

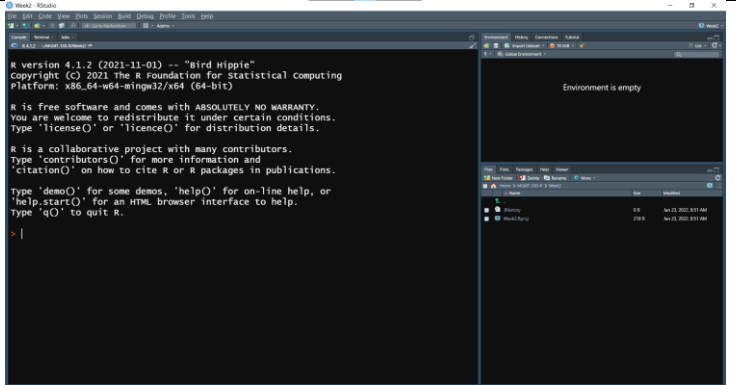
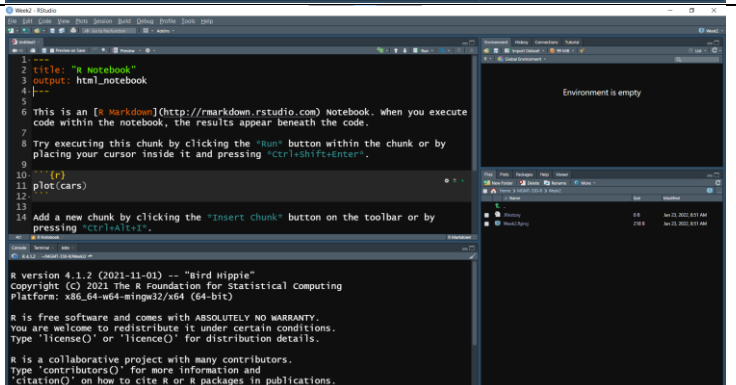
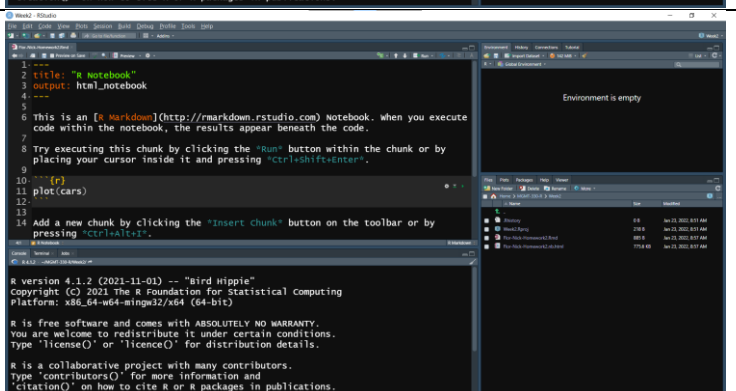
Lecture Notes: Programming Business Formulas in R

by Professor F

I'm assuming you've done the "Lecture Notes: Variables, Operators, Expressions, and Operator Precedence" reading. If you haven't done so, go back and do the reading and all the hands-on sections within the reading.

The bottom line is that after all the readings, you have the foundation for programming basic business formulas. Essentially, you can write an R program for any business formula that does not involve either loops or conditionals, and there are a lot of useful business formulas. Let's go over converting one very popular business formula, Present Value.

Here's the problem: Suppose someone promises to give you \$10,057, 5 years from now. Assuming a 15% rate of return, how much is that money worth today? Write a program to solve the present value.

Action	Reaction
OPEN DEVELOPMENT ENVIRONMENT, SETUP FILE, FIND EQUATION	
<p>1. Run R and open your project (from the first reading)</p> <p>Notes:</p> <ul style="list-style-type: none">The project name will have an .Rproj extension, e.g., Week2.RprojFrom the first reading, I have a project folder named Week2 inside of the folder MGMT-330-R.I recommend you create a main project folder named MGMT-330-R with a subfolder Week 2.	
<p>2. File > New File > R Notebook</p>	
<p>3. File > Save As > <i>LastName-FirstName-Homework2</i></p> <p>Notes:</p> <ul style="list-style-type: none">Please replace <i>LastName</i> and <i>FirstName</i> with your actual names! E.g., Flor-Nick-Homework2Verify that your new notebook file shows up in the lower-right panel.The .Rmd extension is added automatically.	

4. Delete all boilerplate text.
5. Add an appropriate title, e.g., "Homework 2".
6. Add yourself as the author, e.g., "Nick V. Flor".

Notes:

- I didn't show step 6 in the previous readings, but you should always add yourself as the author.

7. Add a label, e.g., *Sample Problem*:

8. Add a code chunk *Code* (menu) > *Insert code Chunk*

9. Locate the appropriate formula in the business formula reading. You may only use those formulas, not ones you find off of the internet.

$$Present\ Value = \frac{Future\ Value}{(1 + Rate\ of\ Return)^{Time}}$$

STEP 1: INPUT

1. Determine the input and output variables.

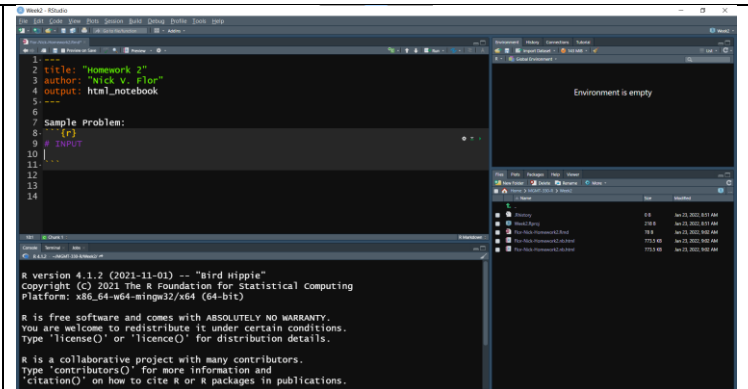
The inputs variables are all the variables to the right of the equals sign, *Future Value*, *Rate of Return*, and *Time*.

The output variable is the variable to the left of the equals sign, *Present Value*

2. Add the comment line: **# INPUT**

Notes:

- Technically, you don't have to add a comment.
- Comments aren't executed by the computer.
- However, you should add comments to denote key parts of the code, and to serve as mental signposts when you're first learning to code.

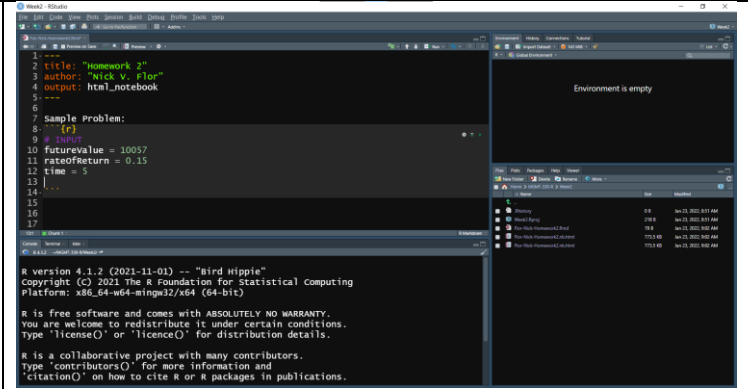


```
1 ----
2 title: "Homework 2"
3 author: "Nick V. Flor"
4 output: html_notebook
5 ----
6
7 Sample Problem:
8 {r}
9 # INPUT
10
11
12
13
14
```

3. Add code to assign initial values to the input variables.

Notes:

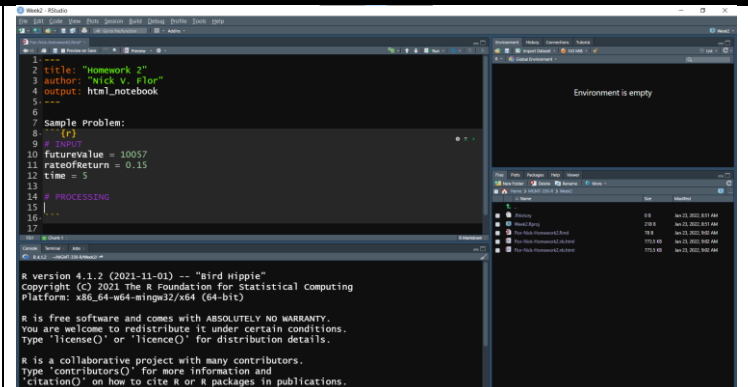
- Make sure you create valid variable names. I did `futureValue`, `rateOfReturn`, `time`.
- You have to enter values without \$ signs and commas, e.g., \$10,507 must be coded as **10507**
- You have to enter percentages as decimals, e.g., 15% must be coded as **0.15**
- You could also enter 15% as 15/100 vs .15



```
1 ----
2 title: "Homework 2"
3 author: "Nick V. Flor"
4 output: html_notebook
5 ----
6
7 Sample Problem:
8 {r}
9 # INPUT
10 futureValue = 10057
11 rateOfReturn = 0.15
12 time = 5
13
14
15
16
17
```

