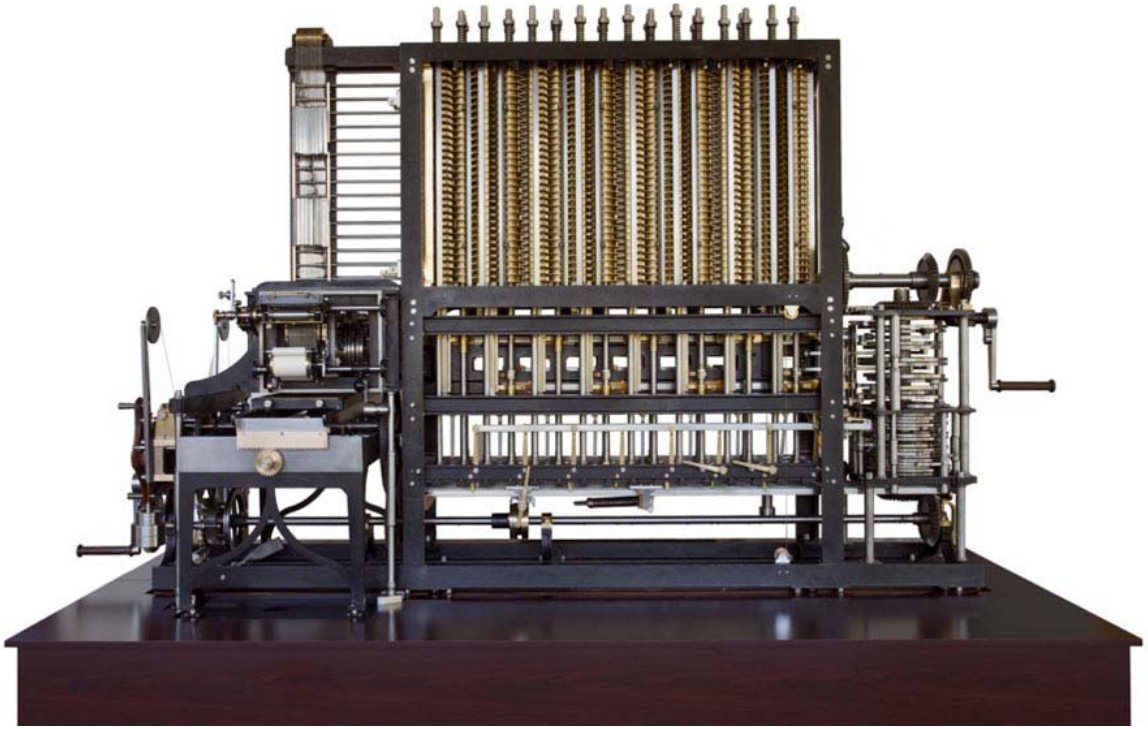
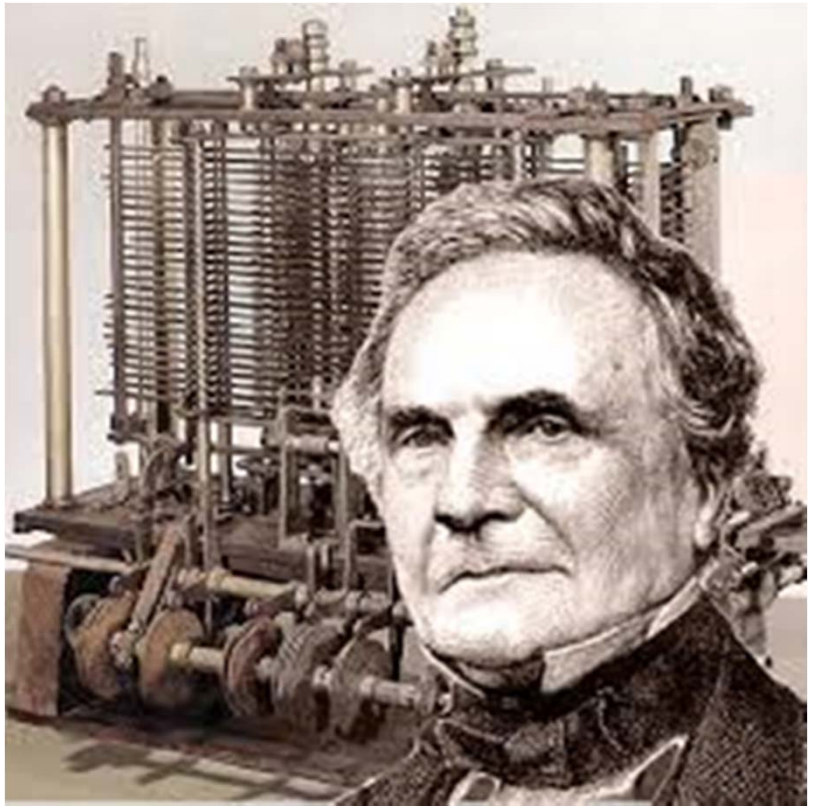
THE HISTORY OF BINARY CODING

By Pauline & Steph



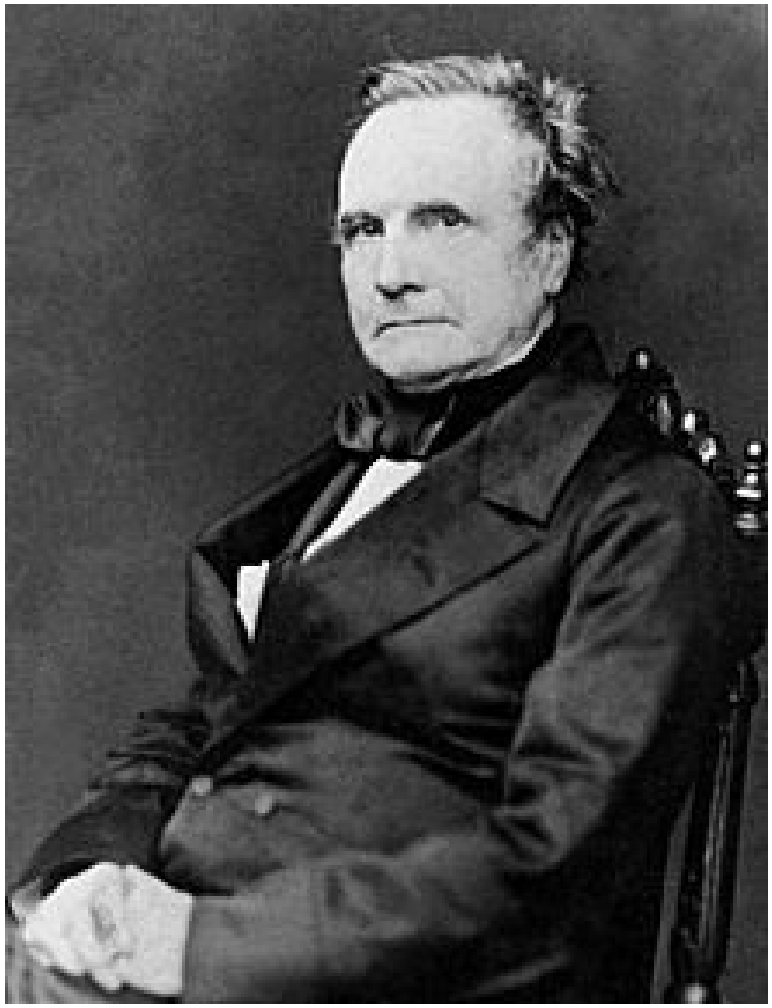
Context



- Charles Babbage
- The Analytical Engine
- Colossus
- Binary Code
- Denary Code
- Place Values
- The Conversion of Binary Codes into Denary Codes

Charles Babbage

- Born 26th December 1791, in London
- Died 18th October 1871 (Aged 79) in Marylebone, London
- **Fields** - Mathematics, Engineering, Political Economy, Computer Science
- **Institutions** - Trinity College, Cambridge
- **Inventions** - Analytical Engine, Colossus

