

## Unit 5

# Drawing + Root

Unit 5 demonstrates how to control Root's wheel speeds. Learners are introduced to the Wheel Speeds Block. When edited, this block tells Root to move forward, backward, turn right or left at varying speeds.

Learners will practice editing the wheel speeds to turn Root and drive around arcs and circles. Practice coding skill development by making Root wiggle, skate along curves, and navigate around a bumper course. The main coding concepts explored include parameters and event scheduling.

### Objectives:

- Set the direction and speed of each of Root's wheels to control the direction Root turns and speed at which Root moves
- Use Wheel Speeds Blocks to move along curved lines
- Combine Wheel Speeds Blocks with the When Bump Block to code Root to react to its surroundings

### Code Blocks Introduced:

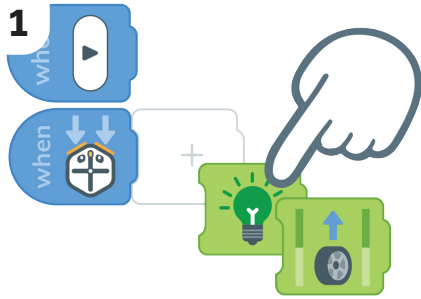
Block Introductions: Wheel Speeds Block

### Coding Concepts:

Parameter  
Event Scheduling

# Wheel Speeds

## LESSON 5.1



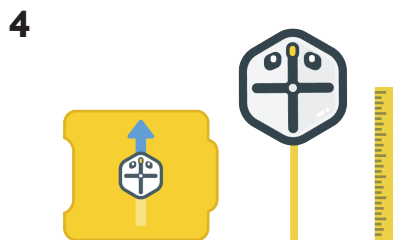
Drag out a When Bump Block and attach a green Light and Wheel Speeds Block.



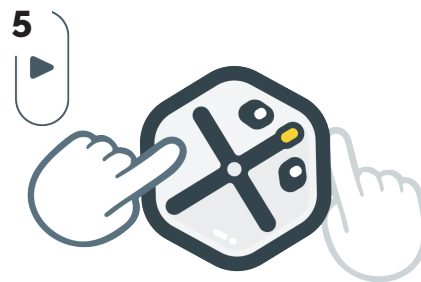
The Wheel Speeds Block turns Root's wheels on. If we don't tell Root to stop, it will keep moving forever!



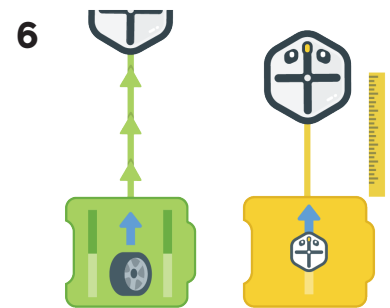
Next, drag out a When Touch Block and attach a yellow Light and Move Block.



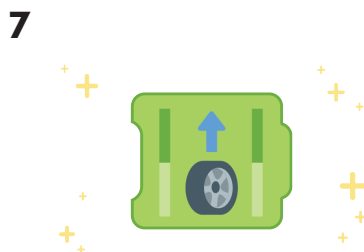
The Move Block tells Root how much to drive forward.



Press Play and try tapping on the top of Root and on its bumpers. What happens?



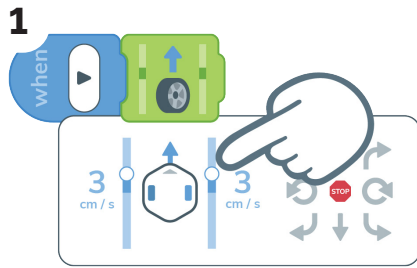
You learned the difference between the Move Block, which tells Root how far to go, and the Wheel Speeds Block, which turns Root's wheels on.



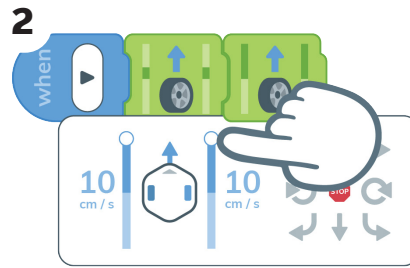
You earned the Wheel Speeds Block.

# Changing Speed

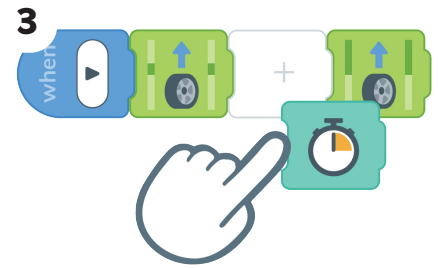
## LESSON 5.2



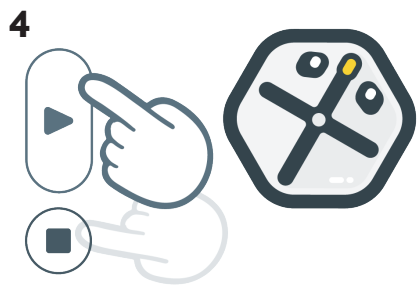
Drag out a Wheel Speeds Block, and edit it so both wheels are set to 3cm/s.



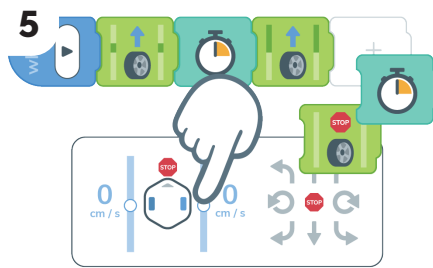
Add another Wheel Speeds Block, and edit it so both wheels are set to 10cm/s.



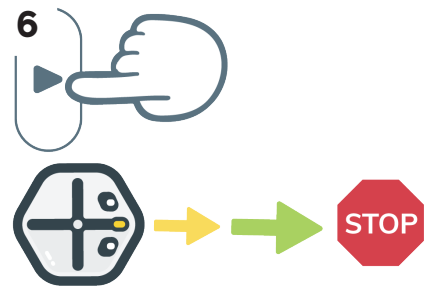
Add a Wait Block in between the two Wheel Speeds Blocks to tell Root how long to move slow.



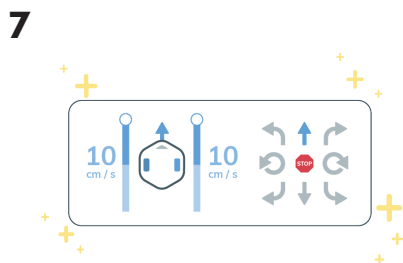
Press Play. Does Root start slow and then speed up? Press Stop when you're done.



Add another Wait Block and Wheel Speeds Block. Edit it so both wheels are set to 0cm/s.



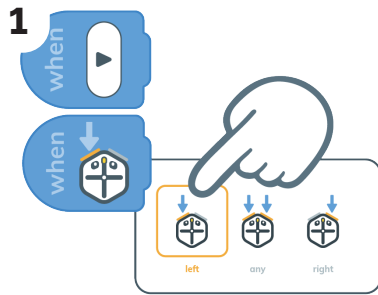
Press Play. Root should drive slow, speed up and then stop.



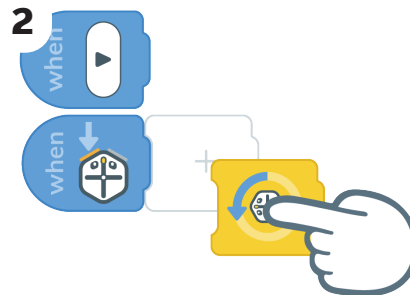
You learned how to edit Root's wheel speeds.

# Turning

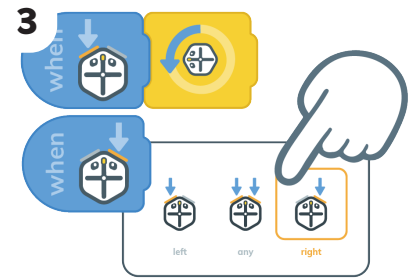
## LESSON 5.3



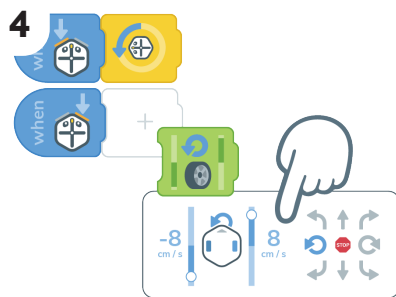
Drag out a When Bump Block, and edit it so only the left bumper is active.



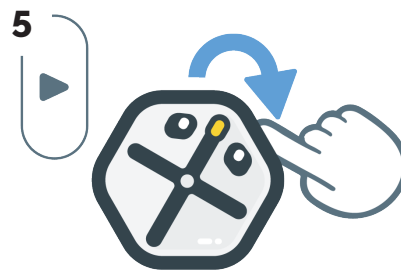
Attach a Turn Left Block. The Turn Left Block tells Root how far to turn left.



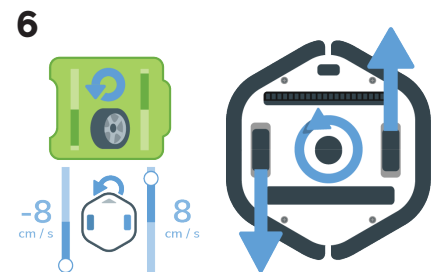
Drag out another When Bump Block, and edit it so only the right bumper is active.



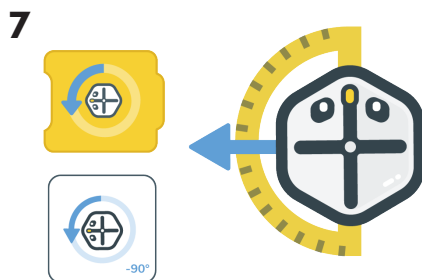
Attach a Wheel Speeds Block, and edit it so Root turns to the left.



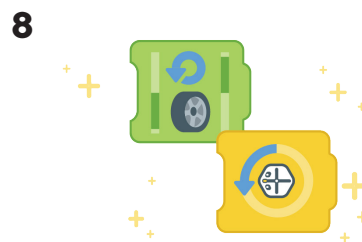
Press Play and try touching each of Root's bumpers. What happens?



The Wheel Speeds Block turns Root's wheels in different directions, making it spin around until we tell it to stop.



The Turn Left Block tells Root how far to turn.

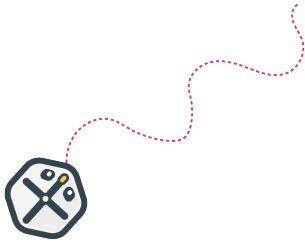


You learned another way to code Root to turn!

# Wiggly Root

## PROJECT 5.1

1



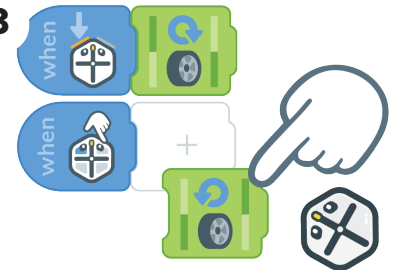
Code Root to wiggle back and forth like a worm.

2



Use Repeat, Wheel Speeds, and Wait Blocks to control Root's movement.

3



For an added challenge, code Root to wiggle in different directions depending on where you tap Root.

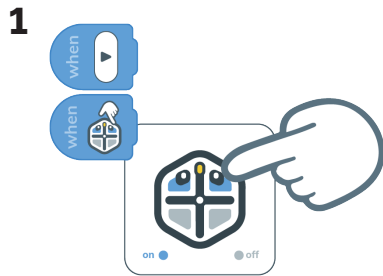
4



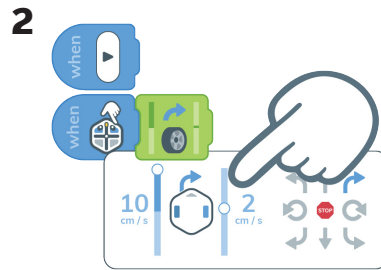
You used Wheel Speeds Blocks and loops to code repetitive movements.

# Different Wheel Speeds

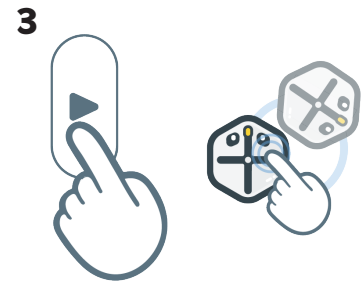
## LESSON 5.4



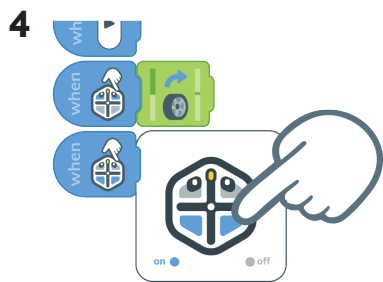
Drag out a When Touch Block and edit it so only the front two zones are active.



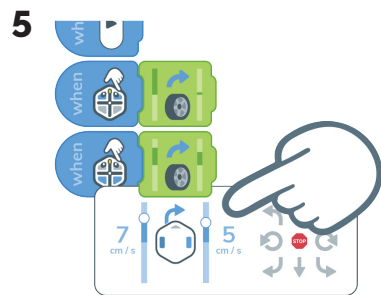
Attach a Wheel Speeds Block. Edit it to change Root's wheel speeds to 10cm/s and 2cm/s.



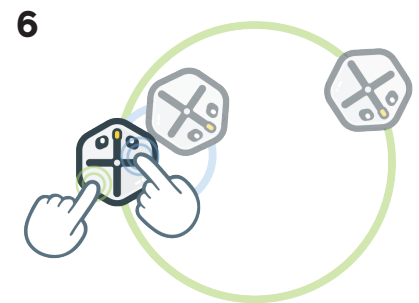
Press Play and tap Root's front zones. Is Root making a big or small circle?



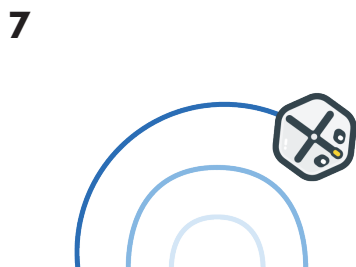
Drag out another When Touch Block and edit it so only the back two zones are active.



Add another Wheel Speeds Block. Edit it to 7cm/s and 5cm/s.



Press Play and touch the front and back touch zones. Which speeds help Root make small circles and which help Root make big circles?



Experiment with other speeds. Can you guess which wheel speeds will be big and which will be small?



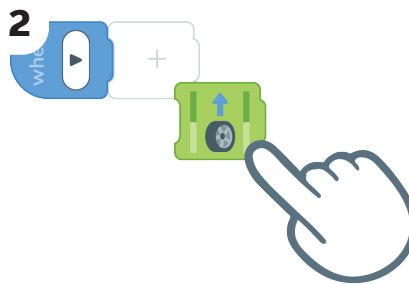
You learned how to use different wheel speeds with Root!

