Exercises: up to Chapter 4

You should not view them as optional. (Though you might want to skip the 'tricky' and 'challenge' tasks for now.)

This sheet is all about choice - programs that use `if` or `switch` statements (chapter 4 of the notes).

1. Read in an integer and print out if it's *positive*, *negative* or *zero*.
2. Do the same for a floating point (`double`) number but also print *small* if it's < 1 and *large* if it's > 1000 000. Extend it so that it prints *zero* if it's *close enough* to zero - see example in the notes.
3. Write a program that prints how many digits a number has (hint: numbers < 10 have 1; numbers < 100 have 2 and so on). Do it for numbers up to 1000 000 (inclusive)
4. Write a program that reads in three numbers `a, b, c` and prints *increasing* if `a < b < c`, and *decreasing* if `a > b > c` and prints *neither* if neither of these things is true (hint you cannot create expressions like `a < b < c` in Java you will have to use either two if statements of (better in this case) `&&`
5. Write a program that either converts inches to mm or mm to inches by reading in a number and asking the user which one they want to do. *Remember that you should not check if strings are equal with* ==!
6. Similarly, convert Celsius to Fahrenheit OR Fahrenheit to Celsius by asking the user which they want to do.
7. Universities in the UK grade on the scale of I ('first'), 2.i ('upper second'), 2.ii ('lower second'), 3 ('third') instead of A-D. Write a program that accepts input in the range A-D (either a string or, better, a char) and prints out the corresponding UK classification. Do the same in reverse.
8. **A Bit Difficult -** Write a program that reads in a string consisting of two characters. The first should be either a digit in the range 0,2,3,4,…,9 representing the numerical value of a playing card - where 0 is being used to represent the value 10 - or one of J, Q, K, A representing J*ack, Queen, King, Ace*. The second character should be one of S,C,D,H - representing *Spades, Clubs, Diamonds, Hearts.* So:

   0S is the 10 of Spades
   2D is the two of Diamonds
   JC is the Jack of Clubs
   AS is the Ace of Spades

   Write a program that reads in the two-character string and prints out the card it represents
9. **Challenge** - Extend your program to 'gracefully' handle incorrect input without crashing or doing anything 'odd'
10. There are many definitions of *Spring, Summer, Autumn/Fall, Winter*, but one is that months 1-3 (January to March) are Winter; 4-6 (April to June) are Summer and so on. Write a program that reads in an integer in the range 1-12 and prints out the corresponding season.
11. **Challenge** - Extend your program (if you did not do this already) so it (a) only accepts numbers 1-12 and asks the user to re-enter incorrect data; and (b) does not crash if they enter a non-integer.
12. Extend your season program so it asks the user if they prefer to speak English or French, and prints the month in the correct language. (Hint: the seasons in French are - starting from winter - *hiver, printemps, été, l'automne* - make sure you get the accents right for *été*).

    For the next one, if you are using the Windows command line, you should type in the command:

    ```
    chcp 65001
    ```

    (you may also need to change the font to Lucida - right-click the top bar of the cmd window, choose properties and then fonts).
13. Extend your season program so that it also works with either Greek or Arabic - *using the correct alphabet and text direction* (Google translate will be very helpful).

14. Write a program that accepts a single character as input and prints out if it's a Vowel or Consonant. In English, in case you've forgotten, vowels are a, e, i, o, u.
15. Extend your program to ask the User if they want to use English or Welsh - and use the correct letters in each case. Ignoring accents on letters - which is fine for this exercise - the vowels in Welsh are the same as in English plus two more. You need to (a) find out what they are if you don't know (Google) and (b) use the fact that most of the letters are shared to simplify the program you write. (You can ignore the fact that in Welsh some 'letters' are actually *digraphs* - pairs of Latin alphabet letters).
16. **Challenge** - Google the layout of a chessboard and the traditional labelling of the columns (using letters a to h) and rows (using numbers 1 to 8). Write a program that given the letter and number representing a square, prints if that square is black or white.
17. **Serious Challenge** - If you go to this page:
    http://www.ben-daglish.net/moon.shtml
    you will find a number of algorithms for computing the phase day of the moon - starting from 0 (New Moon) though 15 (Full Moon) back to 29 (crescent, nearly New Moon). Your task is to write a Java program that, given a day, month and year, computes the phase (not phase day) of the moon. The phase is one of these:
    - new moon - basically invisible
    - waxing crescent - growing crescent moon
    - first quarter - half moon
    - waxing gibbous - greater than half, less than full, getting bigger
    - full moon
    - waning gibbous - greater than half, less than full, getting smaller
    - third quarter - half moon
    - waning crescent - shrinking crescent moon

    You have to map the numbers 0 - 29 to these phases and print out the phase. Because there are 30 phase days and only 8 phases, it's a bit 'messy' in places and you're going to have to make judgements about which phase corresponds with each phase day (there is not always a 'right' answer - use your judgement). Also, to add to the challenge, the algorithms on the web page are in Javascript not Java - but if you're attempting this, you can probably work out what's going on. I'd avoid using the complex Trig based versions though.