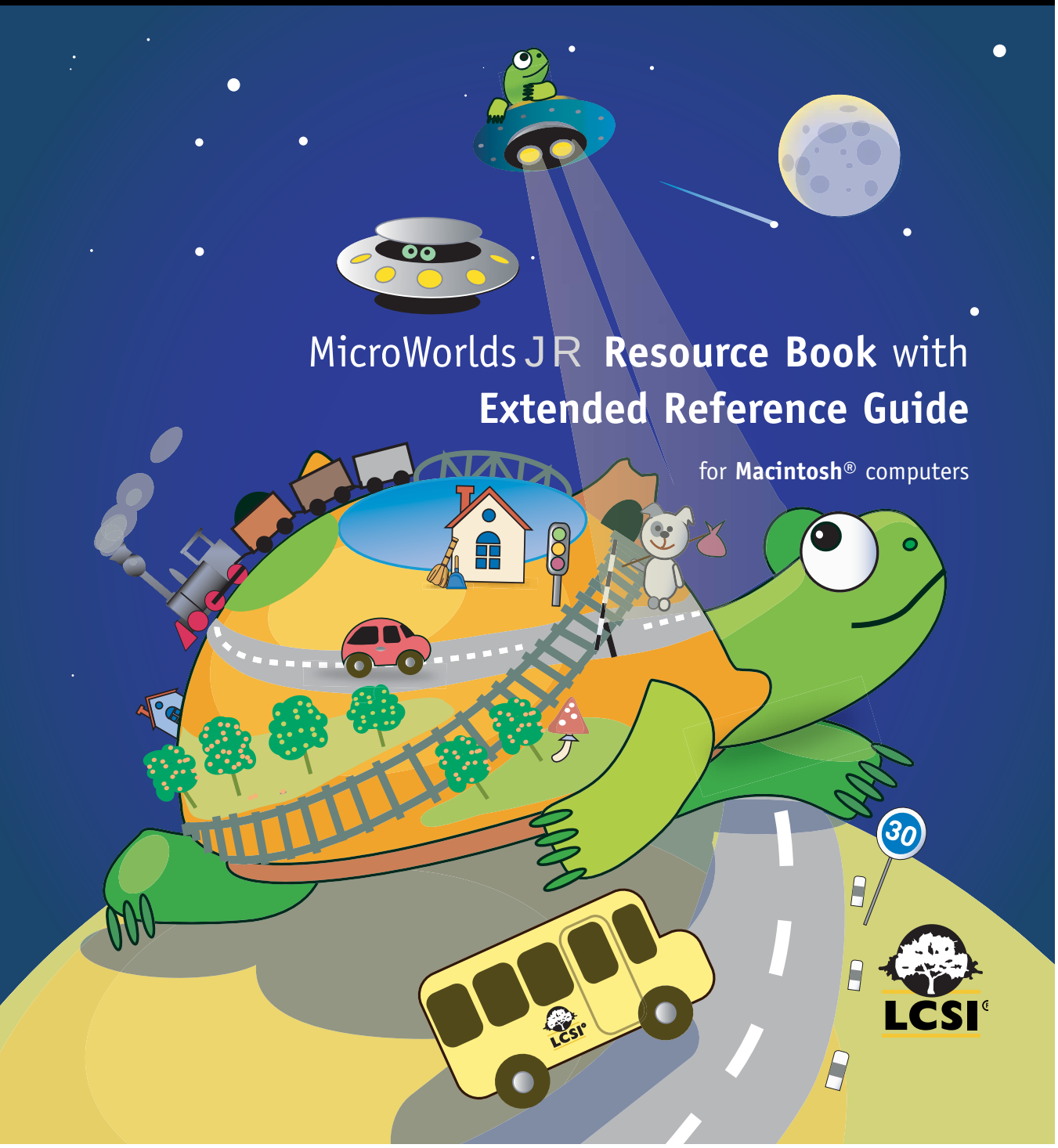
MicroWorlds JR™



MicroWorlds JR **Resource Book** with **Extended Reference Guide**

for **Macintosh**® computers

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Resource Book with
Extended Reference Guide

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We'd like to thank the following people for their efforts and insights: Elena, Sergei, Alain, Rene, Anton, Susan, Marina, Anna, Patrick, Slava, Mario, Brian, Billo, Sharnee, and Seymour.

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Section I - Introduction

MicroWorlds JR is the latest addition to the MicroWorlds family and the only version specifically designed for pre-readers and beginning readers. It provides young children with tools to create simple interactive projects and explore mathematical ideas on the computer. It includes painting tools, stamp-able shapes, text, buttons, multiple pages, and techniques to create simple animation, and it makes it possible for children to explore numbers, movement, and onscreen interactions through the use of an iconic programming and control language.

The star of the MicroWorlds world is the turtle – an onscreen, controllable object that provides children with a link between their real, concrete world and the more abstract virtual world of the computer. In the MicroWorlds world, children are in control. They control the turtle with iconic commands that tell the turtle to move, pivot, pause, put its pen down or pick it up, change and stamp its shape, play music, and much more. There's no end to the types of activities and projects you can create with the turtle. As children become more familiar with MicroWorlds JR, they begin to use logic and problem-solving skills - skills that they will use throughout their lives - to develop more elaborate projects.

Why Use MicroWorlds JR?

MicroWorlds JR lets young children use the computer as a creating and thinking tool. It provides them with opportunities to explore various mathematical ideas (How big is a turn? How large is a large number? What are the components of a square or a triangle?) and build interactive projects and stories. As they build, children encounter questions and obstacles intrinsic to the building process. With guidance, they begin to see that the best way to solve these challenges is to think like the turtle. In so doing, they are able to break the process down into manageable and logical steps. They may also discover that there is more than one way to solve a problem or complete a project. The children begin to develop a "MicroWorlds way" of viewing problems – developing meta-cognitive skills that will be valuable throughout their lives.

For example, a child could use the turtle to draw a square. In so doing, the child would not only need to think about the attributes of a square, but she would also have to consider in which order to invoke MicroWorlds JR's iconic commands to help the turtle draw the square, receiving immediate feedback after each command. If the commands are not in logical order, the results will be immediately obvious and the child can try a different sequence of commands. The child could even stand up and "walk" the square, using her kinesthetic knowledge to help her gain mathematical understanding. After drawing a square, the child may try to create other regular shapes and in so doing find similarities and differences and begin to formulate some "rules" about geometry.

Ten different project ideas are described in this book, but these are just the beginning. The projects introduce many, but not all, of the MicroWorlds JR features. Look through the Reference section of this book to discover other ideas and techniques.

Contents:

- MicroWorlds JR CD that contains:
  - MW JR program
  - Sample projects and Templates
  - MicroWorlds JR Resource Book Extended (PDF)
- MicroWorlds JR Teacher's Resource Book
  - Projects
  - Basic Reference

The MicroWorlds JR Resource Book Extended contains an extended Reference section.

MicroWorlds JR Samples

The Sample projects included on the CD provide ideas for building your own projects as well as playable environments for children. These files are locked, so if you wish to make changes and save them, you will need to use Save As... in the File menu and provide a different name.

MicroWorlds JR Templates and Preferences Panel

Select *Preferences* in the MicroWorlds JR menu and the Preferences Panel appears. In it, you can 1) select a starting Template for new MicroWorlds JR projects; 2) block the Text mode in the Procedures box; and 3) change the audio help default setting to Audio Off.

About the Templates:
The Templates are MicroWorlds JR projects that contain different sets of shapes. These Templates can be used to create themed activities. To use them, select one of the Templates in the drop down menu in the Preferences Panel. Then restart MicroWorlds JR or simply click on the New Project tool. From that point on, new MicroWorlds JR projects open as Untitled projects containing the features that are present in the template. Because the project is Untitled, the template will not be overwritten. As with any other new project, students must choose a name for and a location to which they'll save their projects.

Note that you can add your own templates to the list of available templates. Refer to *Section V - Handy Techniques* for instructions.

About the Text mode:
When creating procedures, the Text mode button allows you to see your procedure as “Logo text” instead of icons. Be aware, however, that any modification made to the text will lock you in Text mode - you won't be able to return to Icon mode for that procedure. If you wish to prevent students from accidentally going to Text mode, check the appropriate checkbox in the Preferences Panel.

Section II – Projects

Organization

Each project description that follows contains these sections:

- Curricular links
- MicroWorlds skills
- Prerequisite skills
- Introductory activity
- Main activity

Each project introduces new MicroWorlds JR features and incorporates features introduced in previous projects. You need not complete all projects nor complete the projects in the order in which they're presented, but before starting a project take note of the prerequisite skills. Introduce any necessary skills the students may have missed if a project was skipped

When setting up each workstation, make sure that each student, when saving a project, will be saving to the directory in which you want the projects kept. If you want students to save to a different drive, make sure this has been pre-selected. To check, save a sample project to this directory before the students begin working.

Project 1 – Introducing MicroWorlds JR.

The goal of this activity is to introduce the MicroWorlds JR environment, the painting tools and the steps needed to save a project. In order to introduce the painting tools, you may find it helpful to use a projector connected to your computer.

MicroWorlds JR Skills

- The turtle and how to move and drag it
- Painting Center
- Undo tool
- Save a project

Prerequisite Skills

None

Introductory Activity

Introduce students to the turtle and show them how they can move the turtle with the mouse by clicking on the turtle and dragging it. If they click on the turtle's nose only and drag the turtle in an arc, it turns.

If the Painting Center is not displayed, click on the *Open Painting Center* button. Many students may be familiar with painting tools from other programs, but, if not, take a few minutes to show the children some painting techniques. You may also want to show them how to scroll through the various color shades. Give them some time to try the different tools and show them how to clear their pages to start again.

Before starting, the main activity, show students how the *Clean* button works. Clicking the *Clean* button erases the whole picture. Tell students that if they do this by mistake or for any mistake using the painting tools, they should:

1) ***Stop clicking immediately!*** If they click a second time they may not be able to recover their picture.

2) Click the *Undo* tool button in the top toolbar.

Main Activity

After your students have experimented a bit, they are ready to create an illustration. Keep the ideas very simple. Here are some suggestions:

- Stars and a moon in the night sky
- A field and sky with a sun and clouds
- A house or building
- Hills
- Your face
- A simple illustration of some topic you recently discussed in class

Although the turtle is the main character for many MicroWorlds JR activities, in this project he is more of a decoration. It can be an interesting challenge to the students to creatively incorporate the turtle into their projects (for example, the turtle could be standing in front of a house or be an earring on a face picture.)

Save your project

It's very important to set aside some time at the end of the class to show students how to save their projects. Point out the *Save Project* button on the top toolbar. When a student clicks this button, a dialog box appears. Each student must type a name for his or her project and then click the *Save* button in the dialog box.

Project 2 – Pattern Game

The goal of this activity is to have students create their own simple patterns using turtle shapes. They can then ask their friends to play *Guess My Rule*.

Curriculum Links:

- Math
  - Algebra:
    - Understand patterns
    - Recognize, describe, and extend patterns

MicroWorlds JR Skills

- Turtle Commands Center - Learn how to use various Turtle Command buttons:
  - Grow (set the turtle to a larger size)
  - Shrink (set the turtle to a smaller size)
  - Stamp
- Shapes Center
  - Set the turtle to this shape

Prerequisite Skills

- Painting Center
- Save a project

Introductory Activity

Have students click on the *Turtle Shapes Center* button at the top of the Centers area.

Explain and, if possible, demonstrate that clicking on any shape in the Turtle Shapes Center sets the turtle to that shape (the turtle is "wearing" the shape). Each shape button in the Center is actually a "set the turtle to this shape" command.

Next, click on the *Turtle Commands Center* button at the top of the Work Centers area. Explain that all the buttons in this center tell the turtle to do something. Click on the *Grow* command button and then the *Shrink* command button to show what they do. Let students adjust the size of the turtle until they are satisfied.

Next, show students that if they click on the *Stamp* command button, the turtle stamps a copy of its shape on the background. If you move the turtle to another position on the screen, the stamped shape remains. Although it looks as if there are two turtles on the screen, explain that the stamped shape is now part of the background just like any of the drawings made with the painting tools in the first activity. The stamped shape cannot move like the turtle.

Main Activity

Have students create a repeating pattern using stamped shapes. For example, they may stamp two small dogs and one large dog, two small dogs and one large dog, etc. Or they may stamp one house, two flowers, and a fish, one house, two flowers and a fish.

Have each student create two patterns. Remind them to try and make each pattern different from the other and that their patterns can be simple or, if they prefer, more complicated. Also, remind students that to see a pattern, it must be repeated at least one time.

You may need to remind students how to erase a shape if they make a mistake or change their minds. They should open the Painting Center and use the *Eraser* tool.

Once all the students have created their patterns, have them save their project. Then pair up the students and let each student invite his or her partner to play *Guess My Rule*. When everyone has finished, have the class discuss all the different types of patterns that can be generated. Why must you stamp the pattern at least two times before asking your partner to guess the rule? Is there a limit to how long a pattern can be before it repeats?

Project 3 – The Tortoise and the Hare

Use animation and multiple turtles to create a simulation that compares the speed of different animals, vehicles or characters.

Curriculum Links

- Math
  - Measurement:
    - Make comparisons of measurements
    - Describe qualitative changes and differences to analyze change
- Science
  - Scientific Process
  - Create and explore a simple simulation of motion

MicroWorlds JR Skills

- Turtle Commands Center:
  - Step (forward or back)
  - Wait
  - Stop
  - Click on the turtle
  - Click off the turtle
  - Set to the turtle shape
- Create multiple turtles
- Turtle backpack
  - OnClick instructions
- Animation

Prerequisite Skills

- Turtle Shapes Center
  - Set the turtle to this shape
- Save a project

Introductory Activity

The turtle can do more than just wear shapes for stamping. It can also move using turtle commands. When the turtle moves a little and does this many times, Presto! You have animation.

Have one or two students walk across the room and ask the other students to describe what they are doing. They may say they take steps, they just go, etc. Show them they are taking steps, over and over again. Each step is not huge (they cannot cross the room in one step!), so step size is also something to consider. You may want to have one student take giant steps and the other take small steps to see the difference. The one who takes giant steps moves across the room faster.

When a turtle moves in an animation, it does the same thing – it takes one step, over and over and over again.

To show students how to create animation, start by introducing the *Step* command. Then show students how to create an instruction that starts when you click on the turtle.

The Step command

On the computer, have students set the turtle to the turtle shape, if it isn't set to it already: To do this, open the Turtle Shapes Center, then Click on the *Set to the turtle shape* button.

Next, show how the turtle moves. Open the Turtle Commands Center and click on the *Step* command button. A dialog box opens. Set the distance the turtle will move each step. The distance can be set by either dragging the paw or by typing a number in the box. First, try a big number, like 100. (Note: if the turtle is under the dialog box, move the box so the turtle is visible.)

Click the green *OK* button.

The turtle moves. Next try a small number in the box. If the number is very small, it may be difficult to see the turtle move. Try a few times, so that everyone understands that the number in the box is the distance (in screen "dots" or pixels) the turtle moves in each step.

OnClick

Once students understand how to make the turtle move one step, it's time to show them how to make it take step after step after step.

First, have students click on the turtle's nose and drag it until it is pointing to the right. This will give students more room for their animation.

Ask students to click on the *Key* tool and then click on the turtle with the key. The turtle's backpack opens (note that "Ctrl-clicking" on the turtle or clicking on the turtle with the right button on a two-button mouse has the same effect). The backpack is where the turtle keeps its special instructions. In it, you can create several different types of actions.

The first type of action, in the tab on the bottom left, is an OnClick action. An Onclick action is one that runs when you click on the turtle once and that (if it's an action that runs repeatedly) stops when you click on the turtle a second time. This is the only action students need to use at this time.

(Note: The other actions are:

- An OnColor action - runs when the turtle moves across a specific color.
- An OnTouching action - runs when the turtle touches another turtle.
- An OnSignal action - runs when the Signal command broadcasts a specific color.

The OnClick instruction line is, by default, the instruction line displayed when the turtle backpack first opens. If students start to click around, ask them to click on the tab on the left showing the hand holding the mouse.)

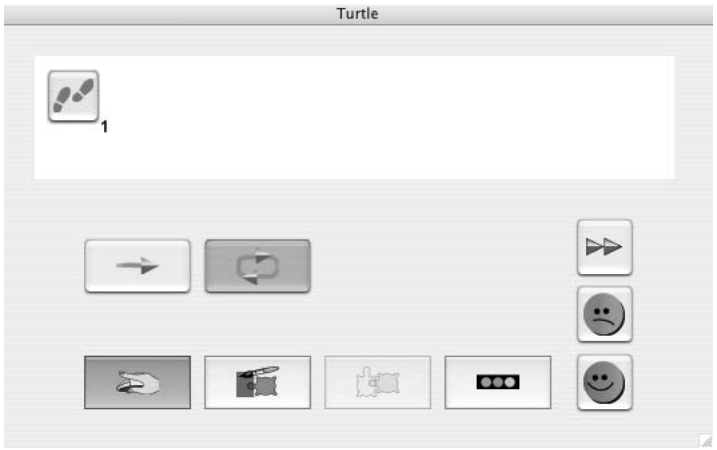
To create an OnClick action, you need to add commands to the instruction line. To do this:

1) Click on the *Step* command button in the Turtle Commands Center:

2) Set the number in the box. It should be a small number (five or less).

3) Click *OK*. The command appears in the turtle's backpack.

4) Click the "looping" arrow on the bottom of the turtle backpack. This means repeat the instruction over and over again – forever (or at least until you click on the turtle again). The backpack should look like this:



5) Click the green *OK* button.

Click on the turtle, and it should start whizzing across the screen. If it is going too fast, click on one of the *Stop Everything* buttons. (Note: There's a *Stop Everything* button in the Turtle Commands Center and another one in the top toolbar. They are identical.)

Discuss how to make the turtle move more slowly. Making the step size smaller is one solution. Open the turtle's backpack. Use the *Key* tool to change the step size without rewriting the instruction. Click the *Key* tool button in the top toolbar and then click on the *Step* icon in the instruction list. The dialog box for *Step* opens and the number can be edited. Change the step size to 1 and try the animation again.

You can also use the *Click on the turtle command* in the Turtle Commands Center to start the OnClick instruction and *the Click off the turtle* command to stop it.

Wait command

Still too fast? Another way to slow the turtle is to have the turtle wait a little after each step: step-wait-step-wait.

Click on the *Key* tool and then click on the turtle again. Place the cursor after the *Step* command. Click on the *Wait* command button in the Turtle Commands Center. The *Wait* command gets MicroWorlds JR to wait a short time (a tick is one tenth of a second). The jumping turtle shows the effect of various pause lengths...if the duration of the pause is very short (set to 1), the turtle still moves fairly fast. If the pause is longer, the turtle moves much more slowly.

Remember, to slow the animation, the pause does not have to be very long. Select a duration, click the green *OK* button, and the *Wait* command is added to the instruction line in the turtle backpack.

Click the green *OK* button. Test your animation.

Main Activity

Have students create a second turtle on their page. They should:

1) Click on the *New Turtle* button in the top toolbar.

2) Click on the page.

Next, have them turn the turtle by clicking on its nose and dragging it until it points in the same direction as the other turtle.

Set the turtle to a different shape, for example, the rabbit. The shape should be one that is "facing" in the same direction as the turtle. To set the turtle to a different shape, open the Turtle Shapes Center and click on that shape.

Create an OnClick instruction for the second turtle. Is a rabbit faster or slower than a turtle? How do you create different speeds?

Two turtles can be set to move at different speeds by using different numbers for either the input to *Step* or for the input to *Wait*. Have students experiment. For example, the rabbit may have a step size of 10 and a wait duration of 1 while the turtle may have a step size of one and a wait duration of 10!

Turtle

Rabbit

Sometimes students forget to turn the turtle before setting it to a different shape. When they create an OnClick instruction, the turtle moves in the wrong direction. This is a great problem-solving opportunity. Ask the student what happened, what she wants the turtle to do and how she can correct the problem. ***Remember***, to see in which direction the turtle is heading, set the turtle back to the original turtle shape.

Have students create other simulations by adding more turtles set to different shapes, for example, boats and dogs, or cars and airplanes, etc. They can then create OnClick instructions to have each turtle-object move at an appropriate relative speed (airplanes are fast, cars slow). Ask students to explain why they made their choices and how they decided on the instructions for each turtle.

Project 4 - My Favorite Place

Students have already learned how to use the painting tools, how to stamp a shape, and how to create a simple animation. They now combine these skills, moving from one center to the other, in order to create a picture of their favorite place. Once their pictures are complete, they use the Text center to add titles or short descriptive sentences.

Curriculum Links

- Language Arts
  - Creative writing:
    - Write in a variety of forms
    - Use various media to convey a message

MicroWorlds JR Skills

- Text
  - New text box
  - Add text
  - Format text
- Turtle Commands Center
  - In front and In back

Prerequisite Skills

- Painting Center
- Turtle Commands Center
  - Step
  - Pause
  - Stamp
- Turtle Shapes Center
  - Set the turtle to this shape
- OnClick instructions
- Save a project

Introductory Activity

Before students begin, discuss the theme – My Favorite Place – and have them think for a few minutes about what that is and how they can illustrate it. Make sure they understand how to move from center to center and what tools or commands are available in each center.

In the previous project, students created animated turtles. You may want to review the steps for setting a turtle to a different shape and getting it to move with an OnClick instruction.

Adding Text

Before starting, show students how to add text to their page. They should:

1) Click on the *Text* button on the top toolbar.
2) Click on the page in order to have a text box appear.
3) Click in the text box to type.

Once students click in the text box, the onscreen keyboard opens beneath the text box. It contains clickable letters arranged in alphabetical order. Students can type using these clickable letters or the keyboard to add text. To create a capital letter using the clickable letters, hold down the *Shift* key and click on the letter.

Have each student write a title for the project or his or her name.

Demonstrate how to change text size, font, style or text color:

1) Highlight the text to be changed by holding the mouse button down and dragging across all the letters in the text.
2) Click on the appropriate function button in the on-screen keyboard.

Once students have completed their text, clicking anywhere outside the text box makes the text box transparent. If the students want to move their title, they can simply click on the text and drag it.

Often students change the text size, causing a scroll bar to appear in the text box. Once they click outside of the box, the text box becomes transparent and not all of their text is visible. If this is the case and not all the title is showing, students should:

1) Click on the text so that the text box reappears.
2) Drag one of the squares in the corners of the text box in order to enlarge the box.
3) When the scroll bar disappears and all the text is visible, click outside the text box to make it transparent once again.

Main Activity

Have each of your students create a picture of his or her favorite place. In general, it's easier to start by painting a background picture with the painting tools and then adding stamped shapes. Next, they can add one (or more) animated turtles.

Sometimes when students are using multiple animated turtles in a scene, they want one turtle to be in back of or in front of another. The last turtle created is always in front of the other turtles. Here is a technique to change the order of the turtles. If the wrong turtle is in front:

1) Click on that turtle to make it "current." Making the turtle current means that you tell this turtle that it should listen to your commands from now on. If you are uncertain about which turtle is the current one, click on the *Who Is Listening?* button on the top toolbar. The current turtle gets a red frame. Click on the button again to hide the frame.
2) Open the Turtles Commands Center.
3) Click on the *In front* command.

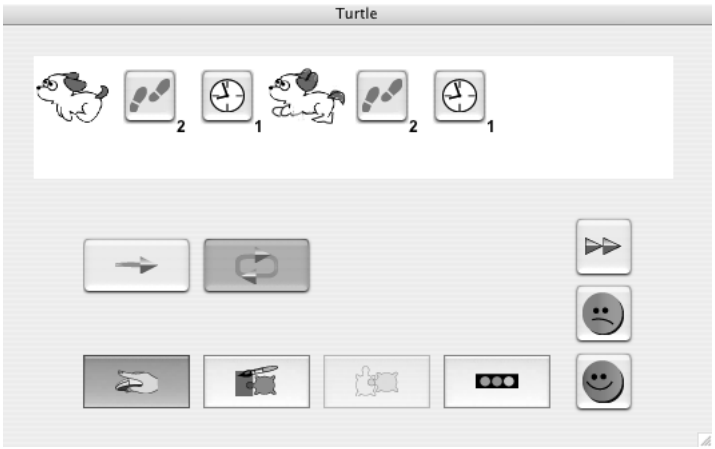
The current turtle is now in front of the other turtles.

Challenges

You probably noticed that there are multiple versions of some shapes, for example, the dog. If the turtle switches between these shapes as it moves, the dog looks as if it's running. In this type of animation, the dog changes shape each time it steps, alternating between the different shapes.

To create this type of animation, click on the turtle with the *Key* tool to open its backpack. Then create an OnClick instruction by following these directions:

1) Open the Turtle Shapes Center and click on the **first** dog shape to add a *Set the turtle to this shape* command to the instruction line.
2) Open the Turtle Commands Center and click on the *Step* command button and set the size of the step (make it small).
3) Click on the *Wait* command button and set the duration of the pause.
4) Open the Turtle Shapes Center and click on the **second** dog shape to add a *Set the turtle to this shape* command to the instruction line.
5) Repeat step 2 and 3 above.
   Set the OnClick instruction to *Forever* by clicking on the looping arrow.
   The turtle's backpack should look like this:



6) Click the green *OK* button.

Project 5 – Guess My Rule II

In this project, students program the turtle to follow a rule when it crosses a specific color. They can then ask their friends to guess the rule.

Curriculum Links

- Math
  - Algebra:
    - Recognize and understand patterns

MicroWorlds Skills

- OnColor instructions
- Turtle Commands Center
  - Turn
  - Set color
  - Set color randomly
- Media Center
  - Melody Editor
  - Recording a sound

Prerequisite Skills

- Painting Center
- Turtle backpack
- OnClick instructions
- Turtle Commands Center
  - Grow
  - Shrink
  - Step
  - Wait
- Save a project

Introductory Activity

Before starting the project, review some of the commands the students already know – *Grow, Shrink, Step,* and *Wait*. Introduce a few new commands that will be very useful in this project.

Turn command

You can change the heading of the turtle by using the *Turn* command. Click on the *Turn* command button in the Turtle Commands Center. The *Turn* dialog box opens. In its center is a wheel. Drag the red knob – the numbers in the center change, showing the number of degrees the turtle is turning. Turn the wheel so that the red knob is pointing to the right. Click the green *OK* button and you'll see that the turtle is now heading to the right, also. Experiment with turning the turtle several times. The turtle can turn left or right.

Set the turtle to a color command

Click on the *Set color* command button. A palette of available colors appears. Select one of the colors and click the green *OK* button. The turtle (and its pen) changes to that color.

Moving Backwards

Turtles move forwards if the shoe in the *Step* dialog box is placed to the right of the 0. If it's placed to the left of the 0, the turtle moves backwards.

OnColor

Using OnColor actions, students can program an action (a list of instructions) to occur when the turtle crosses a specific, pre-selected color.

First, have the children create a filled rectangle on the page using the painting tools. The rectangle can be any color. Then, they should click on the *Pointer* button in the top toolbar to reset the cursor to the regular pointer shape.

Next, have students open the turtle's backpack and click on the second tab from the left – the OnColor tab.

They should see two lines of paws, each set to one of the main colors in the Painting Center. Have each child click on the paw that's the same color as the rectangle they drew. If they cannot remember or identify which color they used (for example, they used a very light or dark shade), they can click on the rectangle on the page (the cursor automatically changes to the color picker). The paw of the correct color is selected.

Next, have each child click on the *Grow* command button in the Turtle Commands Center. This inserts the *Grow* command into the OnColor instruction line. Do not click *OK* yet.

Finally, have students click on the OnClick tab in the turtle's backpack. They should add instructions to have the turtle step and then wait a little over and over again, just as they did in earlier projects. Click the green *OK* button to save all the instructions in the backpack and close it.

Have students turn the turtle so that when it moves, it crosses the rectangle. They should then click on the turtle. When the turtle touches the rectangle, it should grow.

Note that a turtle runs the same set of instructions for all shades of a color.

A turtle can have a different set of instructions for each of the different color paws that appear in the OnColor tab. That means a turtle can have up to 16 different OnColor instructions.

Main Activity

Have students use different colors to create a *Guess My Rule* game for their friends. Here are some suggestions for rules:

When I cross the color _____...

... I get bigger.

... I get smaller.

... I go backwards.

... I take a giant step.

... I turn.

... I change to another color.

Notes:

- Do not put the pen down as one of the rules because when the turtle draws a line it "sees" only the pen color, not the rest of the background colors.
- Do not use stamp as one of the rules. It will stamp over the background color and, again, the turtle won't "see" the background.
- If the turtle has an "I get bigger rule" (using the *Grow* command) for one color, it's a good idea that another color should have an "I get smaller" rule (using the *Shrink* command). Otherwise, the turtle grows and grows until it can't grow anymore and then the rule stops working. The same is true if the turtle has an "I change to another color" rule for one color. You should have an "I change to my original color" rule, also.

Challenges

Here are some other rules students may want to try:

When I cross the color _____...

... I change color randomly.

... I play music.

Setting the Turtle to Different Colors Randomly

Create an OnColor instruction to have the turtle change colors randomly ("I change color randomly.") when it crosses a background color.

1) Open the turtle backpack and click on the OnColor tab. Select a color that doesn't already have an instruction, for example, yellow.
2) Click on the *Set color* command in the Turtle Commands Center. The *Set color* dialog box opens.
3) In the dialog box, click on the dice to select the random color picker.
4) Click the green *OK* button.

Have the turtle move across the background color – in this example, yellow. The turtle should change to a different color each time it crosses yellow (or whatever color you used).

Melody Editor

Some students may want the turtle to play a note or sound when it crosses the color. Here's how to create a melody.

Click on the Media Center button at the top of the Work Centers area. Then, click on the *Create New Media* button on the right (the eggshell with an exclamation mark). The New Media dialog box appears. Click on the first button on the left, the one with a note coming out of a box. This opens the Melody Editor. Have students try some of the notes, instruments, different durations, etc. Once they click *OK* after creating a melody, the melody is saved in the Media Center. Clicking on the melody's button in the Media Center plays the melody - the button is a *Play this melody* command. This *Play this melody* command can be used just like any of the turtle commands.

Students can get a readymade melody by clicking on the *Choose a Media File* button in the New Media dialog box (the second button in the dialog box). This opens a dialog box that contains a list of sounds, melodies and maybe even some videos. Once a media file is selected, it is added to the Media Center of the current project. This new media button is a *Play this media* command.

Students can create their own recording by choosing the third button in the New Media dialog box (the microphone button). Clicking on the *Create a Recording* button opens the New Recording dialog box. Once a recording is made, it is added to the Media Center of the current project. This new media button is a *Play this recording* command.

Project 6 – Tiling

Have students create their own tile shapes for the turtle and then create pictures from the tiles.

Curriculum Links

- Math
  - Geometry:
    - Apply transformations to analyze mathematical situations
    - Investigate and predict the results of putting together and taking apart two-dimensional shapes

MicroWorlds Skills

- Turtle Shapes Center
  - Create/edit shapes

Prerequisite Skills

- Create a turtle
- Painting Center
- Turtle Commands Center
  - Stamp
- Save a project

Introductory Activity

Students can create their own shapes for the turtle. These shapes can be used just like any other shape.

Have students open the Turtle Shapes Center. They should then click on the *New Shape* button (the eggshell with an exclamation mark). The Shape Editor opens. It contains tools identical to those in the Painting Center.

To start, have students use the straight-line tool to draw a line in any color diagonally from the upper left corner to the lower right corner of the empty shape. They should then use the *Fill* tool to fill one side of the square. Their shape should look like this:

Students can decorate the shape by adding some lines or dots of color, but only within the colored triangle.

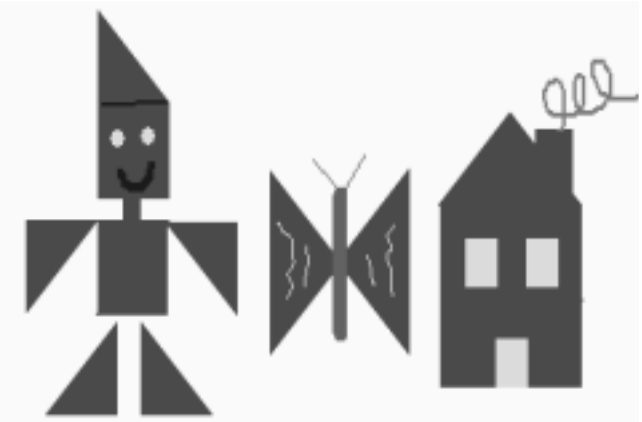
Click the green *OK* button to save the shape.

Next, make three copies of the shape. To do this, click on the *Grab and Drop* tool button on the top toolbar. Once this tool is selected (the icon looks like an open hand), click on the newly-created shape (the hand turns into a fist as the shape is "grabbed") and then click on an empty shape space in the Turtle Shapes Center. Repeat this process two more times so there are four identical shapes.

Four identical tiles are not very interesting. Click on one of the shapes with the *Key* tool to open the Shape Editor. Once open, click on the rotation tool in the editor to rotate the triangle 90 degrees (1/4 way around). Click *OK*. Do this to a second copy of the original shape, but, this time, rotate the shape twice (1/2 way around). Finally, right-click on the third copy of the shape and rotate it three times (3/4 of the way around). Each shape should have a different orientation.

Main Activity

Have students create pictures using their new set of tiles. With four triangles, they should be able to create squares and other geometric shapes to use in their pictures. Here are some ideas:



One of the simplest ways to set up the project is to create four turtles. Each turtle should be set to one of the tile shapes. A student can place the turtle where he or she wants it and then click on the *Stamp* command.

An alternate method is to create 12 - 16 turtles and have three or four turtles set to each shape. The student can move them around to create the picture he or she wants and then stamp each shape. An easy way to do this is to create one set of four turtles, each with a different shape (a different orientation). Drag around all four turtles, then:

1) Select Copy in the Edit menu (or use Ctrl-C).

2) Select Paste in the Edit menu (or use Ctrl-V).

Paste a few times to get a few sets of tiles. The student should then move all the turtles to the side of the page. Once the picture is complete, students can remove the excess turtles with the *Cut* tool (the "scissors") or by selecting them and clicking *Delete* or *Backspace* on the keyboard.

Some Important Tips

- Sometimes the wrong turtle is stamped. Use the *Eraser* tool in the Painting Center to erase the stamped shape.
- To make sure the correct turtle gets stamped, click on the *Who Is Listening?* button in the top toolbar to see which turtle is the current (listening) turtle. If the wrong turtle is listening, click on the turtle you want to be listening. Dragging on the turtle will not make the dragged turtle the current turtle – you must click on it.

Project 7 – Geometric Shapes

Students can use the turtle to draw geometric shapes. As they move the turtle, students can use their knowledge of how they would move if they were the turtle to help them understand the properties of these shapes.

Curriculum Links

- Math
  - Geometry:
    - Recognize, draw and compare two-dimensional shapes
    - Describe attributes of two-dimensional shapes
    - Describe, interpret and apply ideas about direction and distance in navigating space
- Science
  - Scientific Process:
    - Generate a hypothesis, test it, and reflect on results

MicroWorlds Skills

- Turtle Commands Center
  - Pen down

Prerequisite Skills

- Turtle Commands Center
  - Step
  - Right and left Turn
- Save a project

Introductory Activity

This exploration makes an excellent group activity. If possible, use a projector and screen or whiteboard so that the whole class can participate. If this is not possible, work with small groups so that all the students can see the results of their math experiments.

Turtle Commands - *Pen Down*

Every turtle has a pen that it can use for drawing. When you open a new project in MicroWorlds JR, the turtle's pen is up. Open the Turtle Commands Center and click on the *Pen down* command button. Now the turtle's pen is down and it can draw with it.

To show students how turtles draw, click on the *Step* command button and set the step size to 50. Click *OK*. The turtle should have moved and left a trail.

All About Squares

Ask your students to describe a square. They should be able to tell you that it has four sides and four corners (or turns). Through discussion, they should also come to realize that all the sides are the same size and all the corners are the same size. Have one or two students stand up and "walk a square." Point out that they should stop at the same place as where they started and they should be heading in the same direction. So, if when they started they were facing the front of the classroom, they should be facing the front of the classroom when they finish.

The line the turtle drew could be the first side of a square. Ask students what comes next. The turn, of course. Ask if they can guess how much the turtle should turn. Have them stand up and turn to show you.

Click on the *Turn* command button in the Turtle Commands Center. Show students that you can change the heading of the turtle by dragging the red knob. When you click *OK*, the turtle sets its heading to whatever direction the red knob was pointing. Experiment with turning the turtle several times.

Next, point the turtle straight up (either by dragging it or using the *Head north* command). Click on the *Turn* command button. The red knob should be pointing to the top and 0 should appear in the center of the window.

Explain to students that if the red knob is pointing up when the turtle starts drawing a square, *it should be pointing up when they complete their shape*. In drawing a square, the red knob should make a complete trip around the wheel.

Turn the wheel clockwise and show how far around that would be. Once 350 is displayed in the gray center window, use the right arrow key button at the top of the dialog box to increase the turn size one degree at a time. You should get to 359 before the number is reset to 0

Note that the red knob can be moved either clockwise (*Turn right*) or counter-clockwise (*Turn left*). Use only one direction when creating your square.

Drawing a Square

Set the red knob so that it is pointing straight up (the number 0 should be showing in the center of the window). Remind students that you have already drawn the first side of the square. Slowly turn the wheel clockwise. Ask the students to tell you to stop when the red knob is pointing in the direction the turtle should be heading after it turns the first corner of the square. They should tell you to stop when the number in the window equals 90. If not, keep going until the students tell you to stop. Click *OK*. The turtle should turn.

Continue drawing the square, no matter what number was chosen. Draw another side. Since this is a square, the length of the side (the step size in the *Step* command) should be the same number that was used to draw the first side.

The amount turned at each corner (the turn size in the *Turn* command) should also be the same for each corner since all the corners of a square are equal. Turn the turtle again using whatever number was used before. Remind students that on the fourth turn, the turtle (and the red knob) should end up pointing straight up.

Draw four sides and four corners. Did they create a square? Did the red knob end up pointing straight up? If not, keep track of the size of the turn and try again, testing another turn size. Keep trying until the students test a turn of 90. It's important for students to realize that they can start with any size for the side, but they can only draw a square if the number for the turn is 90.

Having four turns of 90 means that when drawing a square the turtle turns, altogether, 360 (degrees). The turtle turns a total of 360 degrees, no matter what geometric shape you are drawing. This is called the Total Turtle Trip.

Now, use the same technique to draw a hexagon, a figure with six sides. Once again, the students can pick any number for the size of the side. Then have them try to figure out what number works for the size of the turn (60). Remind them that the turtle must make six equal turns and, once complete, the turtle should be pointing straight up. Keep track of the different angles tested. For example, the students may guess that the turtle should turn 50 at each turn. After six turns, the turtle will not be pointing straight up and the figure will not be closed. Ask the students if this means the number is too small (yes) or too big (no) and why they think this.

Main Activity

Organize the students into pairs. One student should be the Counter/Recorder and count the sides as they're drawn, keep track of the number of turns, and write down on a piece of paper, each turn size tested. The other student should control the turtle.

Ask each pair to find the size of the turn for some additional shapes, for example an octagon (45 for each turn), a nonagon (40 for each turn) or a triangle (120 for each turn). Students should take turns being the Counter/Recorder and the Turtle Controller. Remember: Use the arrow keys in the Turn dialog box to set the turn sizes to numbers not ending in 0.

Challenge

Ask students to try to draw a circle using the *Step* and *Turn* commands. How many sides does a circle have? In reality, you cannot draw a true circle using MicroWorlds JR. But students can see that the greater the number of sides, the closer they come to a circle shape.

Have students try the following: step size = 20 and turn size = 10. Suggestion: Instead of repeating this instruction 36 times, have students create an OnClick instruction using these *Step* and *Turn* commands and set it to *Forever*. Click the *Stop Everything* button to stop the instruction once they have a circle.

Project 8 – Square Pictures

By creating a square procedure, students can explore patterns and designs created using only squares. They can then write a story to go with their drawing.

Curriculum Links

- Math
  - Geometry:
    - Recognize geometric shapes and structures in the environment
    - Understand attributes of two-dimensional shapes
- Language Arts
  - Creative writing:
    - Students write in a variety of forms

MicroWorlds Skills

- Create a procedure

Prerequisite Skills

- Turtle Commands Center
  - Step
  - Turn
- Text Center
- Save a project

Introductory Activity

MicroWorlds JR comes with a set of built-in commands (*Step, Turn, Stamp,* etc.), but students can create new commands by defining their own procedures.

Procedures

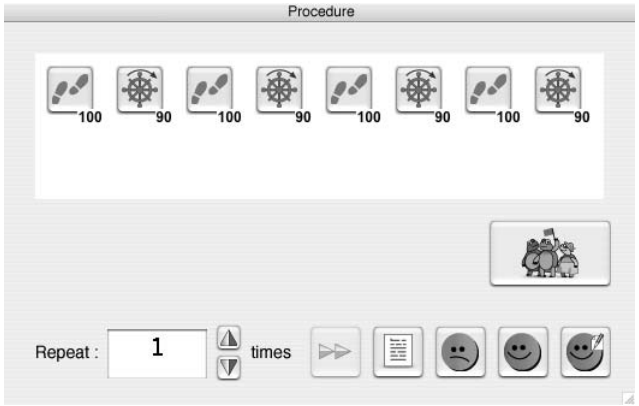
A procedure is an organized set of commands that have been grouped together as a single user-defined command with its own label. It contains commands that will be used over and over again in the same order. You create a procedure so that you do not need to write the complete list of commands each time you want to use it. This user-defined command acts just like any of the built-in commands. The only difference is that it only works in the project in which it was created.

For example, instead of writing all the instructions to draw a square each time you want to draw one, create a *Square* procedure.

Have students open the Turtle Commands Center click on the *New Procedure* button (the eggshell with an exclamation mark) to create a new procedure.

Here are two ways to create a *Square* procedure:

1) Have students add all the instructions they used to draw a square.
   Their procedure box should look like this:



   (Note: The *Step* command may use a different number.)

Leave *Repeat* set to 1.

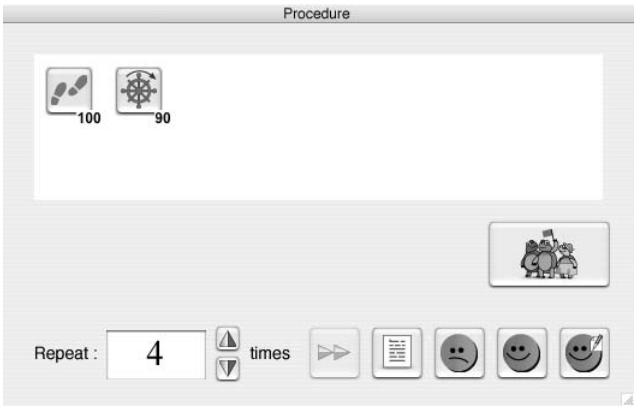
Have students create a label for their procedure by clicking the *Edit a Label* button. Then click *OK*.

A new command appears in the Turtle Commands Center.

OR....

2) Have students add one *Step* and one *Turn* command to draw the first side and first corner of a square. Set *Repeat* to 4.

   Their Procedure box should look like this:



   (Note: The *Step* command may use a different number.)

Have students create a label for their procedure by clicking the *Edit a label* button. When they finish drawing the label they should click *OK*.

A new command appears in the Turtle Commands Center.

Tell students to put the turtle's pen down and then click this new command. Have them play with the *Square* procedure a bit. For example, they could create spinning squares by drawing a square, turning the turtle a little, drawing another square, turning the same amount again, etc.

If students aren't sure what is happening, click on the *Square procedure* button using the *Key* tool. The cursor should be at the beginning of the instruction line. Click the *Step by step* button to run each instruction one at a time. Make sure the procedure dialog box is not covering the turtle!

Handy Technique - Duplicating a procedure

To duplicate a *Square* procedure to create a *Smallsquare* procedure.

1) Click on the *Grab and Drop* tool on the top toolbar, grab a copy of the procedure and drop it on an empty command space.
2) Using the *Key* tool, click on the new procedure to open its procedure box.
3) Using the *Key* tool again, click on the *Step* command(s) in the Procedure's dialog box to open the *Step* dialog box. Change the step size to a smaller number for each Step command.
4) Click on the *Edit a Label* button to create a different label for this new procedure. Click *OK*.

Main Activity

Students should create a picture with squares. It could be a picture of spinning squares, a picture of robots, houses, whatever they can create with squares! They can fill their squares with color using the painting tools.

For example, students could draw a building using a large square, then use small squares to draw windows in the building. They can draw small squares by either duplicating the procedure and making a *Smallsquare* procedure or by reducing the step size for each *Step* command in their *Square* procedure. Remember, you can use the *Key* tool in the top toolbar to change the step size without rewriting the list of instructions.

Next, have students create a text box and write a few sentences to describe their picture. Finally, they can give their story and picture a title.

Project 9 – Spirals and Other Interesting Drawings

Students explore the nature of spirals as they learn how to create these beautiful geometric shapes.

Curriculum Links

- Math
  - Geometry:
    - Describe attributes and parts of two-dimensional shapes
    - Investigate the results of putting together and taking apart the parts of two-dimensional shapes
    - Relate ideas in geometry to ideas in number and measurement
  - Number:
    - Understand the effects of adding and subtracting whole numbers
    - Connect number words and numerals to the quantities they represent using various models

MicroWorlds JR Skills

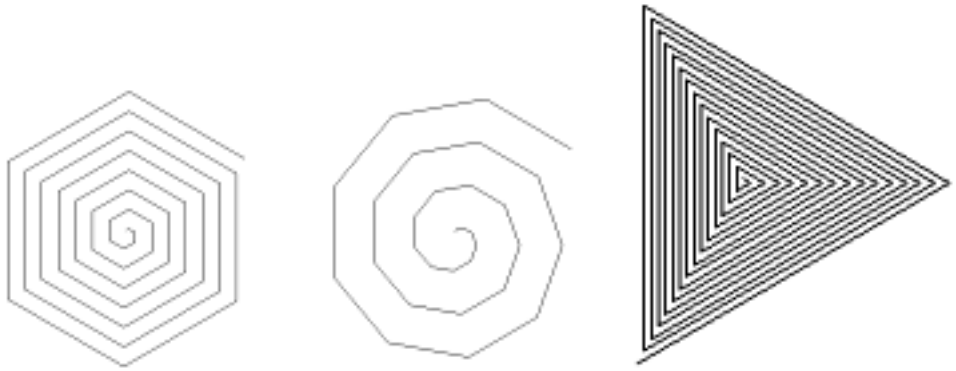
- Create multiple pages

Prerequisite Skills

- Turtle Commands Center
  - Step
  - Turn
  - Pen down
- Save a project

Introductory Activity

Show students the following pictures:



Ask if they know what these are. Not all students may know what a spiral is or that spirals are not always circular. Talk about the sides and turns (angles) of a spiral. How would students describe them? Are the turns always the same? Are the sides always the same? Have one or two of the students "walk a spiral" while the other students provide instructions.

Open MicroWortds JR. Put the turtle's pen down and ask students what command you should give the turtle to start drawing a spiral. You can start with either a *Turn* command or a *Step* command. For example, you may start with a *Step* command with the step size set to 5. After the turtle steps, it must turn. Select a turn size, for example 120.

Create a few additional sides and angles for the spiral. Each time, set the step size to its current size plus 5. Always leave the turn size the same. In this example, the commands would be:

Step 10
Turn 120
Step 15
Turn 120
Step 20
Turn 120
Step 25
Turn 120

....and so on. Gradually, students will see the spiral emerging.

As you create the spiral, write the step size and the turn size in a text box or ask the students to keep track of the amounts on a piece of paper.

What is the rule for turning? The number is *always* the same.

What is the rule for taking steps? The number is always the previous step size + 5.

Adding a New Page

Before students start creating their own spirals, show them how to add a new page to their project. By doing so, they can create one spiral on each page and won't need to erase an old spiral to make room for a new one.

To add a page, students should open the Page Center by clicking on the Page Center button at the top of the Work Centers area. Click on the *Create New Page* button (the eggshell with an exclamation mark) on the right. There should now be two page buttons in the Page Center. Each button is a *Get this page* command. To return to page 1, students should click the *Get page1* button. To go to page 2, students should click the *Get page 2* button.

Students may want to create a unique label for each *Get this page* command. To do so, they can Ctrl-click on the page button or click on the button with the *Key* tool to open the Label Editor. Once they've completed their label, they should click *OK* to return to the MicroWorlds JR screen.

Main Activity

Have students work in pairs. Ask each group of students to create at least one spiral. They can use any number for *Turn* but they must use the same number for all the turns in the spiral. Students can start with any size step, but they must add the same amount to the step size each time they draw a side of the spiral. One student should be the Counter/Recorder and write down the step size for each step. The other student should command the turtle. Students can take turns at each job. Encourage students to use different colors as they build their spirals.

Once every group has created a spiral, have each of them show their spiral to the class and explain how they created it. The students should explain what their number rule was for the *Step* command.

Challenge

Sides of spirals can get smaller, too. Ask students what the number rule could be for a spiral that gets smaller. See if they can draw a spiral that gets smaller. Is it different from one that gets larger?

Project 10 – A Map of My Street

Students integrate many of the skills they've learned in previous projects to create a multi-page project that includes a map of their street and a description of where they live, with buttons to switch from page to page.

Curriculum Links

- Language Arts
  - Descriptive writing
  - Use different media to convey information
- Math
  - Geometry:
    - Find and name locations with simple relationships in coordinate systems such as maps
    - Describe and interpret direction and distance in navigating space

MicroWorlds Skills

- Create buttons
- Switch pages with buttons
- Turtle Commands Center
  - Announce
- Painting Center
  - Freeze background
  - Stamp text

Prerequisite Skills

- Painting Center
- Turtle Commands Center
  - Step
  - Turn
  - Pause
- Text Center
- Create multiple pages
- Save a project

Introductory Activity

At this point, students should be very familiar with many of the MicroWorlds JR tools. By using the painting tools they can draw a map of their street, label the different landmarks with text and even add some animated action to the map. On the second page of their project, students can describe the street and where their house is.

Have students create a second page in their project. Each page button appearing in the Page Center is really a *Get this page* command. It's possible to switch from page to page by opening the Page Center and clicking on the *Get this page* commands to change pages. Another way to change pages easily is to use user-created buttons.

While on page 2 of the project, click on the *New Button* tool in the top toolbar. A dialog box opens. Click on the *Get page1* button in the Page Center. The command is added to the new button's instruction list. Click *OK* in the button dialog box. A button appears on the page and on the button is the label for the *Get page1* command.

A user-created button shows exactly what command or commands will be executed when the button is pressed (buttons can contain more than one command). Click on the button and page 1 appears. Following the same steps, students should create a button on page 1 that opens page 2.

Students have now created a navigation system for their project. These buttons can be placed anywhere on their pages, but you probably do not want them in the center of the page where the map and the description will be.

Useful Techniques

Before starting the project, show students the following two useful techniques.

Freeze Background

The *Freeze background* button is in the Painting Center. Once frozen, a background cannot be erased. Any new drawings created after clicking on *Freeze background*, whether created with the painting tools, a turtle with its pen down, or by stamping a turtle or text, can be erased with the eraser, but the frozen background remains. It is a good idea to freeze the background before stamping text or any shapes that you think you may want to change!

Stamp Text

Stamping the text makes it part of the background. Stamped text does not move and cannot accidentally be changed. It can no longer be edited and can only be erased using the eraser. To stamp the text, click on the *Stamp text* button in the Painting Center. Then click on the text box that is to be stamped. This stamps an image of the text onto the background, making it part of the picture. The text box is still there, as a floating object. To remove it, click on the *Cut* tool (the "scissors") in the top toolbar and click on the text box.

Announce

Another way to provide text information for the project is by using the *Announce* command with a button. It's best to use the *Announce* command in turtle instructions in a turtle's backpack, in a button, or in a procedure. For example, to add announce to a button:

- Click the *New Button* tool in the top toolbar and click on the page. The dialog box opens.
- Click on the *Announce* command in the Turtle Commands Center. A second dialog box opens.

- Type a message in this box. Decide whether you want “speakable text” or not. If you choose speakable text, select a voice.
- Click the green *OK* button in the *Announce* dialog box.
- Click the green *OK* button in the *Button* dialog box.
- Click on the button and the text box should be displayed and, if you chose speakable text, the message will be read out loud.

Note: If the *Announce* command is not used in a turtle's backpack, button or procedure, the message appears only once immediately after the student writes it and clicks OK. It is not saved. The next time the *Announce* command is selected, the dialog box will be empty.

Presentation Mode

Presentation Mode is used for demonstrating completed projects. In Presentation Mode, the toolbars, menus, and centers are hidden, the project is centered on the screen and the surrounding area is filled. If your project has several pages, you must have a way to go from page to page, such as the navigation system you created with the buttons

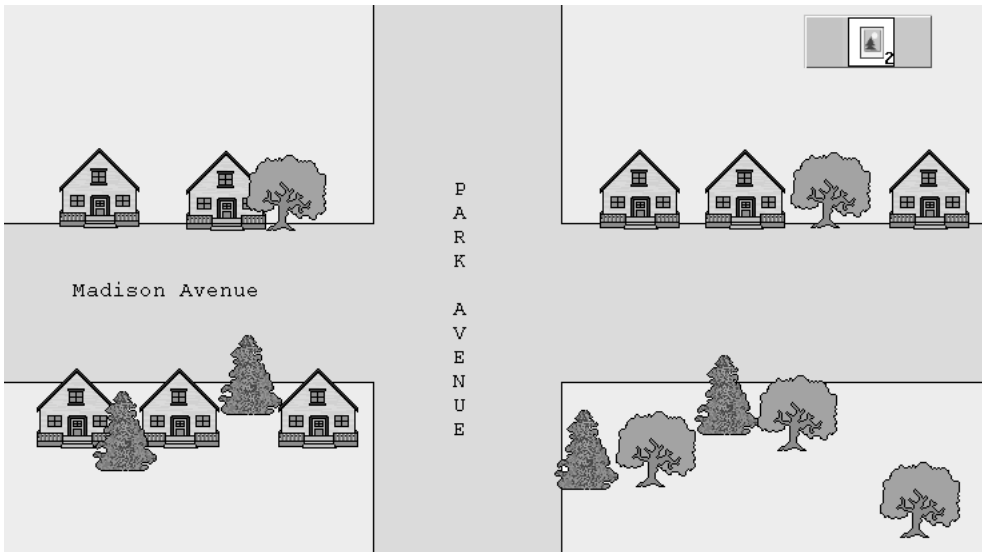
To start Presentation Mode, click on the *Presentation Mode* button in the top toolbar.

To get out of Presentation Mode, press the *Esc* key on the keyboard or click twice outside the project area.

Main Activity

Have each student draw a map of his or her street. They can stamp turtles wearing house or apartment shapes to show where they live or draw the buildings. They should label the street name and their houses using text boxes. It's a good idea to stamp the text in order to make sure the text box is not accidentally moved. Remind students to freeze the background before stamping the text.

Students may want to add some animation, such as a car moving down the street, a dog running, or a person walking. They can use an announce box and a button to describe their street.



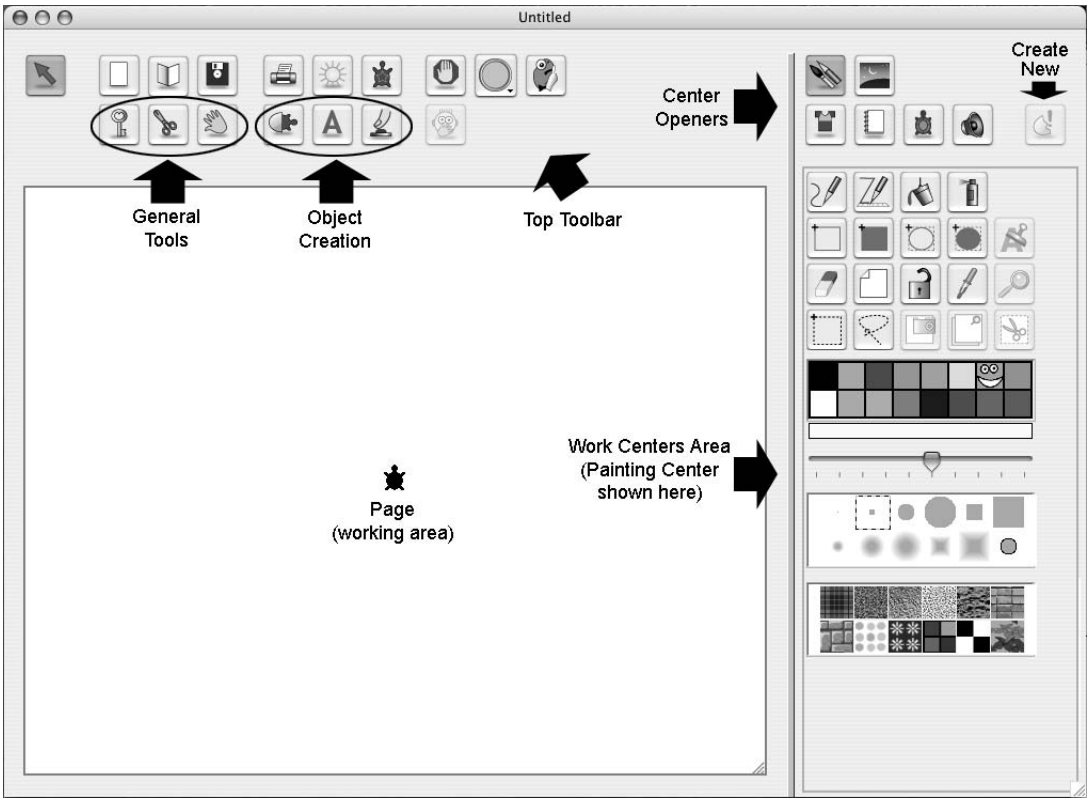
Next, on page 2, students can explain how someone could figure out which house is theirs. For example, they could write "I live on the corner." Or "My house is the one with the yellow windows," or "My house is the third house from the corner."

Students can set their projects to Presentation Mode and present them to their classmates.

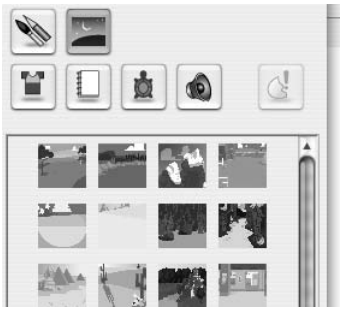
Section III - Reference

This section contains what you need to know to use the software and to complete all the projects in this book. It explains all the various icons and some useful techniques.

The MicroWorlds JR Screen



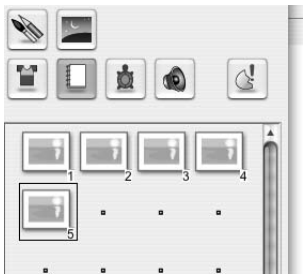
Clicking on one of the Center Openers changes the contents of the Work Centers area on the right side of the screen.



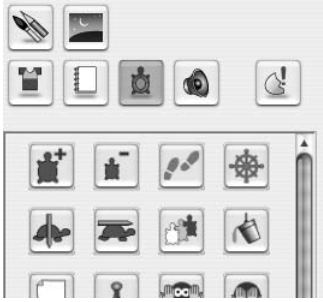
Clicking on opens the Backgrounds Center. This Center contains a collection of backgrounds that you can use on your pages.

Pick the *Grab and Drop* tool in the top toolbar, grab a background image and drop it on the page. You can modify a background on your page using the painting tools.

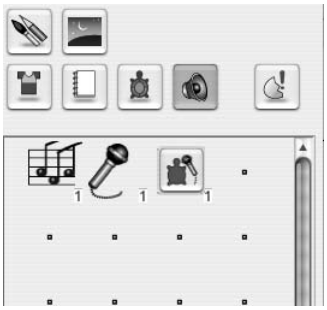
Clicking on opens the Shapes Center. These are all the "costumes" that the turtles can wear. You can also make your own by drawing them manually or pasting graphics taken from other sources. Each shape "button" is a command that sets the turtle to that shape



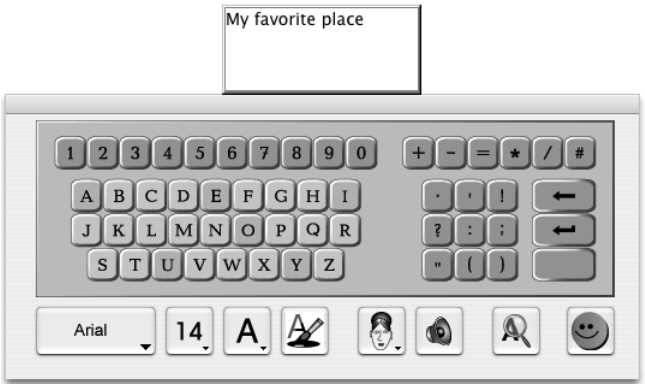
Clicking on opens the Page Center. Here is where you create additional pages for your project. Each page button is a command that opens that page. Page labels can be edited to make them more meaningful.



Clicking on opens the Turtle Commands Center. It contains predefined turtle commands and empty spots (dots) to make your own procedures (set of commands or instruction list - refer to *Making Your Own Procedures*)



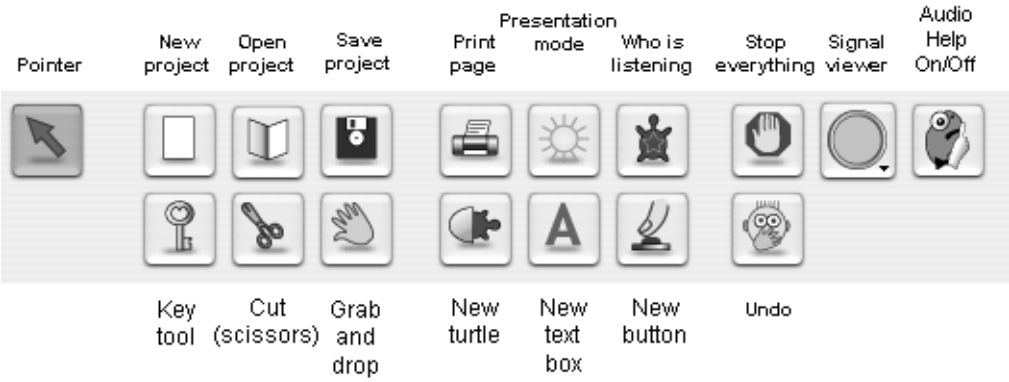
Clicking on opens the Media Center. In this center you create your own recordings or melodies or pick audio or video files from a list. It's also here that you find the buttons for “speakable text” that you create. Each labeled button acts as a command to play the media clip. Button labels can be edited to make them more meaningful



Clicking on then on the page creates a text box. Clicking inside a text box opens the on-screen keyboard. You can use the on-screen keyboard to type letters and numbers, format your text, access the spell checker or make your text “speakable” (enable text-to-speech capabilities).

The Top Toolbar

The Top toolbar contains tools that are always present while working on your projects.



Pointer

Sets the cursor back to the regular pointer. Click on this tool to “get rid” of a tool you don't want - for example if you pick the *Text Stamper* and you change your mind.

The *Normal* pointer is used to:

- Click on “clickable” turtles and buttons;
- Select or move things around on your page;
- Click on different tools in the toolbars and centers;
- Re-enter a text box (click on a transparent text box and it becomes opaque again - click inside the text box to change its contents).

New Project

Opens a new project. A dialog box may open to ask if the current project should be saved or not.

Open Project

Opens a browser window so that you can select a previously saved project to open.

Save Project

Saves the current project to a specified location with whatever name you give it. If the project was previously saved, clicking this icon overwrites the earlier version. If you want to save this version as a new project, select *Save as* in the File menu.

Print Page

Opens the printing dialog box. Select the parameters that you want and click *OK* to print the page. To print the complete project, select *Print Project* in the File menu.

Presentation Mode

Used for demonstrating completed projects. In Presentation Mode, the toolbars, menus, and the Work Centers area are hidden, the project is centered on the screen and the surrounding area is filled. If your project has several pages, you must have a way to go from page to page. See the technique *Switching Pages* in the section *Handy Techniques*.

To get out of Presentation Mode, press the *Esc* key on the keyboard or click twice outside the project area.

Who (what turtle) Is Listening?

Indicates which turtle will follow the next turtle command. The “listening” turtle is also called the *current* turtle. This is very useful if there are multiple turtles on the screen. When you click on this tool, the current turtle gets a red frame. If this is not the turtle that you wish to address, simply click on the turtle of your choice to make it the current turtle. Click on this tool again to get rid of the red frame.

Stop Everything

Stops all running processes. Processes can be an OnClick instruction for turtles (for example, an animation), the instructions of a button, a melody, a sound, etc.

Signal Sender and Viewer

This is a tool and a viewer as well. Light signals can be broadcast by way of different actions or events (by clicking the *Signal* command in the Turtle Commands Center, by choosing a color signal in the *Signal* drop down menu, by clicking a turtle with a signal instruction, etc.) and turtles can be programmed to react to color signals. The signals are a way of sending a message from one turtle to one or more other turtles. When programming color signals, looking at this viewer can help students understand what is happening

As a command: When one or more turtles are programmed to react to a specific color signal, click on this tool and choose that color from the drop down menu to send the "color signal" and test your programmed turtle(s).

As a viewer: When the *Signal Viewer* flashes a bright color for a second, this indicates that a "color" signal is being broadcast. All other times, the *Signal Viewer* is dimmed and set to the color of the last color signal broadcast.

See *Signal* in the section *Turtle Commands* and *OnSignal* in the section *Inside Turtles*.

Audio Help On/Off

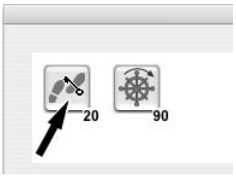
Click on this tool to turn the Audio Help on or off. This does not affect the media buttons that you create in your project.

Key Tool

The *Key* tool "opens" objects so that their contents can be edited. Click on this tool and then on

- A text box to edit the text;
- A turtle or a button to edit its instructions. If the *Key* tool doesn't seem to work, you may be clicking on stamped text instead of a real text box or on a stamped turtle instead of a real turtle;
- A selected area on the page to edit it precisely using the "large view" editor;
- A procedure to edit its instructions, or a blank procedure spot to create a procedure;
- A shape in the Turtle Shapes Center to edit it, or a blank shape spot to create a new shape;
- A page icon in the Page Center to edit its label;
- A Melody in the Media Center to edit it;
- Recordings and prerecorded sounds and melodies in the Media Center to edit their labels

You can also use the *Key* tool if you are looking for a "lost" hidden turtle.
See *Show* in the section *Turtle Commands*.



The key can also be used to edit any command that requires a number as input in a procedure, button, or turtle backpack instruction line. Click the *Key* tool button and then click on any icon in the instruction list that uses a number as input. The dialog box for that command opens and the number can be edited. See the sections *Inside Buttons, Inside Turtles* and *Making Your Own Procedures* further down.

Cut (Scissors)

Changes the cursor to scissors. The *Cut* tool is used for cutting objects, such as turtles, text boxes and buttons present on a page, or pages in the Page Center, media objects in the Media Center or shapes in the Shapes Center. If an object is cut by mistake, immediately click the *Undo* button on the top toolbar to undo the cut.

Grab and Drop

Use the *Grab and Drop* tool to duplicate:

- A shape in the Turtle Shapes Center;
- A page in the Page Center;
- A turtle, a text box or a button on the page;
- An instruction inside a turtle or button dialog box

You can also:

- Grab a text box and drop it on an empty shape in the Shapes Center to create such a shape;
- Grab selected graphics on the page and drop them on an empty shape in the Shapes Center to create a new shape.

When you click on the object that you wish to duplicate, the hand closes, indicating that it has “grabbed” the object. Then, click where you wish to drop the duplicated object, as indicated above.

New Turtle

Click on this tool and then on the page and a new turtle is added to the page. A new page always has one turtle on its page when it is created.

If you need a lot of turtles that won't move, like several trees to make a forest, it may be better to use only one turtle and stamp it several times. Stamped turtles become part of the background and won't be moved by accident. See *Stamp* in the section *Turtle Commands Center*.

There is a lot to say about the turtles and their backpacks. See the section *Inside Turtles* later in this Guide.

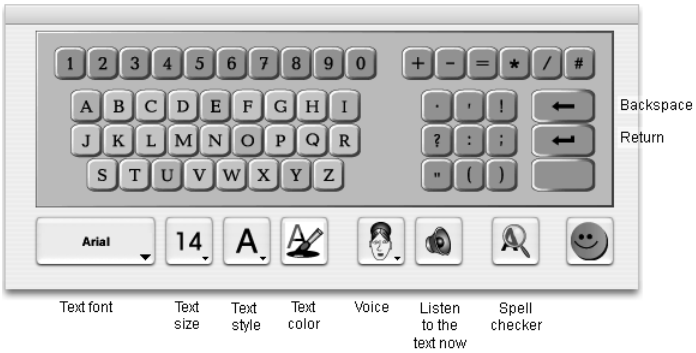
New Text Box

Click on this button and then click (or drag a rectangle) on the page to create a text box. The text box appears with its "handles."

You can resize the text box immediately (drag one of its handles)...

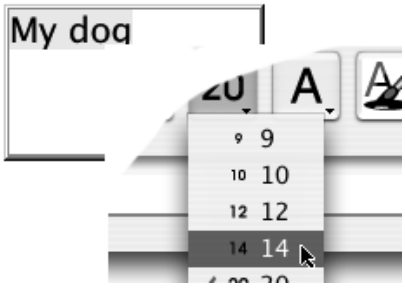
... or relocate it (drag it from anywhere inside the box).

... or, you can simply click *inside* the text box and start typing. Clicking inside the text box gives you a cursor and opens the Text Center. Move it aside if it hides your text box:



You can click the alphabetically arranged letters in the Text Center or use the keyboard to insert characters into the text box.

