your KUBOs start moving at the same time. Whichever KUBO reaches a quadrant first claims the treasure for their team.
7. Do: Instruct the students to save all the post-it notes they collect.
8. Do: Once both KUBOs have finished executing the first function, continue making more until all the treasures have been collected. Tally the end result to declare a winner.

9. Ask: Did you change your strategy along the way?
10. Ask: Was the game difficult? What made it fun or boring?

Exercise 2: Transporting goodies

About

In this exercise, students need to construct a device that helps KUBO transport cakes from the baker's shop to the school. The device must be mobile, sturdy, and must attach securely to KUBO's body (but be easy to detach afterward).

Estimated time

30 minutes

Materials



Movement TagTiles® (incl.)



Blue function and play TagTiles® (incl.)



KUBOs (incl.)



Red function and play TagTiles® (incl.)



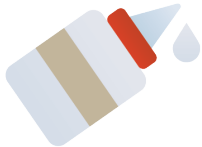
Loops and parameters (incl.)



Worksheet 5.2 (downloadable on KEDU)



Activity map (incl.)



Glue



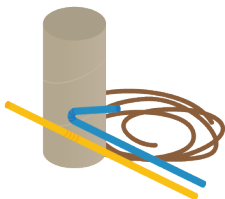
Pencils



Dice (three per group)



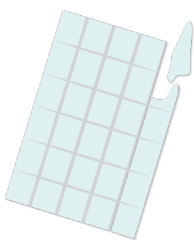
Scissors



Construction materials



Paper



Sticky tack

Steps

1. Say: You must now help KUBO transport cakes from the baker's shop. The only problem is, KUBO doesn't have hands.
2. Ask: Can you construct a device to help KUBO?
3. Do: Instruct students to draw up plans for their device and construct it. It must be able to transport three dice (or similar) securely.

4. Do: Instruct students to build the device and test it, making adjustments as necessary.
5. Do: Instruct students to make a function in this order:
 - KUBO has to start at the parking lot
 - Next, KUBO has to drive over to the baker's shop and pick up three cakes
 - Then KUBO has to move from the baker's shop to the kiosk
 - KUBO then needs to go over the pedestrian crossing
 - Next, KUBO needs to drive to the school's cafeteria and drop off two cakes
 - KUBO needs to get back over the pedestrian crossing safely
 - Finally, KUBO has to drive over to its parents' car with the last cake
5. Say: KUBO cannot enter the car with the device still attached, so make sure it is easy to detach.
6. Do: Give students time to program their KUBOs. They should be encouraged to use both loops and subroutines.
7. Do: At the end of the session, instruct students to visit each other's groups for a demonstration and explanation of the different constructions.

Exercise 3: Robots in the real world

About

In this exercise, students need to discuss where robots are found in real life and what they do. They need to use the blank map to create an environment for KUBO to perform the actions of a robot that works there.

Estimated time

60 minutes

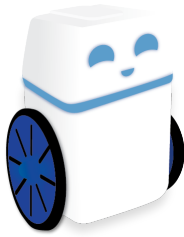
Materials



Movement TagTiles® (incl.)



Blue function and play TagTiles® (incl.)



KUBOs (incl.)



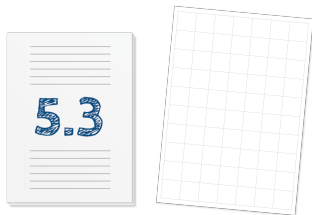
Red function and play TagTiles® (incl.)



loops and parameters (incl.)



Pencils



Worksheet 5.3 (downloadable on KEDU), blank map

(downloadable on KEDU)

Steps

1. Ask: Where are robots found in the real world and what sort of tasks do they do?
2. Ask: What do you plan to do if both KUBOs are on a collision course with each other?
3. Do: Show students clips of robots in action, if you wish.
4. Do: Instruct them to choose one kind of robot and draw a map of its surroundings. They must then program KUBO to do the work of their chosen robot while explaining what it is.
5. Do: During the evaluation, one member from each group goes to visit the other groups to see a demonstration of how the different robots function, while the other stays back to demonstrate. They then switch places.
6. Ask: Are robots helpful and useful to humans? How?

Exercise 4: Design your own exercises

About

In this exercise, students need to design their own maps and give each other exercises to do. When programming KUBO to do the exercises, they must make use of all the coding concepts they have learned thus far.

Estimated time

60 minutes

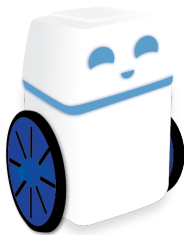
Materials



Movement TagTiles® (incl.)



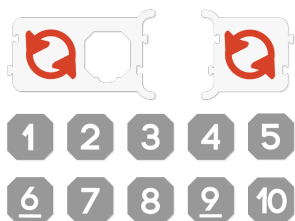
Blue function and play TagTiles® (incl.)



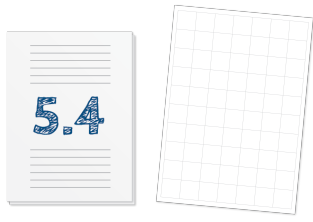
KUBOs (incl)



Red function and play TagTiles® (incl.)



Loops and parameters (incl.)



Worksheet 5.4(downloadable on KEDU), blank map(downloadable on KEDU)



Pencils

Steps

1. Say: For this exercise, you will need to design your own maps and give each other exercises to do.
2. Ask: How will you design your exercises? Will you make them easy or hard?
3. Ask: How will you design your map? What theme will you choose?
4. Do: Instruct students to start by designing their maps. Once they have, they must come up with at least two story-based exercises to give to classmates. One must be easy and the other more challenging. They must write these down on worksheet 5.4.
5. Do: Instruct students to program KUBO to do the exercises.
6. Ask: What were your favorite exercises and why?

Worksheet 1.1

Group: _____

Plan your first route:

Plan your second route:

Worksheet 1.2

Group:

What does KUBO do when it's put on the bricks?





Worksheet 1.4

Group: _____

Draw/write down your routes.

- Draw/write down where you start and end

1. route

2. route

3. route

Worksheet 1.8

Group:

Draw your function:



What do the function TagTiles® do?

