

```
else
    rh=12.5+10.5*(h-19)/14;
    v=pi*12.5^2*19+pi*(h-19)*(12.5^2+12.5*rh+rh^2)/3;
    fprintf('The volume of the water is %7.3f cubic meter.\n',v)
end
```

The following is the display in the Command Window when the program is used with three different values of water height.

```
Please enter the height of the float in meter  8
The volume of the water is 3926.991 cubic meter.
Please enter the height of the float in meter  25.7
The volume of the water is 14114.742 cubic meter.
Please enter the height of the float in meter  35
ERROR. The height cannot be larger than 33 m.
```

6.3 THE switch-case STATEMENT

The switch-case statement is another method that can be used to direct the flow of a program. It provides a means for choosing one group of commands for execution out of several possible groups. The structure of the statement is shown in Figure 6-4. The first line is the switch command, which has the form:

switch switch expression

The switch expression can be a scalar or a string. Usually it is a variable that has an assigned scalar or a string. It can also be, however, a mathematical expression that includes pre-assigned variables and can be evaluated.

- Following the switch command are one or several case commands. Each has a value (can be a scalar or a string) next to it (value1, value2, etc.) and an associated group of commands below it.
- After the last case command there is an optional otherwise command followed by a group of commands.

The last line must be an end statement.

How does the switch-case statement work?

The value of the switch expression in the switch command is compared with the values that are next to each of the case statements. If a match is found, the group of commands that follow the case statement with the match are executed. (Only one group of commands—the one between the case that matches and either the case, otherwise, or end statement that is next—is executed).

- If there is more than one match, only the first matching case is executed.

```

.....    MATLAB program.
.....

switch switch expression
    case value1
        .....    ]   Group 1 of commands.
        .....
    case value2
        .....    ]   Group 2 of commands.
        .....
    case value3
        .....    ]   Group 3 of commands.
        .....
    otherwise
        .....    ]   Group 4 of commands.
        .....
end
.....
.....    MATLAB program.

```

Figure 6-4: The structure of a switch-case statement.

- If no match is found and the `otherwise` statement (which is optional) is present, the group of commands between `otherwise` and `end` is executed.
- If no match is found and the `otherwise` statement is not present, none of the command groups is executed.
- A case statement can have more than one value. This is done by typing the values in the form: `{value1, value2, value3, ...}`. (This form, which is not covered in this book, is called a cell array.) The case is executed if at least one of the values matches the value of switch expression.

A Note: In MATLAB only the first matching case is executed. After the group of commands associated with the first matching case are executed, the program skips to the `end` statement. This is different from the C language, where `break` statements are required.

Sample Problem 6-4: Converting units of energy

Write a program in a script file that converts a quantity of energy (work) given in units of either joule, ft-lb, cal, or eV to the equivalent quantity in different units specified by the user. The program asks the user to enter the quantity of energy, its current units, and the desired new units. The output is the quantity of

energy in the new units.

The conversion factors are: $1\text{ J} = 0.738\text{ ft-lb} = 0.239\text{ cal} = 6.24 \times 10^{18}\text{ eV}$.
Use the program to:

- (a) Convert 150 J to ft-lb.
- (b) Convert 2,800 cal to J.
- (c) Convert 2.7 eV to cal.

Solution

The program includes two sets of switch-case statements and one if-else-end statement. The first switch-case statement is used to convert the input quantity from its initial units to units of joules. The second is used to convert the quantity from joules to the specified new units. The if-else-end statement is used to generate an error message if units are entered incorrectly.

```

Ein=input('Enter the value of the energy (work) to be converted: ');
EinUnits=input('Enter the current units (J, ft-lb, cal, or eV): ','s');
EoutUnits=input('Enter the new units (J, ft-lb, cal, or eV): ','s');
error=0;
switch EinUnits
case 'J'
    EJ=Ein;
case 'ft-lb'
    EJ=Ein/0.738;
case 'cal'
    EJ=Ein/0.239;
case 'eV'
    EJ=Ein/6.24e18;
otherwise
    error=1;
end
switch EoutUnits
case 'J'
    Eout=EJ;
case 'ft-lb'
    Eout=EJ*0.738;
case 'cal'
    Eout=EJ*0.239;
case 'eV'
    Eout=EJ*6.24e18;

```

Assign 0 to variable error.

First switch statement. Switch expression is a string with initial units.

Each of the four case statements has a value (string) that corresponds to one of the initial units, and a command that converts Ein to units of J. (Assign the value to EJ.)

Assign 1 to error if no match is found. Possible only if initial units were typed incorrectly.

Second switch statement. Switch expression is a string with new units.

Each of the four case statements has a value (string) that corresponds to one of the new units, and a command that converts EJ to the new units. (Assign the value to Eout.)