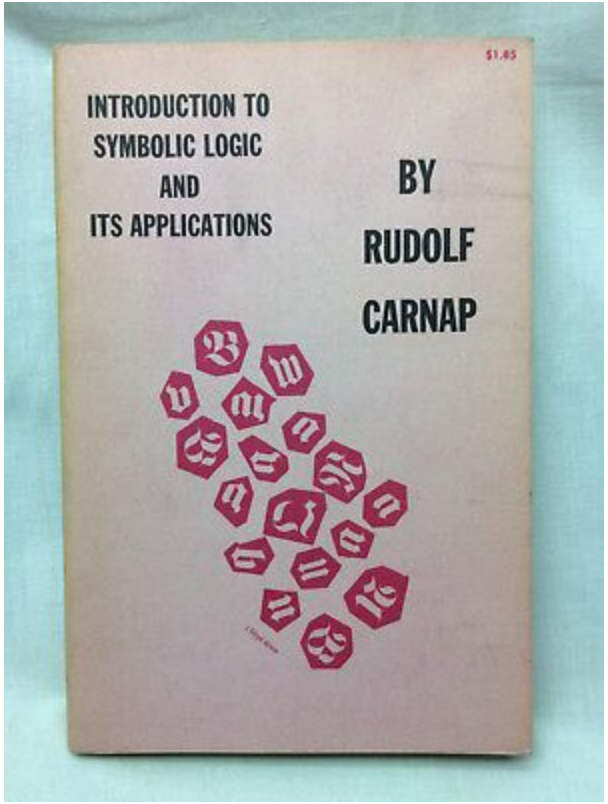
LOGIC


$1.45
INTRODUCTION TO
SYMBOLIC LOGIC
AND
ITS APPLICATIONS
BY
RUDOLF
CARNAP

$$p \rightarrow q$$

$\neg \rightarrow \leftrightarrow \wedge \vee$

$\Rightarrow \Leftrightarrow$

E A

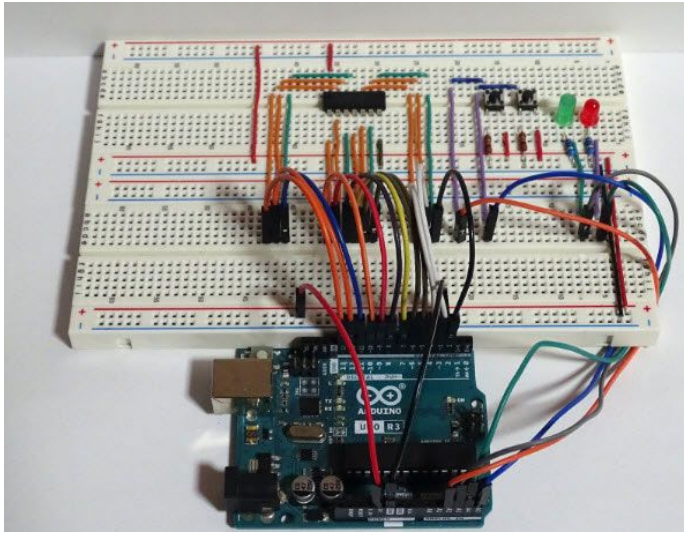
$$(\forall x)(P(x) \rightarrow Q(x))$$

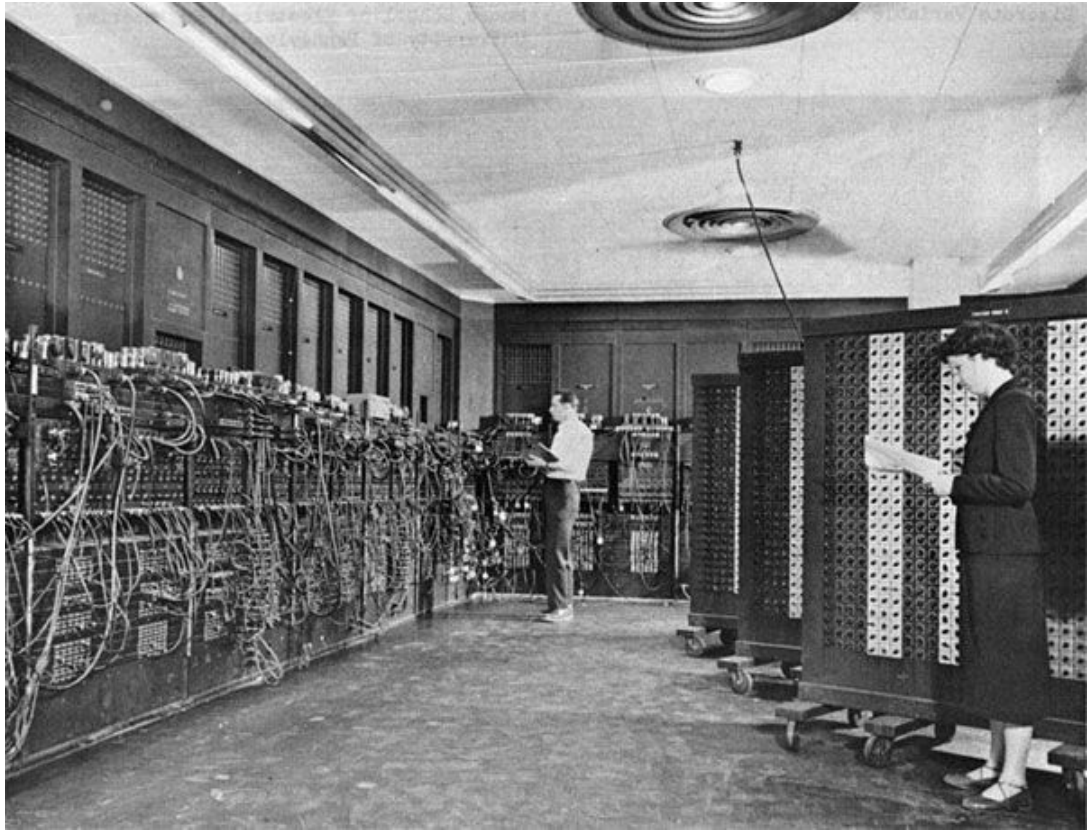
$$(\exists x) \neg (P(x) \rightarrow Q(x))$$

$$(\exists x)(P(x) \wedge \neg Q(x))$$

P	Q	R	$P \to Q$	$Q \to R$	$(P \to Q) \wedge (Q \to R)$
T	T	T	T	T	T
T	T	F	T	F	F
T	F	T	F	T	F
T	F	F	F	T	F
F	T	T	T	T	T
F	T	F	T	F	F
F	F	T	T	T	T
F	F	F	T	T	T

□


ARDUINO
UNO R3



AND Truth Table

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

OR Truth Table

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

XOR Truth Table

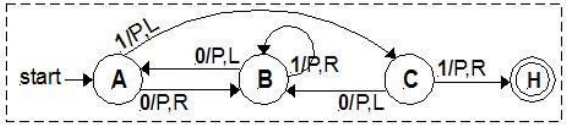
A	B	Y
0	0	0
0	1	1
1	0	1
1	1	0

NOT Truth Table

A	B
0	1
1	0

```
if(x){print(x)}
```

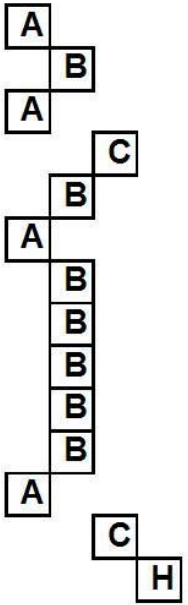
3-state busy beaver:



Sequence	Instruction	Head
1	A	0 0 0 0 0 0 0 **0** 0 0 0 0 0 0 0
2	B	0 0 0 0 0 0 0 **0** **1** 0 0 0 0 0 0
3	A	0 0 0 0 0 0 **1** **1** 0 0 0 0 0 0 0
4	C	0 0 0 0 0 **1** **1** **0** 0 0 0 0 0 0 0
5	B	0 0 0 0 **1** **1** **1** **0** 0 0 0 0 0 0 0
6	A	0 0 0 **1** **1** **1** **1** **0** 0 0 0 0 0 0 0
7	B	0 0 0 0 **1** **1** **1** **1** 1 0 0 0 0 0 0
8	B	0 0 0 0 0 **1** **1** **1** 1 1 0 0 0 0 0
9	B	0 0 0 0 0 0 **1** **1** 1 1 1 0 0 0 0
10	B	0 0 0 0 0 0 0 **1** 1 1 1 1 0 0 0
11	B	0 0 0 0 0 0 0 **0** 1 1 1 1 1 0 0
12	A	0 0 0 0 0 0 **1** **1** 1 1 1 1 0 0 0
13	C	0 0 0 0 0 **1** **1** **1** 1 1 1 0 0 0 0
14	H	0 0 0 0 0 0 **1** **1** 1 1 1 1 0 0 0

Instruction: A B C H

time -->



Total system state -- complete configuration (aka "instantaneous description")
TAPE & TABLE & HEAD

A **0**
B **0** 1
1 A **1**
1 1 C **0**
1 1 1 B **0**
1 1 1 1 A **0**
1 1 1 B **1** 1
1 1 B **1** 1 1
1 B **1** 1 1 1
B **1** 1 1 1 1
B **0** 1 1 1 1 1
1 A **1** 1 1 1 1
1 1 C **1** 1 1 1
1 H **1** 1 1 1 1

Progress of the computation (state-trajectory) of a 3-state busy beaver

```
boolean y = true;

if(y){

print(y);

}
```

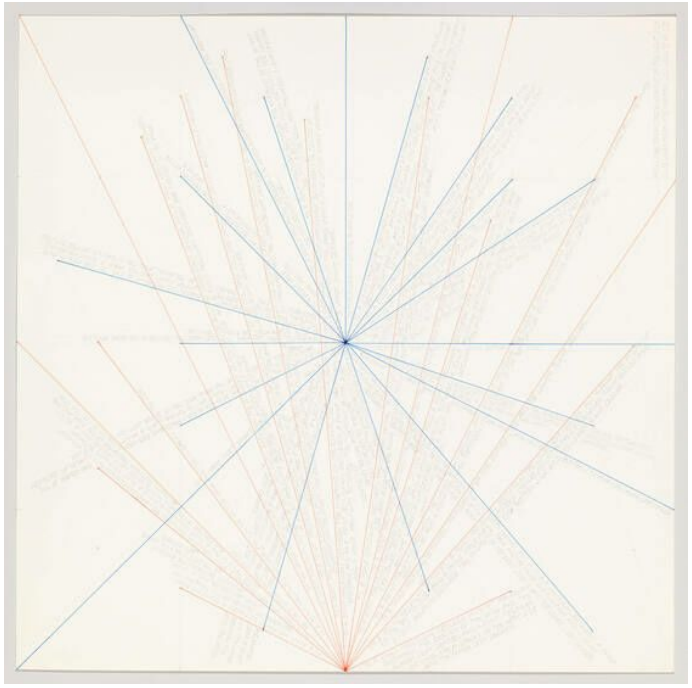
```
—---------------------------------
Console: true
```

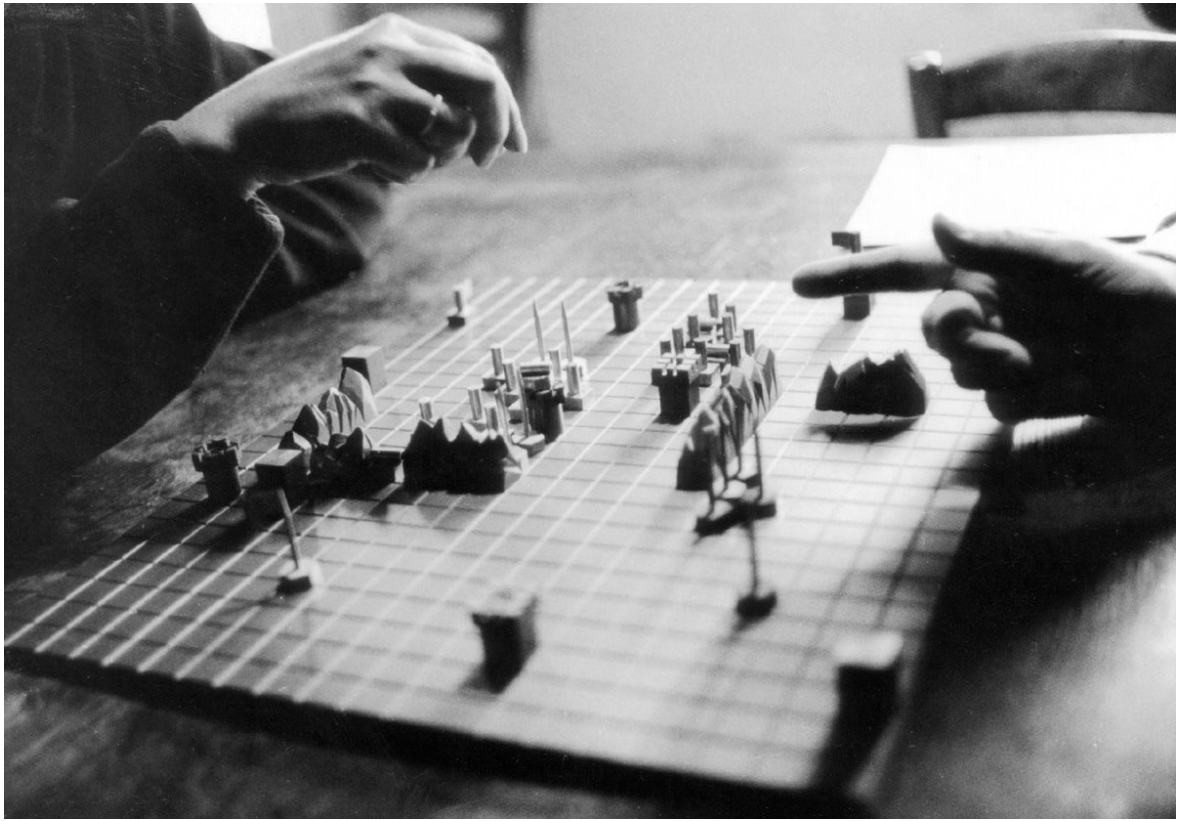
```
int a = 1;
int b = 2;
int c = 3;

boolean y = true;

if(a < b && a < c){
float d = c * b;
  if(d * 0.5 ==  c){
    print(d, y);
    }
  } else if (a > c){
    print(!y);
 }
```

```
--------------------------------
Console: 6.0 true
```





Homework: create a simple interactive program using arithmetic, nested if statements, and multiple data types.