This Constructopedia™ is a building guide for RoboSports™ that offers suggestions, hints, and tips to get you started on the CD-ROM Challenges and robotic athletes of your own design.

To master a Challenge, you must follow three basic steps:

1. Construct - To start, review the Design Brief. Then gather the pieces you need to meet the Challenge and start building.

2. Program - Once your robot is built, you can program it using the simple, but powerful, programming language included on the CD-ROM. Your program will determine how your Sports player reacts to its environment.

3. Test - Now it's time to test your program and design. Once you have downloaded your program from your PC to your RCX™ using the infrared transmitter, your robot can run independent of your computer. Now let it loose and watch what happens!

**Catch'ndunk**

- Needs 1 motor to move forward and back
- Needs a 2nd motor to shoot the ball
- Needs a place to catch and hold the ball
- Needs a light sensor to SEE it has the ball
What follows are basic instructions for building the six subassemblies associated with the CD-ROM Challenges. The same instructions can also be used for building your own robotic athletes.

**PLAYER 1**
- Slowly moves back and forth.
- Requires one motor.

**PLAYER 2**
- Slowly turns left and right and constantly kicks.
- Requires two motors.

**PLAYER 3**
- Slowly turns left and right.
- Requires one motor.
PLAYER 4

- Quickly turns left and right and constantly scoops.
- Requires two motors.

THROWER

- Mechanism to throw or kick.
- Requires one motor.

TRICYCLE

- Slowly moves back and forth.
- Requires one motor.
To get started on Player 1, follow these 3 steps.

BEFORE YOU GET STARTED...
Make sure there are batteries in your RCX. For help installing batteries, turn to page 34.

1. For this step, you need:
   - Bushing

   2x means you need 2 of these. To measure an axle, see page 34.

2. For this step, you need:
   - 2x8 plate with holes

   Do this first! Put the 2x8 plates with holes here.
For this step, you need:

- Small pulley
- Motor
- Large pulley

Put a large pulley on the axle over here.
Put the small pulley onto the motor.

HINT: Try this wheel.
HINT: Try this wheel.

IF YOU NEED HELP COMPLETING YOUR ROBOT...
- Check out “Special Features” on page 22.
- Turn to “Tips and Tricks” on page 28.

TO PROGRAM YOUR ROBOT...
- Go to the Robodunk challenge or the Catch’ndunk challenge on the CD-ROM.
To get started on Player 2, follow these 5 steps.

**BEFORE YOU GET STARTED...**
Make sure there are batteries in your RCX. For help installing batteries, turn to page 34.

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**1.** For this step, you need:

- Dark gray connector peg
- Black connector peg

2x means you need 2 of these.

To measure an axle, see page 34.

Put the dark gray connector pegs here.

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**Do this first!**
Connect the beams using the four black connector pegs.

There is one behind here.

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**2.** For this step, you need:

- Bushing
- 24-tooth gear

Put the axle through the hole, then add the 24-tooth gear and the bushing.
3. For this step, you need:

- 1/2 bushing
- Put two 1/2 bushings here.
- Put a bushing here.

4. For this step, you need:

- Hub
- Half beam
- Put the half beams here.
- Attach a hub to each motor.
5

For this step, you need:

Electrical wire

Do this first!
Attach the electrical wires to the motors.

Put this in the middle of the gray plate.

HINT: Try this wheel.

IF YOU NEED HELP COMPLETING YOUR ROBOT...
• Check out “Special Features” on page 22.
• Turn to “Tips and Tricks” on page 28.

TO PROGRAM YOUR ROBOT...
• Go to one of the following challenges on the CD-ROM:
  Tipodunk, Flickapuck, Slydapuck, Trapapuck,
  Handygrapper, Gourmetgrapper or Highgrapper.
To get started on Player 3, follow these 5 steps.

**BEFORE YOU GET STARTED...**

Make sure there are batteries in your RCX. For help installing batteries, turn to page 34.

1. **For this step, you need:**
   - [Image of LEGO pieces]
   - **Place with rail**
   - **Black connector peg**
   - **2x means you need 2 of these.**
   - **To measure an axle, see page 34.**
   - **Do this first!** Connect the beams using the black connector pegs.

2. **For this step, you need:**
   - [Image of LEGO pieces]
   - **Bevel gear**
   - **Motor**
   - **2x2 plate**
   - **Differential**
   - **Put the plate with rail here.**
   - Put the motor in place and secure it with the 2x2 plate.
   - Put the bevel gear in place and push the axle into it.
   - **Do this first! Put the bevel gear on the differential.**

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For this step, you need:

- Black connector peg
- 1x4 plate
- 24-tooth gear
- 2x6 plate with holes
- Put the 1x4 plates here.
- Put the 2x6 plate with holes here.

Do this first!
Connect the beams using the black connector pegs.
IF YOU NEED HELP COMPLETING YOUR ROBOT...
- Check out “Special Features” on page 22.
- Turn to “Tips and Tricks” on page 28.

TO PROGRAM YOUR ROBOT...
- Go to one of the following challenges on the CD-ROM:
  Catch’ndunk, Tipodunk or Highgrapper.
To get started on Player 4, follow these 7 steps.

**BEFORE YOU GET STARTED...**
Make sure there are batteries in your RCX. For help installing batteries, turn to page 34.

1. For this step, you need:
   - 2x
   - 2x10 plate
   - 2x means you need 2 of these.

   ![Diagram of step 1]

   Put the 2x10 plate here.

2. For this step, you need:
   - Bushing
   - To measure an axle, see page 34.

   ![Diagram of step 2]

   Put the bushings here.
3
For this step, you need:

1x2 plate

Put this underneath the studs marked with an "x".

4
For this step, you need:

2x6 plate with holes

Put the 2x6 plates with holes here.

Make sure you put the gear on this way.
For this step, you need:

- 40-tooth gear
- 1x2 beam

Do this first!
Put the 1x2 beams onto the axle.
IF YOU NEED HELP COMPLETING YOUR ROBOT...
- Check out “Special Features” on page 22.
- Turn to “Tips and Tricks” on page 28.

TO PROGRAM YOUR ROBOT...
- Go to one of the following challenges on the CD-ROM: Collectadunk, Handygrapper, Gutgrapper or Gourmetgrapper.

HINT: Try this wheel.

Put the bushings onto the axles.

Put a 40-tooth gear on the axle over here.

Make sure the lift arm can rotate without hitting anything.

Lift arm

For this step, you need:

12

3x

1k

2x
To get started on the Thrower, follow these 4 steps.

1. **BEFORE YOU GET STARTED...**
   Make sure there are batteries in your RCX. For help installing batteries, turn to page 34.

   For this step, you need:
   - 1x2 brick
   - 2x means you need 2 of these.
   - Put a 1x2 brick here...
   - and another one here.

2. For this step, you need:
   - Black connector peg
   - Put the black connector pegs here.
For this step, you need:

- 1/2 bushing
- Bushing
- 2x motor
- 1x large pulley
- 1x 8x8 base

To measure an axle, see page 34.

For this step, you need:

- Put two 1/2 bushings here.
- Put a bushing here.

This brick should be in the center of the axle.

HINT: Try this.

IF YOU NEED HELP COMPLETING YOUR ROBOT...
- Check out "Special Features" on page 22.
- Turn to "Tips and Tricks" on page 28.

TO PROGRAM YOUR ROBOT...
- Go to the Robodunk challenge or the Catch'ndunk challenge on the CD-ROM.
Tricycle

To get started on the Tricycle, follow these 4 steps.

BEFORE YOU GET STARTED...
Make sure there are batteries in your RCX. For help installing batteries, turn to page 34.

1
For this step, you need:

1x2 brick

2x means you need 2 of these.

Put the 1x2 bricks here.

2
For this step, you need:

2x4 brick

To measure an axle, see page 34.

Rim

Tire

Put the tire onto the rim.
3. For this step, you need:

- 2x6 plate with holes

4. For this step, you need:

- Large pulley

IF YOU NEED HELP COMPLETING YOUR ROBOT...
- Check out “Special Features” on page 22.
- Turn to “Tips and Tricks” on page 29.

IF YOU NEED HELP COMPLETING YOUR ROBOT...
- Go to the Flickapuck challenge or the Reactapuck challenge.
Special Features

MOVEMENT

There's more than one way to get things moving. Here are a few ideas to get your mind in gear.

1. Push the hub into the tire.

2. This wheel swivels.

3. Pulleys can be used as wheels (especially front wheels that need to “slide” as the robot turns).

4. You can use more than one-sized wheel to make your player move.

5. You can enclose the wheels to protect them.
Put a 16-tooth gear here.

Big wheels lift your robot high off the ground.

This wheel can be attached directly to the motor.

This wheel uses pulleys and a belt to make the wheel spin.
Special Features

ATTACHMENTS

1. This stick is good for shooting the puck.
2. This foot is good for kicking a ball.
3. Use this stick to control the puck.
4. This hand is good for pushing a ball or puck down the field.
5. Use this arm to hold the ball up high.
6. This hand is good for holding the ball.
This makes a good hockey stick.

This leg is made to spin and is good for kicking (especially with Player 2 and the Tricycle). It can also be made wider.

This makes a good foot attachment (especially when used on the Thrower).

These feet for blockin.

These feet can be used to push the ball down the field.
Sensors make it possible for your robot to respond to its environment. Here are a few ideas on how to use light sensors and touch sensors.

**Touch Sensors**

1. Use a bumper to activate your touch sensors.
2. Use feelers to activate your touch sensors.
3. Make a touch sensor that moves along the ground.
4. Make a touch sensor that reaches up high.

**Light Sensors**

5. Try a light sensor up high.
6. Try a light sensor that rotates to many positions.
Try a light sensor facing down. 7

Try a light sensor at an angle. 8

Features

Make a face with eyes and a nose. 9

Make a face with eyes and a mouth. 10

Try this pair of hands on your robot. 11
If you want to make your invention bigger, stronger, faster, or work even better, try using these tips and tricks.

Adding Length

1

Attaching a tube

2

Adding height

3

Adding pieces to an axle

4
Adding plates to a beam

Making angles

Making angles
Adding gears to a beam

Use two gray connector pegs to attach a gear that won't spin (good when used as eyes).

Attaching rubber bands

Gray connector pegs can be used to attach the rubber bands.

Connecting beams

Adding a round piece to a beam

Making angles

Attaching eyes to a beam

Attaching an eye to a gear
Attaching an axle to a beam 15

Attaching an axle to a beam 16

Attaching an axle to a beam 17

Making a ratchet

This ratchet will only let the gear turn in one direction.

18

Using gears to turn corners

This is how to get two axles to spin while positioned at right angles to each other.

19

Using pulleys

Use the yellow rubber band when the two pulleys are far apart.

20

Using pulleys

Use the white rubber band when the pulleys are close together.

21

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Changing speed using different-sized pulley wheels

This combination will make the axle spin very fast (especially good for the Thrower).

Changing speed using different-sized gears

Changing speed using different-sized pulley wheels

This combination will make the axle spin quickly (especially good for the Thrower).
Making a bumper with a wheel

Making a single bumper

a. Making a double bumper

b. 26

27
How to Measure an Axle

Use this chart to measure the length of an axle.

Battery Installation for the RCX

1. Remove the bottom of the RCX.
2. Insert 6 AA (LR6) batteries.
3. Put the bottom back on the RCX.

Battery Installation for the Infrared Transmitter

1. Slide the cover back.
2. Insert the 9V battery.
3. Close the cover.

Instructions for use of battery box:
- Never mix different types of batteries or old and new batteries in one battery box.
- Always remove the batteries from the battery box for long-term storage or if they have reached the end of their life.
- Leakage from zinc batteries will damage the battery box. Non-rechargeable batteries can be reused, but power may be reduced. Do not recharge the batteries in the battery box. Rechargeable batteries are only to be charged under adult supervision.
Playing Field

This is how to make a wall around your playing field.
The goal is: 5 inches wide (12.70cm)
3 3/4 inches deep (9.53cm)
3 7/16 inches tall (8.73cm)

To build your own hockey or soccer goal, use these dimensions.
Basketball

Put these pieces together to make a hoop for your backboard.
The basket is 5 1/2 inches off the ground (13.97cm)
The basket is 3 inches round (7.62cm)
The backboard is 2 inches tall (5.08cm)
The backboard is 3 3/4 inches wide (9.53cm)