# Figure Skating Routine

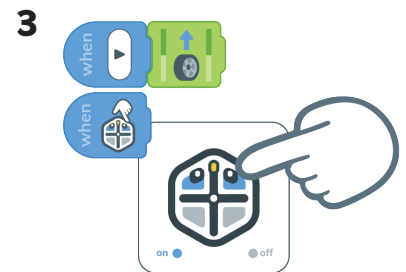
## PROJECT 5.2



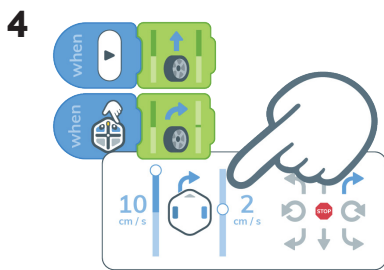
Let's create a skating routine for Root!



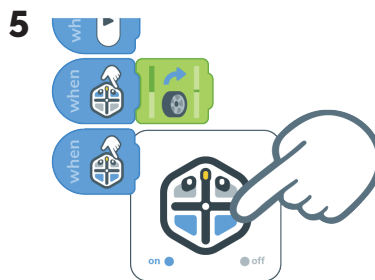
Drag out a Wheel Speeds Block.



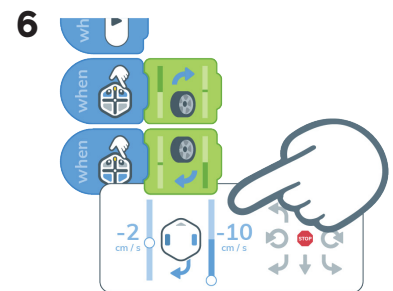
Drag out a When Touch Block and edit it so only the front two zones are active.



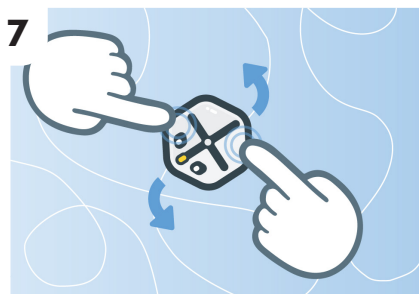
Attach a Wheel Speeds Block. Edit it to change Root's wheel speeds to 10cm/s and 2cm/s.



Drag out another When Touch Block and edit it so only the back two zones are active.



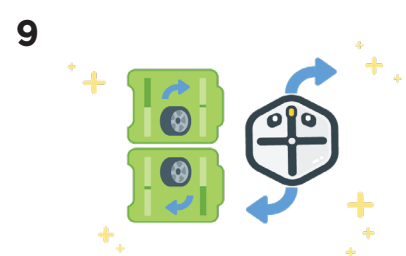
Add another Wheel Speeds Block. Edit it to -2cm/s and -10cm/s. These wheel speeds will make Root curve backward.



Press Play. Touch Root's front and back zones to make Root skate all over!



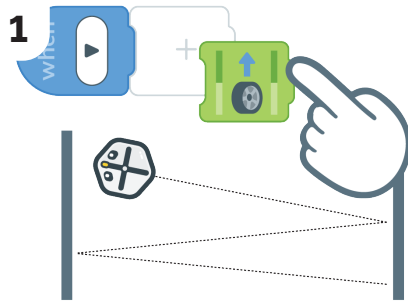
To create a more detailed routine, add more Wheel Speeds Blocks to When Bump Blocks.



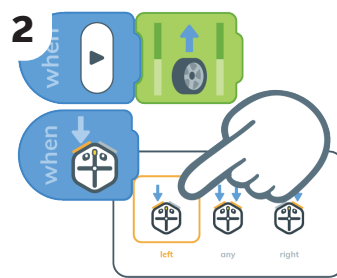
You learned how to edit wheel speeds to make Root curve forward and backward.

# Ping Pong Root

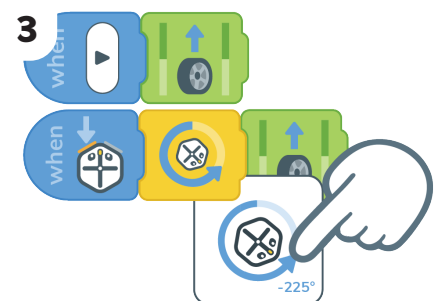
## LESSON 5.5



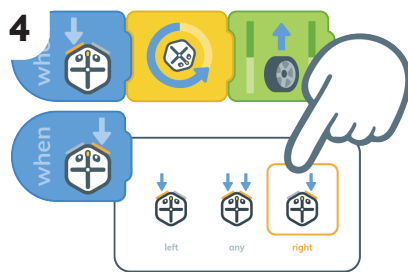
Add a Wheel Speeds Block to the first line of your code.