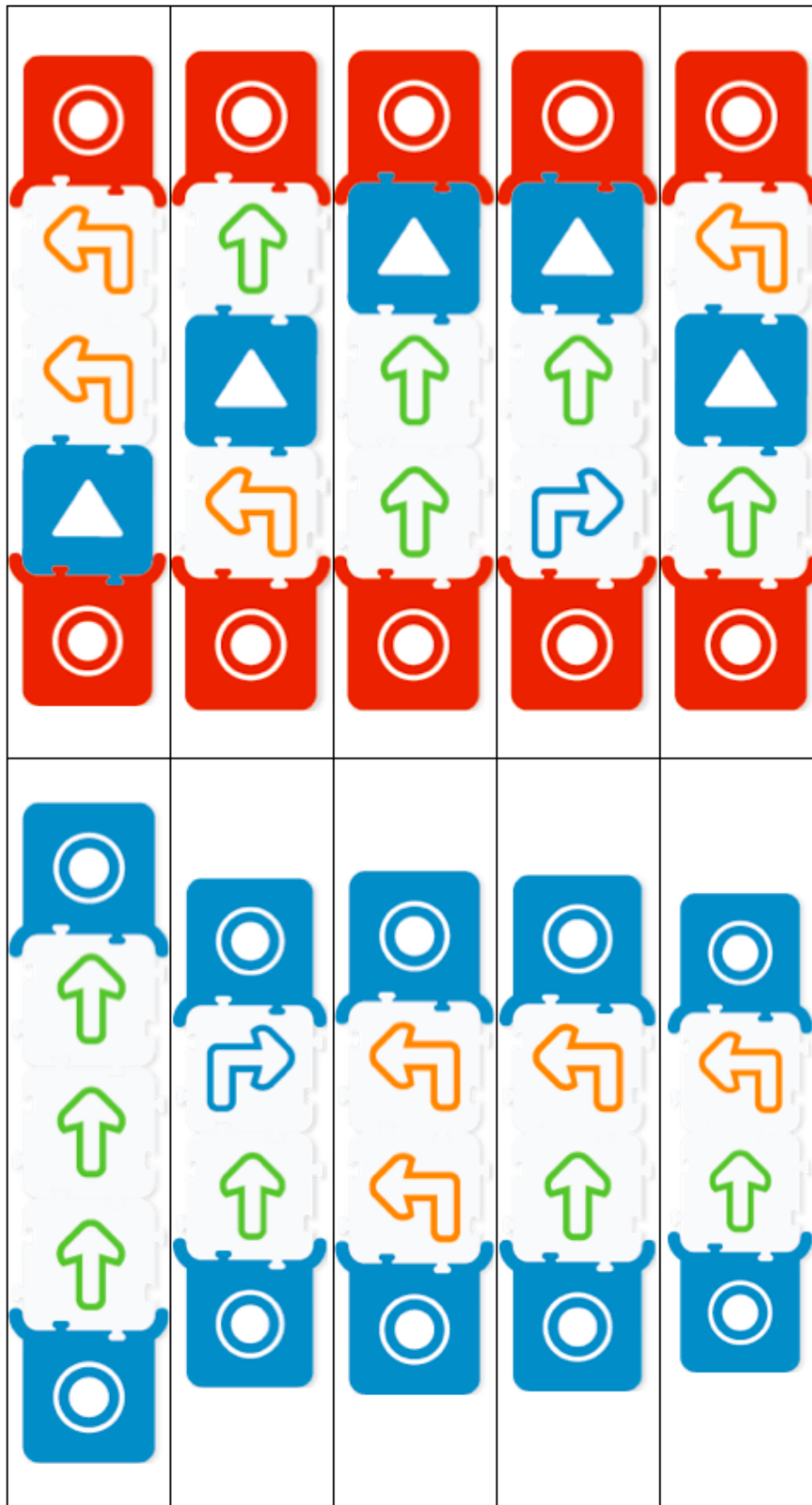
Worksheet 2.3

Group:

Draw/write down your best story:

How do the function TagTiles® work?

Worksheet 3.2



Worksheet 3.3

Group: _____

--	--	--	--

Red function

Blue function

Worksheet 4.1

Group: _____

Around the bonfire

Around the swing set and sandbox

Around the box with the rainbow

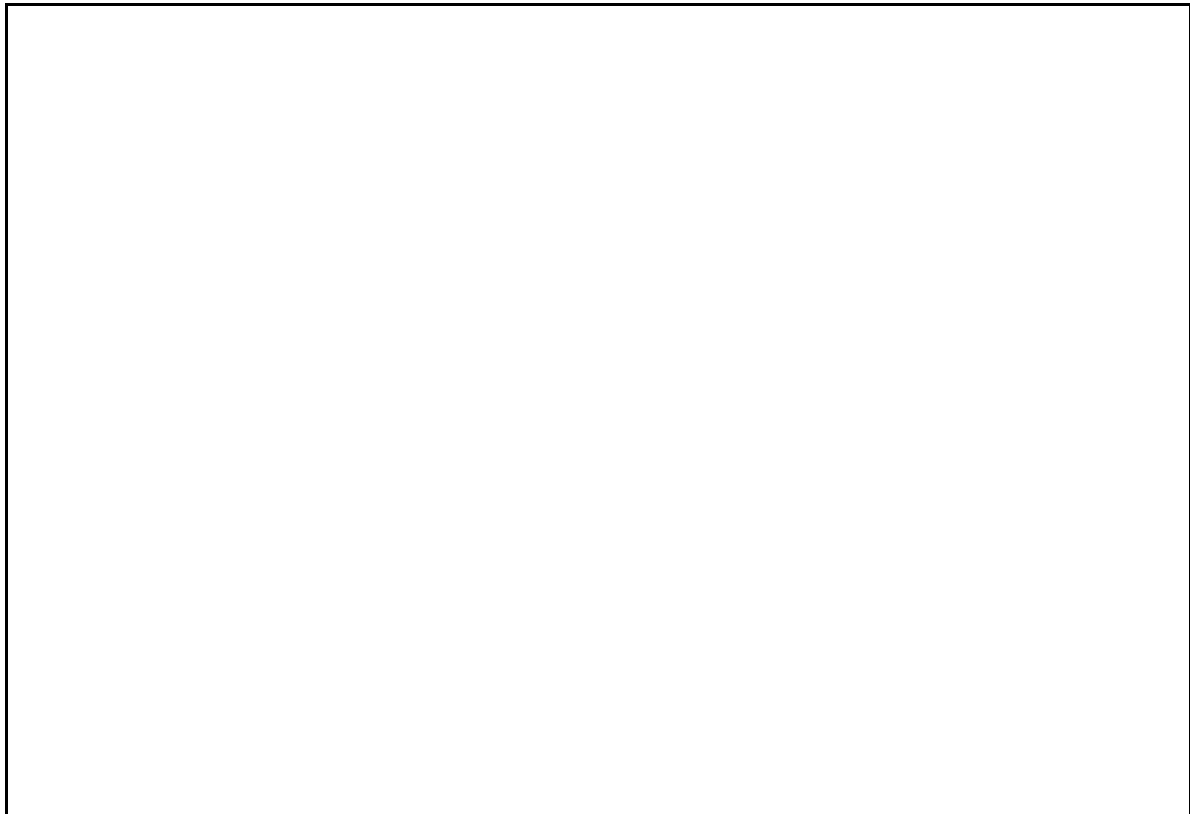
How do the loop TagTiles® work?

What is a smart trick so we can see when we need to use the loop TagTiles®?

Worksheet 5.2

Group:

Draw KUBO's mobility device:



How does it help KUBO bring the cakes out?

Worksheet 5.3

Group: _____

Where does your robot work?

What does your robot do?

How is it helpful to mankind?

Write down the key words you want to tell the others about your robot:

Worksheet 5.4

Group: _____

Short description of map:

Exercise 1:

Exercise 2: