

True or false? (unless otherwise specified.)

Answer grid

Circle one answer for each question.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	B1	B2
True	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
False	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

- The binary number $(101.101)_2$ is equal to the decimal number 5.625.
- A real number has a finite representation in base 2 if and only if it is a rational number.
- The binary representation of $\frac{1}{3}$ is $(0.\overline{01})_2$.
- Let $(\bullet)_2$ denote binary representation. Then

$$(1000000000)_2 \times (0.001)_2 = (1000000)_2.$$

- It holds that

$$(0.111111)_2 + (0.000001)_2 = (1.001)_2.$$

- It holds that $(0.\overline{1100})_2 = \frac{4}{5}$.

- Let ε_{32} denote the machine epsilon for the **Float32** format, i.e. `eps(Float32)`. Then the number 3 is representable exactly in this format, and the next representable number in the **Float32** format is $3 + 2\varepsilon_{32}$.
- In Julia, `Float64(3.25) == Float32(3.25)` evaluates to **true**.
- The spacing (in absolute value) between successive half-precision (**Float16**) floating point numbers is always greater than or equal to `eps(Float16)`.
- In Julia, `Float64(.6) == Float32(.6)` evaluates to **true**.
- There exists $n \in \mathbf{N}$ such that the machine epsilon for the **Float64** format equals 2^{-n} . In other words, the machine epsilon is an exact negative power of two.
- In Julia, it holds that `eps()/3 + eps()/3 + 1 > 1` evaluates to **true**.
- For any real number x such that $x \in \mathbf{F}_{64}$, it holds that $2x \in \mathbf{F}_{64}$.
- Infinitely many distinct real numbers can be represented exactly in the **Float64** format, but only finitely many can be represented exactly in the **Float32** format.
- Let x and y be two numbers in $\mathbf{F}_{64}$. The result of the machine multiplication $x \hat{*} y$ is sometimes exact and sometimes not, depending on the values of x and y .
- (Bonus)** Does the Julia expression `sqrt(1 + 2eps()) == 1` evaluate to **true** or **false**?

Explain briefly:

- (Bonus)** Does the Julia expression `log2(2 + eps()) == 1` evaluate to **true** or **false**?

Explain briefly: