IMAGINELOGO
Primary work book

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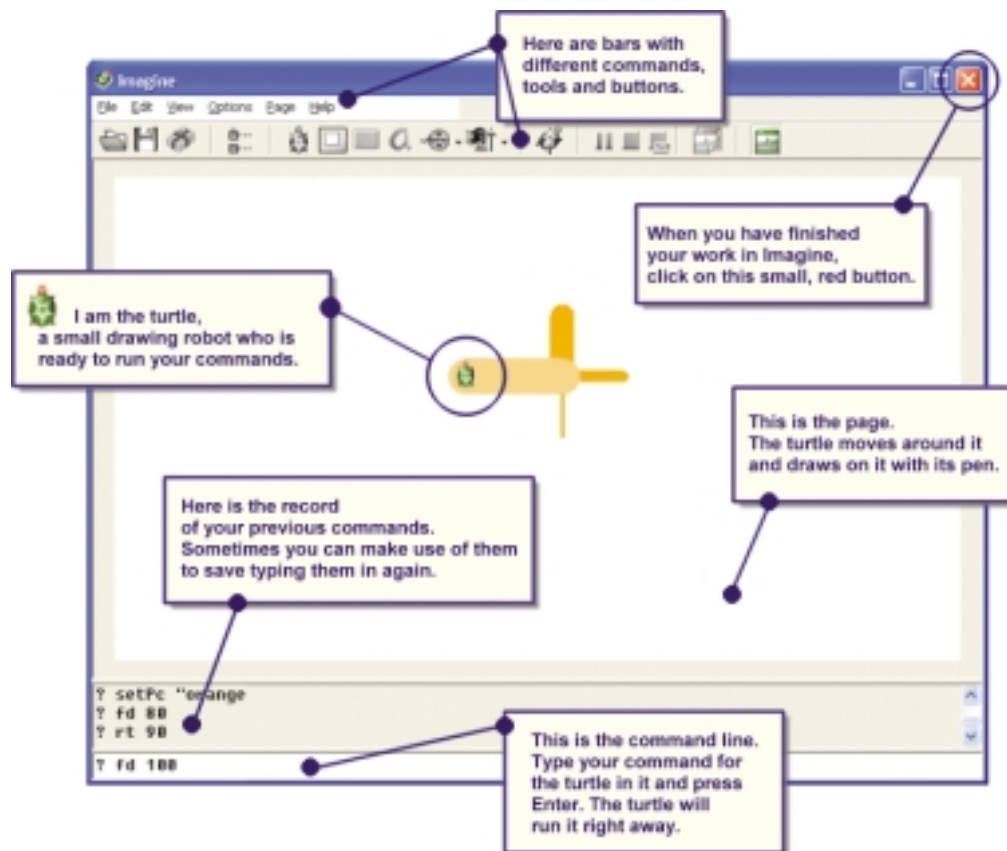
IMAGINE LOGO PRIMARY WORKBOOK

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All the extra Logo project files for this workbook can be found on our Website at www.logo.com/imagine/workbooks. You will need to download these examples before working through the exercises in this book.

For all your Imagine Logo work a useful photocopy help sheet can be found on the inside back cover of this book

Imagine Logo Primary Workbook

Look at your computer desktop for this pair of icons – the pair of turtles. Click on the green one using the mouse and press `Enter` on the keyboard. This lets you enter the land of Imagine Logo. Imagine Logo is a program developed for children, students and their teachers to help them **learn how to explore and discover using a computer**.

Your friend and guide through this land will be the turtle – a small **drawing robot**, which lives inside a white page in your computer. The turtle sits and waits for your commands to tell it where it is to move, how it is to turn, which pen colour it should use for drawing and so on.

To talk to the turtle you will make use of the **Logo scripting language**. You will learn which words and sentences are understood by the turtle and which are not. You will learn the language of the land of Imagine Logo, the land of ideas and discoveries, the land of thoughts, explorations and the joy of your own success.

Initially you will think that the land of Imagine Logo is just a simple sheet of paper with a drawing robot living inside it. Soon you will notice that the turtle is quite willing and skilful – it will move and draw according to your own commands. And shortly after that you will find that it is very smart and easy to teach. You will find out how much you can teach it and how much you can learn whilst doing so.

You will learn that in many drawings a certain pattern or move is repeated many times. You will also find out how to teach the turtle **new commands.**
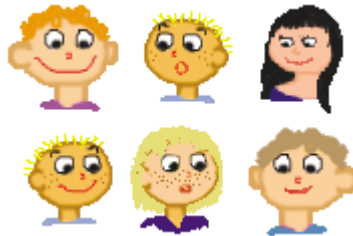
You will start **combining** simple commands into more complex ones. You will draw squares, triangles, circles... You will turn the turtle's pen on and off.

You will find that the turtle notices certain **events** and **reacts** to them according to your instructions. Such events are `onClick`, `onDrag` and others.

You will create **more turtles**. You will teach one of them to draw simple stars whilst being dragged, another one to draw unusual stars... and the third one to stamp a funny cottage when clicked.

You will turn the turtles into the heads of children. You will learn how to **address** them with different commands.

The shape of a turtle can be a character that **lives** in the page – it may move its feet, it may jump or fly. You will combine such characters into your own game.

You will learn to define your own **commands with variables**, to make a `tree` of variable height, a `square` of variable colour or with variable pen width. You will create your own colouring book.
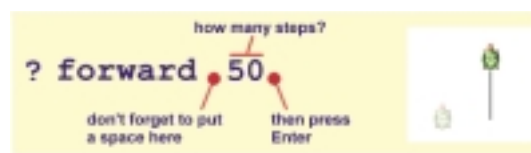
You will build a living picture with turtle-boats, turtle-houses and turtle-balloons. You will teach the turtles to examine the colour of the background and **decide** their next actions depending on the result.

You will build your own games with turtle-letters. You will teach the turtle to make more complex decisions and react in different ways.

Forward and back, right and left

The turtle sits in the centre of the page and waits for your commands. If it understands a command, it runs it right away. An example of a command is `forward` to make the turtle move. Type in the command line:

The turtle moved forward by `50` steps. Now type in `right 90` and press `Enter` again – the turtle will turn right by `90` degrees. Type in `back 20`, then `left 45` and `back 20`. Remember to press `Enter` each time.

how many steps?

? forward 50

don't forget to put a space here   then press Enter

? right 90   ? back 20   ? left 45   ? back 30

HOW TO CLEAR THE PAGE

You will run many experiments with simple commands and the empty page will quickly get covered with lines. You can clear it using the command:
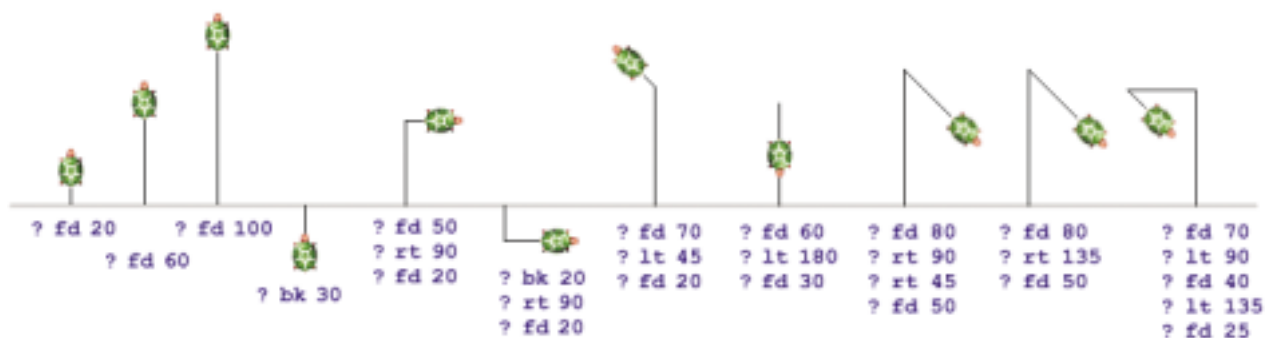
? clearScreen

Imagine Logo will then clear the page and move the turtle back to the centre. It will also turn it to face upwards.

LONG WORDS AND SHORT WORDS

Fortunately, the turtle understands some short versions of words. Instead of `forward 50` you can type in `fd 50`. Some other commands have short versions as well:

forward 50 ► fd 50
back 30 ► bk 30
right 45 ► rt 45
left 90 ► lt 90

Read the following commands and make sure that you understand everything. Use `clearScreen` after each experiment.

? fd 20   ? fd 100   ? fd 50   ? fd 70   ? fd 60   ? fd 80   ? fd 80   ? fd 70
? fd 60   ? rt 90   ? lt 45   ? lt 180   ? rt 90   ? rt 135   ? lt 90
? bk 30   ? fd 20   ? bk 20   ? fd 20   ? fd 30   ? rt 45   ? fd 50   ? fd 40
? rt 90   ? fd 50   ? lt 135
? fd 20   ? fd 25

Pen width

The turtle's pen can have different widths. If you want to change its width from `1`, use `setPenWidth`, or `setPw` for short:

? setPw 10

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

The thinnest pen is 1, then you have 2, then 3... Note that lines drawn in widths of 5 or more have rounded ends. You can also obtain interesting drawings if you use a very thick pen, like `setPw 50` or `setPw 100`! You may also let Imagine Logo itself give you a choice. Type `setPw` and press F9:

? setPw + F9

A `Line Widths` **helper window** will open. Choose a pen width and click on the [Do it] button.

To get back to the basic pen width, type in:
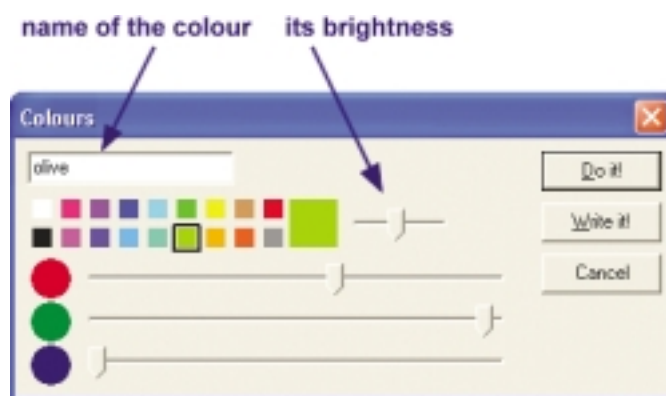? setPw 1

Exercise: Alternate two different pen widths and make the turtle draw the following pictures:

Pen colour

In addition to different widths, the pen may also have different colours. To change the pen colour, make use of the `Colours` **helper window**. Type `setPenColour`, or `setPc` for short into the command line and press F9:

? setPc + F9

In the `Colours` helper click on one of the colours. Use the slider to set its **brightness** and click on the `Do it!` button. Type in your next command, like `fd 100` to see the result. If you can remember the names of colours, type `setPc` and instead of using the F9 key type in a **space**, **a double quotation mark** and **the colour name itself**.

? setPc "olive
? setPc "olive4

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In the `Colours` **helper** Imagine Logo offers you these colours. Use their names either without any number at the end, or with a number between 1 and 12 at the end. Always put a double quotation mark in front of the colour name.

white	magenta	purple	blue	cyan	green	yellow	taupe	red

black	pink	darkBlue	paleBlue	darkGreen	olive	orange	paleRed	grey

Exercise: Explore the following drawings. Experiment with different pen widths, pen colours and rotations of `rt 90` and `lt 90`

```
? setPw 11
? setPc "blue
? fd 100
? rt 90
? fd 20
? rt 90
? setPc "paleRed
? fd 100
? lt 90
? fd 20
? lt 90
? ...
```

Exercise: Sometimes it is interesting enough using just two colours, one of which is `white`!

To create the left-hand picture, we used `orange5` and pen width `30` to draw `fd 60`. Then we reset the pen colour to `white` and pen width to `5` to draw `bk 60`. Try this for yourself.

RANDOM COLOURS AND WIDTHS

The `setPc` command expects you to specify a colour, for example `setPc"blue8`. The `setPw` command expects to get a pen width. However, you can also use a magic word to specify **any random colour** or **any random width**.

```
setPc any - set any
               random pen colour
setPw any - set any
               random pen width
```
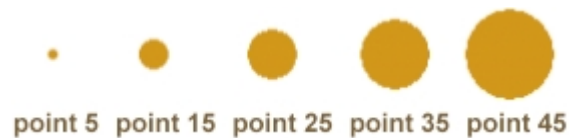
Try this:
```
? setPw any
? setPc any
? fd 100
? rt 90
? setPw any
? setPc any
? fd 90
? rt 90
? ...
```

COLOUR POINTS IN LOGO PICTURES

Type `point`, a space and then the size of the point to be drawn by the turtle – in its current pen colour.

point 5   point 15   point 25   point 35   point 45

Create this drawing. Start by:
```
? rt 90
? setPc "orange1
? point 50
? fd 35
? setPc "orange2
? …
```

Exercise: The following three programs have got mixed up, so now you do not know which one draws which picture. Look at the drawings, read the programs carefully and then match them correctly.

```
? setPc "purple        ? setPc "black         ? setPc "red5
? setPw 17             ? setPw 5              ? point 100
? fd 70                ? fd 50                ? setPc "yellow8
? bk 35                ? setPw 11             ? point 70
? rt 90                ? setPc "red
? fd 40                ? rt 30
? lt 90                ? fd 50
? fd 35                ? lt 120
? bk 70                ? fd 50
                       ? lt 120
                       ? fd 50
```

Exercise: You want the turtle to draw these pictures. Look at them carefully and find the correct commands.

OTHER HELPERS

Imagine Logo provides you with helpers to set not only colours and widths but angles, distances and other things as well. Type the name of a command, like `rt` and press `F9`. A **Turn** helper will open. You will see a compass in it, which is turned to the same direction as the turtle. Click on the red needle and drag it to another direction. Then click on the `Do it!` button. Try to discover other commands that have their own helpers.

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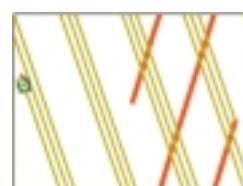
INTERESTING EXPERIMENT

```
? rt 17
? setPc any
? setPw any
? fd 200
```

```
? fd 200
```

```
? fd 600
```

```
? lt 35
? setPc any
? setPw any
? fd 7300
```

Make the turtle turn right, for example using `rt 17` and give it the command `fd 200` – it will reach the edge of the page. Now type `fd 200` again. Will the turtle disappear from the page? No, it will reappear at the opposite edge and keep drawing! That is why **long lines** look so strange! Continue now using `lt 35` and `fd 7300`.

Remember Some other commands know this **magic word** `any` as well – for a random number of steps, random turn …

`setPw any`	• Set a random pen width.
`setPc any`	• Set a random pen colour.
`forward any`	• Move forward by a random number of steps.
`back any`	• Move back by a random number of steps.
`right any`	• Turn right by a random angle.
`left any`	• Turn left by a random angle.
`point any`	• Draw a point of a random size.

