

## PC/CP220 Project Phase II Checklist (3.01)

### A. General

1. Professionally presented  
Neat, etc. \_\_\_\_\_
2. Properly identified  
(eg. name, id) \_\_\_\_\_
3. On time  
at *beginning* of lab *with checklist* \_\_\_\_\_
4. Good grammar  
(eg. complete sentences where required) \_\_\_\_\_
5. Correct spelling \_\_\_\_\_

### B. Content

1. *All outputs analyzed*  
*(truth table)* \_\_\_\_\_
2. *Karnaugh maps (or equations)*  
*match truth table* \_\_\_\_\_
3. *Equations tested*  
*(Maple, Maxima, etc.)* \_\_\_\_\_
4. *Summary statement*  
*(all equations pass all tests)* \_\_\_\_\_
5. *Previous phase included*  
*(updated if necessary)* \_\_\_\_\_

CP220 PHASE II  
Connor Logan  
190209360

Equations

Table

Digit	a3a2a1a0	Digit of Pi	b2b1b0
0	0000	3	0011
1	0001	1	0001
2	0010	4	0100
3	0011	1	0001
4	0100	5	0101
5	0101	9	1001
6	0110	2	0010
7	0111	6	0110
8	1000	5	0101
9	1001	3	0011

Master Table

a3	a2	a1	a0	b3	b2	b1	b0
0	0	0	0	0	0	1	1
0	0	0	1	0	0	0	1
0	0	1	0	0	1	0	0
0	0	1	1	0	0	0	1
0	1	0	0	0	1	0	1
0	1	0	1	1	0	0	1
0	1	1	0	0	0	1	0
0	1	1	1	0	1	1	0
1	0	0	0	0	1	0	1
1	0	0	1	0	0	1	1

B0 Truth Table

a3	a2	a1	a0	b0
0	0	0	0	1
0	0	0	1	1
0	0	1	0	0
0	0	1	1	1
0	1	0	0	1
0	1	0	1	1
0	1	1	0	0
0	1	1	1	0
1	0	0	0	1
1	0	0	1	1

### B0 Karnaugh Map

b0	a1a0				
a3a2		00	01	10	11
	00	1	1	0	1
	01	1	1	0	0
	10	1	1	0	0
	11	0	0	0	0

### B0 SOP

$$B0 = (a0') (a1') (a2') (a3') + (a0) (a1') (a2') (a3') + (a0) (a1) (a2') (a3') + (a0') (a1') (a2) (a3') + (a0) (a1') (a2) (a3') + (a0') (a1') (a2') (a3) + (a0) (a1') (a2') (a3) + (a0') (a1) (a2') (a3)$$

### B0 Maxima

Code (with screen caps)

t1: (not a1) and (not a3);

t2: (not a0) and (not a2) and a3;

t3: (not a1) and (not a2);

t4: a0 and (not a2) and (not a3);

b0: t1 or t2 or t3 or t4;

b0, a0=false,a1=false,a2=false,a3=false;

b0, a0=false,a1=false,a2=false,a3=true;

b0, a0=false,a1=false,a2=true,a3=false;

b0, a0=false,a1=false,a2=true,a3=true;

b0, a0=false,a1=true,a2=false,a3=false;

b0, a0=false,a1=true,a2=false,a3=true;

b0, a0=false,a1=true,a2=true,a3=false;

b0, a0=false,a1=true,a2=true,a3=true;

b0, a0=true,a1=false,a2=false,a3=false;

b0, a0=true,a1=false,a2=false,a3=true;

b0, a0=true,a1=false,a2=true,a3=false;

b0, a0=true,a1=false,a2=true,a3=true;

b0, a0=true,a1=true,a2=false,a3=false;

b0, a0=true,a1=true,a2=false,a3=true;

b0, a0=true,a1=true,a2=true,a3=false;

b0, a0=true, a1=true, a2=true, a3=true;

```
(%i1) t1:(not a1) and (not a3);
(%o1)  $\neg a_1 \wedge \neg a_3$ 

(%i2) t2: (not a0) and (not a2) and a3;
(%o2)  $\neg a_0 \wedge \neg a_2 \wedge a_3$ 

(%i3) t3: (not a1) and (not a2);
(%o3)  $\neg a_1 \wedge \neg a_2$ 

(%i4) t4: a0 and (not a2) and (not a3);
(%o4)  $a_0 \wedge \neg a_2 \wedge \neg a_3$ 

(%i5) b0: t1 or t2 or t3 or t4;
(%o5)  $\neg a_1 \wedge \neg a_3 \vee \neg a_0 \wedge \neg a_2 \wedge a_3 \vee \neg a_1 \wedge \neg a_2 \vee a_0 \wedge \neg a_2 \wedge \neg a_3$ 

(%i6) b0, a0=false, a1=false, a2=false, a3=false;
(%o6) true

(%i7) b0, a0=false, a1=false, a2=false, a3=true;
(%o7) true

(%i8) b0, a0=false, a1=false, a2=true, a3=false;
(%o8) true
```

```
(%i9) b0, a0=false, a1=false, a2=true, a3=true;
(%o9) false

(%i10) b0, a0=false, a1=true, a2=false, a3=false;
(%o10) false

(%i11) b0, a0=false, a1=true, a2=false, a3=true;
(%o11) true

(%i12) b0, a0=false, a1=true, a2=true, a3=false;
(%o12) false

(%i13) b0, a0=false, a1=true, a2=true, a3=true;
(%o13) false

(%i14) b0, a0=true, a1=false, a2=false, a3=false;
(%o14) true

(%i15) b0, a0=true, a1=false, a2=false, a3=true;
(%o15) true

(%i16) b0, a0=true, a1=false, a2=true, a3=false;
(%o16) true
```

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Project Phase II instructions -

Phase II checklist - CP-220-P

CP220 PHASE II - Google Docs

CESGA - Maxima on line

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Apps

VHL Central | Ho...

New Tab

CP213 TEXTBOOK

CP212 TEXTBOOK

```

(%o14) true

(%i15) b0, a0=true,a1=false,a2=false,a3=true;
(%o15) true

(%i16) b0, a0=true,a1=false,a2=true,a3=false;
(%o16) true

(%i17) b0, a0=true,a1=false,a2=true,a3=true;
(%o17) false

(%i18) b0, a0=true,a1=true,a2=false,a3=false;
(%o18) true

(%i19) b0, a0=true,a1=true,a2=false,a3=true;
(%o19) false

(%i20) b0, a0=true,a1=true,a2=true,a3=false;
(%o20) false

(%i21) b0, a0=true,a1=true,a2=true,a3=true;
(%o21) false

```

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CP220 PHASE II.pdf

Show All

B1 Truth Table

a3	a2	a1	a0	b1
0	0	0	0	1
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	1
0	1	1	1	1
1	0	0	0	0
1	0	0	1	1

### B1 Karnaugh Map

b1	a1a0				
a3a2		00	01	10	11
	00	1	0	0	0
	01	0	0	1	1
	10	0	1	0	0
	11	0	0	0	0

### B1 SOP

$$B1 = (a3')(a2)(a1')(a0') + (a3)(a2')(a1')(a0) + (a3')(a2)$$

### B1 Maxima

Code (with screen caps)

t1: (not a3) and (a2) and (not a1) and (not a0);

t2: (a3) and (not a2) and (not a1) and (a0);

t3: (not a3) and (a2);

b1: t1 or t2 or t3;

b1, a0=false, a1=false, a2=false, a3=false;

```

b1, a0=false,a1=false,a2=false,a3=true;
b1, a0=false,a1=false,a2=true,a3=false;
b1, a0=false,a1=false,a2=true,a3=true;
b1, a0=false,a1=true,a2=false,a3=false;
b1, a0=false,a1=true,a2=false,a3=true;
b1, a0=false,a1=true,a2=true,a3=false;
b1, a0=false,a1=true,a2=true,a3=true;
b1, a0=true,a1=false,a2=false,a3=false;
b1, a0=true,a1=false,a2=false,a3=true;
b1, a0=true,a1=false,a2=true,a3=false;
b1, a0=true,a1=false,a2=true,a3=true;
b1, a0=true,a1=true,a2=false,a3=false;
b1, a0=true,a1=true,a2=false,a3=true;
b1, a0=true,a1=true,a2=true,a3=false;
b1, a0=true,a1=true,a2=true,a3=true;

```

```

(%i1) t1: (not a3) and (a2) and (not a1) and (not a0);
(%o1)  ¬a3 ∧ a2 ∧ ¬a1 ∧ ¬a0

(%i2) t2: (a3) and (not a2) and (not a1) and (a0);
(%o2)  a3 ∧ ¬a2 ∧ ¬a1 ∧ a0

(%i3) t3: (not a3) and (a2);
(%o3)  ¬a3 ∧ a2

(%i4) b1: t1 or t2 or t3;
(%o4)  ¬a3 ∧ a2 ∧ ¬a1 ∧ ¬a0 ∨ a3 ∧ ¬a2 ∧ ¬a1 ∧ a0 ∨ ¬a3 ∧ a2

(%i5) b1, a0=false,a1=false,a2=false,a3=false;
(%o5)  false

(%i6) b1, a0=false,a1=false,a2=false,a3=true;
(%o6)  false

(%i7) b1, a0=false,a1=false,a2=true,a3=false;
(%o7)  true

(%i8) b1, a0=false,a1=false,a2=true,a3=true;
(%o8)  false

```

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Apps VHL Central | Ho... New Tab CP213 TEXTBOOK CP212 TEXTBOOK

(%i9) b1, a0=false,a1=true,a2=false,a3=false;

(%o9) false

(%i10) b1, a0=false,a1=true,a2=false,a3=true;

(%o10) false

(%i11) b1, a0=false,a1=true,a2=true,a3=false;

(%o11) true

(%i12) b1, a0=false,a1=true,a2=true,a3=true;

(%o12) false

(%i13) b1, a0=true,a1=false,a2=false,a3=false;

(%o13) false

(%i14) b1, a0=true,a1=false,a2=false,a3=true;

(%o14) true

(%i15) b1, a0=true,a1=false,a2=true,a3=false;

(%o15) true

(%i16) b1, a0=true,a1=false,a2=true,a3=true;

(%o16) false

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maxima.cesga.es/index.php?c=twjzp5rav00koxtvbkb55&n=21

AppsVHL Central | Ho...New TabCP213 TEXTBOOKCP212 TEXTBOOK

(%o13) false

(%i14) b1, a0=true,a1=false,a2=false,a3=true;

(%o14) true

(%i15) b1, a0=true,a1=false,a2=true,a3=false;

(%o15) true

(%i16) b1, a0=true,a1=false,a2=true,a3=true;

(%o16) false

(%i17) b1, a0=true,a1=true,a2=false,a3=false;

(%o17) false

(%i18) b1, a0=true,a1=true,a2=false,a3=true;

(%o18) false

(%i19) b1, a0=true,a1=true,a2=true,a3=false;

(%o19) true

(%i20) b1, a0=true,a1=true,a2=true,a3=true;

(%o20) false

Yumwi

ph2\_chk\_301\_co....pdfCP220 PHASE II.pdfShow All

B2 Truth Table

a3	a2	a1	a0	b2
0	0	0	0	0
0	0	0	1	0
0	0	1	0	1
0	0	1	1	0
0	1	0	0	1
0	1	0	1	0

0	1	1	0	0
0	1	1	1	1
1	0	0	0	1
1	0	0	1	0

### B2 Karnaugh Map

b2	a1a0				
a3a2		00	01	10	11
	00	0	0	1	0
	01	1	0	0	1
	10	1	0	0	0
	11	0	0	0	0

### B2 SOP

$$B2 = (a3')(a2')(a1)(a0') + (a1')(a0') + (a3')(a2)(a1)(a0)$$

### B2 Maxima

Code (with screenshots)

t1:(not a3) and (not a2) and (a1) and (a0);

