Digital Media

Conor Keighrey

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What we will Cover

- $Base_2$
  - Addition
  - Subtraction

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Binary Addition

Binary Addition

- Binary Addition Rules: 4 rules!

A	B	A + B
0	0	0
0	1	1
1	0	1
1	1	10

2 in decimal

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Binary Addition

- Add individual bits!
- Follow the 4 rules of addition!
- Carry “1” if applicable!

A	B	A + B
0	0	0
0	1	1
1	0	1
1	1	10

```
  10101
+ 11001
-------
```

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1 + 1 = 10

```
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+ 11001
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Connect & Discover

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```
    10
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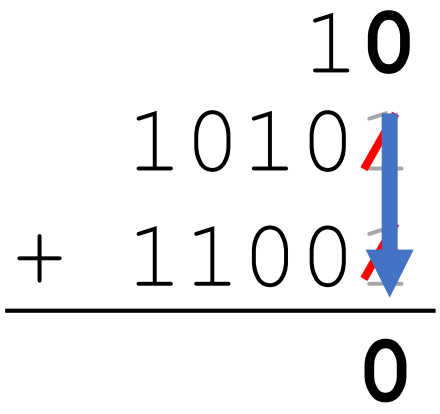

1 + 1 = 10

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0	0	0
0	1	1
1	0	1
1	1	10

```
      1
  10101
+ 11001
-------
      0
```

0 + 0 = 0

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```
      0
      1
   10101
+  11001
-------
      0
```

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```
      0
      1
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      0
```

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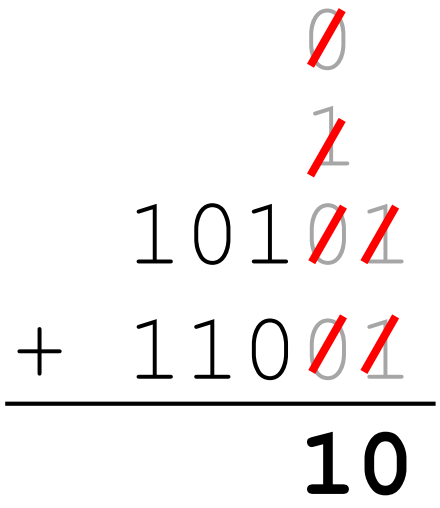

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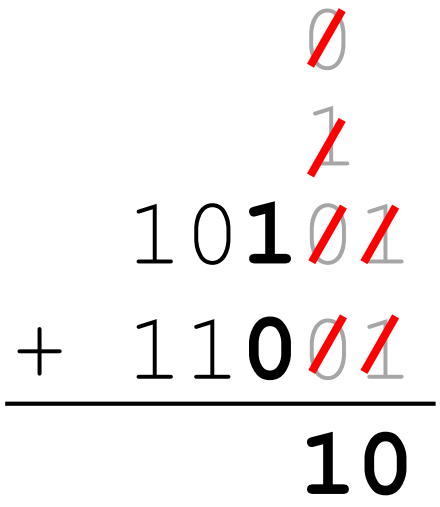

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A	B	A + B
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```
    0
    1
  10101
+ 11001
-------
  110
```

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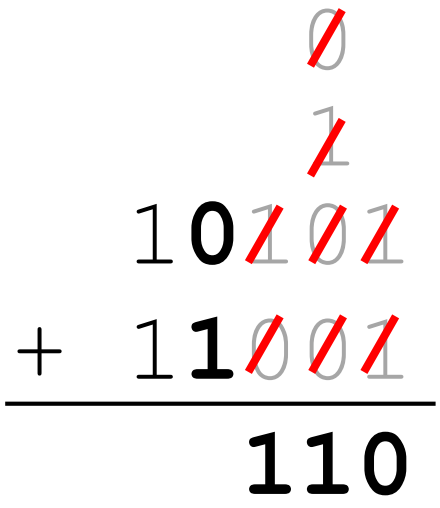

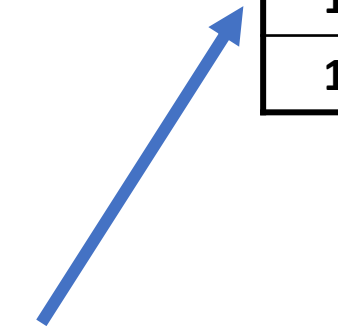

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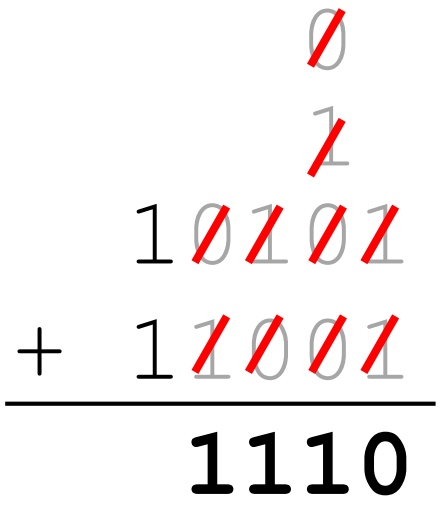

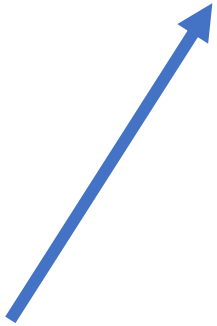

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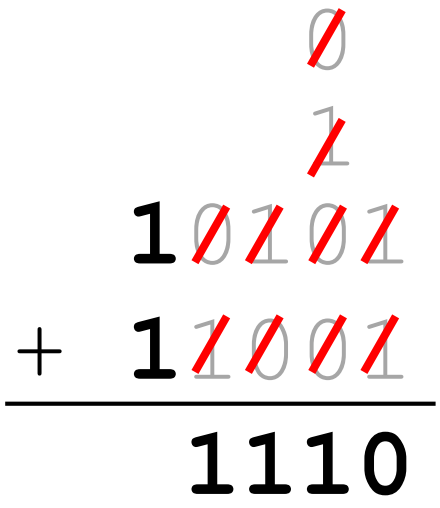

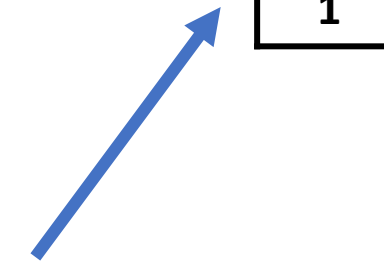

1 + 1 = 10

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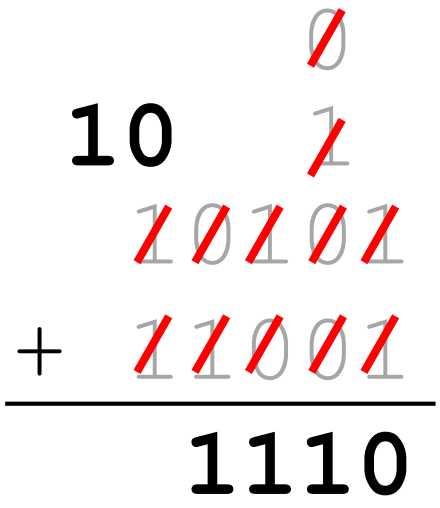
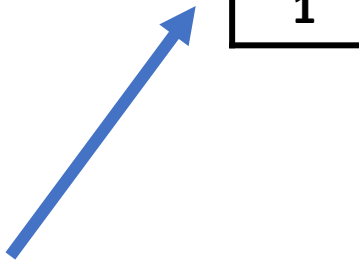
Binary Addition

- Add individual bits!
- Follow the 4 rules of addition!
- Carry “1” if applicable!

A	B	A + B
0	0	0
0	1	1
1	0	1
1	1	10





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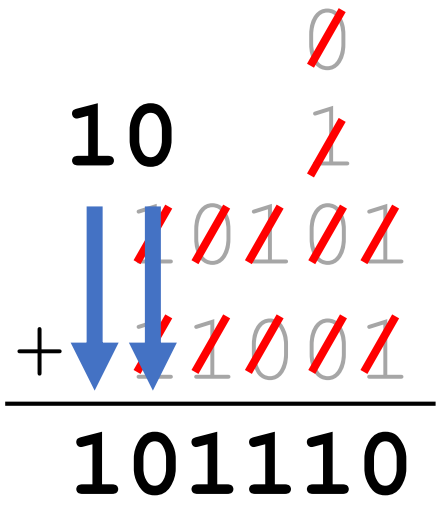

1 + 1 = 10

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Connect & Discover

Binary Addition

- Confirm the binary addition! (Optional)
  - Convert $Base_2$ to $Base_{10}$

$Base_2$		$Base_{10}$
10101	→	21
+ 11001		+ 25
101110		46

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Binary Addition – 3 Values

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- Carry “1” if applicable!

A	B	A + B
0	0	0
0	1	1
1	0	1
1	1	10

```
  1  1  1
  1  1  1
  1  0  1
-------------
```

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Binary Addition – 3 Values

- **Add individual bits!**
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0	1	1
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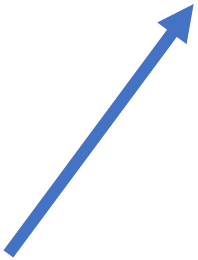

1 + 1 = 10

```
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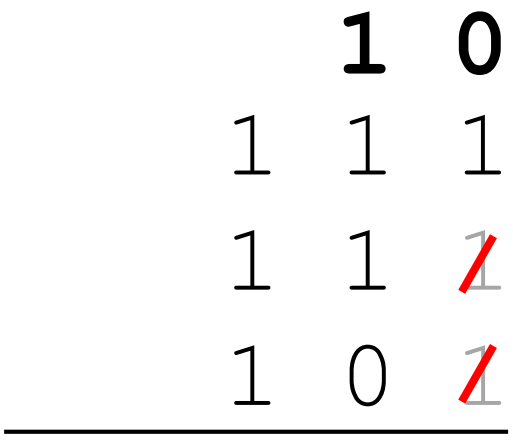

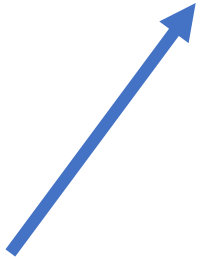

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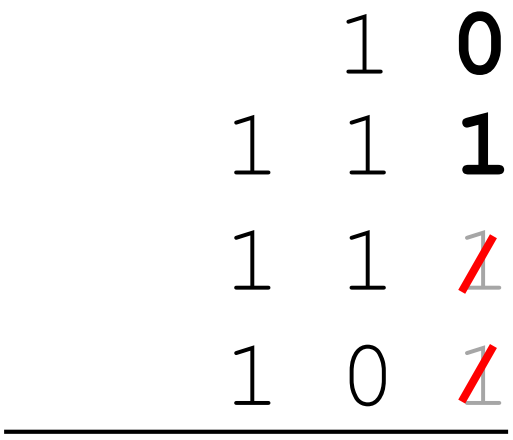

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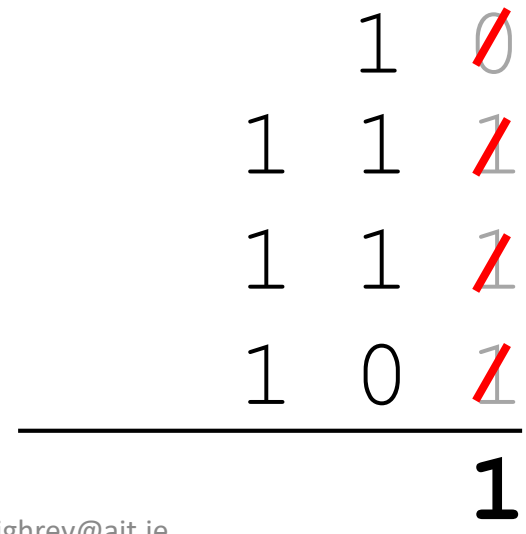

