4. In what variable would the result of the following expression be stored:

    >> 3 + 5

5. Use the built-in function **namelengthmax** to find out the maximum number of characters that you can have in an identifier name under your version of MATLAB.

6. Create two variables to store a weight in pounds and ounces. Use **who and whos** to see the variables. Use **class** to see the types of the variables. Clear one of them using **clearvars** and then use **who** and **whos** again.

7. Explore the **format** command in more detail. Use **help format** to find options. Experiment with **format bank** to display dollar values.

8. Find a **format** option that would result in the following output format:

    >> 5/16 + 2/7

    ans =
        67/112

9. Think about what the results would be for the following expressions, and then type them in to verify your answers.

    25 / 5 * 3
    4 + 2 ^ 3
    (4 + 1) ^ 2
    2 \ 12 + 5
    4 - 1 * 5

10. There are 1.6093 kilometers in a mile. Create a variable to store a number of miles. Convert this to kilometers, and store in another variable.

11. Create a variable *ftemp* to store a temperature in degrees Fahrenheit (F). Convert this to degrees Celsius (C) and store the result in a variable *ctemp*. The conversion factor is C = (F − 32) * 5/9.

12. The following assignment statements either contain at least one error, or could be improved in some way. Assume that *radius* is a variable that has been initialized. First, identify the problem, and then fix and/or improve them:

    33 = number
    my variable = 11.11;
    area = 3.14 * radius ^2;
    x = 2 * 3.14 * radius;

13. Experiment with the functional form of some operators such as **plus, minus**, and **times**.

14. Explain the difference between constants and variables.

15. Generate a random

    - real number in the range (0, 30)
    - real number in the range (10, 100)
    - integer in the inclusive range from 1 to 20

- integer in the inclusive range from 0 to 20
- integer in the inclusive range from 30 to 80

16. Get into a new Command Window, and type **rand** to get a random real number. Make a note of the number. Then, exit MATLAB and repeat this, again making a note of the random number; it should be the same as before. Finally, exit MATLAB and again get into a new Command Window. This time, change the seed before generating a random number; it should be different.

17. What is the difference between x and 'x'?

18. What is the difference between 5 and '5'?

19. The combined resistance R_T of three resistors R_1, R_2, and R_3 in parallel is given by

$$R_T = \frac{1}{\dfrac{1}{R_1} + \dfrac{1}{R_2} + \dfrac{1}{R_3}}$$

Create variables for the three resistors and store values in each, and then calculate the combined resistance.

20. What would be the result of the following expressions?

```
'b' >= 'c' - 1
3 == 2 + 1
(3 == 2) + 1
xor(5 < 6, 8 > 4)
```

21. Explain why the following expression results in 0 for false:

```
5 > 4 > 1
```

22. Explain why the following expression results in 1 for true:

```
result = -20;
0 <= result <= 10
```

23. Create two variables x and y and store numbers in them. Write an expression that would be **true** if the value of x is greater than five or if the value of y is less than ten, but not if both of those are **true**.

24. Use the equality operator to verify that 4*10 ^3 is equal to 4e3.

25. In the ASCII character encoding, the letters of the alphabet are in order: 'a' comes before 'b' and also 'A' comes before 'B'. However, which comes first - lower or uppercase letters?

26. Are there equivalents to **intmin** and **intmax** for real number types? Use **help** to find out.

27. Use **intmin** and **intmax** to determine the range of values that can be stored in the types **uint32** and **uint64**.

28. Use the **cast** function to cast a variable to be the same type as another variable.

29. Use **help elfun** or experiment to answer the following:
   - Is **fix(3.5)** the same as **floor(3.5)**?
   - Is **fix(3.4)** the same as **fix(-3.4)**?
   - Is **fix(3.2)** the same as **floor(3.2)**?
   - Is **fix(3.2)** the same as **floor(-3.2)**?
   - Is **fix(-3.2)** the same as **floor(-3.2)**?
   - Is **fix(-3.2)** the same as **ceil(-3.2)**?

30. For what range of values is the function **round** equivalent to the function **floor**? For what range of values is the function **round** equivalent to the function **ceil**?

31. Use **help** to determine the difference between the **rem** and **mod** functions.

32. Use the equality operator to verify that log10(1000) is 3.

33. Using only the integers 2 and 3, write as many expressions as you can that result in 9. Try to come up with at least 10 different expressions (e.g., don't just change the order). Be creative! Make sure that you write them as MATLAB expressions. Use operators and/or built-in functions.

34. A vector can be represented by its rectangular coordinates x and y or by its polar coordinates r and θ. Theta is measured in radians. The relationship between them is given by the equations:

$$x = r * \cos(\theta)$$
$$y = r * \sin(\theta)$$

Assign values for the polar coordinates to variables r and $theta$. Then, using these values, assign the corresponding rectangular coordinates to variables x and y.

35. In special relativity, the Lorentz factor is a number that describes the effect of speed on various physical properties when the speed is significant relative to the speed of light. Mathematically, the Lorentz factor is given as:

$$\gamma = \frac{1}{\sqrt{1 - \dfrac{v^2}{c^2}}}$$

Use 3×10^8 m/s for the speed of light, c. Create variables for c and the speed v and from them a variable *lorentz* for the Lorentz factor.

36. A company manufactures a part for which there is a desired weight. There is a tolerance of N percent, meaning that the range between minus and plus $N\%$ of the desired weight is acceptable. Create a variable that stores a weight, and another variable for N (e.g., set it to 2). Create variables that store the minimum and maximum values in the acceptable range of weights for this part.

37. A chemical plant releases an amount A of pollutant into a stream. The maximum concentration C of the pollutant at a point which is a distance x from the plant is:

$$C = \frac{A}{x}\sqrt{\frac{2}{\Pi e}}$$

MATLAB Reserved Words	
function	end

MATLAB Functions and Commands			
type	plot	clf	bar
input	xlabel	figure	load
disp	ylabel	hold	save
fprintf	title	legend	
display	axis	grid	

MATLAB Operators	
comment %	comment block %{, %}

Exercises

1. Using the top-down design approach, write an algorithm for making a sandwich.
2. Write a simple script that will calculate the volume of a hollow sphere,

$$\frac{4\pi}{3}\left(r_0^3 - r_i^3\right)$$

   where r_i is the inner radius and r_0 is the outer radius. Assign a value to a variable for the inner radius, and also assign a value to another variable for the outer radius. Then, using these variables, assign the volume to a third variable. Include comments in the script. Use **help** to view the block comment in your script.
3. Write a statement that prompts the user for his/her favorite number.
4. Write a statement that prompts the user for his/her name.
5. Write an **input** statement that will prompt the user for a real number and store it in a variable. Then, use the **fprintf** function to print the value of this variable using 2 decimal places.
6. Experiment, in the Command Window, with using the **fprintf** function for real numbers. Make a note of what happens for each. Use **fprintf** to print the real number 12345.6789
   - without specifying any field width
   - in a field width of 10 with 4 decimal places
   - in a field width of 10 with 2 decimal places
   - in a field width of 6 with 4 decimal places
   - in a field width of 2 with 4 decimal places