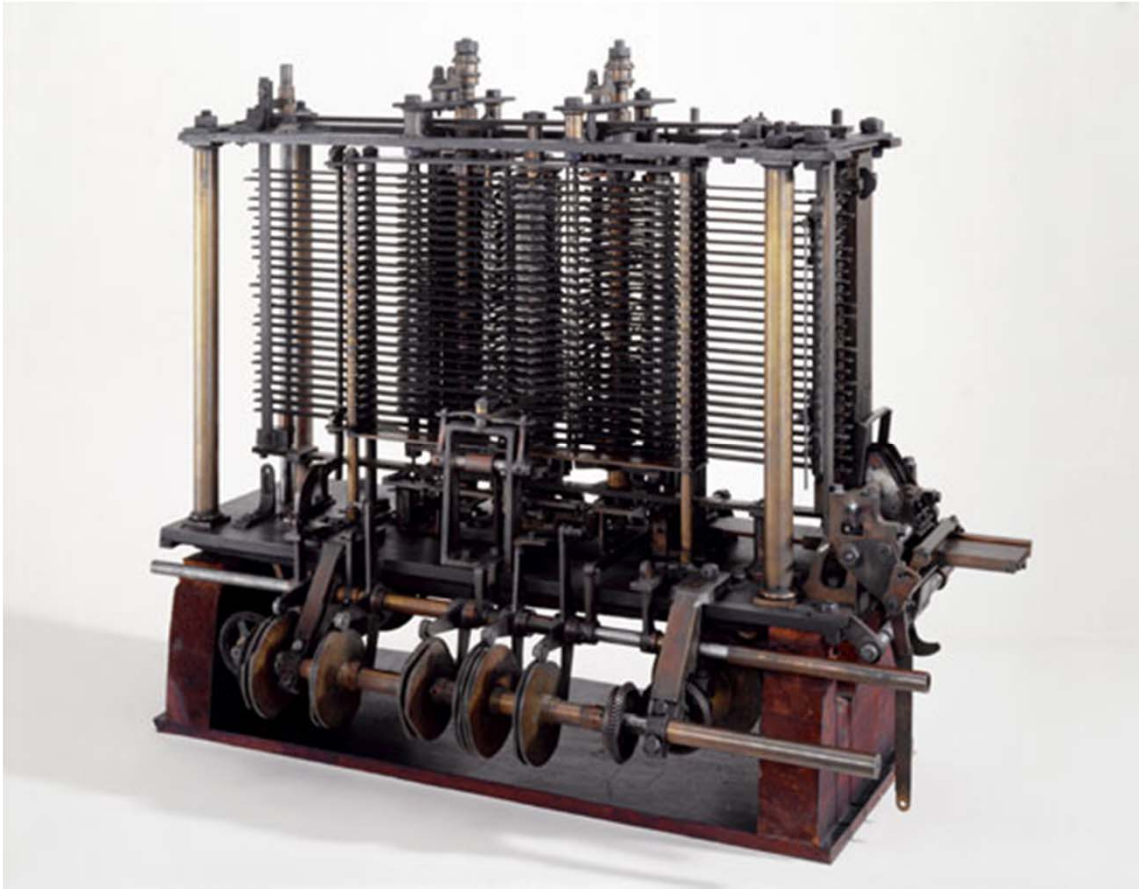


Analytical Engine

- **Ability:** Calculate and print mathematical tables
- **Purpose:** Babbage's time, mathematical tables (logarithmic and trigonometric functions) were generated by teams of mathematicians -> Babbage wanted to eliminate mistakes
- **Facts:** Steam-powered, 50.000 components, card containing operation instructions, memory of 1,000 numbers of up to 50 decimal digits long, accurate to 31 decimal places

Analytical Engine

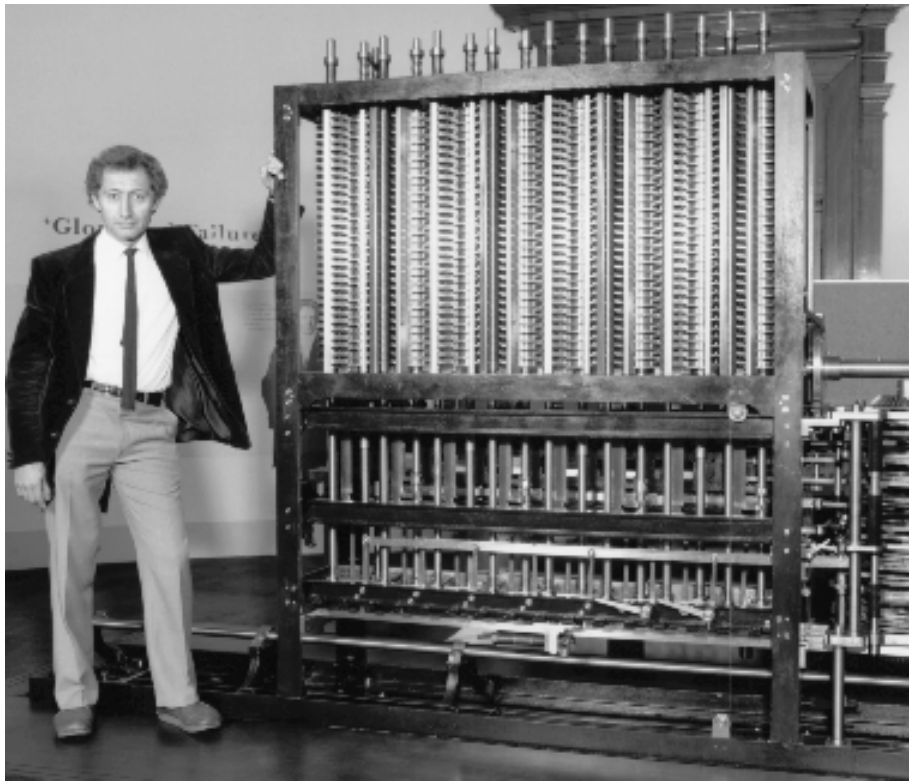
- Babbage invented computers but failed to build them
- Machine exceeded technology at the time
- Designed between 1834 - 1871
- **First Babbage Engine**: London in 2002
- Operated using punched cards and tapes



