

## 640:192:01 Part I: playing with arithmetic on maple 9/1/2005

What you should type will be in *this typeface* with numbers that look like this *1 4 7 9* and these suggestions will be indented about an inch. I'll ask you to hit the "enter" key (new line) with the request **RET**.

Start the **maple** program as discussed on the **Goals ...** page. The system should eventually respond with a **maple** screen on your display. It may take a few seconds, since **maple** is a big program. There are standard ways for you to move or resize the screen, and various **maple**-specific command possibilities. **maple** has many capabilities. We'll explore only a few of them. Right now I'd like you to move your mouse into the **maple** window. Under **Document Options** please click on Start with Blank Worksheet.

You should see what's below inside the **maple** worksheet. This is the **maple** command line:

```
> /
```

Your cursor position is the blinking / on an input line, indicated by the > sign. Type

```
3+2 RET
```

"Things" should happen: you should get 5 and a new input line. By the way, if you looked carefully, you will see that the cursor changed from a slightly tilted / to | when the input line is not empty. You can move your cursor up and down with the arrow keys. Please do this. The phrase above the **maple** worksheet changes from **2D Input** on the **maple** screen to **2D Output** and then to **2D Input** when your cursor gets back to the original line.

Now move your cursor back to your new input line. Type

```
17*3 RET
```

and see the result. The input line will display 17·3, using a centered dot for multiplication. But you must type \* to tell **maple** about the multiplication.

At the next input line type

```
%+5 RET
```

and explain the result. In **maple**, % is called the *ditto operator*.

Now type the following to learn what ^ means.

```
2^3 RET
```

Notice that **maple**'s graphical interface interprets ^ as a typographical request for superscripts. But I wanted to calculate the 300<sup>th</sup> power of 2. Move your cursor back to the input line with 2<sup>3</sup> and position it as shown: > 2<sup>31</sup> and type 00 and then **RET**. What happened? You should learn to navigate superscripts, so please compute 2<sup>300</sup> · 300<sup>2</sup>. The first five digits of the answer should be 18333.

Please type (look carefully here – I'm asking for a **colon** at the end of the expression!).

```
5+6: RET
```

You should immediately get another input line. Type (for example)

```
%+7
```

and deduce what **maple** does when an input line ends with a : (that is, a colon). Note that computations might and do occur (such as 2^(2^(2^(2^2)))) which have results that are huge and silly to print out if you don't need them. Try that if you'd like, with no ":" and see how **maple** handles the result. Onward: please type

```
20 RET
```

Put a space between the 2 and the 0, then **RET**. What happens?

**OVER**

Our next experiment:

```
2*3+7 RET
```

and observe that **maple** follows the usual rules of precedence. Can you put parentheses in so that **maple** will compute two times the sum of three plus seven instead? Remember **RET** after you make the alterations. You should have gotten 20, of course. If you did **not** make an error inserting the parentheses, go back and take one out (create an intentional **error!**) and then hit **RET**. What happens? You haven't broken anything. Let's keep exploring. Please get a new input line and try the following commands in succession to learn how to do more arithmetic and to explore more features of **maple**.

```
2/3; RET
```

The result on the screen is a more traditionally typeset fraction. Please go back and change this to  $\frac{4}{3}$  and then change it to  $\frac{4}{7}$ . The arrow keys will help you. Now suppose you have entered the command `4/7 RET`. **maple** computes "exactly" and can do simple arithmetic:

```
%*700 RET
```

Now try

```
sqrt(2) RET
```

followed by

```
%^2 RET
```

so **maple** knows the "meaning" of fractions and square roots – or at least how to manipulate them. And now try (remember, if you mess up with a parenthesis or something else, just go back and do it again – nothing is broken!):

```
(sqrt(2)-1)^5 RET
```

This result is puzzling. Sometimes **maple** is lazy. Let's urge it to work by writing

```
expand(%) RET
```

That's better. But what if we want or need decimal approximations? Try

```
evalf(sqrt(2)) RET
```

Parentheses must match – always a source of anxiety as more complex expressions and commands are typed. We can coax *evalf* to get more digits of  $\sqrt{2}$ . To see how, type

```
help(evalf); RET
```

Another screen should pop up. When I use **maple** I need a lot of *help!* Read the *evalf* screen (I usually skip to the examples on any help screen first!) until you figure out how to get the first 100 digits of  $\sqrt{2}$  (see the entry link on the left entitled *evalf,details*). What is the one-hundredth digit after the decimal point of  $\sqrt{2}$ ? (The answer is 7: be careful with the specification of the number of digits.) Can you tell me the three-hundredth digit after the decimal point of  $17^{1/3}$ ? (I think the answer is 5.) If we type

```
1400/24; RET
```

we learn that **maple** knows how to factor integers. Please get **maple** to factor your social security number. How would you find a factoring command in **maple**? If the first thing you try with the *help* command doesn't work, look at the references below the **See Also** line at the end or look to the left and check them out. My social security number has three distinct prime factors. How many does yours have?

We can go on to try some algebra. But you can stop your **maple** session at any time in several ways. One way: go to **File** on the top of the window and look for **Exit**. You need not save this **maple** session!