t2: (not a1) and (not a0);

t3: (not a3) and (a2) and (a1) and (a0);

b2: t1 or t2 or t3;

b2, a0=false,a1=false,a2=false,a3=false;

b2, a0=false,a1=false,a2=false,a3=true;

b2, a0=false,a1=false,a2=true,a3=false;

b2, a0=false,a1=false,a2=true,a3=true;

b2, a0=false,a1=true,a2=false,a3=false;

b2, a0=false,a1=true,a2=false,a3=true;

b2, a0=false,a1=true,a2=true,a3=false;

b2, a0=false,a1=true,a2=true,a3=true;

b2, a0=true,a1=false,a2=false,a3=false;

b2, a0=true,a1=false,a2=false,a3=true;

b2, a0=true,a1=false,a2=true,a3=false;

b2, a0=true,a1=false,a2=true,a3=true;

b2, a0=true,a1=true,a2=false,a3=false;

b2, a0=true,a1=true,a2=false,a3=true;

b2, a0=true,a1=true,a2=true,a3=false;

b2, a0=true,a1=true,a2=true,a3=true;

```
(%i1) t1:(not a3) and (not a2) and (a1) and (a0);
```

```
(%o1)  $\neg a_3 \wedge \neg a_2 \wedge a_1 \wedge a_0$ 
```

```
(%i2) t2: (not a1) and (not a0);
```

```
(%o2)  $\neg a_1 \wedge \neg a_0$ 
```

```
(%i3) t3: (not a3) and (a2) and (a1) and (a0);
```

```
(%o3)  $\neg a_3 \wedge a_2 \wedge a_1 \wedge a_0$ 
```

```
(%i4) b2: t1 or t2 or t3;
```

```
(%o4)  $\neg a_3 \wedge \neg a_2 \wedge a_1 \wedge a_0 \vee \neg a_1 \wedge \neg a_0 \vee \neg a_3 \wedge a_2 \wedge a_1 \wedge a_0$ 
```

```
(%i5) b2, a0=false,a1=false,a2=false,a3=false;
```

```
(%o5) true
```

```
(%i6) b2, a0=false,a1=false,a2=false,a3=true;
```

```
(%o6)  $\neg a_1$ 
```

```
(%i7) b2, a0=false,a1=false,a2=true,a3=false;
```

```
(%o7) true
```

```
(%i8) b2, a0=false,a1=false,a2=true,a3=true;
```

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## B3 Truth Table

a3	a2	a1	a0	b3
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	1
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0

B3 Karnaugh Map

b3	a1a0				
a3a2		00	01	10	11
	00	0	0	0	0
	01	0	1	0	0
	10	0	0	0	0
	11	0	0	0	0

### B3 SOP

$$B3 = (a3')(a2)(a1')(a0)$$

### B3 Maxima

Code (with screencaps)

```
t1:(not a3) and (a2) and (not a1) and (a0);
```

```
b3: t1;
```

```
b3, a0=false,a1=false,a2=false,a3=false;  
b3, a0=false,a1=false,a2=false,a3=true;  
b3, a0=false,a1=false,a2=true,a3=false;  
b3, a0=false,a1=false,a2=true,a3=true;  
b3, a0=false,a1=true,a2=false,a3=false;  
b3, a0=false,a1=true,a2=false,a3=true;  
b3, a0=false,a1=true,a2=true,a3=false;  
b3, a0=false,a1=true,a2=true,a3=true;  
b3, a0=true,a1=false,a2=false,a3=false;  
b3, a0=true,a1=false,a2=false,a3=true;  
b3, a0=true,a1=false,a2=true,a3=false;  
b3, a0=true,a1=false,a2=true,a3=true;  
b3, a0=true,a1=true,a2=false,a3=false;  
b3, a0=true,a1=true,a2=false,a3=true;  
b3, a0=true,a1=true,a2=true,a3=false;  
b3, a0=true,a1=true,a2=true,a3=true;
```

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Apps VHL Central | Ho... New Tab CP213 TEXTBOOK CP212 TEXTBOOK

```
(%i1) t1:(not a3) and (a2) and (not a1) and (a0);
(%o1)  $\neg a_3 \wedge a_2 \wedge \neg a_1 \wedge a_0$ 

(%i2) b3: t1;
(%o2)  $\neg a_3 \wedge a_2 \wedge \neg a_1 \wedge a_0$ 

(%i3) b3, a0=false,a1=false,a2=false,a3=false;
(%o3) false

(%i4) b3, a0=false,a1=false,a2=false,a3=true;
(%o4) false

(%i5) b3, a0=false,a1=false,a2=true,a3=false;
(%o5) false

(%i6) b3, a0=false,a1=false,a2=true,a3=true;
(%o6) false

(%i7) b3, a0=false,a1=true,a2=false,a3=false;
(%o7) false

(%i8) b3, a0=false,a1=true,a2=false,a3=true;
(%o8) false
```

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bet365 - Online Sports Betting X Project Phase II instructions - X Phase II checklist - CP-220-P X CP220 PHASE II - Google Docs X CESGA - Maxima on line X

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```
(%i8) b3, a0=false,a1=true,a2=false,a3=true;
(%o8) false

(%i9) b3, a0=false,a1=true,a2=true,a3=false;
(%o9) false

(%i10) b3, a0=false,a1=true,a2=true,a3=true;
(%o10) false

(%i11) b3, a0=true,a1=false,a2=false,a3=false;
(%o11) false

(%i12) b3, a0=true,a1=false,a2=false,a3=true;
(%o12) false

(%i13) b3, a0=true,a1=false,a2=true,a3=false;
(%o13) true

(%i14) b3, a0=true,a1=false,a2=true,a3=true;
(%o14) false

(%i15) b3, a0=true,a1=true,a2=false,a3=false;
(%o15) false
```

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bet365 - Online Sports Betting

Project Phase II instructions

Phase II checklist - CP-220-PC

CP220 PHASE II - Google Docs

CESGA - Maxima on line

maxima.cesga.es/index.php?c=twjzp5rav00koxtvbkb55&n=24

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(%o11) false

(%i12) b3, a0=true,a1=false,a2=false,a3=true;

(%o12) false

(%i13) b3, a0=true,a1=false,a2=true,a3=false;

(%o13) true

(%i14) b3, a0=true,a1=false,a2=true,a3=true;

(%o14) false

(%i15) b3, a0=true,a1=true,a2=false,a3=false;

(%o15) false

(%i16) b3, a0=true,a1=true,a2=false,a3=true;

(%o16) false

(%i17) b3, a0=true,a1=true,a2=true,a3=false;

(%o17) false

(%i18) b3, a0=true,a1=true,a2=true,a3=true;

(%o18) false

Yumwi

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Fall Semester of 2020

### Description

In mathematics, there are a number of significant concepts. One of which is Pi. The Greek letter  $\pi$  is used to represent the ratio of a circle to its diameter. As well, Pi is used very heavily within trigonometry. This mathematical constant also has no end, it is an irrational number. The Digits of Pi Sequence Circuit will output the binary representation of the first 10 digits of Pi to the user using this circuit.

### Inputs

The Digits of Pi Sequence Circuit will have 4 inputs. Ranging from  $a_0$  to  $a_3$ . There will be 10 sequences of inputs all representing the binary value of each decimal place.

### Outputs

The Digits of Pi Sequence Circuit will have 4 outputs. Ranging from  $b_0$  to  $b_3$ . These outputs will be the binary representation of the digit of Pi that corresponds to the input decimal place.

### Notes

This circuit will only be allowed to display the first 10 digits of Pi. Any inputs from 11-15 that are possible will result in errors. For these inputs, all lights will turn on to indicate there is an error. This is due to the fact that all LED lights on would be more noticeable in case there is an error. There are also no ambiguities related to this project.

### Table

Input	Output
0000	0011
0001	0001
0010	0100
0011	0001
0100	0101
0101	1001
0110	0010
0111	0110
1000	0101

10001	0011
-------	------