Repeat the following commands again and again in the command line: set any colour, draw a point of any size, go forward by `any` and turn right by `any`
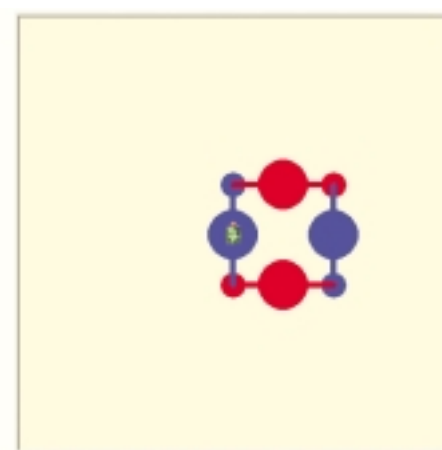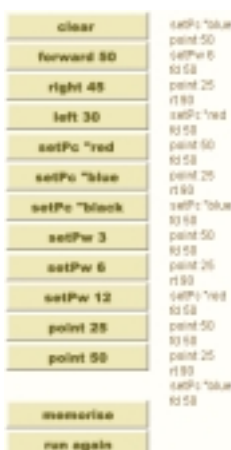
PROJECT FROM WEBSITE

Click on the `Open Project` button and from the list of projects choose the one called `Pen`.

Then click on the `Open` button and you are there!

Click on all the buttons in the project to set the pen colour and pen width, to make the turtle move forward and turn right or left, to draw points... How much can you draw using just these simple tools?

• Note the `memorise` button. If you draw something and click on it, the turtle will memorise all the steps taken from the most recent `clear` button. If you then (or later) click on the `run again` button, all the steps will be run again. Try it!

• Note also that the turtle prints all the commands in a column next to the buttons. Can you read this long list of commands and understand it?

Exercise: You can draw many different pictures in the `Pen` Project.
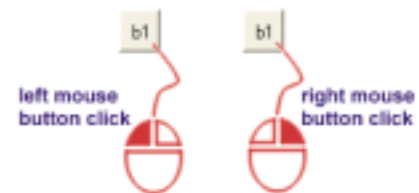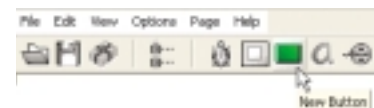Can you find a way of drawing these rather complex ones?
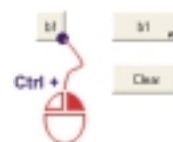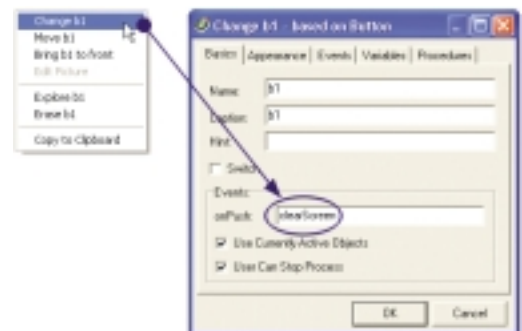
CREATE YOUR OWN BUTTON

Do you want to clear the page with a single mouse click? Create your own button, which runs the `cs` (`clearScreen`) command when clicked.

1. Click on the `New Button` tool. The mouse cursor will turn into a shadow of the button.
2. Click on the page – a new button with the caption `b1`, that is `button` number `1` will appear at that position.
3. If you click on the new button, nothing will happen because you have not taught it how to react yet.
4. Click on the new button using the right mouse button and choose the `Change b1` command from the list.
5. The `Change b1` window will open. In its `onPush` edit line type `clearScreen` or `cs` for short. It will be run whenever you click on this button.
6. To close the window click on the `OK` button.

To resize the new button, press `Ctrl` and drag its lower right-hand corner using the right mouse button. To replace its caption, click on it using the right mouse button, choose `Change b1` and in the window change the `Caption: b1` to `Caption: Clear`.
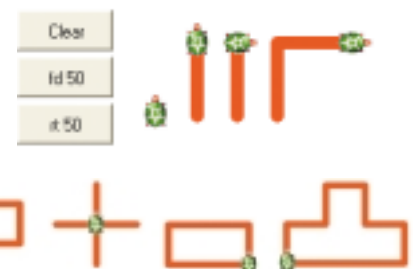
Left mouse click does nothing so far,
right mouse click opens the list of commands.

Exercise: You have just created a button to clear the page. Create two more buttons in the same way. One is to run `fd 50` whenever you click on it. Set its caption to `fd 50`. The other button is to run `rt 90`. Set its caption to `rt 90`. Set the pen width to `9` and pen colour to `red` and just by clicking on these buttons draw the following:

WHAT YOU HAVE LEARNED

- You can give commands to the turtle. However, you have to use exactly the language it is used to.

- The simplest things to give it are the `forward` and `right` and `left` commands. Each of them requires you to add **how far** the turtle should go or **how much** it should turn.

- The turtle understands some short forms of the commands: `fd` means `forward`, `rt` means right etc.

- It is easy to change the turtle's pen colour or width. You can use **helpers** to do so.

- You can clear the page using `clearScreen` or `cs`. You can create your own button to do this for you.

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The turtle is a small drawing robot, which lives inside Imagine Logo. Here you can control it by commands, make it draw pictures, change its shape into a boat or balloon... You can also create more turtles, boats or balloons... and build your own game or living picture.

Helper window – type the command and press F9

TURTLE MOVES ALONG THE PAGE
Use these commands to make the turtle move forward or back and turn right or left. If you move its pen up, it will not draw a line.

pu – pen up   pd – pen down

Long words:	Short words:
forward 100	fd 100
forward 50	fd 50
back 80	bk 80
right 90	rt 90
left 45	lt 45

TURTLE HAS A PEN AND CAN DRAW
The turtle's pen has its own colour and width.

setPenWidth 10 thick pen
setPw 15   thick pen
setPw 1   the thinnest pen
setPenColour "pink
setPc "pink

dotColour – what colour is the dot behind the turtle?

white   magenta   purple   blue   cyan   green   yellow   taupe   red
black   pink   darkBlue   paleBlue   darkGreen   olive   orange   paleRed   grey

setBgColour "blue3   setFillColour "green   fill

setPc "pink9   point 5 point 20 point 25
pink colour with   Draw a point sized 5 in your actual pen
the brightness of 9 colour.

RANDOM COLOURS, WIDTHS, TURNINGS...
fd any   move forward by any number of steps
bk any   move back by any number of steps
rt any   turn right by any number of steps

lt any   turn left by any
setPc any   set random pen colour
setPw any   set random pen width

point any   random point
setPos any   random position
setFrame any random frame

CREATE YOUR OWN BUTTON
Use the New Button tool. Create a new button in the page and click on it with the right mouse button. In its Change b1 type in onPush line – for example cs.

ID CARD OF THE TURTLE
Right click the turtle and choose the Change t1 command. Its ID card will open. There you can change its name, shape, events and other settings.

DEFINE YOUR OWN COMMAND
Type in edit "balloon. A window will open where you can define your own command. Type in between the lines to balloon and end how to draw a balloon. Your command may have its own variable, like :size.

EVENTS AND AUTO DRAGGING
Define for the turtle how to react when it is clicked or dragged... that is, when its onClick or onDrag or onLeftUp or other event occurs. Go to its Shape tab and tick its Auto Drag tick box.

MORE TURTLES
Use the New Turtle tool to create more turtles within the page. Define their own onClick or onDrag... events. Change their shapes. Address them correctly:
t2'hideTurtle or
ask all [fd 50] or ask [t1 t3] [home]

repeat 4 [fd 60 rt 90]
setPc pick [blue red]
if xCor > 200 [rt 180]
stampPicture "house1
stamp   stamp your own shape

SHAPE OF THE TURTLE AND ANIMATIONS
setShape "Dorothy   setFrame 3
showTurtle and hideTurtle setFrame frame + 1

EXACT POSITION AND EXACT HEADING
Use setPos [100 50] to set exact position of the turtle.
Use setXCor -200 or setYCor 50 to set its exact coordinates.
Use setHeading 90 to set exact heading of the turtle.
Use home to move the turtle to its initial position.

PROCESSES ARE MOTORS
every 50 [fd 2 rt 1]
every 1000 [setPc any setPw any]

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