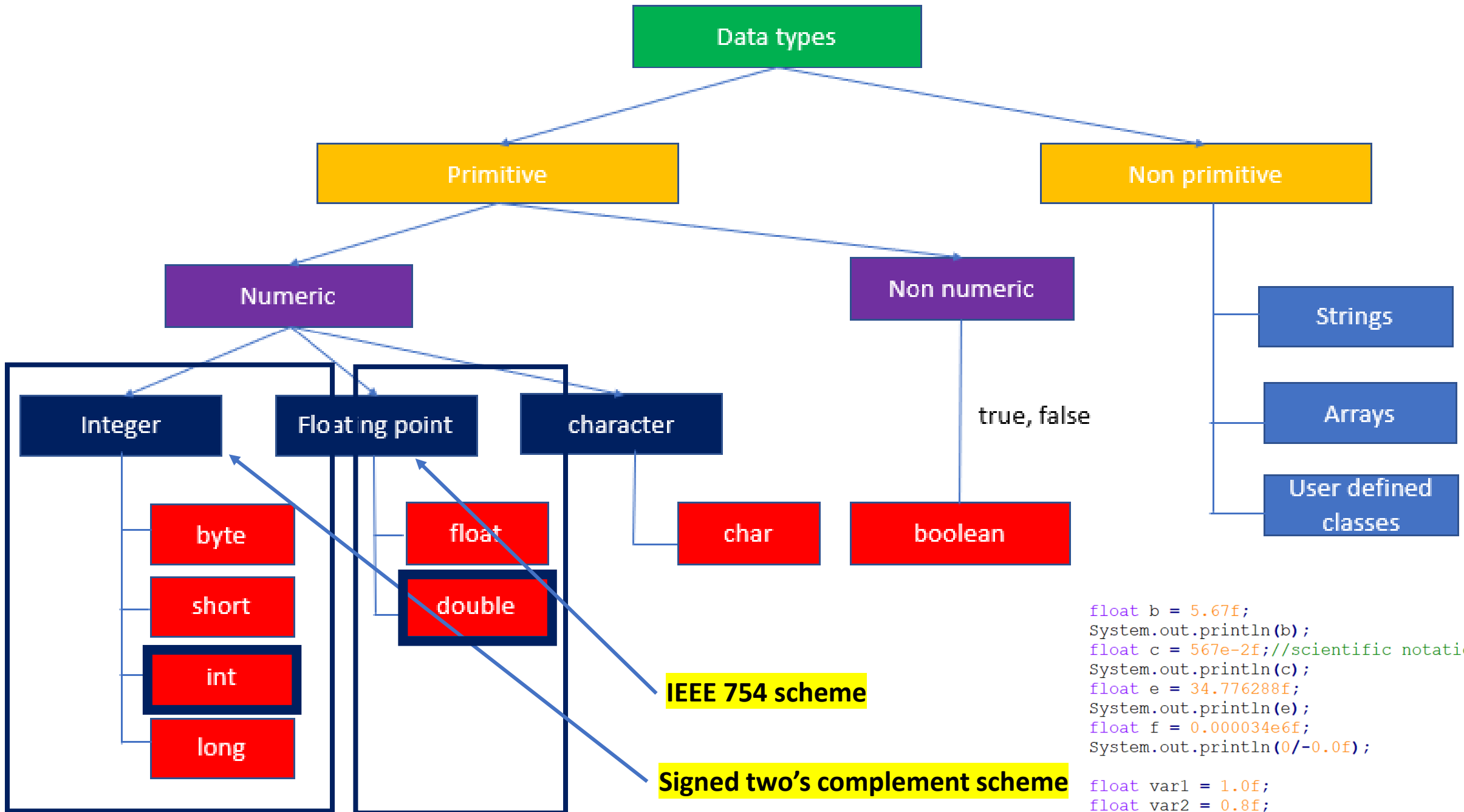# Chapter 23

IEEE 754 scheme

```
float b = 5.67f;
System.out.println(b);
float c = 567e-2f;//scientific notation...
System.out.println(c);
float e = 34.776288f;
System.out.println(e);
float f = 0.000034e6f;
System.out.println(0/-0.0f);

float var1 = 1.0f;
float var2 = 0.8f;
```

IEEE 754

- **I**nstitute of **E**lectrical and **E**lectronics **E**ngineers

- It is a standard to represent floating point numbers which was established in 1985 by the **Institute of Electrical and Electronics Engineers**

```java
float b = 5.67f;
System.out.println(b);
float c = 567e-2f;//scientific notation...
System.out.println(c);
float e = 34.776288f;
System.out.println(e);
float f = 0.000034e6f;
System.out.println(0/-0.0f);

float var1 = 1.0f;
float var2 = 0.8f;
```

Float

- **Uses 32 bits** to store floating point number in the IEEE 754 format

- **Single-precision** 32 bit IEEE 754 floating point

- 4 bytes of size

- -2^31 to 2^31-1

- ~~-2,14,74,83,648 to 2,14,74,83,647~~

- **-3.4E38 to 3.4E38**

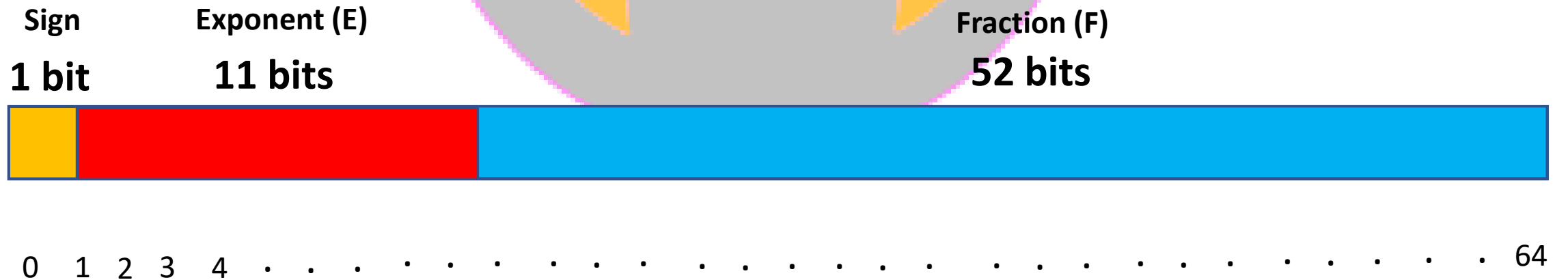**Why is it called single and double? why the range is different?**

Double

- **Uses 64 bits** to store floating point number in the IEEE 754 format

- **Double-precision** 64 bit IEEE 754 floating point

- 8 bytes of size

- -2^63 to 2^63-1

- ~~-92,23,37,20,36,85,47,75,808 to 92,23,37,20,36,85,47,75,807~~
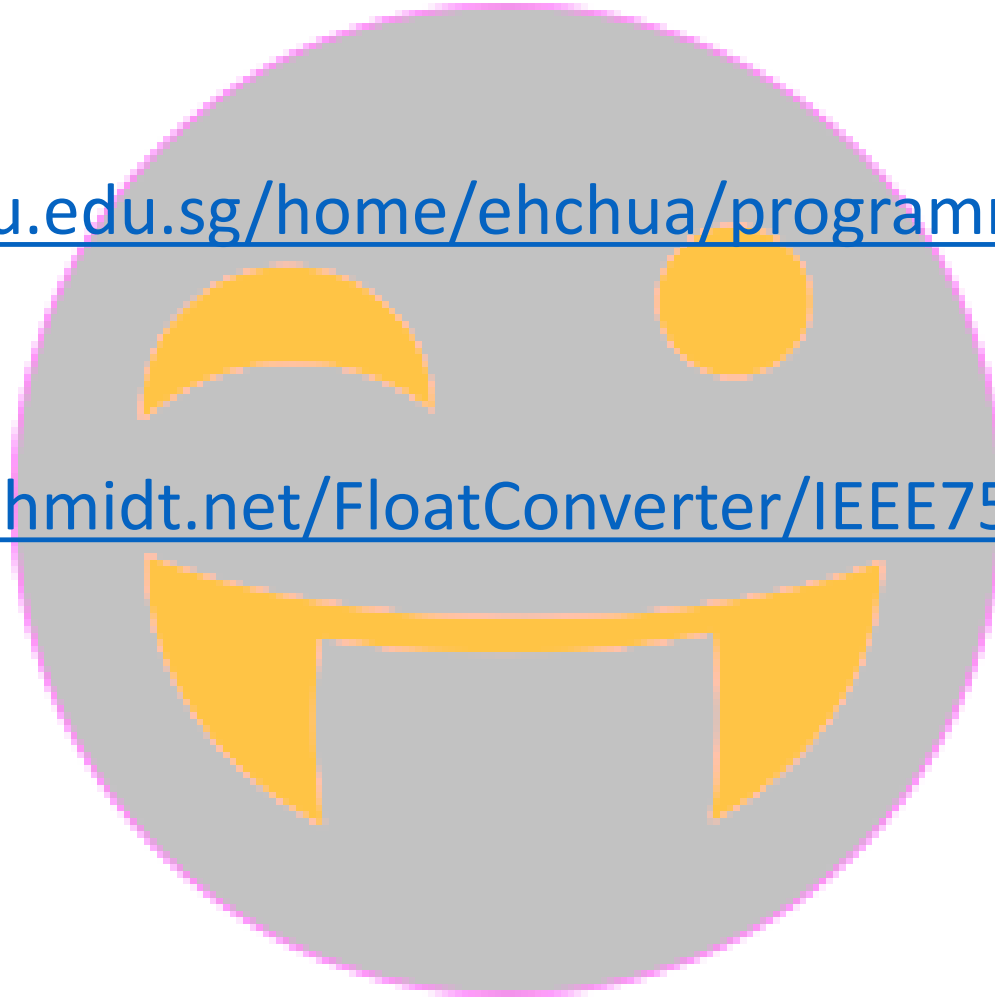
- **-1.7E308 to 1.7E308**

float(Ex: 37.4f) – 32 bits

Sign

Exponent (E)

Fraction (F)

1 bit

8 bits

23 bits

0 1 2 3 4 31

Double – 64 bits

Sign

Exponent (E)

Fraction (F)

1 bit

11 bits

52 bits

0 1 2 3 4 64

Useful links

- https://www3.ntu.edu.sg/home/ehchua/programming/java/DataRepresentation.html

- https://www.h-schmidt.net/FloatConverter/IEEE754.html

Let's see the action😎

IEEE 754

float(Ex: **37.4f**) − 32 bits

What next?

char data type

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