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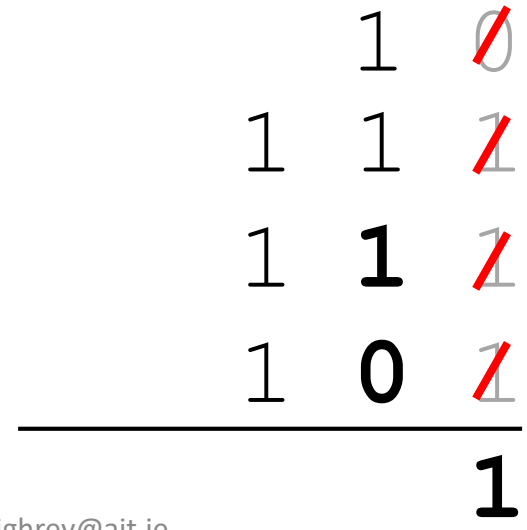

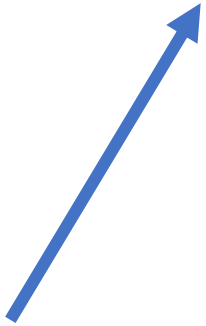

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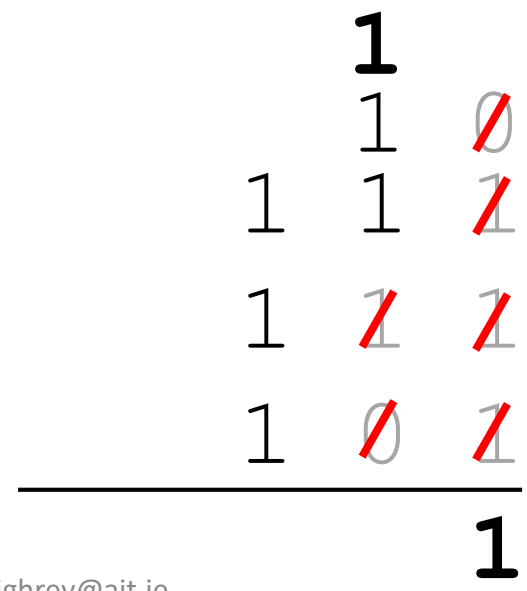

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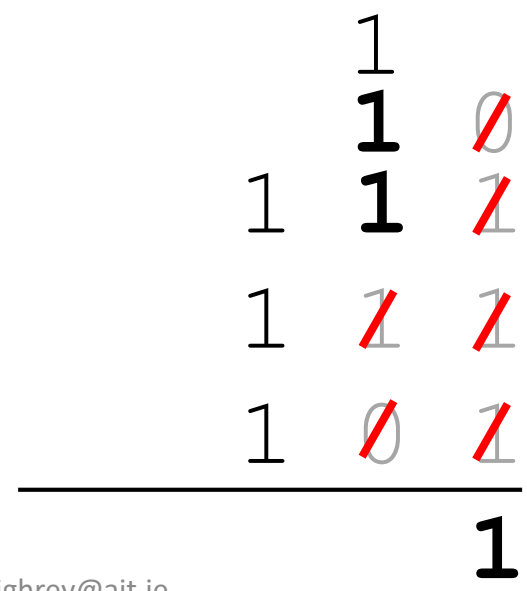

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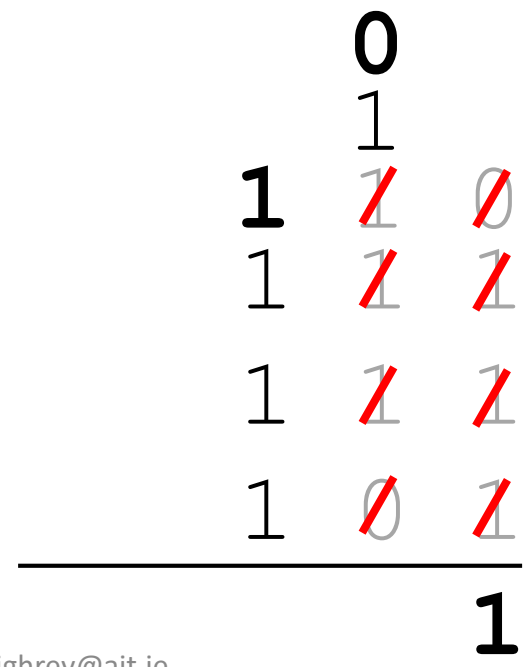

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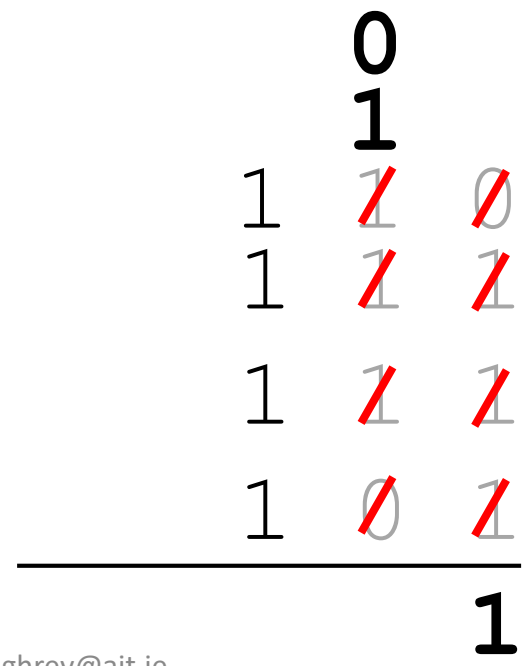

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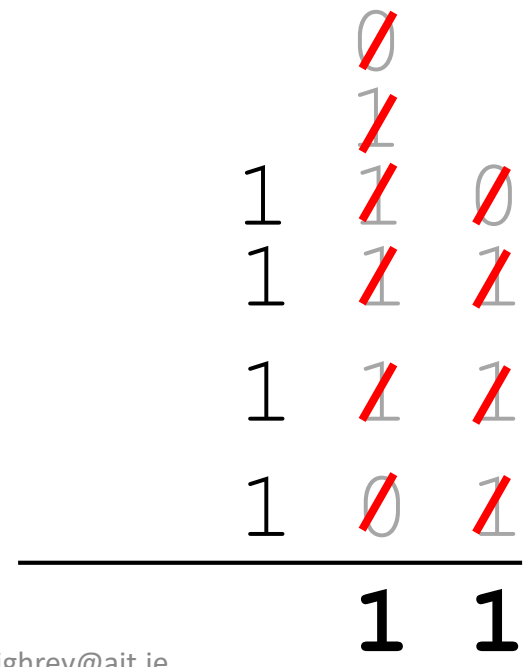

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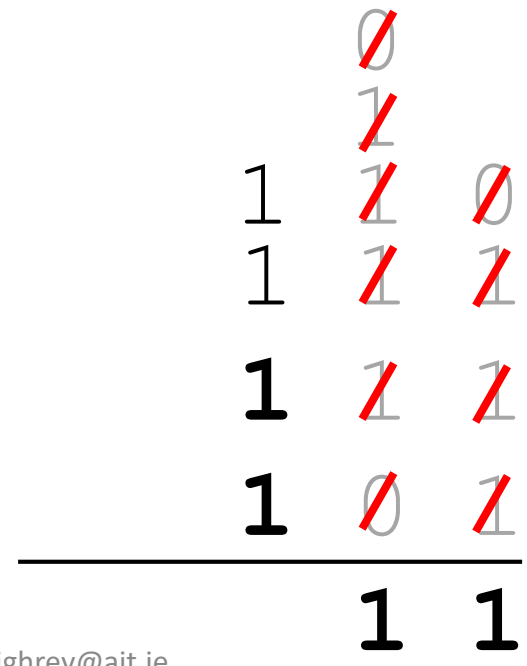

