CS1010E Programming Methodology
Semester 1 2016/2017

Week of 29 August – 2 September 2016
Tutorial 2
Control Structures – Selection

1. The following program fragment determines the maximum of three possibly duplicating integers.

```
if ((a >= b) && (a >= c)) {
   max = a;
}
if ((b >= a) && (b >= c)) {
   max = b;
}
if ((c >= a) && (c >= b)) {
   max = c;
}
```

   For each of the following code fragments below, fill in the missing parts .. so that it can be used in place of the selection constructs in the above program to effectively output the maximum of three input values.

   (a)
```
if (..
   max = a;
else
   if (..
      max = b;
   else
      max = c;
```

   (b)
```
max = a;
if (..
   max = b;
if (..
   max = c;
```

   (c)
```
if (a > b)
   if (..
      max = a;
   else
      max = ..
else
   if (..
      max = b;
   else
      max = ..
```

2. Study the following program fragment.

```
if (a > 0)
   if (a >= 1000)
      a = 0;
   else
      if (a < 500)
         a = a * 2;
      else
         a = a * 10;
else
   a = a + 3;
```

   Deduce the functionality of the program fragment and re-compose the nested `if..else` statements into a form that is easier to understand.

3. The following rules describe a way to determine if a year is a leap year or otherwise.

   - 2000, 2004, 2008, ... are leap years; however
   - 2100, 2200, 2300, 2500, 2600, 2700, ... are not; but
   - 2000, 2400, 2800, ... are.
   - All other years are not.

   Write a program that accepts a year and determines whether it is a leap year or otherwise. Assume that the year spans from 1 to 9999. The following are several sample runs of the program. User input is underlined.

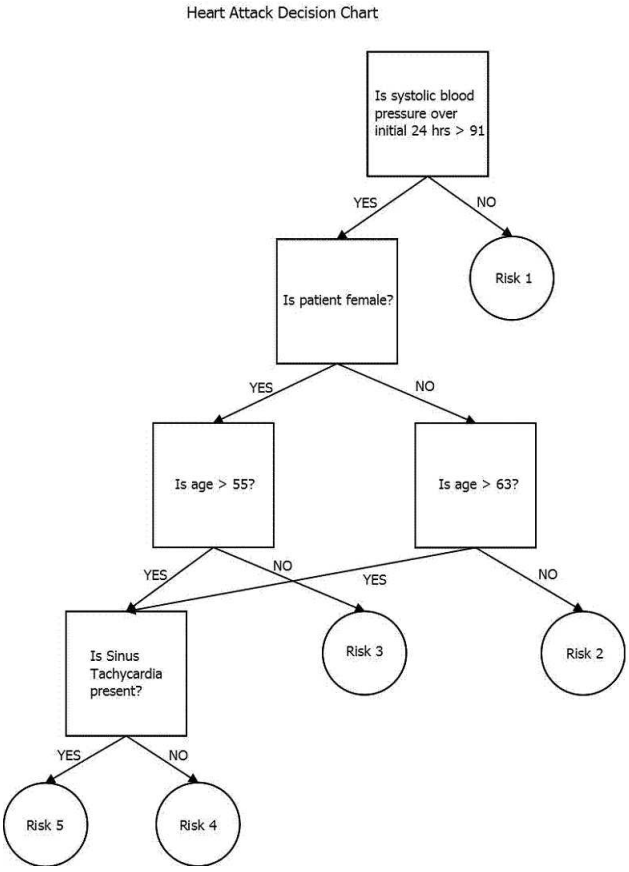
   - `Enter year:` 2000
     `Year 2000 is a leap year.`
   - `Enter year:` 1900
     `Year 1900 is not a leap year.`
   - `Enter year:` 2012
     `Year 2012 is a leap year.`
   - `Enter year:` 2015
     `Year 2015 is not a leap year.`

   Implement your program in the following ways.

   (a) Using nested `if..else` with conditions involving arithmetic and relational operators. You may also use a boolean variable if you wish.

   (b) Using one condition comprising of arithmetic, relational and logical operators.

4. The following decision chart allows doctors to decide whether a patient is at a low or high risk of having a heart attack. Note that this is a mere simplification of the actual chart.



Write a program to simulate the decision chart by first reading in four user input values representing the Systolic blood pressure, gender, age and presence of Sinus Tachycardia.

- Systolic BP: an integer value ≥ 0;
- Gender: 0 for male, 1 for female
- Age: integer value ≥ 0
- Presence of Sinus Tachycardia: 0 for absent, 1 for present

The program then outputs whether the patient's risk level (ranging from 1 to 5). The following is a sample run of the program. User input is underlined.

```
Systolic blood pressure: 135
Gender: 1
Age: 64
Presence of Sinus Tachycardia: 1
Risk level: 5
```