

## Worksheet 6 – conditional code execution

### If statements

**Q1:** Make a script in which the variable 'temp' is initialized to the value of 30. Then use an if statement to test the value of 'temp'. If 'temp' is below 0 the script should print to the screen 'It's freezing outside!'. Change the value of 'temp' so that the content of the if statement is executed.

**Q2:** Initialize the variable 'temp' to the value of 500. Then write an **if** statement to test if the value of temp is above 660. If the condition is met the script should print to the screen, “hotter than the melting point of Aluminum”

**Q3:** Make a new script where the variable age is initialized to 17. Make the script print “Happy 18 th birthday!”, if age is set to 18. Test the script for values of age equal and not equal to 18.

**Q4:** Write a program which applies the quadratic formula  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ . The program should ask the user for three values of a,b and c. If  $b^2 - 4ac$  is smaller than 0, then the program should print “Ooh, that will be a complex number”. The results should be printed to the screen with a nicely formatted printf command.

**Q5:** In this question we are going to make a script that acts as an alarm clock. Make a new script file called q5.m.

a) In the script file q5.m define a variable called awake, and a variable called 't' (t stands for time). Set the value of 'awake' to 0 and 't' to 0. Then make a while loop which will run until the value of awake is set to 1. The while loop should increment the value of 't' by one each time it is run. The while loop should also print the words 'the time now is xxx seconds', where xxx is replaced by the current value of the variable 't'. Test this code 'ctrl+c' will stop it running.

b) use the sleep(1) command to make the while loop run only once per second.

c) At the top of the script define a variable called time\_to\_sleep and set the value to 30. Within the while loop make an if statement that compares the value of 't' to 'time\_to\_sleep' if the values are equal, the script should print the words 'Time to wake up!!! press ctrl+c to stop the alarm clock' and reset the value of t to 0.

d) Within the if statement add the commands

**load handel**  
**sound(y,Fs)**

the script should not play some music when it is time to wake up.

e) Adding a snooze function. Instead of setting t to 0 within the **if** statement, make it subtract 10 from t. This will reset the count to 20 and sound the alarm in ten seconds again.

**Q6:** In this example you are going to make a machine to play the Lotto. Make a new script called q6.m.

- a) In this script generate a 1D array of random numbers using `draw_numbers=rand(1,6)`
- b) Multiply this array by 20 then use the `floor` function to chop of any decimal points the numbers may have.
- c) Define an array of six numbers containing six numbers from 1 to 19, this array should be called `lucky_numbers`. These are the numbers that you think will win the Lotto.
- d) Write a `for` loop, to loop through the array 'draw\_numbers', printing out each number in turn. The loop should use the variable `r` to count.
- e) Write a second `for` loop, nested in the first `for` loop, which counts from 1 to 6. Make this print out each element of 'lucky\_numbers' in turn. The loop should use the variable `l` to count.
- f) Now add an `if` statement within the loop which counts through 'lucky\_numbers' to compare the  $r^{\text{th}}$  value of 'draw\_numbers' to the  $l^{\text{th}}$  value of 'lucky\_numbers'. If the numbers match the value one should be added to the variable 'matches'. Initialize the variable 'matches' at the top of the script to zero. As the end of your script make it print 'You have matched xxxx numbers', where xxxx is the value of matches. Run your script a few times, is your script working how it is expected to?
- g) Add a case statement at the end of your script to print the following messages depending upon the value of matched numbers.

Matched numbers	Message
0	No win this time, don't give up the day job
1	You win ten pounds! Ice cream?
2	You win 100 pounds! New pair of shoes?
3	You win 1000 pounds! New bike?
4	You win 5000 pounds! You can buy yourself a second hand car!
5	You win 100000 pounds! You can buy a house!
6	You win 1000000 pounds! You can buy a tropical island!

### If-else statements

**Q7:** Write a new script to ask the user for their age. If the age is bigger or equal to 18 then print to the screen "You are allowed to vote in general elections", if the age is lower than 18, then get the script to print to the screen "You are not yet allowed to vote in general elections."

**Q8:** Write a script to ask the user for a speed of sound in meters per second. Then use and if-else statement to print “Slower than the speed of sound”, if the value entered is lower than 340.29. If the value entered by the user is higher than 340.29 m/s the script should print “Faster than the speed of sound”.

### If-elseif-else

**Q9:** You are writing software to run a lift. Write a script to ask the user which floor he/she would like to go to. You should save your script in the file q9.m. If the user enters a value below 1 or above 5 the computer should print, “there are only five floors in this building”, if the user enters 1, the computer should print “Going to Electronic engineering”, if the user enters 2, the computer should print “Going to Mechanical engineering”, if the user enters 3, the computer should print “Going to Computer Science”, if the user enters 4, the computer should print “Going to Biology” and if the user enters 5, the computer should print “Going to the cafe”.

**Q10:** Copy the script file q9.m to a file called q10.m. Rewrite the code to use a switch statement, you can find examples of this in the lecture slides.

**Q11:** Write a script to ask the user for their exam mark. If the user enters a value below 0 or above 100 the script should print the text “This is not a valid grade” to the screen. If the grade is below 40, the computer should print “Fail” to the screen, if the grade between 40 and 49, the computer should print the words “well done you passed and got a third” to the screen, if the user enters a between 50 and 59 the computer should print the text “well done you passed and got a 2:2”, if the user enters a value between 60 and 69, the computer should print the text “You got a 2:1!”, and if the user enters a value above or equal to 70, the computer should print to the screen the words “First!!!”

### More challenging but more fun

**Q12:** In work sheet five you learnt about how computers store images as *red*, *green* and *blue* pixels. You also learnt how to load and display jpeg images in MATLAB. Download the file uk.jpg from moodle save this in your z: drive. Use the commands *imread*, and *image* to *load* in the image and display it.

a) Find the size of the image and store it in variables 'x\_max' and 'y\_max'.

b) Use a *disp* command and two nested for loops which scan over the image and print out all the value of the red, green and blue pixels. You should use an *sprintf* command to nicely format your answer.



c) You are an engineer working for a company processing satellite images. It is your job to write a program to find out where the clouds are on the satellite image. Clouds appear on the image as white pixels, white pixels generally have red green and blue values all higher than 100. Use three nested *if* statements within your nested for loops to test if each pixel in the image is white or not. If the pixel is white then you should make the pixel red. There is an example of how to do this in example sheet 5.

Figure 1: Satellite image of the UK

d) Your image should now show the clouds colored red. You have now been asked to make the program **only** show the clouds on image and cover the land and sea with black pixels. At the top of the innermost for loop set the variable 'cloud=0'. If your nested if statement from 12c detects clouds set the variable 'cloud' to 1. Below your nested if statement, make a new if statement which tests if the variable 'cloud' is equal to zero. If 'cloud' is equal to zero, turn the pixel in the image to a black color by setting the red, green and blue pixels all to 0.

**Q13:** Copy the script you made in question 12 to a file called q13.m. This time the company you are working for wants you to design an algorithm that detects land. Land in North Europe is often green. You can detect if a pixel represents land by check if the green value is over 60 and the red and blue values are under 60. Use the && operator to join three if conditions together and check if this condition is met. If it is met color the pixel bright green, if it is not met color the pixel black. You should now have an algorithm to detect land. Try adjusting the numbers in the if statements to see if you can improve on the algorithm.