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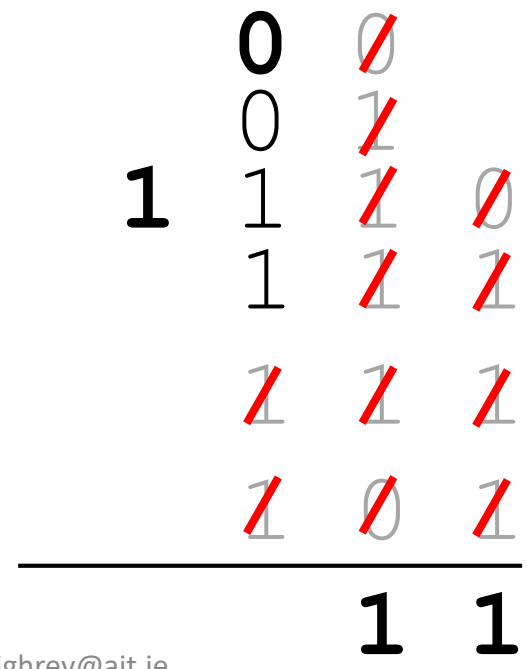

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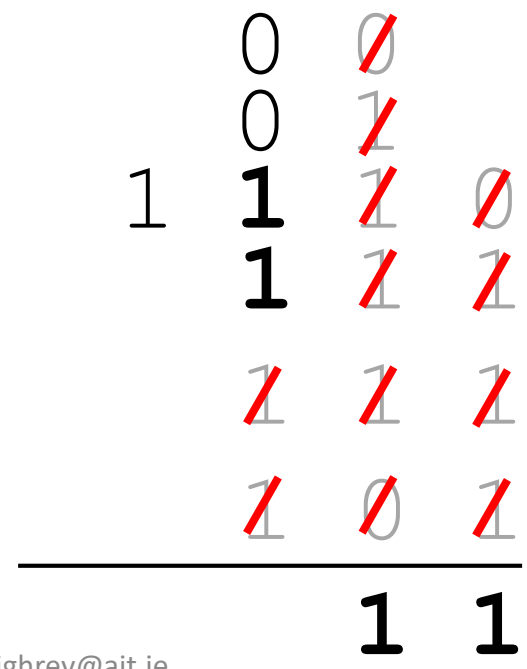

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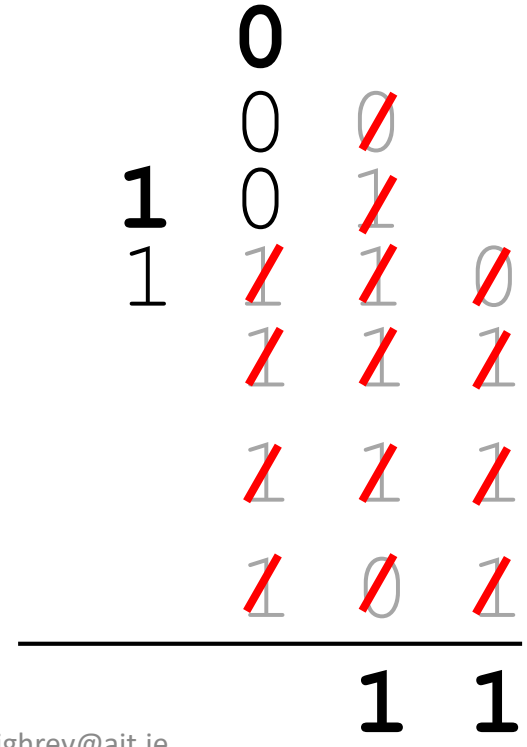

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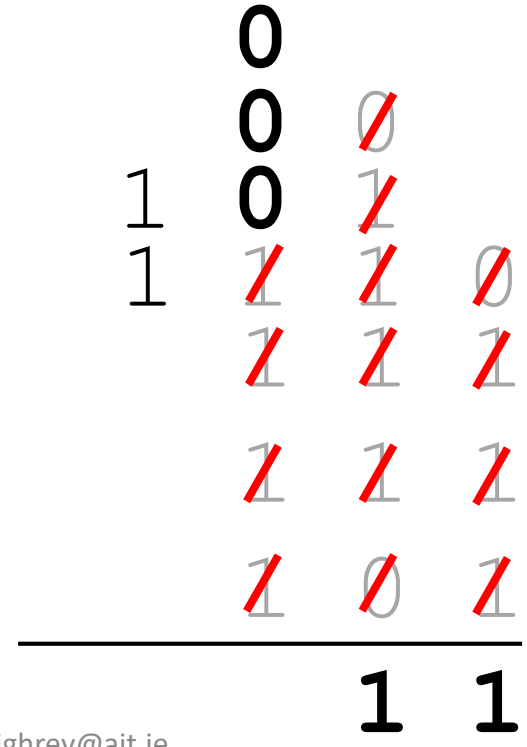

0 + 0 = 0

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Connect & Discover

Binary Addition – 3 Values

- Add individual bits!
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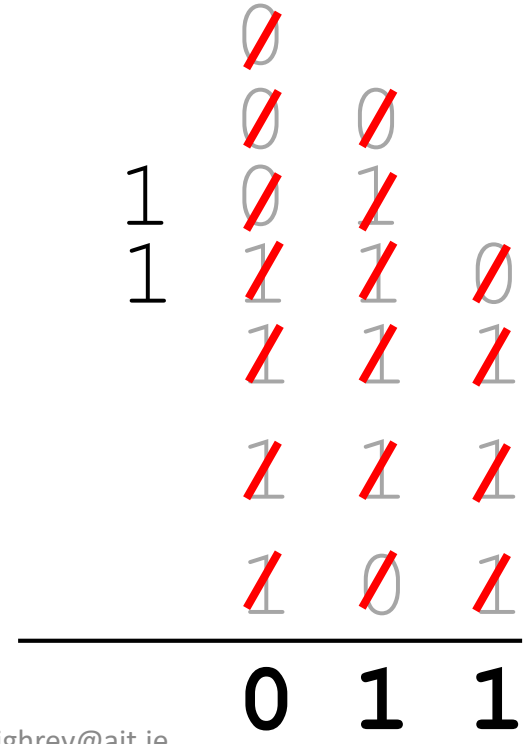

A	B	A + B
0	0	0
0	1	1
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0 + 0 = 0

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AIT Connect & Discover

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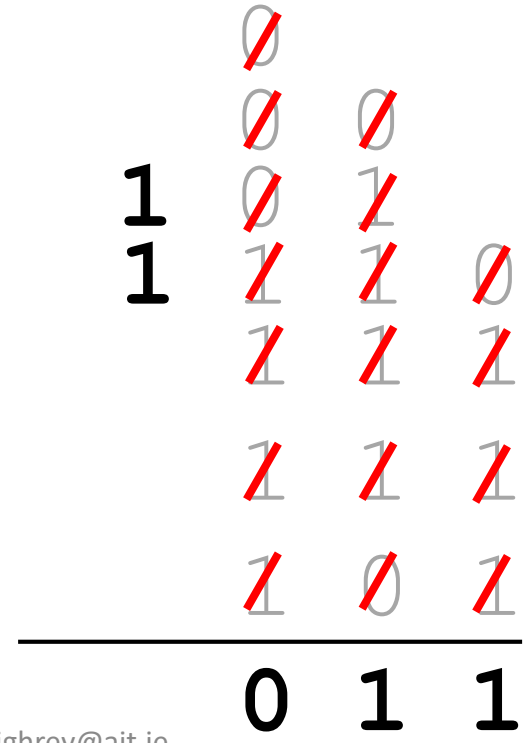
- Follow the 4 rules of addition!
- Carry “1” if applicable!



A	B	A + B
0	0	0
0	1	1
1	0	1
1	1	10

1 + 1 = 10

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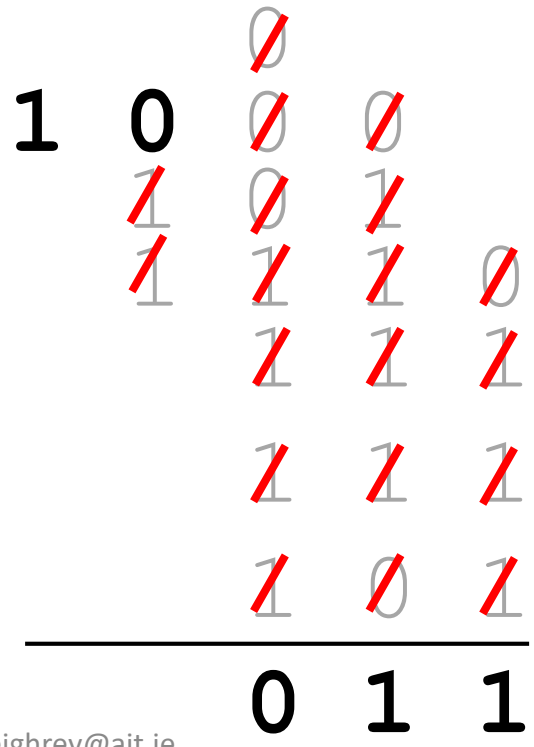
Binary Addition – 3 Values

- Add individual bits!
- Follow the 4 rules of addition!
- Carry “1” if applicable!



A	B	A + B
0	0	0
0	1	1
1	0	1
1	1	10

1 + 1 = 10

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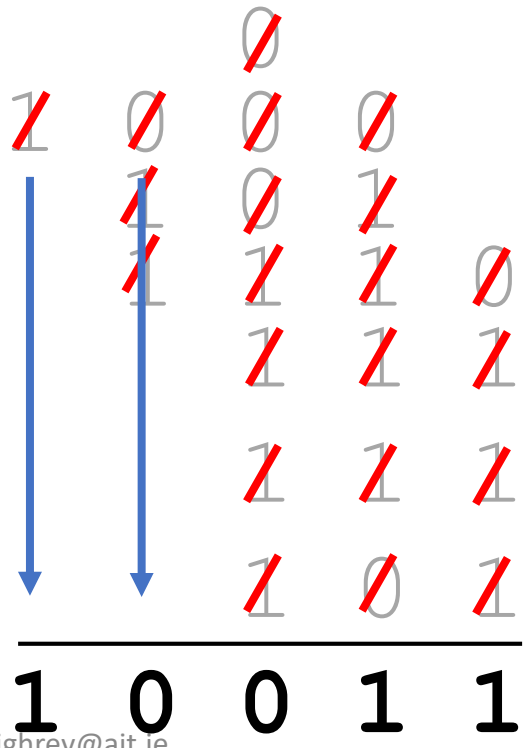
Binary Addition – 3 Values

- Add individual bits!
- Follow the 4 rules of addition!
- Carry “1” if applicable!



A	B	A + B
0	0	0
0	1	1
1	0	1
1	1	10

1 + 1 = 10

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Binary Subtraction

Binary Subtraction

- Binary Addition Rules: 4 rules!

A	B	A - B
0	0	0
0	1	1*
1	0	1
1	1	0

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Binary Subtraction

- Binary Addition Rules: 4 rules!

A	B	A - B
0	0	0
0	1	1*
1	0	1
1	1	0

Borrow from the next more significant bit

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Binary Subtraction

- Subtract individual bits!
- Follow 4 rules!
- Remember to borrow from the next most significant bit!

A	B	A - B
0	0	0
0	1	1*
1	0	1
1	1	0

```
  1 1 0 1
- 1 0 1 1
---------
```

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Binary Subtraction

- **Subtract individual bits!**
- Follow 4 rules!
- Remember to borrow from the next most significant bit!

A	B	A - B
0	0	0
0	1	1*
1	0	1
1	1	0

```
    1  1  0  1
-   1  0  1  1
-------------
```

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Binary Subtraction

- Subtract individual bits!
- **Follow 4 rules!**
- Remember to borrow from the next most significant bit!

A	B	A - B
0	0	0
0	1	1*
1	0	1
1	1	0

```
    1  1  0  1
-   1  0  1  1
-------------
```

1 - 1 = 0

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Binary Subtraction

- Subtract individual bits!
- Follow 4 rules!
- **Remember to borrow from the next most significant bit!**

A	B	A - B
0	0	0
0	1	1*
1	0	1
1	1	0

```
    1  1  0  1
-   1  0  1  1
-------------
             0
```

0 - 1 = **1***

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Binary Subtraction

- Subtract individual bits!
- Follow 4 rules!
- **Remember to borrow from the next most significant bit!**

A	B	A - B
0	0	0
0	1	1*
1	0	1
1	1	0

$$\begin{array}{rcccc} & & 0 & \mathbf{1} & \mathbf{0} \\ & 1 & \cancel{1} & \cancel{0} & \cancel{1} \\ - & 1 & 0 & \mathbf{1} & \cancel{1} \\ \hline & & & \mathbf{1} & \mathbf{0} \end{array}$$

10 - 1 = **1***

(2 – 1 = 1)

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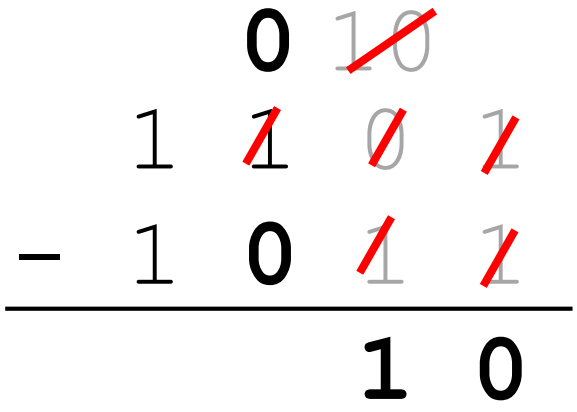
Binary Subtraction

- Subtract individual bits!
- Follow 4 rules!
- Remember to borrow from the next most significant bit!

A	B	A - B
0	0	0
0	1	1*
1	0	1
1	1	0



0 - 0 = 0

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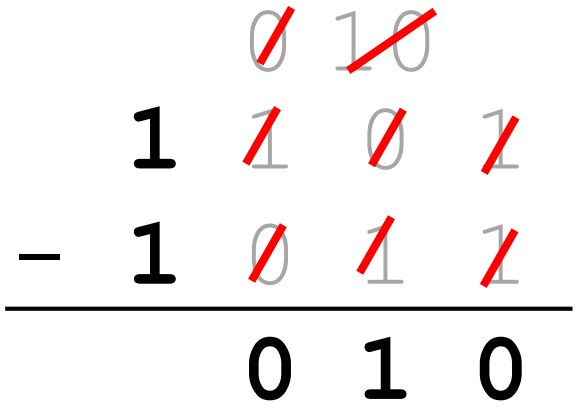
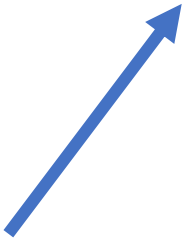
Binary Subtraction

- Subtract individual bits!
- Follow 4 rules!
- Remember to borrow from the next most significant bit!

A	B	A - B
0	0	0
0	1	1*
1	0	1
1	1	0





1 - 1 = 0

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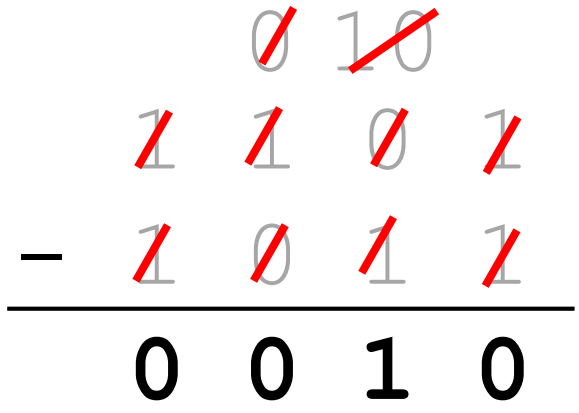
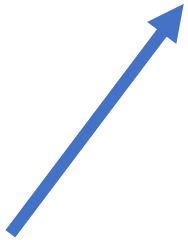
Connect & Discover

Binary Subtraction

- Subtract individual bits!
- Follow 4 rules!
- Remember to borrow from the next most significant bit!

A	B	A - B
0	0	0
0	1	1*
1	0	1
1	1	0





1 - 1 = 0

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Connect & Discover

Questions

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