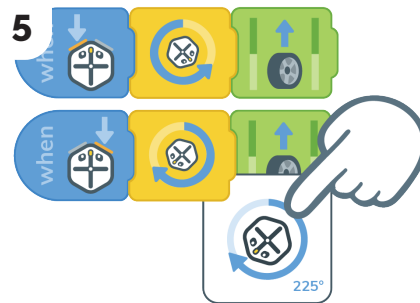
Start the second line with a When Bump Block. Edit it so only the left side is active.



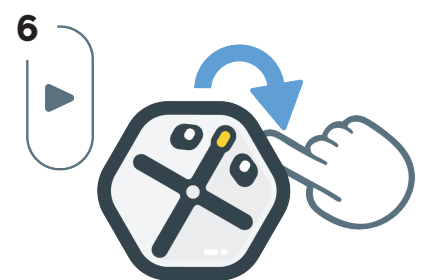
Add a Turn Left Block and a Wheel Speeds Block. Edit the Turn Left Block to turn -225°.



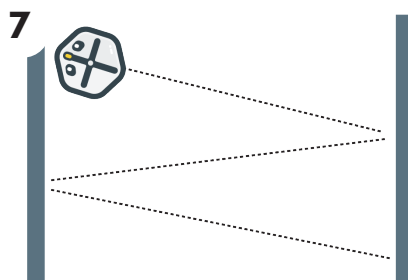
Add another When Bump Block. Edit it so only the right side is active.



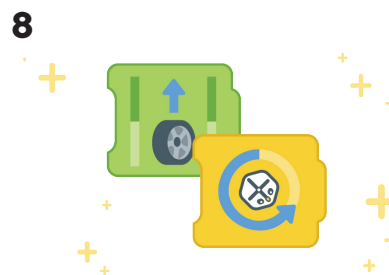
Add a Turn Right Block and a Wheel Speeds Block. Edit the Turn Right Block to turn 225°.



Press Play and tap each of Root's bumpers to test your code.



Root will drive around forever, bouncing off of objects in its way.



You coded Root to turn and move around when it bumps into an object.

# Bumper Course

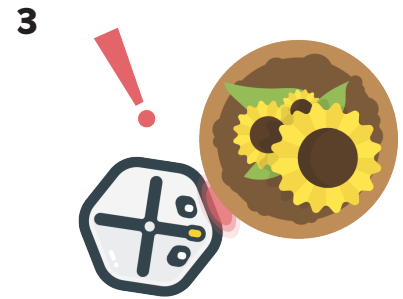
## PROJECT 5.3



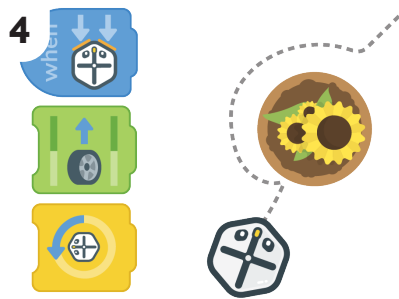
Create an obstacle course and make Root react to the obstacles when it bumps into them.



Place Root in the middle of the room. Place objects for Root to bump into all around.



The objects you select need to be heavy. They should be sturdy enough to press Root's bump sensors, but not move around when Root runs into them.



Use the Wheels Speeds, Move, and Turn Blocks to code Root to drive forward by itself and move around objects it bumps into.



Try also coding Root to play music and flash its lights when it bumps into an object.



You got Root through the bumper course, coding Root to respond to sensor inputs!