

CP220 PHASE II
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Equations

Table

Digit	a3a2a1a0	Digit of Pi	b3b2b1b0
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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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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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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CP220 PHASE II - Google Docs

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AppsVHL Central | Ho...New TabCP213 TEXTBOOKCP212 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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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

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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
```

ph2_chk_301_co....pdf CP220 PHASE II.pdf Show All 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

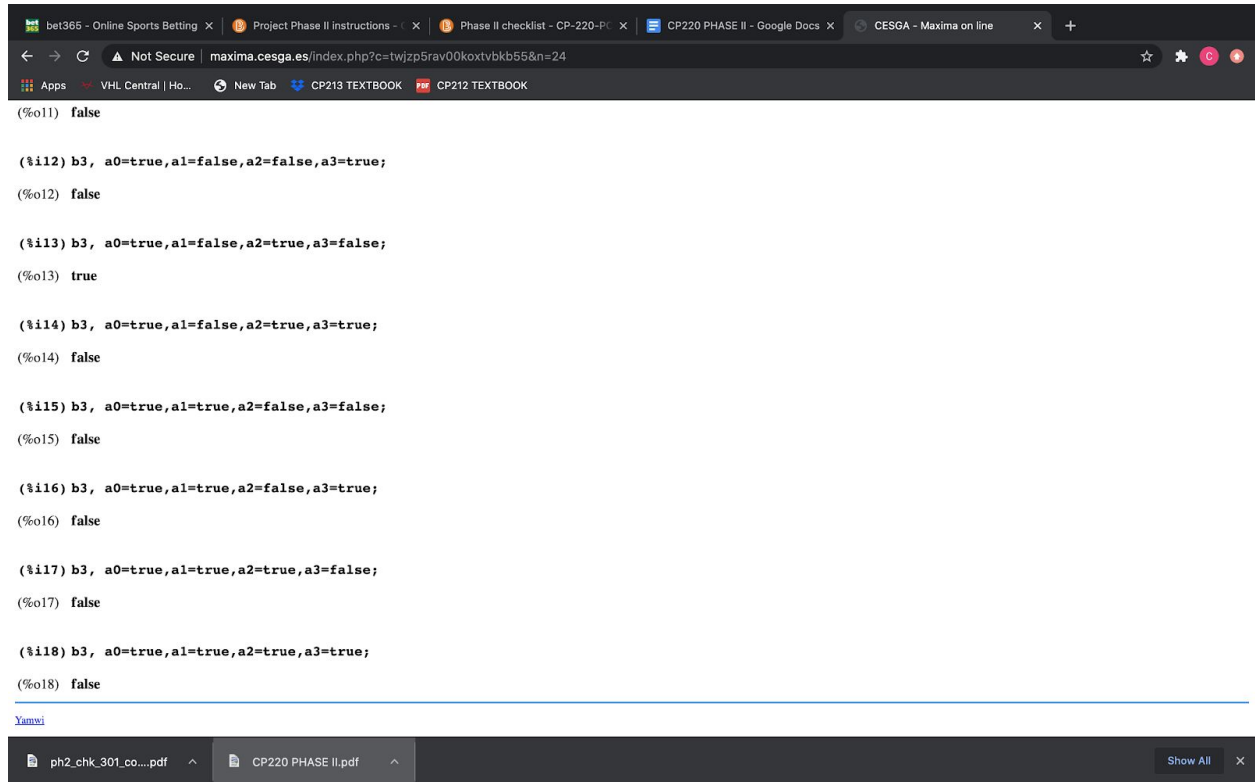
(%i12) b3, a0=true,a1=false,a2=false,a3=true;
(%o12) false

(%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
```

ph2_chk_301_co....pdf CP220 PHASE II.pdf Show All X



Final Part

Logic Equation

The first 11 digits of Pi are: 3,1,4,1,5,9,2,6,5,3,5. So for each binary input starting from 0000 to 1111 will generate either an error, or one of these numbers.

Circuit Diagrams

Video Attached

Circuit

