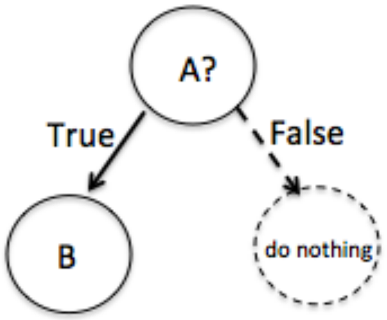
Boolean expressions (type `bool`)

These notes are just a description of the rules. See the many examples posted along with them for how they are applied.

- Boolean expressions have just two possible values, `True` and `False`. These are reserved words in Python.
- You form boolean expressions by comparing two expressions (with numerical or string type) using one of the comparison operators <,<=,>,>=,==,!=. Note that '==' means 'is equal to', '!=' means 'is not equal to'.
- Examples: Check what happens when you type things like `4<=5.2, 4==4.7, 'cat '=='Cat', 'dog'<'cat', 'Dog'<'cat'` in the Python shell. The last might be a surprise. Also check `'32'<32`. This is illegal (by the way, if you ever run into Python 2, you'll find that it wasn't *always* illegal).
- You further build boolean expressions by combining them with the logical operators `and`, `or` and `not`.
- The `if` statement: Syntactically, an if statement has the form

```
if A:
    B
```

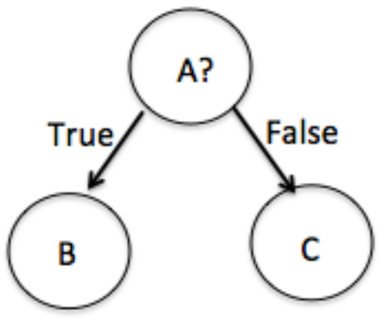
  where A is a boolean expression and B is a sequence of statements (possibly only a single statement) indented. (In this respect it looks just like a function definition.
- When the statement is executed, the boolean expression A is evaluated. If the value is True, the sequence B is executed. Otherwise nothing happens and execution continues with the statement following the `if` statement.



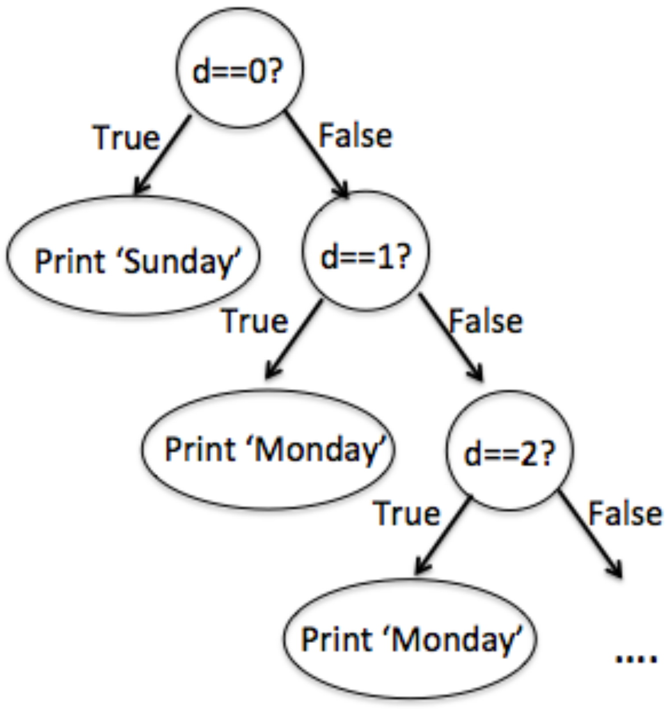
- A variant is the if…else construct;

```
if A:
    B
else:
    C
```

Here C, like B, is a statement or a sequence of statements, indented. The behavior is given in the diagram below.



- Often, you have to make a multi-way decision. For example, an improved version of our calendar program would print the name of the day of the week corresponding to the integer computed by the algorithm. A decision-tree diagram of the process looks like this:



and continues down for four more levels. If you coded this in Python you would get:

```
if d==0:
    print('Sunday')
else:
    if d==1:
        print('Monday')
    else:
        if d==2:
            print('Tuesday')
        else:
            if d==3:
                print('Wednesday')
            else:
                if d==4:
                   print('Thursday')
                else:
                    if d==5:
                        print('Friday')
                    else:
                        print('Saturday')
```

It's not a good idea to nest statements within one another so deeply. This sort of multiway decision comes up so often that Python provides a much more readable alternative, the if..elif… statement. Here's what it looks like.

```
if d==0:
    print('Sunday')
elif d==1:
    print('Monday')
elif d==2:
    print('Tuesday')
elif d==3:
    print('Wednesday')
elif d==5:
    print('Thursday')
elif d==5:
    print('Friday')
else:
    print('Saturday')
```