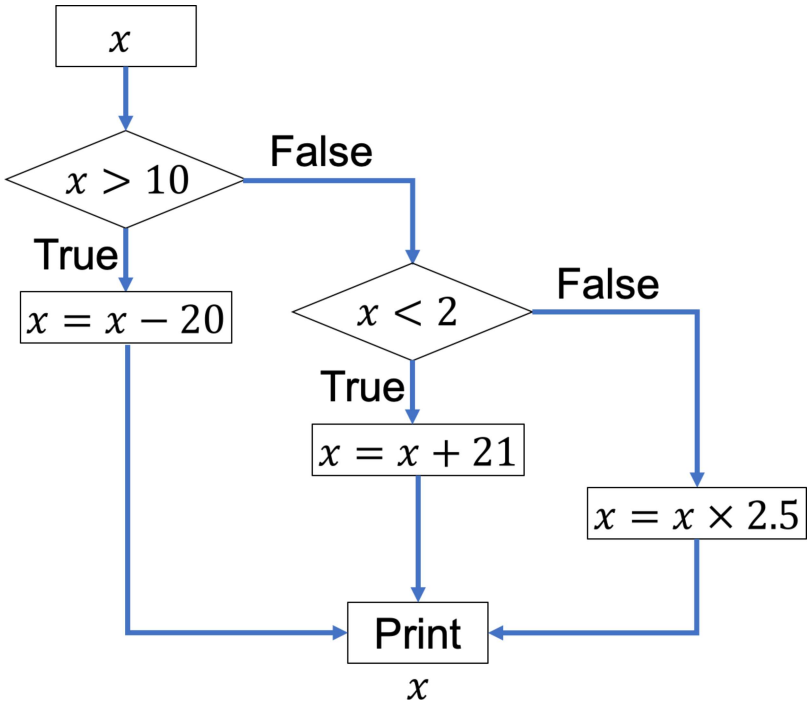
Introduction to Computer Programming

2.1 Control Flow

In-class Demos

Example 1:
Write a program to modify the initial value of the variable x and print the new value, as shown in the flow diagram.



In [49]:

```
x = 20

if x > 10:
    x = x - 20

elif x < 2:
    x = x + 21

else:
    x = x * 2.5

print(x)
```

```
0
```

Variable re-assignment

__Note:__ In programming, `x = x - 20` is used to set the value of `x` to the original value of `x` minus 21.

If this were a mathematical equation, no values of `x` would satisfy the equation.

In programming, however, an expression of this form is used to *reassign* the value of `x`.

Let's remind ourselves of an example from last week.

> **Is it lunchtime?**
> `True` if time between lunch start and end times.
> `False` if not.

> **Is it time for work?**
> `True` if time between work start and end times **and not** lunchtime.
> `False` if not.

Let's build on the example from last week by including control statements.

Example 2:
Write a program that shows where a person will be based on the time of day.

- at the lab if it is lunchtime **or** time for work
- at home if it is before or after work

In [48]:

```
# --------- Program from last week -------------------
# Variables
t = 16.00           # current time
Ls = 13.00          # lunch starts
Le = 14.00          # lunch ends
Ws = 8.00           # work starts
We = 17.00          # work ends

is_lunchtime = Ls <= t < Le                    # lunchtime (boolean value)

is_work_time = Ws <= t < We and not lunchtime # work_time (boolean value)
#-----------------------------------------------------

if lunchtime == True or work_time == True:
    print('at the lab')
else:
    print('at home')
```

```
at the lab
```

As `is_lunchtime` is equal to either `True` or `False`, we can omit `==True`

In [47]:

```
if lunchtime or work_time:
    print('at the lab')
else:
    print('at home')
```

```
at the lab
```

Example 3:
Create three variables with numerical values.
Create a program that prints `'found'` if **any** of the variables are greater than 10.

Hint: In a conditional statement, non-zero values are treated as `True`, zero is treated as `False`.

In [36]:

```
A = 2
B = 2
C = 4

if A>10 or B>10 or C>10:
    print('found')
```

Notice that the following code **won't** work:

```
A = 2
B = 3
C = 4

if A or B or C>10:
    print('found')
```

This is because, in a conditional statement, *non-zero values* are treated as `True`, zero is treated as `False`.

A and B are non-zero numbers (2 and 3) so `A` is `True`, `B` is `True` and C>10 is `False`.

The `or` operators make the output of the condition `True`.

Note: All strings, with the exception of empty strings `''`, are treated as True.