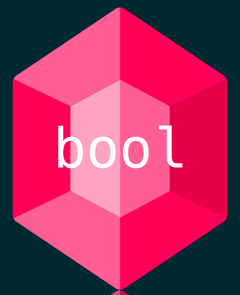
Basic Types in Go


bool
uint
float32
int8
uint8/byte
float64
int
int16
uint16
uint32
complex64
int32/rune
uint64
complex128
int64
uintptr
string

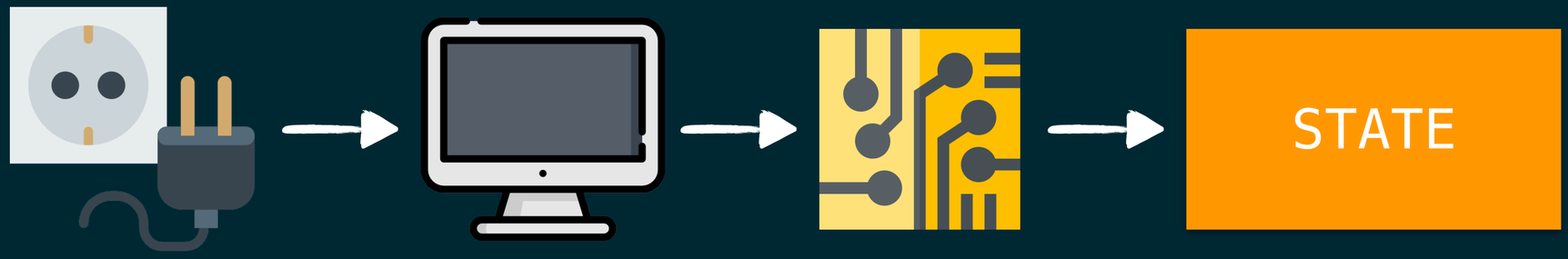
BASIC TYPES

bool	uint	float32
int	uint8/byte	float64
int8	uint16	complex64
int16	uint32	complex128
int32/rune	uint64	string
int64	uintptr	


bool

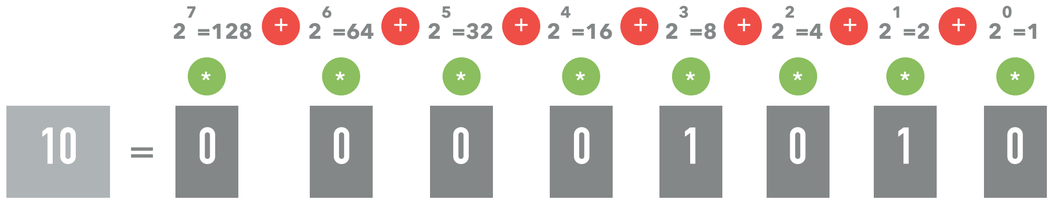
BOOL VALUES

true	1	ON
false	0	OFF



BASE 2

- The number of values - {*0*, *1*}
- What is a **B**yte - ***8 bits***
- What is a bit - one of the values (***0 or 1***)
- How to represent a **B**yte:



BOOL SIZE

1B	8b	$2*2^{8-1}-1$	0–255

1 Byte is the smallest addressable unit (**not 1 bit**)

BOOL OPERATIONS

operators & punctuation

+	&	+=	&=	&&	==	!=	(	)
-	|	-=	|=	||	<	<=	[	]
*	^	*=	^=	<-	>	>=	{	}
/	<<	/=	<<=	++	=	:=	,	;
%	>>	%=	>>=	--	!	...	.	:
			&^=					


int
int8
int16
int32
int64

INT VALUES

8	$-2^{7}=-128 <=> 2^{7}-1=127$
16	$-2^{15}=-32,768 <=> 2^{15}-1=32,767$
32	$-2^{31}=-2,147,483,648 <=> 2^{31}-1=2,147,483,648$
64	$-2^{63}=-9,223,372,036,854,775,808 <=> 2^{63}-1=9,223,372,036,854,775,807$

POSITIVE & NEGATIVE NUMBERS

LEFTMOST BIT	0 - positive	1 - negative

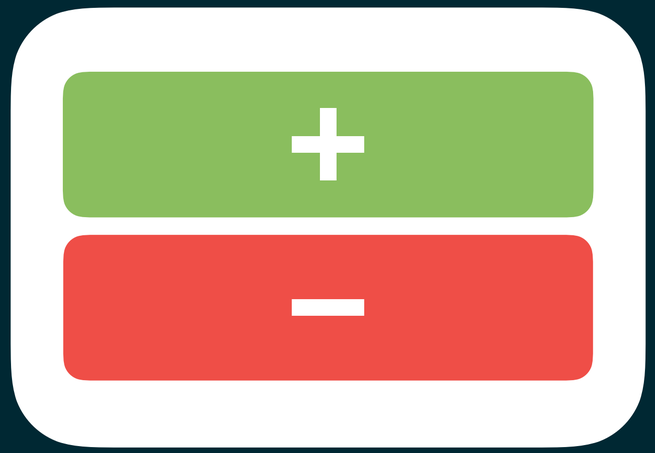
12	**0**000 1100
-12	**1**000 1100

2'S COMPLEMENT	
12	0000 1100
-12	1111 0101


uint
uint8
uint16
uint32
uint64

WHAT IS UINT?

`int`



`uint`

UINT VALUES

8	$0 <=> 2^7*2-1=255$
16	$0 <=> 2^{15}*2-1=65,535$
32	$0 <=> 2^{31}*2-1=4,294,967,295$
64	$0 <=> 2^{63}*2-1=18,446,744,073,709,551,615$

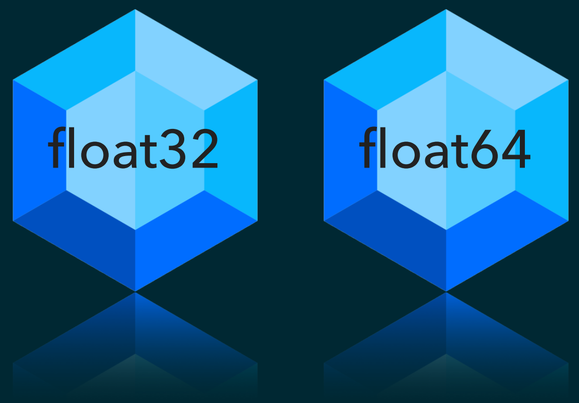
INT/UINT SIZE

int	uint	4/8B	32/64b
int8	uint8	1B	8b
int16	uint16	2B	16b
int32	uint32	4B	32b
int64	uint64	8B	64b

INT/UINT OPERATIONS

operators & punctuation

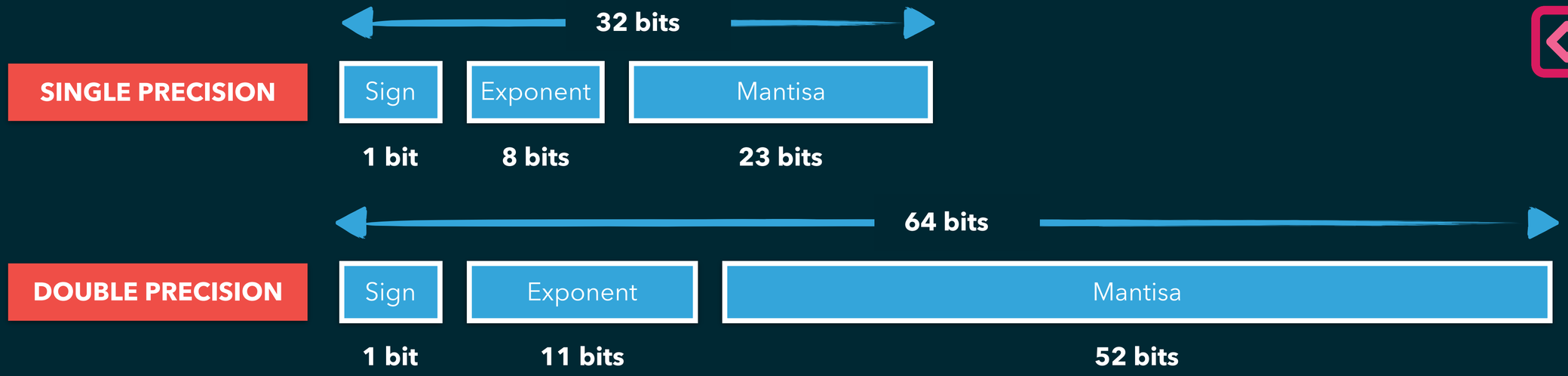
+	&	+=	&=	&&	==	!=	(	)
-	|	-=	|=	||	<	<=	[	]
*	^	*=	^=	<-	>	>=	{	}
/	<<	/=	<<=	++	=	:=	,	;
%	>>	%=	>>=	--	!	...	.	:
			&^=					


float32
float64

FLOAT VALUES

32	$0 <=> 2^{31}*2-1=4,294,967,295$
64	$0 <=> 2^{63}*2-1=18,446,744,073,709,551,615$

IEEE 754 STANDARD



FLOATING POINT FACTS

- **Cannot** be represented **exactly** in **binary**
- **Rounding error** - Precision is lost when applying certain operations on floats
- **Equality checks** are done by a **delta E**rror not by the value stored in memory

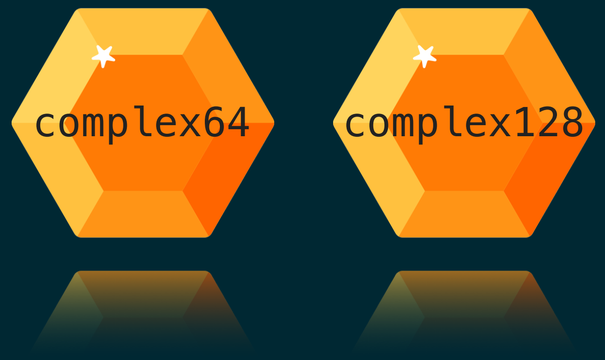
FLOAT SIZE

`float32`	4B	32b
`float64`	8B	64b

FLOAT OPERATIONS

operators & punctuation

+	&	+=	&=	&&	==	!=	(	)
-	|	-=	|=	||	<	<=	[	]
*	^	*=	^=	<-	>	>=	{	}
/	<<	/=	<<=	++	=	:=	,	;
%	>>	%=	>>=	--	!	...	.	:
			&^=					


complex64
complex128

COMPLEX VALUES

64	$0 <=> 2^{63}*2-1=18,446,744,073,709,551,615$
128	$0 <=> 2^{127}*2-1=3.4028237e+38$

WHAT IS COMPLEX?

A complex number is a number of form **a+b*i***, where **a** and **b** are **real numbers** and **i** is the solution of the equation $x^2=-1$

COMPLEX SIZE

complex64	4B	32b
complex128	8B	64b

COMPLEX OPERATIONS

operators & punctuation

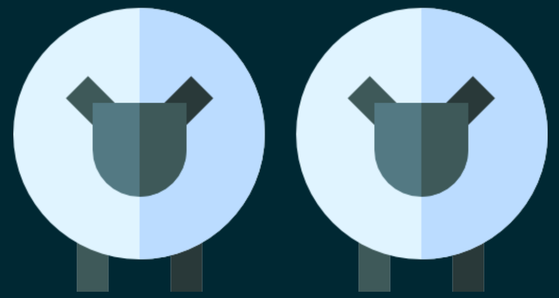
+	&	+=	&=	&&	==	!=	(	)
-	|	-=	|=	||	<	<=	[	]
*	^	*=	^=	<-	>	>=	{	}
/	<<	/=	<<=	++	=	:=	,	;
%	>>	%=	>>=	--	!	...	.	:
			&^=					

TYPE ALIASES

Type **A**

Type **B**

Type **A**




rune

RUNES ARE JUST NUMBERS

`rune` = `int32`


byte

BYTES ARE JUST NUMBERS

`byte` = `uint8`


string

STRING = SEQUENCE OF BYTES

ASCII & UTF8

1B

1-4B

STRING VALUES

Any UTF-8 sequence

STRING SIZE

```
type _string struct {
    elements *byte // 4/8B
    len int // 4/8B
}
```

string	8/16B	64/128b

STRING OPERATIONS

operators & punctuation

+	&	+=	&=	&&	==	!=	(	)
-	|	-=	|=	||	<	<=	[	]
*	^	*=	^=	<-	>	>=	{	}
/	<<	/=	<<=	++	=	:=	,	;
%	>>	%=	>>=	--	!	...	.	:
			&^=					

STRING FACTS

- **Read only** sequence of bytes (**[]byte**)
- 2 styles: **double quote**(interpreted) or **back quote** (raw) `"string"` `` `string` ``
- Strings are **comparable** & can use **comparison operations**
- When comparing, the **underlying bytes** are **compared**
- Destination **string variable** and **source string value** **share** the same **underlying bytes**
- **[]byte** & **[]rune** interchangeably convert to **string** and vice versa


uintptr

UINTPTR SIZE

uintptr	8/16B	64/128b

UINTPTR VALUES

32	$-2^{31}=-2,147,483,648 <=> 2^{31}-1=2,147,483,648$
64	$-2^{63}=-9,223,372,036,854,775,808 <=> 2^{63}-1=9,223,372,036,854,775,807$

UINTPTR OPERATIONS

operators & punctuation

+	&	+=	&=	&&	==	!=	(	)
-	|	-=	|=	||	<	<=	[	]
*	^	*=	^=	<-	>	>=	{	}
/	<<	/=	<<=	++	=	:=	,	;
%	>>	%=	>>=	--	!	...	.	:
			&^=					

UINTPTR FACTS

- **Integer** type that is **large enough** to hold **any pointer** bit pattern
- Supports **pointer arithmetic operations**
- A uintptr is **an integer**, **not** a **reference**
- **Converting unsafe.Pointer** to a **uintptr** creates an **integer value**
- Even if a **uintptr holds** the **address** of some **object**, the **GC will not update** that **uintptr's value** if the object moves

POINTERS ARE INTERCHANGEABLE

`uintptr`  `unsafe.Pointer`

WHAT IS UNSAFE POINTER

- **Pointer** represents a **pointer to** an **arbitrary type**
- Allows the program to **read** and **write arbitrary memory**
- A **pointer value** of any type can be converted to a **Pointer** and **vice versa**
- An **uintptr** can be converted to a **Pointer** and **vice versa**

PLATFORM DEPENDENT TYPES

`int`	`uint`	8/16B
`uintptr`	`string`	64/128b

QUICK EXERCISE

```
s := []byte("你 好")
if len(s) == 3 {
      fmt.Println("3B")
} else {
      fmt.Println("7B")
}
```