STEP 2: PROCESSING

1. Add the comment **# PROCESSING**

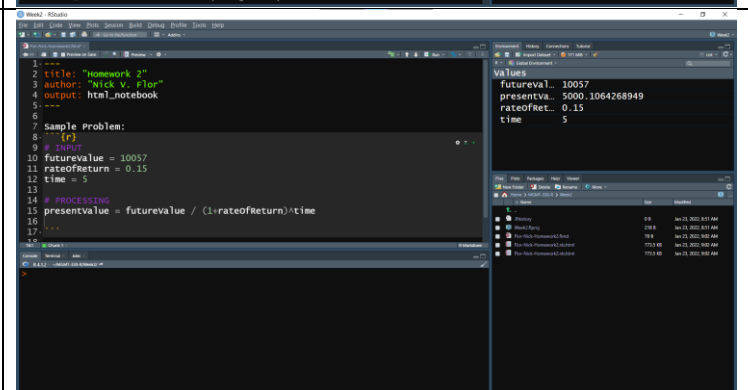


```
1 ----
2 title: "Homework 2"
3 author: "Nick V. Flor"
4 output: html_notebook
5 ----
6
7 Sample Problem:
8 {r}
9 # INPUT
10 futureValue = 10057
11 rateOfReturn = 0.15
12 time = 5
13
14 # PROCESSING
15
16
17
```

2. Code the equation using your variable names AND using the proper operators and operator precedence (PEMDAS-Parenttheses, Exponent [power], Multiplication, Division, Addition, Subtraction)

Operator notes:

- Multiplication: *
- Division: /
- Addition: +
- Subtraction: -



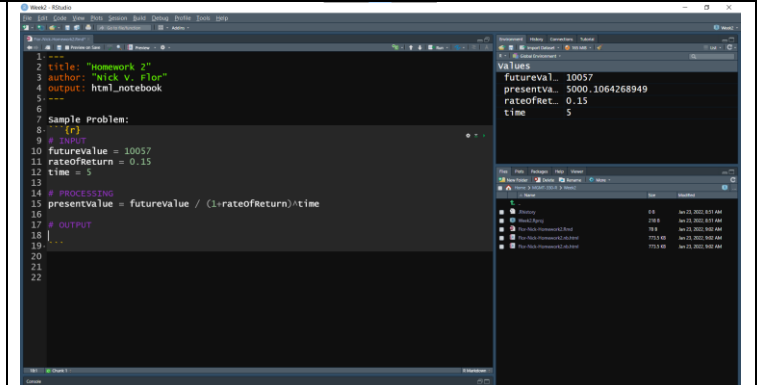
```
1 ----
2 title: "Homework 2"
3 author: "Nick V. Flor"
4 output: html_notebook
5 ----
6
7 Sample Problem:
8 {r}
9 # INPUT
10 futureValue = 10057
11 rateOfReturn = 0.15
12 time = 5
13
14 # PROCESSING
15 presentValue = futureValue / (1+rateOfReturn)^time
16
17
```

Values

Variable	Value
futureVal	10057
presentVal	5000.1064268949
rateOfRet	0.15
time	5

STEP 3: OUTPUT

1. Add the comment: **# OUTPUT**



```
1. title: "Homework 2"
2. author: "Nick V. Flor"
3. output: html_notebook
4. ---
5.
6.
7. Sample Problem:
8. [?]
9. # INPUT
10. futurevalue = 10057
11. rateofreturn = 0.15
12. time = 5
13.
14. # PROCESSING
15. presentValue = futurevalue / (1+rateofreturn)**time
16.
17. # OUTPUT
18.
19.
20.
21.
22.
```

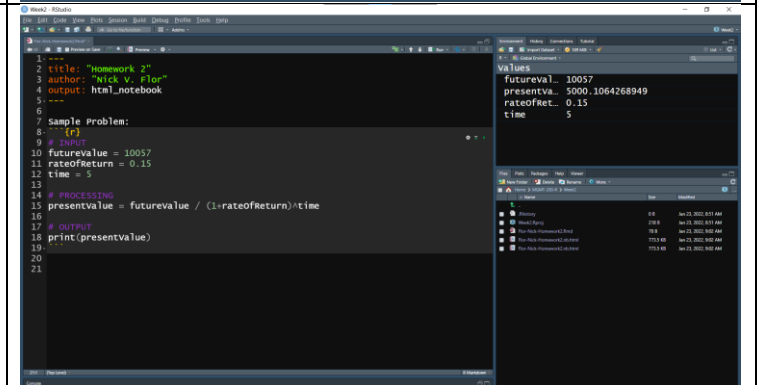
Values

Variable	Value
futureval_	10057
presentva_	5000.1064268949
rateofret_	0.15
time	5

2. Print the answer variable, e.g., **presentValue**

Notes:

- **print()** is a function that displays whatever variable is between the parentheses.
- We'll learn about functions in a couple of weeks.
- You could just enter the variable name, e.g., **presentValue**, to see its value without using the print function.



```
1. title: "Homework 2"
2. author: "Nick V. Flor"
3. output: html_notebook
4. ---
5.
6.
7. Sample Problem:
8. [?]
9. # INPUT
10. futurevalue = 10057
11. rateofreturn = 0.15
12. time = 5
13.
14. # PROCESSING
15. presentValue = futurevalue / (1+rateofreturn)**time
16.
17. # OUTPUT
18. print(presentValue)
19.
20.
21.
```

Values

Variable	Value
futureval_	10057
presentva_	5000.1064268949
rateofret_	0.15
time	5

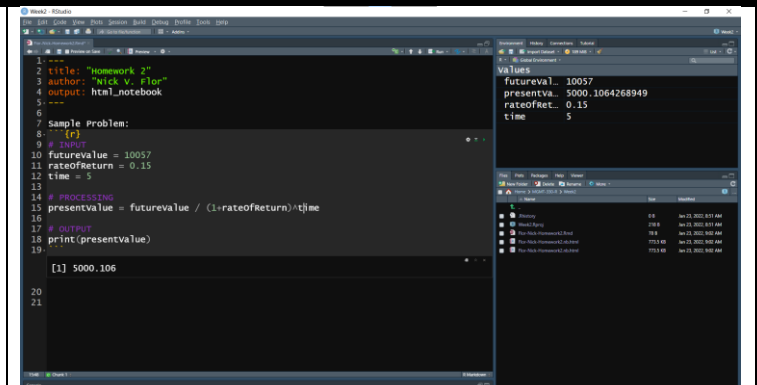
STEP 4: TEST

1. Click the green run arrow in the upper-right corner of your code chunk.

Notes:

- 5000.106 should appear after your code block

YOU'RE DONE!!!



```
1. title: "Homework 2"
2. author: "Nick V. Flor"
3. output: html_notebook
4. ---
5.
6.
7. Sample Problem:
8. [?]
9. # INPUT
10. futurevalue = 10057
11. rateofreturn = 0.15
12. time = 5
13.
14. # PROCESSING
15. presentValue = futurevalue / (1+rateofreturn)**time
16.
17. # OUTPUT
18. print(presentValue)
19.
20.
21.
```

Values

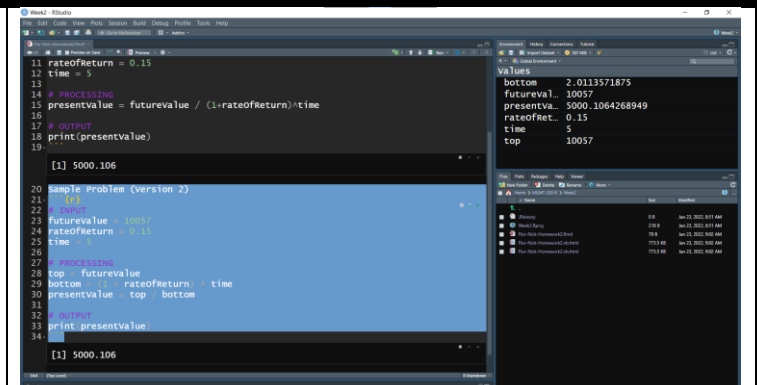
Variable	Value
futureval_	10057
presentva_	5000.1064268949
rateofret_	0.15
time	5

STEP 2A: PROCESSING (ALTERNATIVES)

Sometimes the equations are so complex that you have to assign variables to intermediate expressions before doing the final calculation. Here's one example

Note:

- I declared **top** and **bottom** variables
- The variable **top** doesn't really do anything but copy the **futureValue**
- The variable **bottom** calculates the denominator.
- **presentValue = top / bottom**
- The answer is the same: \$5000.11



```
1. title: "Homework 2"
2. author: "Nick V. Flor"
3. output: html_notebook
4. ---
5.
6.
7. Sample Problem:
8. [?]
9. # INPUT
10. futurevalue = 10057
11. rateofreturn = 0.15
12. time = 5
13.
14. # PROCESSING
15. presentValue = futurevalue / (1+rateofreturn)**time
16.
17. # OUTPUT
18. print(presentValue)
19.
20.
21.
```

Values

Variable	Value
futureval_	10057
presentva_	5000.1064268949
rateofret_	0.15
time	5

Don't be afraid to put complex expressions in variables and to substitute those variables in the original equation.

That's it. And it's the answer to one of the 20 homework problems.

The other 19 problems will go into this same file.

Checklist. For each problem you will:

1. Add a problem label
2. Add a code chunk
3. Add input, processing, and output comments
4. Add the appropriate code
5. Run the code chunk

Now practice programming with the other 19 problems.

Good luck!