Using the formatting tools in the Text Center, you can change the text font, size, color or style. To do this, select some or all the text in your text box. Then choose one or more of the options in the Text Center. If no text is selected, any changes appear only in text added after the cursor insertion point.



You can ask MicroWorlds JR to “say” the contents of your text box. When you choose a voice from the Voice menu, text-to-speech is enabled and a media object is created in the Media Center. This media object can be used as a command to “say” the contents of your text box:

Click on  to select a voice and create a media object. Click on  to hear the spoken text immediately.

Note that for the media object to work, you must keep your text box in your project. If you need the media object but you don't want to see the text box, put it on a different page. The media object works throughout the project, even if the text box is on a different page.

Undo

Undoes the previous action. Can be used after a *Cut* operation (with the scissors), a painting action, a text edit or even after most “mouse” actions. For mouse actions, this tool undoes what happened since the last mouse click on a turtle, a turtle command or on a button. The keyboard equivalent is *Command-Z*.

Spell Checker

Once you have typed the text in a text box, you can check the spelling of the text in the current text box if you have Microsoft Word installed on your computer. The spell checker takes the same settings as those already in Microsoft Word. If a word is found that the spell checker cannot identify, the following dialog opens:

If some text is selected, the spell checking is done only on the selected text.

New Button

Click on this button and then on the page to add a user-created button.
The following dialog box appears:

To add instructions inside the button, simply open the center that contains the type of command you want to add, then click on the desired commands. A button can carry:

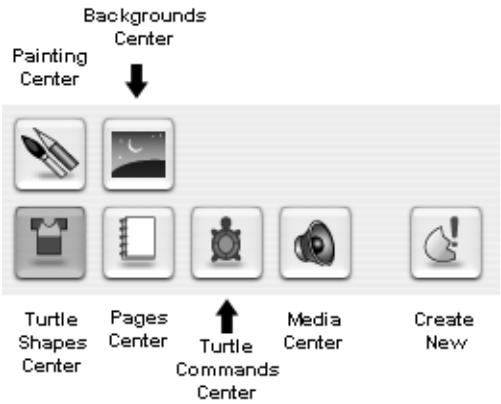
- Turtle commands to act on turtles;
- Page commands to go to a different page;
- Media commands to play sounds, melodies or videos.

Buttons cannot act on text or text boxes, they cannot use the background images from the Backgrounds Center, and they cannot contain any of the functions found in the Painting Center (use turtle commands to draw instead).

There is a lot to say about buttons, See the section *Inside Buttons* later in this Guide.

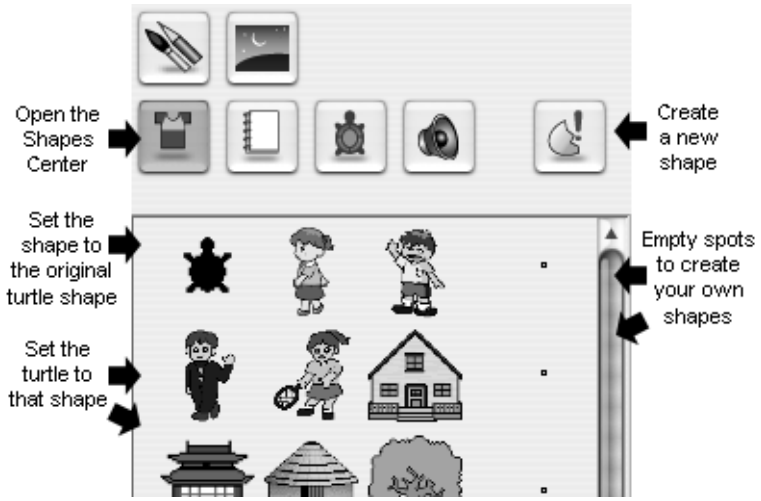
Work Centers

The Center Openers open the many Work Centers in the area on the right-hand side of the page.



Turtle Shapes Center

Clicking on opens the Turtle Shapes Center which contains shape command buttons to set the turtle to one of the predefined shapes, plus empty shape spaces where you can create your own shapes.



You can use the shape commands in direct mode: click on any of them to change the shape of the *current* turtle.

The current turtle is the last turtle you created or on which you clicked. To see which turtle is the *current* turtle, click on the *Who Is Listening?* tool in the top toolbar so that the current turtle gets a red frame. If this is not the turtle you want to be listening, click on the right turtle. Click on the *Who Is Listening?* button again to get rid of the red frame.

You can also use these commands in instruction lines inside turtles, buttons or procedures. For more information about using these commands in instruction lines, see *Inside Turtles, Inside Buttons* and *Making Your Own Procedures,* further down in this Guide.

Shape commands

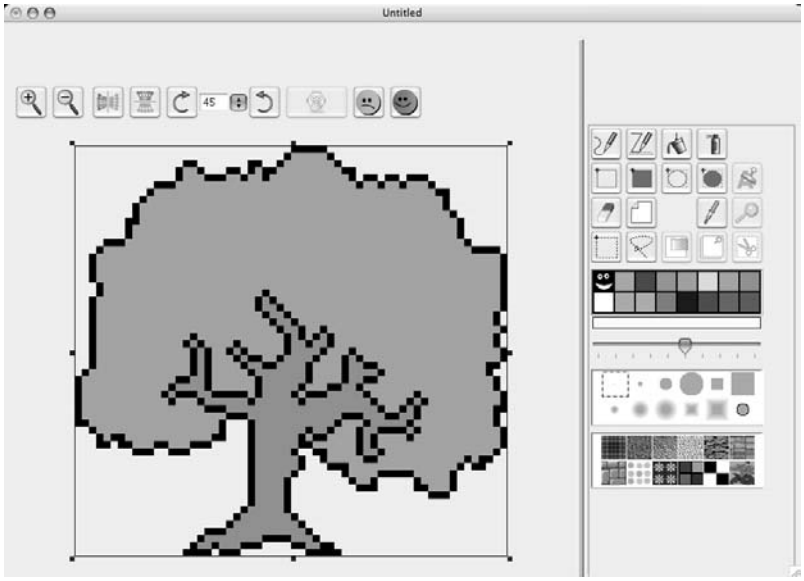
Clicking on any of these shapes instructs MicroWorlds JR to give whatever shape appears in the square to the current turtle. If you click on empty shape spaces, or if you delete the shape that a turtle is currently wearing, the turtle uses the "nil" shape: ☒ .

Clicking on the very first shape of the Turtle Shapes Center sets the turtle on the screen to the original turtle shape. The turtle shape is the only shape that rotates as a turtle turns, indicating in which direction it is heading. All other shapes are like costumes and they always appear as they are in the Turtle Shapes Center, no matter in which direction the turtle is heading. To see in which direction the turtle is heading, set the turtle to the original turtle shape or click on the *Turn* command button.

You can modify the existing shapes, duplicate existing shapes, or create your own shapes.

Modifying existing shapes and creating your own shapes

Pick the *Key* tool and click on any shape, empty or not, to open the Shape Editor. You can also Ctrl-click on the shape or click on it using the right button on a two-button mouse:



Use the painting tools to modify the shape. Note that you can paste in graphics that you copied from outside of the Shape Editor or even from a different application. The easiest method for creating your own shape using graphics copied from elsewhere is to first copy the graphic to the clipboard and paste it onto the page using *Paste* in the Edit menu or Command-V. Then, use the *Grab and Drop* tool in the top toolbar to grab the graphic from the page and drop it onto an empty shape in the Turtle Shapes Center.

In the Shape Editor, drag one of the eight handles (small squares) around the frame to enlarge or shrink the “working area” for drawing the shape (this doesn't change the size of the turtle, only the “drawing area”)

Click on these buttons to zoom in or out on the image. This does not change its size... you will simply see it larger or smaller in the Editor. You may have to zoom out in order to enlarge the shape, or zoom in in order to edit the shape very precisely.

Click on these buttons to flip the shape horizontally or vertically. This is useful when you need a shape facing the other direction.

Click on these buttons to rotate the shape in one direction or the other. Choose the angle from the drop down menu.

Click on *Undo* if you have just made a mistake.
If you can't undo an action (because you have done more actions since then), click on Cancel to exit the Editor without saving the changes you made.

Click on *OK* to save your changes or on *Cancel* to close the editor without saving the changes you made.

Duplicating Existing Shapes

Before modifying a shape, or when you want a shape (such as an animal) to sometimes point in one direction and sometimes in another direction, you may want to duplicate the original shape before editing it. To duplicate a shape:

1) Click on this *Grab and Drop* tool in the top toolbar.
2) Click on the shape that you wish to duplicate . The hand closes, indicating that it has "grabbed" the image.
3) Click on an empty shape space or on a shape you don't mind losing for this project (the shape will be overwritten). You now have two identical shapes. Ctrl-click on one of them to edit it, or click on it using the *Key* tool.

To create a project using your own shapes, refer to the section, *Handy Techniques* at the end of the book.

Turtle Commands Center

Clicking on opens the Turtle Commands Center, which contains turtle commands and empty command spaces where you can create procedures.

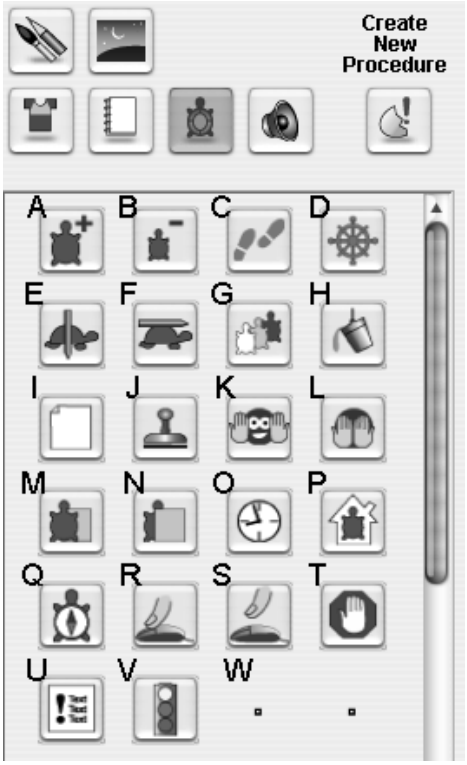
Each of the icons in this area represents a built-in command for the turtle. You can use the turtle commands in direct mode: click on any of them to act on the current turtle. See below for a description of each of these commands.

You can also use these commands in instruction lines inside turtles, buttons or procedures. For more information about using these commands in instruction lines, see *Inside Turtles, Inside Buttons* and *Making Your Own Procedures*, further down in this Guide.

The blank spaces (dots) can be used to create sets of commands grouped together by the user. These groups of commands are called procedures. A procedure is a user created command. It behaves just like built-in commands, except it is only available in the project in which it is created. Refer to *Making your Own Procedures*, below.

Every turtle command icon has a corresponding text command in the MicroWorlds language. Using the names of the iconic commands helps give children a language with which to discuss their actions - a language that's consistent and understood by others. Refer to the section *MicroWorlds JR Commands vs Traditional MicroWorlds Text Commands*.

Some commands work just as is, some others require additional information - input. Clicking on those commands opens a command dialog box in which you can set the input value. The Turtle Commands are:



A: Grow
B: Shrink
C: Step
D: Turn
E: Pen down
F: Pen up
G: Set color
H: Fill
I: Clean page
J: Stamp turtle
K: Show turtle
L: Hide turtle
M: Bring in front
N: Send to back
O: Wait
P: Home position
Q: Head north
R: Click on
S: Click off
T: Stop everything
U: Announce
V: Signal
W: Empty spot for your own procedures

Grow

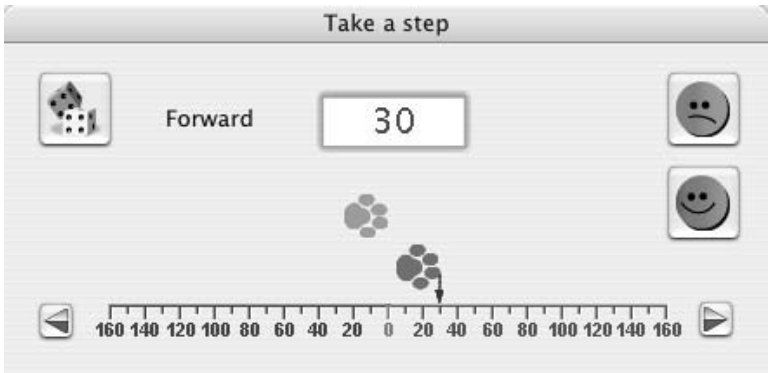
Sets the turtle to a bigger size - makes the turtle larger. This command has no effect if the turtle has reached its maximum size.

Shrink

Sets the turtle to a smaller size - makes the turtle smaller. This command has no effect if the turtle has reached its minimum size.

Step

Moves the turtle forward or backward by the selected step size. Click on the button and the following dialog box opens:



Technical note: One step equals one pixel on the screen.

Slide the dark paw forward or backward to the desired step size or type a number in the box.

Click on the arrows on either side of the scale to increase or decrease the step size by increments of one, or type a number in the white box to set the step size.

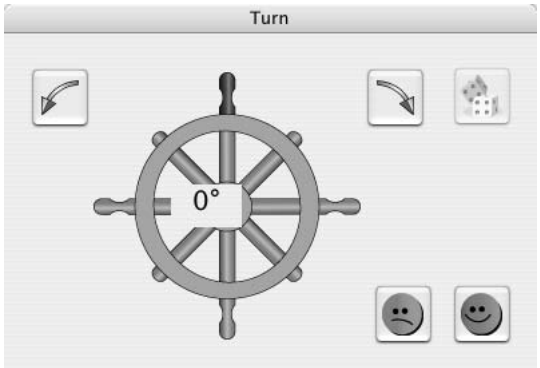
Turtle steps on the scale in the dialog box are the same size as turtle steps on the page. Children can look at this scale to figure out how far they want the turtle

to move. The step-size can be set to a number greater than 160 by typing the number in the white box, but the distance won't be shown on the scale. The paw moves to the far left or right of the screen to indicate a number larger than 160. (To move the paw back to the scale, click on one of the arrows or erase the contents of the number box and enter a number between -160 and 160.) The maximum value is 9999.

To set a random input to step, set the step size to one more than the maximum number you want for the size. Then click the dice to indicate that you want MicroWorlds to pick a random number from all the positive numbers less than the number in the box, including 0. If you set the step size to 50 and click on the dice, the turtle step size will be a random number between 0 and 49, inclusive.

Turn

Tells the turtle to turn or pivot the number of degrees selected. Click on the icon and the following dialog box opens:



When this tool is used in direct mode, the dialog box opens with the red knob heading in the same direction as the turtle is heading. This reinforces the idea that you are about to make an “immediate” turn from the turtle's current heading.

When this tool is used while constructing instruction lines (inside turtles, buttons or procedures), the dialog box opens with the red knob pointing up because there is no way to know where the turtle will be heading when this instruction will be executed. See *Inside Turtles, Inside Buttons* and M*aking Your Own Procedures* below.

Drag the red knob to set how far the turtle will turn. The number of degrees is indicated in the center box. Drag the knob clockwise to set a right turn and drag it counter-clockwise to set a left turn. Click on the arrow keys above the wheel to change the input more precisely.

To select a random turn, set the turn size to one more than the maximum turn size that you want. Then click the dice to indicate that you want MicroWorlds to pick a random number for the turn size from all the positive numbers less than the number in the box, including 0.

Pen Down

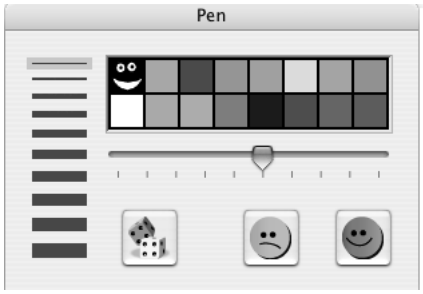
Puts the turtle's pen down. When the turtle moves, it draws a line. The turtle's pen is up when you open a new MicroWorlds JR project. See *Set color and pen size* below.

Pen Up

Picks the turtle's pen up. When the turtle moves, it does not draw a line.
The turtle's pen is up when you open a new MicroWorlds JR project.

Set Color and Pen Size

Sets both the turtle's pen size and the turtle's pen's color. Click on the button and the following dialog box opens:



Click on a color to select it. Click on one of the width lines to set the pen's width. To randomly select a color, click on the dice and click *OK*.

Fill

Tells the turtle to fill the area where it is currently with its current pen color. This is equivalent to the paint bucket in the painting tools but the *Fill* command can be used in an instruction line rather than manually. For example, you can draw a grid on the page and ask the turtle to repeatedly move a random number of steps, pick a random color, and fill a section of the grid.

Clean Page

Clears all the background graphics, including stamped shapes and stamped text. This command does not affect turtles, text boxes (unless they are stamped) and buttons. Any graphics present on the page prior to using Freeze Background are also unaffected. See *Freeze Background* in the section *Painting Tools*.

Stamp

Stamps the turtle's shape onto the background. Move the turtle a bit and you will see the stamped image. Stamped images are just like drawings on the page background. You can edit a stamped image using the tools in the Painting Center.

Show

Shows the turtle if it's hidden.

If you are looking for a “lost” hidden turtle, use the *Key* tool to make all turtles visible temporarily. Open the turtle's backpack using the *Key* tool and when you close the backpack, this turtle will be the *current* turtle. You can now make it visible using the *Show* command.

Hide

Hides the turtle if it is showing.

In Front

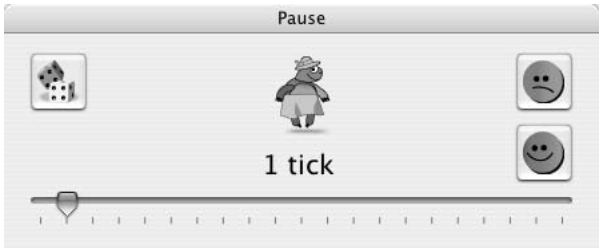
Sometimes when students are using multiple animated turtles in a scene, they want one turtle to be in back of or in front of another. The last turtle created is always in front of the other turtles. Use this command to bring the current turtle in front of all the other turtles.

In Back

Use this command to push the current turtle at the back of all other turtles. A turtle can be pushed behind all other turtles, but not behind the background graphics on the page.

Wait

Causes MicroWorlds JR to pause for a specific number of ticks. Each tick is one tenth of a second. Click on the *Wait* button and the following dialog box opens:



Drag the slider to the number of ticks desired. The turtle pauses between jumps for a length of time equal to the time indicated by the selected number of ticks.

To select a random input for wait, set the number of ticks to one more than the maximum number of ticks you want. Then click the dice to indicate that you want MicroWorlds JR to pick a random number from all the positive numbers less than the number of ticks, including 0.

The results of this command are only apparent when used inside a turtle's instruction, a button or a procedure.

Home

Moves the turtle that's listening (the current turtle) to home position, which is the center of the screen.

Head North

Rotates the turtle so that it is heading up, with its nose pointing to the top of the screen. This is equivalent to the MicroWorlds command *setheading 0* (set heading to 0).

In regular (text-based) MicroWorlds, the input to *setheading* is in degrees. The degrees correspond to those of a compass: 0 degrees is due North, 90 is East, 180 is South, and 270 is West.

The *Turn* command turns the turtle a number of degrees to the right or left, relative to its current heading. *Setheading* makes a turtle point to a specific direction, regardless of its previous heading.

Click On the Turtle

Starts the OnClick instruction for the current turtle (the turtle that is listening to commands). This command has an effect only if the turtle is not already running its OnClick instruction. See *Inside Turtles* below.

Click Off the Turtle

Stops any OnClick instruction that was started by a mouse click on the current turtle (the turtle that is listening to commands). This command has an effect only if the turtle is running its OnClick instruction. See *Inside Turtles* below.

Stop Everything

Stops all processes on the page including animations, media, and button actions.

Announce

Use this command to create an "alert" box. Click on the command and a dialog box opens. This dialog box allows you to create the announcement that will appear in the alert box:

Type in the text that you wish to see in the alert box. Use the leftmost button to check the spelling.

If you wish to have the words spoken when the alert box is displayed, choose a voice by clicking on this button: inside the dialog box (not the one in the top toolbar). Click on the speaker to hear your message immediately.

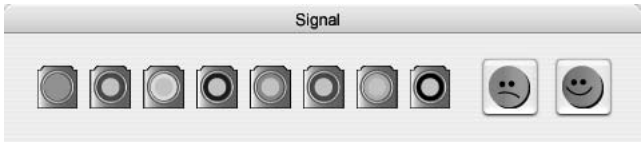
Click the green *OK* button. MicroWorlds JR displays a typical alert box, with or without speaking the text:

It's best to use the *Announce* command in turtle instructions in a turtle's backpack, in a button, or in a procedure. If the *Announce* command is not used in a turtle's backpack, a button or a procedure, the message appears only once immediately after the user closes the *Announce* dialog box. It is *not* saved. The next time the *Announce* command is selected, the dialog box will be empty.

Signal

"Broadcasts" a signal color for the turtles to detect. Turtles can be programmed to react to a color signal that is broadcast. If no turtle is set to detect a signal for that color, nothing happens.

Click on the *Signal* button and this dialog box opens:



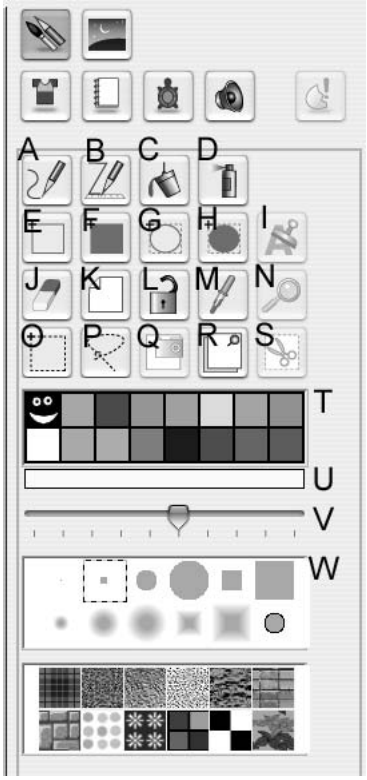
Select a signal color and click *OK*. The *Signal* command broadcasts that color as a message and the Signal Viewer displays that color, flashing it brightly for a second as the message is broadcast. Then, the *Signal Viewer* is dimmed, but still set to the same color as a reminder of which color was the last color broadcast.

This command must be used in conjunction with turtles programmed to react to a color signal. See *OnSignal*, in the section *Inside Turtles* below.

If you wish to send a signal immediately, you can use the *Signal Viewer*'s drop down menu in the top toolbar. However, if you wish to send a signal from within a turtle instruction line, a button or a procedure, you must use the *Signal* command.

Painting Center

Clicking on opens the Painting Center.



A: Pencil
B: Straight line
C: Fill
D: Spray can
E: Rectangle
F: Filled rectangle
G: Oval
H: Filled oval
I: Text stamper
J: Eraser
K: Clean page
L: Freeze background
M: Color picker
N: Edit selected area
O: Selector (rectangle)
P: Selector (lasso)
Q: Copy selection
R: Paste
S: Cut selection
T: Color palette
U: Transparent color
V: Color intensity
W: Brushes
X: Patterns

Pencil

Draws in the selected color or pattern and the current brush. Besides being used to draw directly on the page, the *Pencil* is also used to set a pen size and a pen color for the turtle: select the *Pencil*, a color and a brush type, then click on a turtle on the page. Note that the turtle uses the brush size but not the brush effect (fading edge). Also, a pattern cannot be given to the turtle using this technique.

Straight Line Pencil

Draws a straight line in the selected color and line thickness.

Fill

Fills an enclosed area with the selected color. Use the *Undo* tool to restore an area that you have accidentally filled.

Spray Can

Sprays speckles of the selected color in the selected width.

Rectangle

Draws a rectangle (unfilled) in the selected color and line thickness.

Filled Rectangle

Draws a filled rectangle in the selected color.

Oval

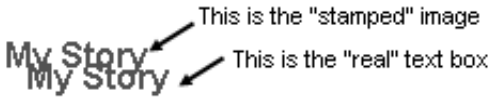
Draws an oval (unfilled) in the selected color and line thickness.

Filled Oval

Draws a filled oval in the selected color.

Text Stamper

Changes the cursor to a text stamper that is used to stamp an image of the text onto the page background. Click on the *Text Stamper* button and then on any text box to stamp an image of its text. The text is stamped exactly where you placed it and the actual text box then moves a little bit lower, to the right.



If you click on the text using the *Key* tool, you see that the lower text is in the text box. You can delete the text box or move it elsewhere on the page to stamp it again, with the same text or different text.

The stamped text (the text that isn't inside the box in the picture above) is now part of the page background. It cannot be edited but it can be moved or erased using tools in the Painting Center or the *Clean Page* command. See the *Painting Center* and the *Turtle Commands Center*.

Eraser

Erases graphics as you drag it across the background, using the selected width. Objects such as turtles, text boxes, and buttons are not part of the background graphics, so they are not erased (If the turtles or text are stamped, they are part of the background graphics and are erased.) Use the *Undo* tool to restore anything you may have erased accidentally. Any graphics present on the page prior to using *Freeze Background* are unaffected. See *Freeze Background* below.

Clean Page

Clears all graphics, stamped shapes and stamped text on the page. Any graphics present on the page prior to using *Freeze Background* are unaffected. See *Freeze Background* below.

Freeze Background

Freezes the background graphics in their current state so they can't be erased. You can still draw over the background and erase the new drawings, but the original background (before freezing) won't be erased.

Color Picker

Picks the color in the graphics background where you click. The color becomes the selected color for painting. The *Color Picker* works only on background images; for instance, it won't detect the color of turtles or the shapes they are wearing.

Edit Selected Area

Used to do detailed editing of a graphic. Select a region of the background with the *Selector*, then click on the *Edit Selected Area* tool. When the editor opens, the selected background graphic is magnified to the maximum size in which it can be completely displayed.

The Selected Area Editor works just like the Shape Editor. See *Modifying existing shapes* and *creating your own shapes* for more information about the Editor.

Selector (Rectangle and Lasso)

Selects a rectangular (using *Rectangle Selector*) or irregular (using *Lasso* tool) area of graphics. Once a selection is made on the page's background, you can:

- Drag the selected area to relocate the graphics elsewhere on the page;
- Use the *Copy selected area* tool, menu item or key combination (Command-C) to “take a picture” of the selected graphics in order to paste them onto a different page, inside a Graphics Editor, or into a different application;

- Use the *Cut Selection* tool, menu or key combination (Command-X) to delete the selected graphics, while maintaining a copy in the clipboard in order to paste them later;
- Click in the area using the *Key* tool or Ctrl-click in the area to open the Graphics Editor, which displays an enlarged view of the selected graphics.

Copy Selection

Copies (takes a picture) of the selected area in order to paste it elsewhere on the page, on a different page, or inside an image editor. An area must first be selected with the *Rectangle* or *Lasso Selector*.

Paste

Pastes on the page or inside the image editor whatever graphics area was previously selected and copied or cut.

Cut Selection

Cuts whatever background graphics have been selected with the *Rectangle* or *Lasso Selector*.

Color palette

Choose a color for the painting tools. Or, pick a color, then click on the Pencil tool and click on a turtle to give it the selected pen color (don't forget to put the turtle's pen down).

Transparent Color

Use this color to draw a transparent color over existing drawings. This color works like the eraser, but it can be used with the various painting tools.

Color Intensity

Before or after choosing a color in the Color Palette, move the slider on the Color Intensity scale to choose a brighter or darker shade for this color.

Brushes

Choose a brush for the painting tools. Or, choose a brush, then click on the *Pencil* tool and click on a turtle to give it the selected brush (don't forget to put the turtle's pen down).

Patterns

Choose a pattern, a brush and a painting tool. Patterns can only be used with the painting tools. You cannot give a pattern to a turtle.

Backgrounds Center

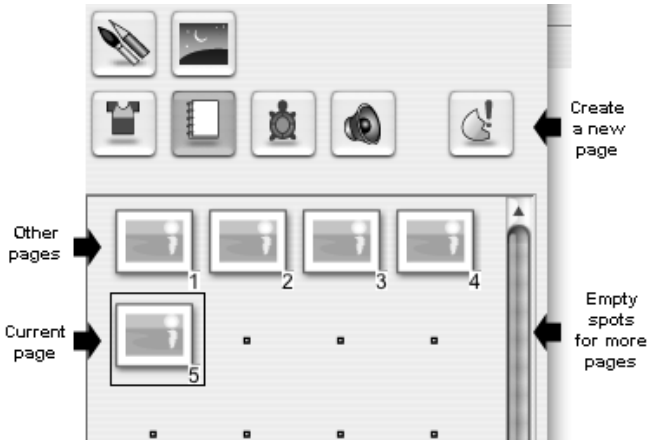
Clicking on opens the Backgrounds Center. This center contains a collection of backgrounds that you can use on your page. A background selected in this center appears on your page just as any drawing you yourself may have created using the painting tools. You can also modify a background on your page using the painting tools.

Pick the *Grab and Drop* tool , grab a background image and drop it on the page.

Page Center

Clicking on opens the Page Center. The Create a *New Page* button creates new pages and the empty spaces are containers for the pages that you create.

In the image below, there are five pages in the project. Click on the *Create a New Page* button to create a new page. Click on a page button to display that page. Click on the page button using the *Key* tool to edit its label.



Note: A project opens on the page that was showing when the project was saved.

Duplicating a page

In a multi-page project, you may want a second page to be just a slight modification of the first one you did (the same background and turtles, for example). Simply duplicate the first page and make the necessary changes on the second page.

1) Click on the *Grab and Drop* tool .
2) Click on the page that you wish to duplicate. The hand closes, indicating that it has “grabbed” the page.
3) Click on an empty square. You now have two identical pages. And you are now looking at the new, duplicated page.

Removing a page

Click on the *Cut* (scissors) tool in the General Tools section of the top toolbar and click in the Page Center, on the button of the page that you want to remove. You cannot remove the last and only page of your project. If you change your mind about removing a page, immediately click the *Undo* tool.

Editing a page label

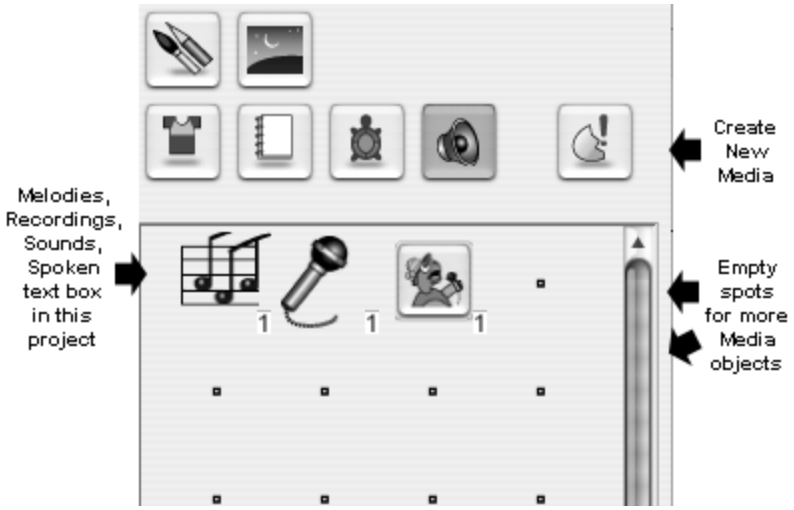
Click on the page button with the *Key* tool or Ctrl-click on a page button to edit its label. The Label Editor allows you to change the appearance of the label representing a page, a sound, a melody or a procedure. Refer to the section *Turtle Shapes Center* for a description of the Editor.

Using page buttons as commands

Clicking on page buttons in the Page Center displays the desired page. It is equivalent to a *getpage* command in traditional MicroWorlds. In addition to this direct method of displaying pages, page commands can be used inside turtles, buttons and procedures to go from page to page, based on user interactions or programmed actions on the page. See *Inside Turtles, Inside Buttons*, and *Making Your Own Procedures* further in the Guide.

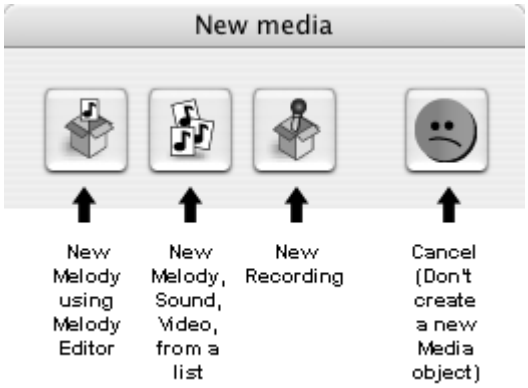
Media Center

Clicking on  opens the Media Center. Use it to create your own recordings or melodies or to choose audio or video files from a list. Here you also find the buttons for “speakable text” that you create. Each labeled button acts as a command to play the audio or video clip. The empty spots (dots) are blank spaces for more media objects. Button labels can be edited to make them more meaningful.



Creating a new media object

Clicking on the *Create New Media* button above the Media Center opens a small dialog box where you can choose what kind of new media object to create:



Click on the first button to create a melody using the Melody Editor, the second button to pick a melody, a sound or a video from a list, or the third button to create a recording using the computer's microphone. Use the fourth (*Cancel*) button if you change your mind about creating a new media object. Each option is described below.

Refer to the section *New Text Box* for instructions about creating the fourth type of Media, spoken text.

Using media buttons as commands

Clicking on a media button in the Media Center plays the chosen recording, sound, melody, video or spoken text. In addition to this direct method of playing media, media icons can be used inside turtles, buttons and procedures, to play media based on user interactions or programmed actions on the page See *Inside Turtles*, *Inside Buttons*, and *Making Your Own Procedures* further in the Guide.

Editing a media object or its label

To modify an existing melody object or its label, click on the media button with the *Key* tool, or Ctrl-click on the melody button in the Media Center. Refer to the section *Turtle Shapes* Center for a description of the Editor.

For a spoken text object, you can modify the media object by changing the contents of the text box to which it is linked. To modify its label, click on the spoken text button in the Media Center with the *Key* tool or Ctrl-click on it.

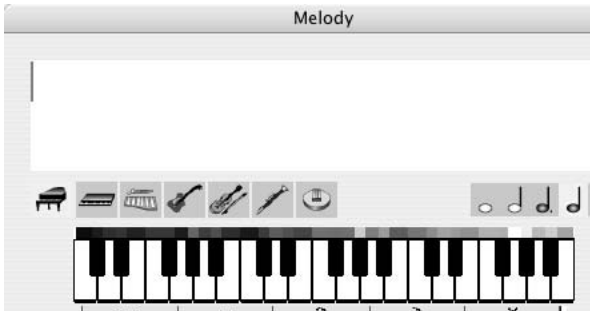
For other types of media (recordings, prerecorded media, video), only the label can be modified. To open the Label Editor, pick the *Key* tool and click on the media button in the Media Center or Ctrl-click on it.

Removing a media object

Click on the *Cut* (scissors) tool in the top toolbar and click on the media button (melody, sound, recording, etc.) that you want to remove. Use the *Undo* tool immediately if you change your mind about this action.

Melody Editor

Clicking on  in the New Media dialog box opens the Melody Editor in which you can create your own melodies on a piano keyboard.



Recording a new melody

Click on the piano keyboard to create a melody. The “score” of the melody appears at the top. You can select notes in the score and delete them, copy them, cut them, or change their duration. You can click anywhere in the list of notes and add new notes by clicking on the piano keyboard.

If you want to play only a section of your score, select those notes in the score, then click on the *Play* button.

To change the duration of a group of notes in the score, first select them, then choose one of the duration notes:  . All of the notes in the selected group change to that duration.

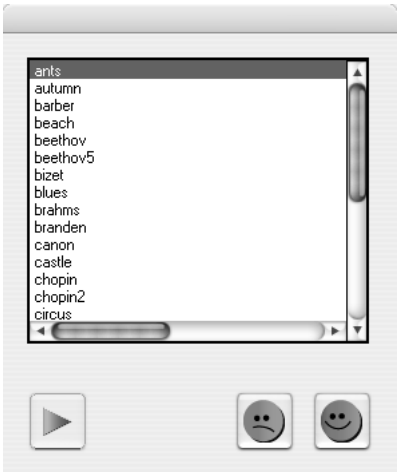
You can also change the tempo and the volume of the melody using these icons:  . A melody can use only one instrument at a time, but different melodies can use different instruments.

After recording a melody, either click on:

- The Label Editor to edit the label for that melody and save it;
- *OK* to save the melody (without changing the label); or,
- *Cancel* to not save the melody.

Prerecorded Sounds, Melodies and Videos

Clicking on in the New Media dialog box opens the Media List dialog box. This opens a special window that lists available sounds, melodies, music files and videos:



Select a media file from the list and click on *Play* to hear it. After selecting a media file, either click on *OK* to save the media object or *Cancel* to not save the media object in your Media Center.

Use the *Key* tool on the media object in the Media Center to change its icon.

Recordings

Clicking on in the New Media dialog box opens the Recording Center, which you can use to record your own sounds (provided that you have a microphone attached to your computer).

Recording a new sound

The *Record, Stop* and *Play* buttons do what their names indicate. If you use the *Record* button more than once while the dialog box is open, the new recording always overwrites the previous one.

After recording a sound, either click on:

- The Label Editor to edit the label for that sound and save it;
- *OK* to save the sound (without changing the label); or,
- *Cancel* to not save the sound file in your Media Center.

Instruction Lines

The preceding section described how to use commands in direct mode by opening the appropriate Work Center and clicking on the desired command to produce an immediate result.

Instructions lines consist of the same commands placed inside turtles, buttons and procedures. There are several good reasons to do this:

- You don't have to remember the sequence of commands that are stored inside the turtle, button or procedure;
- You can run several commands in a predictable order with one mouse click;

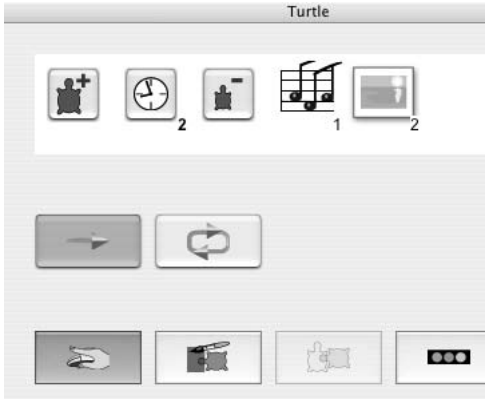
- You can make one event (for example, a turtle crossing over a color) trigger another (the turtle grows) so that it seems like actions are happening “by magic;”
- You don't have to grab the commands each time from the different Work Centers.

The next three sections, *Inside Turtles, Inside Buttons* and *Making Your Own Procedures*, deal with various techniques to use when grouping several commands of any type.

Creating and editing instruction lines

An instruction line can have commands from the Turtle Commands Center, the Shapes Center, the Media Center and/or the Page Center. Turtle and shape commands are used to “give life” to turtles, media commands add audio or video to your project and page commands are used to go from one page to another.

Here is an example of an OnClick instruction line:



If you click on this turtle, it grows, waits a bit, shrinks, plays Melody1 and goes to Page2. The arrow beneath the commands indicates that these instructions are carried out only once. The “finger on a mouse” button highlighted at the bottom indicates that these are OnClick instructions.

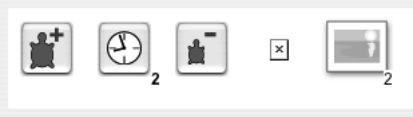
To add instructions to the instruction line, click on commands in the Turtle Commands Center, the Turtle Shapes Center, the Page Center, or the Media Center. You cannot add tools found in the Painting Center or a background from the Backgrounds Center to the instruction line - use turtle commands to draw instead.

The flashing vertical bar in the instruction line is the insertion point. This is where new commands are inserted. You can position the insertion point anywhere on the line to insert new commands or to delete the command that is on the left using the *Backspace* key or to the right using the *Delete* key on the keyboard. You can also use the *Cut* ("scissors") tool to delete commands and the *Grab and Drop* tool to duplicate commands. Finally, you can select one or more commands (by dragging over them as you would for plain text) and use the functions Cut, Copy and Paste from the Edit menu (or their keyboard equivalents) to modify the instruction line as you would do with plain text.

You can also change the input used for commands already in an instruction line. In the example above, there is a "two-tick" wait between the *Grow* and the *Shrink* commands. Pick the *Key* tool in the top toolbar and click on the *Wait* command in the instruction line. Its dialog box reopens and you can set a different value for the number of ticks. You can also use the Ctrl-click key combination to achieve the same result.

Lost commands in instruction lines

An "X" square, like in the following example, indicates that the command that had been there cannot be executed anymore because it has been deleted.



If you compare the last two pictures, you notice that the fourth icon was, in fact, a melody. It is sometimes hard to find exactly what was deleted and in this case, you can either:

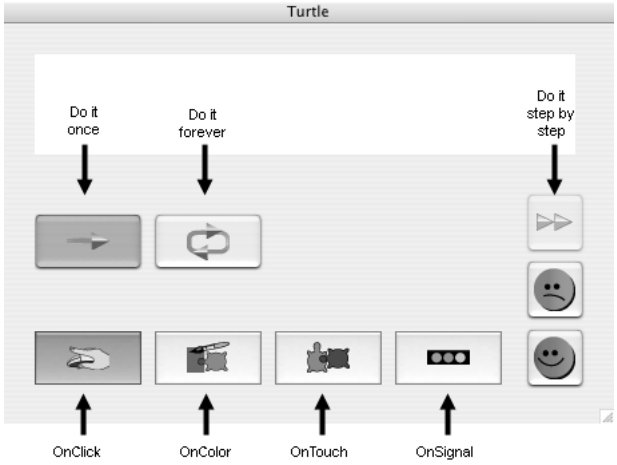
- Recreate the missing elements exactly in the same spot (in this example, recreate a media object in the now empty space in the Media Center where the missing media object was originally), or
- Delete the command from the instruction line (see *Creating and Editing Instruction Lines* above), recreate the command (the melody, in this case) anywhere in the Media Center and reinsert the command in the instruction line (see technique above).

Inside Turtles

The turtle is the central character in MicroWorlds JR. It responds to the turtle commands and can be used to draw, to create animation and to act like a button and start other events.

Each turtle has a backpack in which it keeps its instructions. Pick the *Key* tool in the top toolbar and click on the turtle to open its backpack. You can also Ctrl-click on a turtle to open its backpack.

There are four tabs in the backpack for four different types of action or event instructions:



To add instructions to the instruction line, first select the appropriate tab (OnClick, OnColor, OnTouch, OnSignal) and click on commands in the Page Center, the Media Center, the Shapes Center or the Turtle Commands Center, including procedures that you may have created.

Clicking *OK* saves all the contents of the backpack (all tabs). Clicking *Cancel* cancels any changes made to the backpack since the backpack was opened.

Step by step

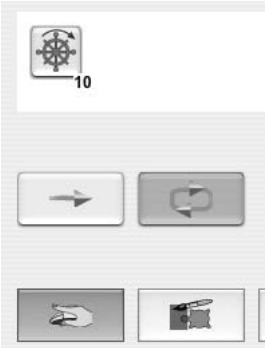
The *Step by step* button in the backpack lets you step through the instruction line one instruction at a time to help debug it. Place the insertion point (the vertical bar) at the beginning of (or anywhere in) the instruction list and click the *Step by step* button.

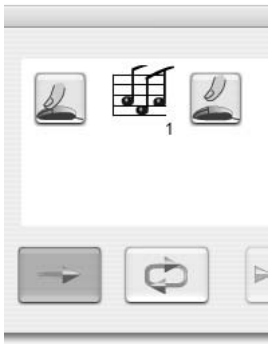
Before doing so, make sure that the turtle who is executing the commands is not hidden by the backpack. If it is, move the dialog box aside by dragging it by its title bar.

OnClick

The instructions in this tab run whenever you click on the turtle. If the tab is set to run forever, the instructions stop running when you click on the turtle again, or when you click on one of the *Stop Everything* buttons in either the top toolbar or in the Turtle Commands Center.

Remember that you don't have to click on a turtle with the mouse to activate its OnClick instruction. There are two commands in the Turtle Commands Center that simulate clicking on and clicking off the turtle. Using these, you can “click-on” or “click-off” a turtle without actually clicking on it with the mouse. The examples below illustrate how you might use these commands:

Turtle: 

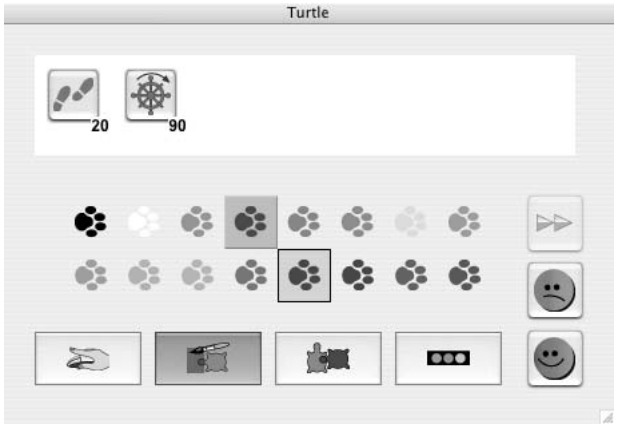
Button: 

If you click directly on the turtle, it spins in one spot forever (notice the *Forever* setting). If you click on the button instead, the button “clicks on” the turtle, plays a melody, and “clicks off” the turtle. In other words, the turtle spins in one spot for the exact duration of the melody. This is a nice trick to synchronize a turtle action and a song.

OnColor

The instructions in this tab run whenever the turtle crosses the selected color on the page background. The turtle does not react to other objects on the page that may be in color, such as text, buttons and other turtles. If you use a background or if you stamp turtles and text, then the stamped images become part of the background and can be detected by OnColor.

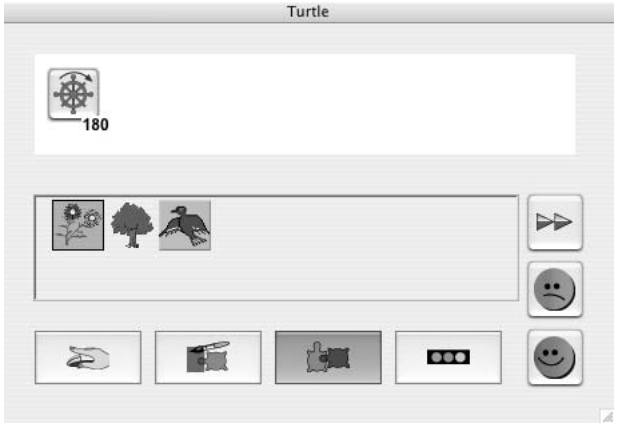
To program an OnColor action, open the turtle's backpack, click on the OnColor tab, click on one of the paws to select the color to be detected (it becomes highlighted) and add commands to the instruction line. You can also click directly on the your drawings, on the page. The turtle can run a different set of instructions for each different color; simply select a different color and create an instruction line for that color. When a color has a list of instructions associated with it, a black frame appears around it. The color that is currently being programmed is highlighted. In the following picture, the displayed instruction line *(Step 20 Turn 90)* is run when the turtle crosses the red color in the top row. There's also an instruction for blue (in the bottom row), but the instruction line is not currently showing.



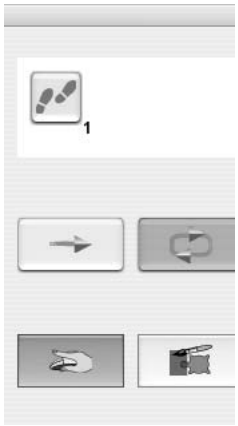
OnTouch

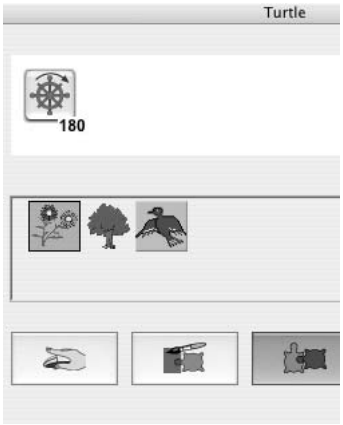
The instructions in this tab run whenever the turtle touches another specified turtle. This tab is not available if there is only one turtle on the page. When the tab opens, the other turtles on the page are displayed below the instruction line area. Choose a turtle from the list or click on the turtle of your choice directly on the page. The instruction line that is showing runs when the current turtle (who owns the backpack) touches the turtle that is highlighted in color in the list below the instruction line. The current turtle can run a different set of instructions for each turtle on the page. When a turtle (one to be touched) has a list of instructions associated with it, a black frame appears around it.

For example, in the following picture, there are three other turtles on the page, one shaped like flowers, one like a tree and one like a bird. The instruction in the instruction line that is displayed *(Turn 180 degrees)* runs when the turtle (the one that owns the backpack) touches the bird. There is also an instruction that is run when the turtle touches the flowers (framed), but this instruction is not currently displayed. You must click on the flowers to see it.



Programming OnTouch instructions only makes sense for moving turtles. The turtle programmed with an OnTouch instruction should probably be programmed to move by itself using *Step* instructions either in an OnClick instruction set to *Forever* mode, or in a procedure with a repeated instruction. In the example below, this turtle has an OnClick instruction to do *Step 1* in *Forever* mode, and it has an OnTouch instructions (for when it touches the flowers) to do *Turn 180* (degrees).





Note that you won't be able to distinguish different “target” turtles if they all have their original turtle shape. Before programming OnTouch instructions, give your turtles different shapes.

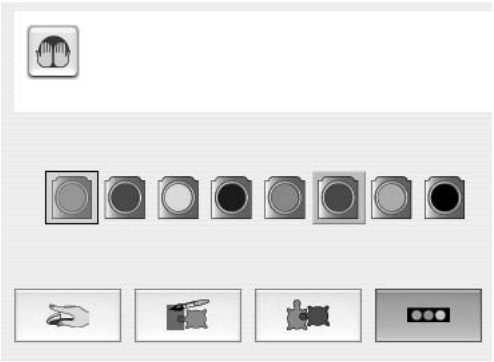
OnSignal

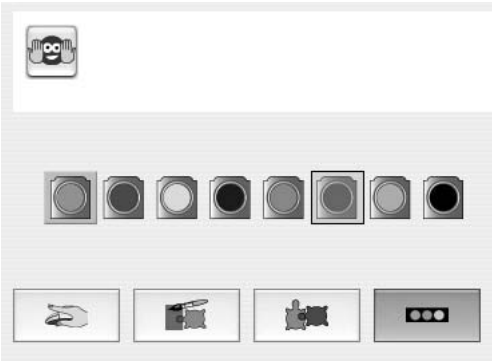
The Signal command in the Turtle Commands Center or in the top toolbar “broadcasts” a color signal. If a turtle is programmed to detect a signal of a particular color, it reacts when that color is broadcast. Several turtles can be programmed to react to one color signal or one turtle can be programmed to react to different color signals.

For example, you can program a turtle shaped like a sun to rise, a turtle shaped like a flower to grow and a turtle shaped like a bird to fly when the signal “red” is detected. All three actions will take place when you use the *Signal* command in the Turtle Commands Center or the one in the top toolbar to broadcast the signal “red”

When a signal is broadcast, the *Signal Viewer* in the top toolbar first displays the color, flashing it brightly for a second. At all other times, the *Signal Viewer* is dimmed but stays set to the color of the last signal that was broadcast, as a reminder.

To see how a signal works, open a turtle's backpack, click on the Signal tab and set its OnSignal Purple instruction to *Hide*. Then click on the green circle and set the turtle's OnSignal Green instruction to *Show*.





In the pictures above, the color circle *with a thick frame* is the color that you are currently programming. The circle with a *thin black frame* indicates that there is also an instruction line for that other color, but it is not the instruction line currently displayed.

Click *OK* to close the backpack. and use the *Signal* command in the top tool bar or the one in the Turtle Commands Center to broadcast different colors: first purple, then green. The turtle should hide and then reappear when you broadcast the green signal. If you make several copies (or clones) of this turtle, they will all react to the signal. This is a convenient method to set several turtles into action.

Inside Buttons

Buttons run instructions when you click on them. While the instructions are running, you can do other things. For example, you can type in a text box or click on other buttons or “clickable” turtles.

A button can be set to run its instruction once or repeatedly .

Click on the *New Button* tool in the top toolbar and click on the page. The button dialog box opens. To add an instruction, open one of the work centers and click on a turtle command, a shapes command, a page command, a media command or a procedure. For example, the following button is used to switch pages. It is set to run its instruction *Once*.

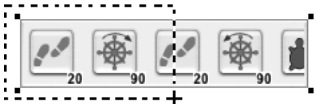
When you click *OK*, a button that shows the instruction icons appears on the page:

Click on the button to run its instructions. If the instruction takes a long time to execute, or if the button is set in *Forever* mode, click on it again to stop it. If the button brought you to a different page (and you can't see it to click it off), you can stop its action using the *Stop Everything* button in the top toolbar.

