

```
In [7]: i=0
y=0
assert y == (2**i - 1) # assert initial
n = 20
for i in range (0,n):
    assert(y == 2**(i) - 1) # true so far for i; assert for i
    print(y)
    print(2**(i) - 1)
    y = y + 2**i
    assert(y == 2**(i+1) - 1) # now assert for i+1
print(2**(n) - 1)
assert(y == 2**(n) - 1) # assert termination
```

0
0
1
1
3
3
7
7
15
15
31
31
63
63
127
127
255
255
511
511
1023
1023
2047
2047
4095
4095
8191
8191
16383
16383
32767
32767
65535
65535
131071
131071
262143
262143
524287
524287
1048575

```
In [3]: i=0
y=0
assert y == (2**i - 1)
n = 20
for i in range (0,n):
    assert(y == 2**(i+1) - 1) # cannot assert yet for i+1
    print(y)
    print(2**(i) - 1)
    y = y + 2**i
    assert(y == 2**(i+1) - 1)
```

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AssertionError                                Traceback (most recent call
last)
<ipython-input-3-f947adf92b02> in <module>()
      4 n = 20
      5 for i in range (0,n):
----> 6     assert(y == 2**(i+1) - 1) # cannot assert yet
      7     print(y)
      8     print(2**(i) - 1)
```

AssertionError:

```
In [8]: # if we had wrong loop invariant
i=0
y=0
n = 20
for i in range (0,n):
    assert(y == 2**(i)) # true so far for i?
    print(y)
    print(2**(i) - 1)
    y = y + 2**i
print(2**(n) - 1)
assert(y == 2**(n) - 1) # assert termination
```

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AssertionError                                Traceback (most recent call
last)
<ipython-input-8-d7ee22c282cd> in <module>()
      4 n = 20
      5 for i in range (0,n):
----> 6     assert(y == 2**(i)) # true so far for i?
      7     print(y)
      8     print(2**(i) - 1)
```

AssertionError:

In []:

In []:

In []: