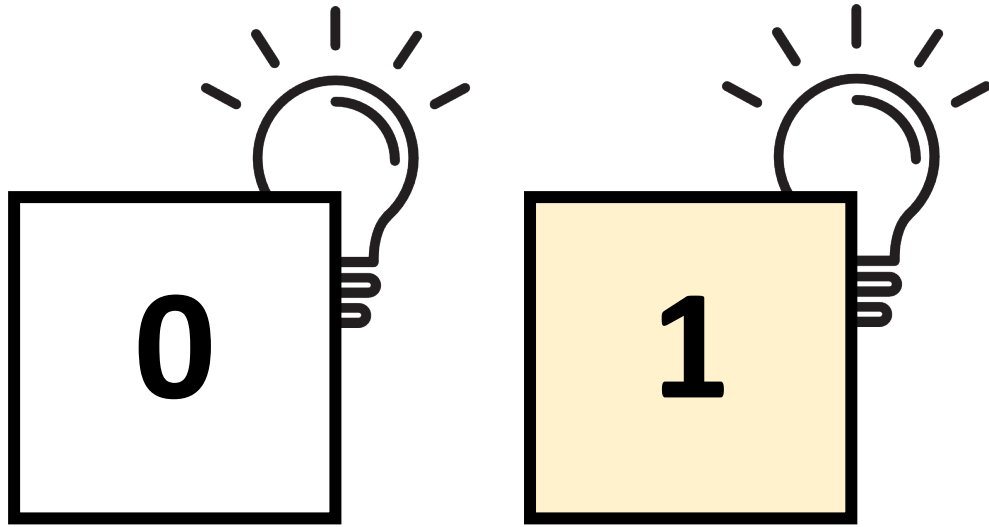


# 1.1 Number systems

## Converting between number systems – Part 1

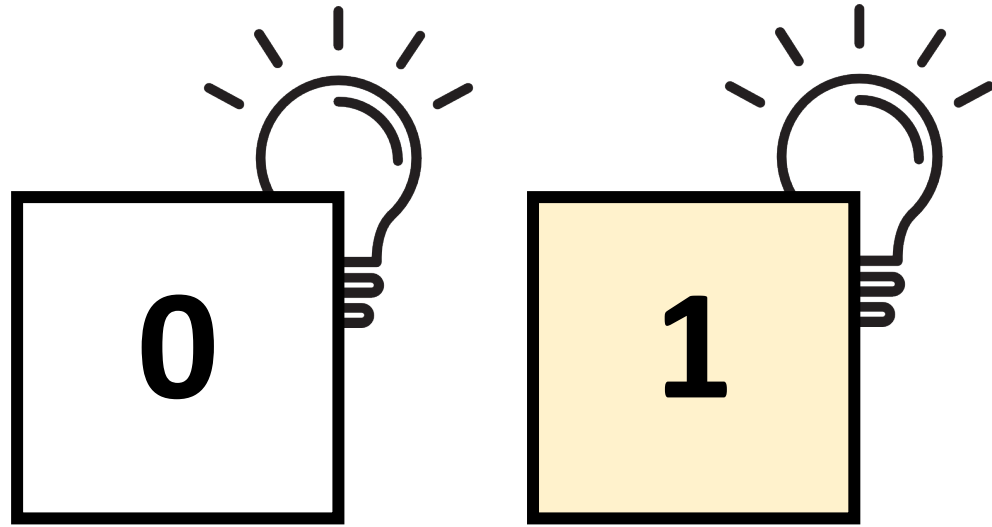


## About denary



= Binary Digit

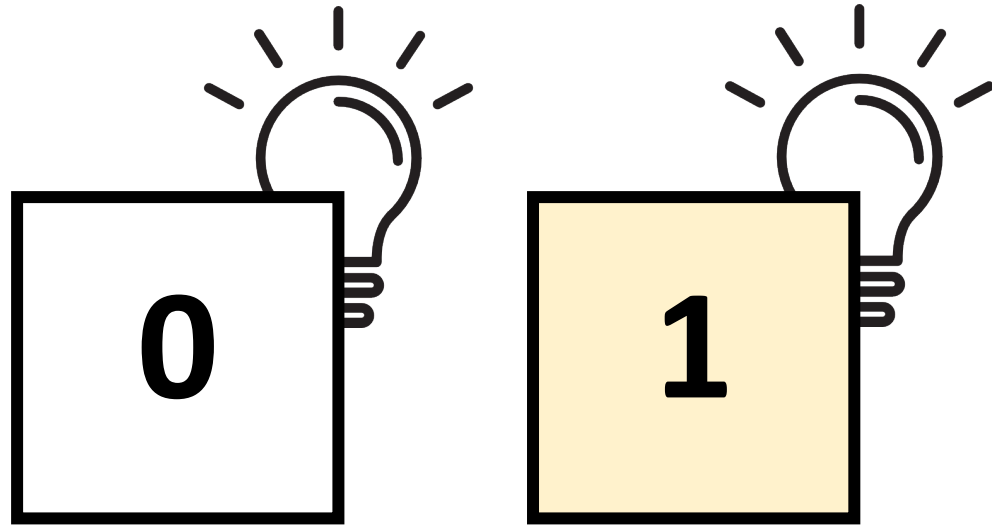
### About denary



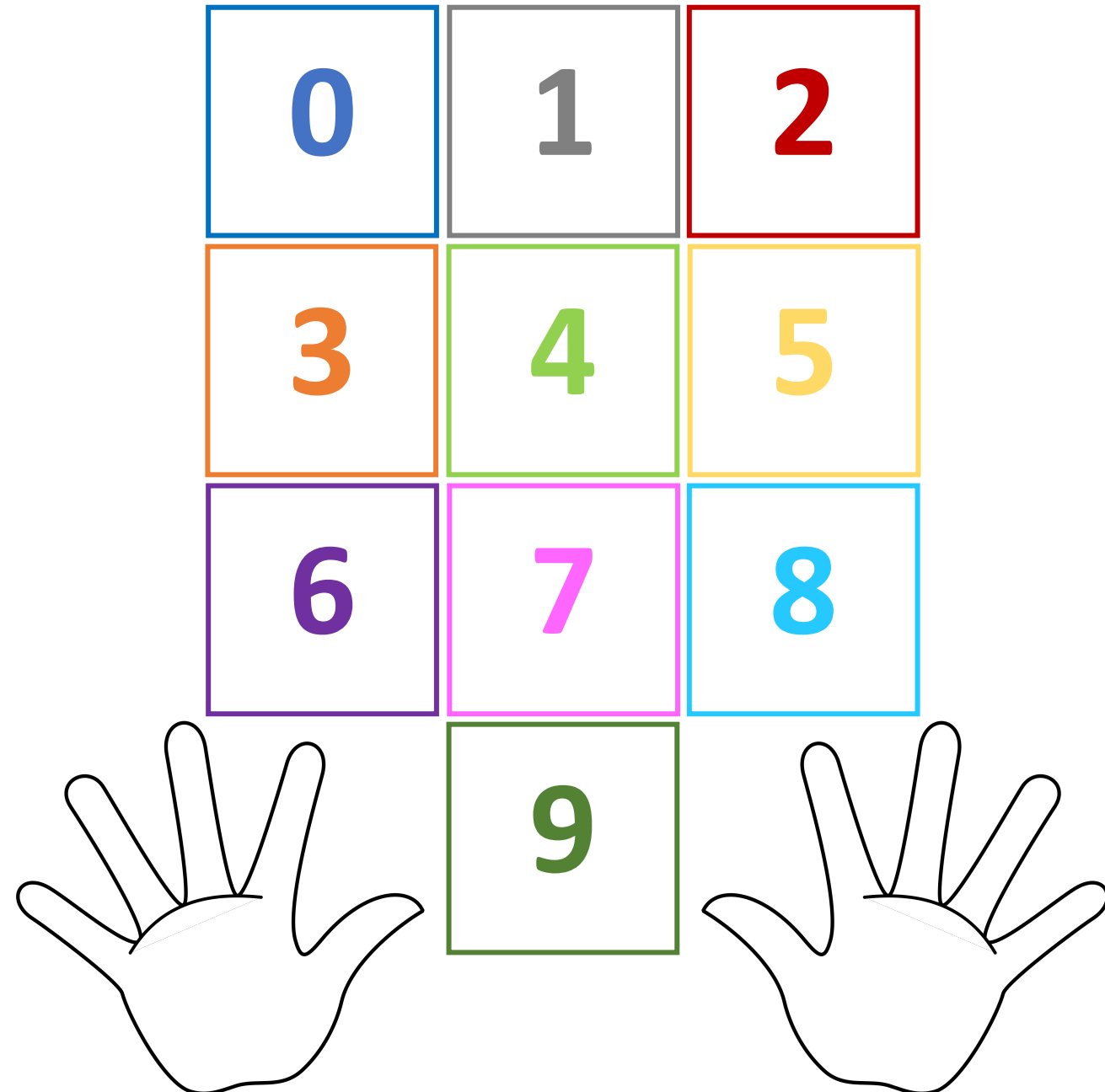
= Binary Digit

0	1	2
3	4	5
6	7	8
	9	

### About denary



= Binary Digit



About denary

100s	10s	1s
0	1	0

About denary

100s	10s	1s
0	1	0

$0 \times 100$	+	$1 \times 10$	+	$0 \times 1$	= 10
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About denary

100s	10s	1s
0	8	9

$0 \times 100$	+	$8 \times 10$	+	$9 \times 1$	= 89
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About binary

4s	2s	1s
0	1	1



About binary

4s	2s	1s
0	1	1
$0 \times 4$		

About binary

4s	2s	1s
0	1	1
$0 \times 4$	$+ \quad 1 \times 2$	

## About binary

4s	2s	1s
0	1	1
$0 \times 4$	$+ \quad 1 \times 2$	$+ \quad 1 \times 1 = 3$

## About binary

4s	2s	1s
0	1	1
$0 \times 4 + 1 \times 2 + 1 \times 1 = 3$		

### Denary to binary

There are two main methods you can use to convert from denary to binary:

#### Method 1

Divide-by-two

#### Method 2

Binary  
number line

Both are equally as valid, so use whichever you feel most comfortable with.



## Denary to binary: Divide-by-two method

## Convert the denary number 89 into binary

[illegible]

## Denary to binary: Divide-by-two method

## Convert the denary number 89 into binary

[illegible]



Denary to binary: Divide-by-two method

Convert the denary number 89 into binary

Divisions by 2	Remainder
89	1
44	0
22	0
11	

Denary to binary: Divide-by-two method

Convert the denary number 89 into binary

Divisions by 2	Remainder
89	1
44	0
22	0
11	1
5	

Denary to binary: Divide-by-two method

Convert the denary number 89 into binary

Divisions by 2	Remainder
89	1
44	0
22	0
11	1
5	1
2	

Denary to binary: Divide-by-two method

Convert the denary number 89 into binary

Divisions by 2	Remainder
89	1
44	0
22	0
11	1
5	1
2	0
1	

Denary to binary: Divide-by-two method

Convert the denary number 89 into binary

Divisions by 2	Remainder
89	1
44	0
22	0
11	1
5	1
2	0
1	1
0	

Denary to binary: Divide-by-two method

Convert the denary number 89 into binary

Divisions by 2	Remainder
89	1
44	0
22	0
11	1
5	1
2	0
1	1





Denary to binary:  
Divide-by-two method

Convert the denary number 89 into binary

Divisions by 2	Remainder
89	1
44	0
22	0
11	1
5	1
2	0
1	1
	0



= 01011001

Denary to binary: Binary number line method

Convert the denary number 89 into binary

128	64	32	16	8	4	2	1



Denary to binary: Binary number line method

Convert the denary number 89 into binary

89

128	64	32	16	8	4	2	1
0							

Denary to binary: Binary number line method

Convert the denary number 89 into binary

89 - 64 = 25

128	64	32	16	8	4	2	1
0	1						

Denary to binary: Binary number line method

Convert the denary number 89 into binary

89 - 64 = 25

128	64	32	16	8	4	2	1
0	1	0					

Denary to binary: Binary number line method

Convert the denary number 89 into binary

89 - 64 = 25 - 16 = 9

128	64	32	16	8	4	2	1
0	1	0	1				

Denary to binary: Binary number line method

Convert the denary number 89 into binary

$89 - 64 = 25 - 16 = 9 - 8 = 1$

128	64	32	16	8	4	2	1
0	1	0	1	1			

Denary to binary: Binary number line method

Convert the denary number 89 into binary

$89 - 64 = 25 - 16 = 9 - 8 = 1$

128	64	32	16	8	4	2	1
0	1	0	1	1	0		

Denary to binary: Binary number line method

Convert the denary number 89 into binary

$89 - 64 = 25 - 16 = 9 - 8 = 1$

128	64	32	16	8	4	2	1
0	1	0	1	1	0	0	

Denary to binary: Binary number line method

Convert the denary number 89 into binary

$89 - 64 = 25 - 16 = 9 - 8 = 1$

128	64	32	16	8	4	2	1	
0	1	0	1	1	0	0	1	= 01011001





Denary to binary:  
Binary number line method

Convert the denary number 89 into binary

$89 - 64 = 25 - 16 = 9 - 8 = 1$

128	64	32	16	8	4	2	1	= 01011001	
0	1	0	1	1	0	0	1	= 89	
<hr/>									
	64		+	16	+	8		+	1

Binary to denary

Convert the binary number 01100110 into denary

128	64	32	16	8	4	2	1

Binary to denary

Convert the binary number 01100110 into denary

128	64	32	16	8	4	2	1
0	1	1	0	0	1	1	0



# Binary to denary

Convert the binary number 01100110 into denary

128	64	32	16	8	4	2	1				
0	1	1	0	0	1	1	0				
<hr/>											
	64	+	32	+		+	4	+	2		= 102

## Number bases: Binary (base 2)

The maximum binary number length you will get in your exam is 16 bits – this means:

- The smallest positive whole number you can represent will be 0.
- The largest positive whole number you can represent will be 65,535.

32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
--------	--------	-------	-------	-------	-------	-----	-----	-----	----	----	----	---	---	---	---

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

= 0

1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

= 65,535