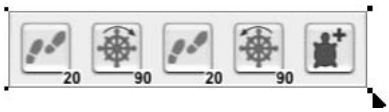
Resizing buttons

If the button is too small to show all its commands, as in this example:

1) Select the button (drag around it) to make its “handles” appear:



2) Then, drag one of its handles:



Note that the button works even if all of its commands are not showing.

To edit the contents of a button, click on it using the *Key* tool or Ctrl-click on it. See *Instruction Lines* above for more information about creating and editing instruction lines.

Making Your Own Procedures

MicroWorlds JR comes with a set of built-in single action commands; for example, *Step, Turn, Pen up, Stamp,* etc. You can also create your own procedures. Procedures work like built-in commands but they can do several actions, depending on how many commands you include in them. The other difference between a procedure and a built-in command is that a procedure works only in the project in which it is created.

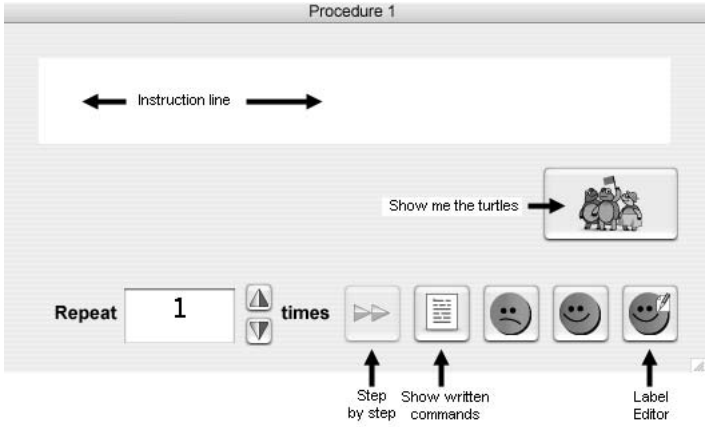
A procedure is a command created by a user. It is an organized list of commands designed to provide an easy, one-button (or one-word) command for a sequence of commands that will be used frequently. Since a procedure acts like a built-in command, it can also be included in other procedures. A procedure that is included

in another procedure is referred to as a *subprocedure*. A *superprocedure* is the procedure that uses (or "calls") a *subprocedure*.

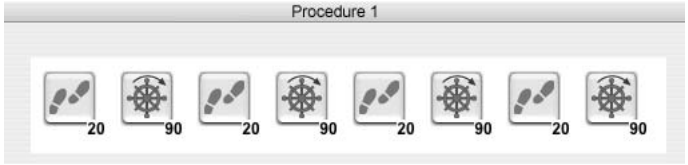
For example, instead of clicking on eight commands to create a square, you may want to create a *Square* procedure that draws a square with just one user-created command.

Open the Turtle Commands Center and click on the *New Procedure* tool:

The following dialog box appears.



Click on the series of commands that you want to use in your procedure, in the order in which they should be executed. For example:

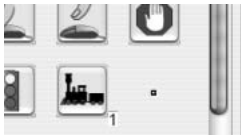


After creating your instruction line, click on either:

- The Label Editor to edit the label for that procedure and save it;
- *OK* to save the procedure (without changing the label); or,
- *Cancel* to not save the procedure.

Note that you can edit the label later by clicking on the icon with the *Key* tool or by Ctrl-clicking on the icon in the Turtle Commands Center.

Your Turtle Commands Center now may look like this (the new procedure is indicated). In this example, the default label has not been modified:



Click on the procedure to try it!

Editing a procedure

To edit the contents of a procedure, click on it using the *Key* tool  or Ctrl-click on its icon.

See *Instruction Lines* above for more information about creating and editing instruction lines.

Repeating the instruction line

You may want a series of commands repeated more than once. If that's the case, change the number in the box next to the word Repeat:

Step by step

The *Step by step* button in the procedure dialog box lets you step through the instruction line one instruction at a time to help debug a procedure. Place the insertion point (the vertical bar) where you want to begin debugging - either at the beginning of or anywhere in the instruction list - and click the *Step by step* button.

Before using the *Step by step* button, make sure that the turtle who is executing the commands is not hidden by the dialog box. If it is, move the dialog box aside by dragging it by its title bar.

Removing a procedure

Click on the *Cut* (the "scissors") tool in top toolbar and click on the procedure in the Turtle Commands Center that you want to remove. Use the *Undo* tool immediately if you change your mind about this action.

Duplicating a procedure

You may want a second procedure to be just a slight modification of the first one you did (for example, you may want a big square procedure and a little square procedure). Simply duplicate the first procedure and make the necessary changes in the second procedure.

1) Click on the *Grab and Drop* tool .
2) Click on the procedure that you wish to duplicate. The hand closes, indicating that it has "grabbed" the procedure.
3) Click on an empty command space. You now have two identical procedures. Click on the new procedure with the *Key* tool to edit it.

Linking a procedure to a specific turtle

If a procedure is not linked to a specific turtle, the *current* turtle executes the commands. The *curren*t turtle is the last turtle that you have created or the last turtle on which you have clicked. So, any turtle may execute the command as long as it is the *current* turtle.

If there are several turtles on the screen, there are two ways you can specify which turtle will run the procedure.

After the procedure is defined, click on one of the turtles on the screen (it becomes the *current* turtle) and then click on the procedure icon. The turtle on which you clicked runs the procedure. Another time, you may decide that you want another turtle to run the procedure. All you need to do is click on the other turtle (it becomes the *current* turtle), click on the procedure button, and the second turtle runs the procedure.

You can link a procedure to a specific turtle. In this case, that turtle, and only that turtle, will always be the one to execute the turtle commands contained in that procedure.

To link a turtle to a procedure:

1) Click on the *Show me the turtles*  button in the procedure's dialog box.
2) A “list” of all available turtles appears. It may look like this (Note: If several of your turtles have the same shape, you won't be able to tell which is which. It's a good idea to set your turtles to different shapes or colors.):

3) Click on the turtle that will always run this procedure. It will become highlighted.
4) Click *OK* and try your procedure. Create a new turtle and try the procedure again. Only the turtle you selected in the procedure's dialog box should run the procedure

Important: If you link a procedure to a turtle and you later delete this turtle, your procedure loses its link. It becomes a “general” procedure and its turtle commands will be executed by whatever turtle is the current turtle.

Looking at your procedure as text

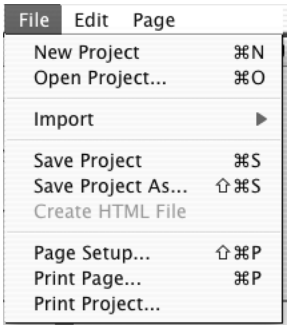
To see the list of text commands that are used in the procedure, click the *Show written commands* button .

You will see a list of all the commands, in the order in which they appear in the procedure. You can then flip back to the iconic view using the *Show Iconic Commands* button.

You can also use the written commands side to write procedures using MicroWorlds commands. If you write a procedure with text commands, you cannot flip to the iconic view. In fact, if you make any changes, even slight ones, in the text, you cannot flip back to the iconic view. If you wish to prevent students from accidentally going to the Text mode and getting stuck there, you can disable the *Show written commands* button in the Preferences Panel. See *Preferences* in the *Introduction* for instructions.

Menus

File Menu



New Project

Opens a new project. If there is an open project already on the screen, you'll be asked if you want to save it first. You can resize a new project immediately after creating it (but not once anything has been added to it).

Open Project

Opens a dialog box where you choose which project to open. If there is already an open project on the screen, you'll be asked if you want to save it first.

Import Media

Opens a dialog box where you can choose a music, sound or video file and places the appropriate icon in the Media Center. This is equivalent to clicking on New Media Object in the Media Center. Note that you can also drag and drop media objects from the Finder.

Picture

Opens a dialog box where you can choose a picture file and places it on the page as part of the background graphics.

Save Project

Saves any changes you've made to the project.

Save Project As

Opens a dialog box where you choose a new location and/or name for your project.

Create HTML File

Creaes a file that contains the HTML code needed to view your project in a web browser. See *Posting Your Projects on the Web* in *Section IV - Handy Techniques*.

Page Setup

Opens a dialog box where you can choose the paper size and other printer details before you print.

Print Page

Opens a dialog box to print the contents of the project page. The page will be printed just as it appears on the screen. If a text box contains more text than is visible, only the text you see on the screen will be printed. Choose *Page Setup* before printing.

Print Project

Opens a dialog box to print all the pages in your project. Choose *Page Setup* before printing.

Exit

Exits MicroWorlds JR. If you have made changes to the current project, you'll first be asked if you want to save it.

Edit Menu

Undo

Undoes the last text editing operation, painting action, or deletion of page elements (buttons, for example).

Cut

Cuts the selected text, graphics, or MicroWorlds JR object on the page and puts it in the Clipboard, ready to be pasted elsewhere.

Copy

Copies the selected text, graphics, or MicroWorlds JR object and puts it in the Clipboard.

Paste

Pastes the contents of the Clipboard. Paste only works if the contents of the Clipboard are of the right type for the current location (for example, you can't paste graphics in a text box).

Select All

Selects all the objects on the page, including those that are not visible. If the cursor is inside a text box, all the text is selected.

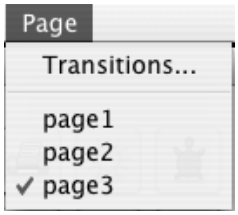
Clear

Clears whatever is selected. If the cursor is in a text box, the selected text is erased. If objects (buttons, turtles, text boxes, etc.) are selected, they are removed.

Stop All

Stops all running processes, including repeating processes launched by buttons and clicked turtles, music and sounds.

Pages Menu



Transitions

This menu item allows you to select a transition for displaying the current page. Your project must have more than one page for this to work. For example:

- Create a second page in your project if you don't already have one.
- Choose *Transition* in the Pages menu.
- Choose a transition from the list in the Transitions dialog box and click OK.
- Go to the first page, using the buttons in the Page Center.
- Go back to the second page, the one that was showing when you chose a transition. You should see the transition as the page opens.

Page1

All pages in the current project are listed in the *Pages* menu. Selecting a page displays it. A project opens on the page that was showing when the project was saved. Clicking a page name in the menu is the same as selecting a page icon in the Page Center.

Section IV - Handy Techniques

Switching Pages Using Some Magic

The first and obvious method for going from page to page consists of using the buttons in the Page Center or the page list in the Pages menu. Another choice is to include page switchers directly on your pages. This adds a nice touch to multi-page projects and solves any page-switching problem that may arise when in Presentation Mode.

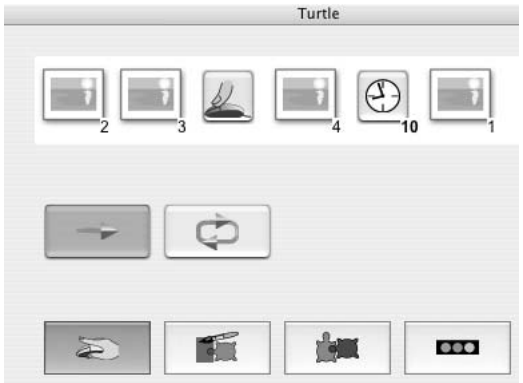
Here are a few techniques that let you switch pages without using the Page Center or the Pages menu.

Using a Button

This button, placed on Page 1, makes a slide show that comes back to Page 1 at the end. You can include a *Wait* command anywhere in the instruction list.

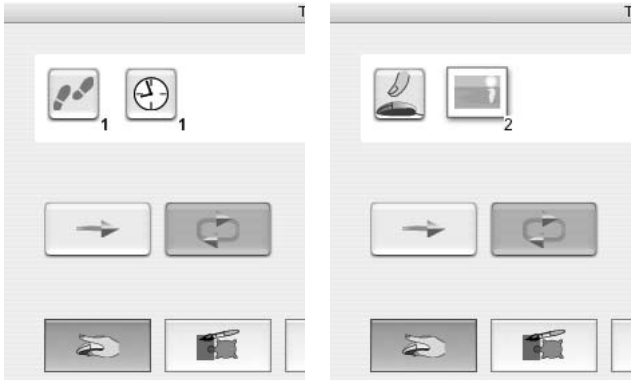
Using a Clickable Turtle

If you need something nicer than a button, you can create a clickable turtle wearing a pretty shape. Clicking on this turtle, located on Page 1, goes to Page 2, simulates a click on the turtle on Page 2 (for example, it animates when clicked), goes to other pages, waits a bit and comes back to Page 1.



Using Color Detection

In this example, the page switch occurs when the animated turtle on Page 1 runs over the light blue color. Its OnClick instruction says *"Step 1 Wait 1"* in *Forever* mode. Its OnColor instruction says *"Click me off and Go to Page 2"*. You want to click this turtle off before leaving Page1, because, otherwise, it keeps running and crosses over the light blue color again and again ... you will forever be brought to Page 2 if you don't click it off!



Creating Your Own Templates

The *Preferences* menu item in the MicroWorlds JR menu lets you tailor what MicroWorlds JR displays when it starts.

The Templates provided with the software are MicroWorlds JR projects that contain different sets of shapes. These Templates can be used to create themed activities. To use these Templates, select one in the drop down menu in the Preferences Panel. Then restart MicroWorlds JR or simply click on the New Project tool. From then on, all new MicroWorlds JR projects open as Untitled projects containing the features that are present in the project used as the template. Because the project is Untitled, the original template will not be overwritten. Students must choose a name and a location to save their projects.

Note that you can add your own templates to the list of available templates. Simply create a project with the shapes, turtles, procedures, text - whatever features you wish, and save it in the Templates folder inside the MicroWorlds folder. Reopen the Preferences Panel; your template should be listed in the drop down menu.

See *MicroWorlds Jr Templates and Preferences Panel* in the *Introduction*.

Using Your Own Shapes in a Project

Sometimes you may want students to create a project using only shapes you've pre-selected for them or no shapes at all. In order to do this, you should open a new project and create the shapes you want to use. You can either use the shape editor to create shapes or you can import pictures into MicroWorlds JR. For example, you may want to create a project using photos of the faces of all the children in class as shapes.

In order to do this, you must paste the pictures into empty shape spaces.

Delete any shapes you do not want to use.

To create new shapes from imported pictures:

1) Select *Import picture* in the *File* menu or copy a picture from a different application and paste it on the page background;
2) Select all or a part of the picture using the *Selector* in the Painting Center. While the selection is active (with the four "handles" at the corners), take the time to resize the selection if it is not the right size for the shape you wish to create;
3) Pick the *Grab and Drop* tool in the top toolbar and click on the selected image to grab it;
4) Open the Shapes Center and click on an empty shape or a shape you don't mind losing.

Save the project in the Templates folder, as described above.

Posting Your Projects on the Web

The technique described below allows you to post your projects on the web and make your projects viewable using a recent Web browser and the free MicroWorlds EX Web Player (a plug-in for your Internet browser). The technique consists of saving your project and then creating an HTML file for that project. The HTML file is truly a web file that contains the HTML code required to call up the MicroWorlds EX Plugin and the designated project from your Web browser.

First, visit www.lcsi.ca to download the latest MicroWorlds Web Player for your operating system. Then follow these steps:

1) Create a project and make sure it is perfectly debugged before saving it.
2) Save your project, using only lowercase letters in the name.
3) Choose *Create HTML File* from the File menu. MicroWorlds JR saves a file that has exactly the same file name as your project, but with the extension .html. For example, if your project was saved under the name myproject.mj3, *Create HTML File* saves a file called myproject.html in the same location where the actual project was saved.
4) Locate the HTML file and double-click on it to test it by viewing it in your Internet Browser.
5) If everything works well, post both files (the project file and the HTML file) on your web site, and create a hyperlink that points to the HTML file (myproject.html in the example).

Some recommendations for projects to be posted on the Web

- Use buttons and clickable turtles to run your programs as well as to change pages in the project, since there is no Pages menu.
- Avoid including videos, or any lengthy recordings in your projects because they will dramatically increase the project size and this will severely impact the time required to download the project over the Web. User created melodies (even long ones), very short recordings and short WAV and MIDI files are OK. No matter what you choose to include, we suggest that you verify the size of your project from the Finder (Get Info) before posting it.
- Remember that on the Internet, it is better to use lowercase letters for all file names, including extensions. We recommend that you use only lowercase letters when saving your project.
- Finally, since the Internet is not specific as to system configuration, the following tip will help you make your project compatible with different hardware configurations/platforms: If your project has text boxes (used as labels or decorative text), stamp the text with the stamper to make it part of the background graphics, then delete the text box. In this way, the font/color/size will remain the same on any system even if the other system does not have access to the font settings you used.

Section V - MicroWorlds JR Commands vs. Traditional MicroWorlds Text Commands

All of MicroWorlds JR concepts and commands have a traditional MicroWorlds counterpart. One way to visualize the correspondence is to include the commands in procedures and use the *Show written commands* button in the Procedure dialog box.

Following is a list of turtle commands as they appear in MicroWorlds JR and their text equivalent in the traditional MicroWorlds language.

	setsize size + 5
	setsize size - 5
	forward (fd) *number (*or *random number)*
	back (bk) *number (*or *random number)*
	right (rt) *number (*or *random number)*
	left (lt) *number (*or *random number)*
	pd (pen down)
	pu (pen up)

	setcolor (setc) *number (*or *random number)*
	fill
	clean
	stamp
	st (show turtle)
	ht (hide turtle)
	inFront
	inBack
	wait *number*
	home
	setheading (seth) 0
	setshape 0 (in the Shapes Center)
	clickon
	clickoff
	stopall
	announce
	broadcast