Portion of the mill with a printing mechanism of 1843; Only part of the machine was completed before his death in 1871

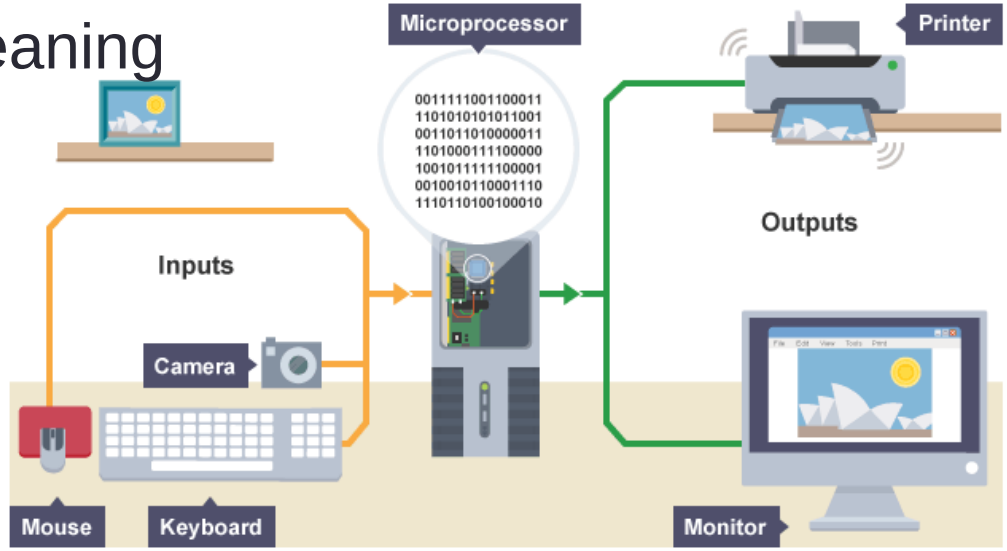
Colossus

- **Definition:** First fully functioning electronic digital computer
- **Central site** for UK's government code during WW2: Bletchley Park, in Milton Keynes, Buckinghamshire
- **Used** by the Bletchley Park cryptanalysts from February 1944
- **First ever Colossus**: Bletchley Park, January 1943
- At end of the war -> 10 Colossi at Bletchley Park



Binary Code

- Smallest unit of data in computing
- Number 1 -> ON
- Number 0 -> OFF
- Information processed by a computer (software, music, documents) -> stored using binary coding
- Numbers are encoded in different data formats to give them meaning



Denary Codes

- **Denary** - Numbers based on combinations of the digits between 0 and 9, base 10.
- **Number base** - Digits available within numerical system
- Can convert between denary and binary
- Information processed by a computer -> stored using both binary and denary
- Broader range of variety than binary

Place Values

Denary Place Values:

- Each number has a **place value**
- Base ten

Thousands 1000s (10^3)	Hundreds 100s (10^2)	Tens 10s (10^1)	Ones 1s (10^0)
6	4	3	2

Binary Place Values:

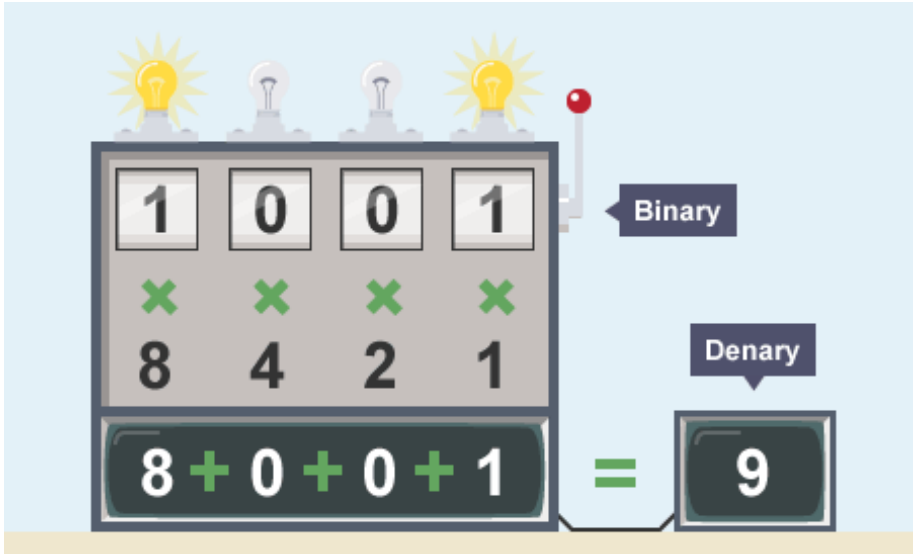
- Base two
- Example: Binary number **1001**

Eights 8s (2^3)	Fours 4s (2^2)	Twos 2s (2^1)	Ones 1s (2^0)
1	0	0	1

$2^3 = 8$
$2^2 = 4$
$2^1 = 2$
$2^0 = 1$

Converting from Binary to Denary: Example

-> Converting binary code 1001

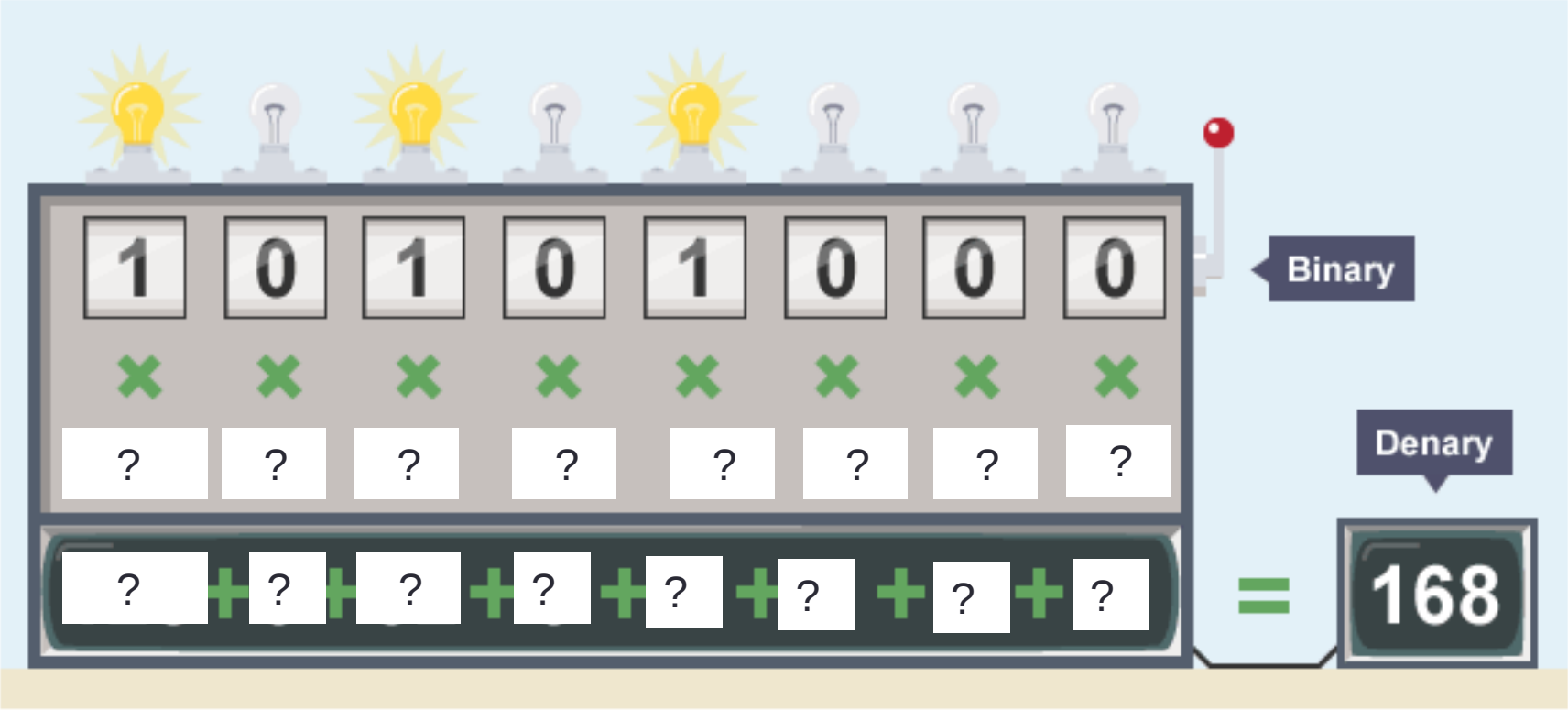


$2^3 = 8$
$2^2 = 4$
$2^1 = 2$
$2^0 = 1$

1. Binary has a base of 2 so we use 2 as the base
2. The power (starting from zero) up to the number of binary digits you have
3. Multiply the two together and add the them

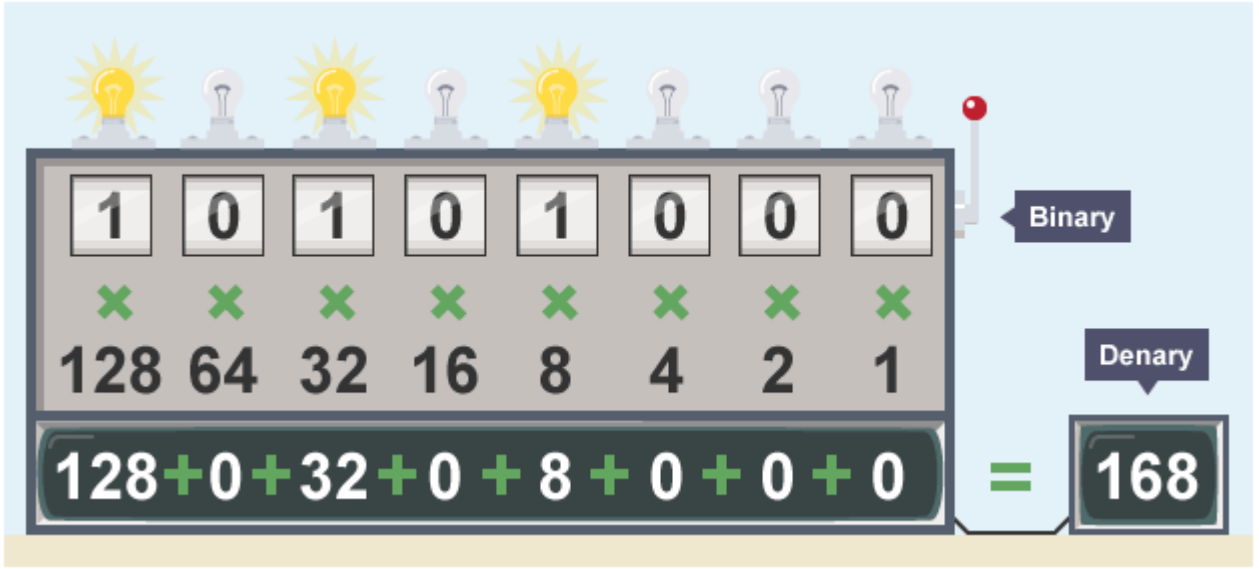
Question

Please convert the binary code **10101000** into its denary code.



Answer

$2^7 = 128$
$2^6 = 64$
$2^5 = 32$
$2^4 = 16$
$2^3 = 8$
$2^2 = 4$
$2^1 = 2$
$2^0 = 1$



In **denary** the sum is calculated as:

(**1** x 128) + (**0** x 64) + (**1** x 32) + (**0** x 16)+ (**1** x 8) + (**0** x 4) + (**0** x 2) + (**0** x 1) =
128 + 32 + 8 = **168**

Thank you for listening