# Sine

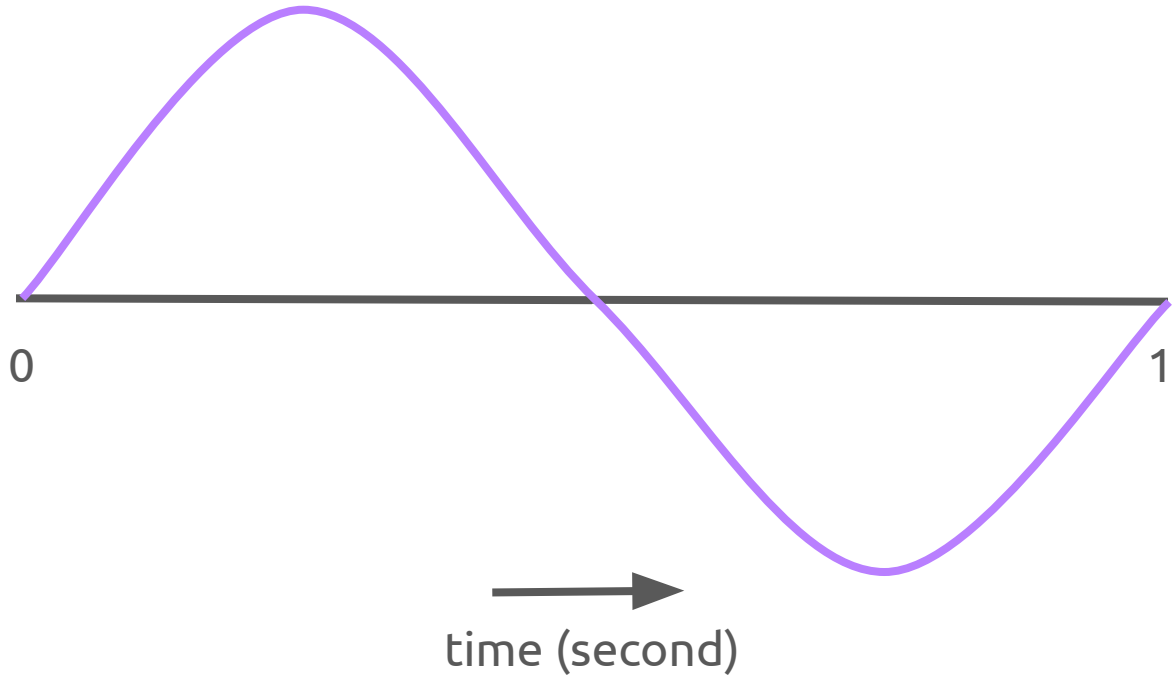
- function
- continuous- to discrete time domain
- phase

# Sine

function

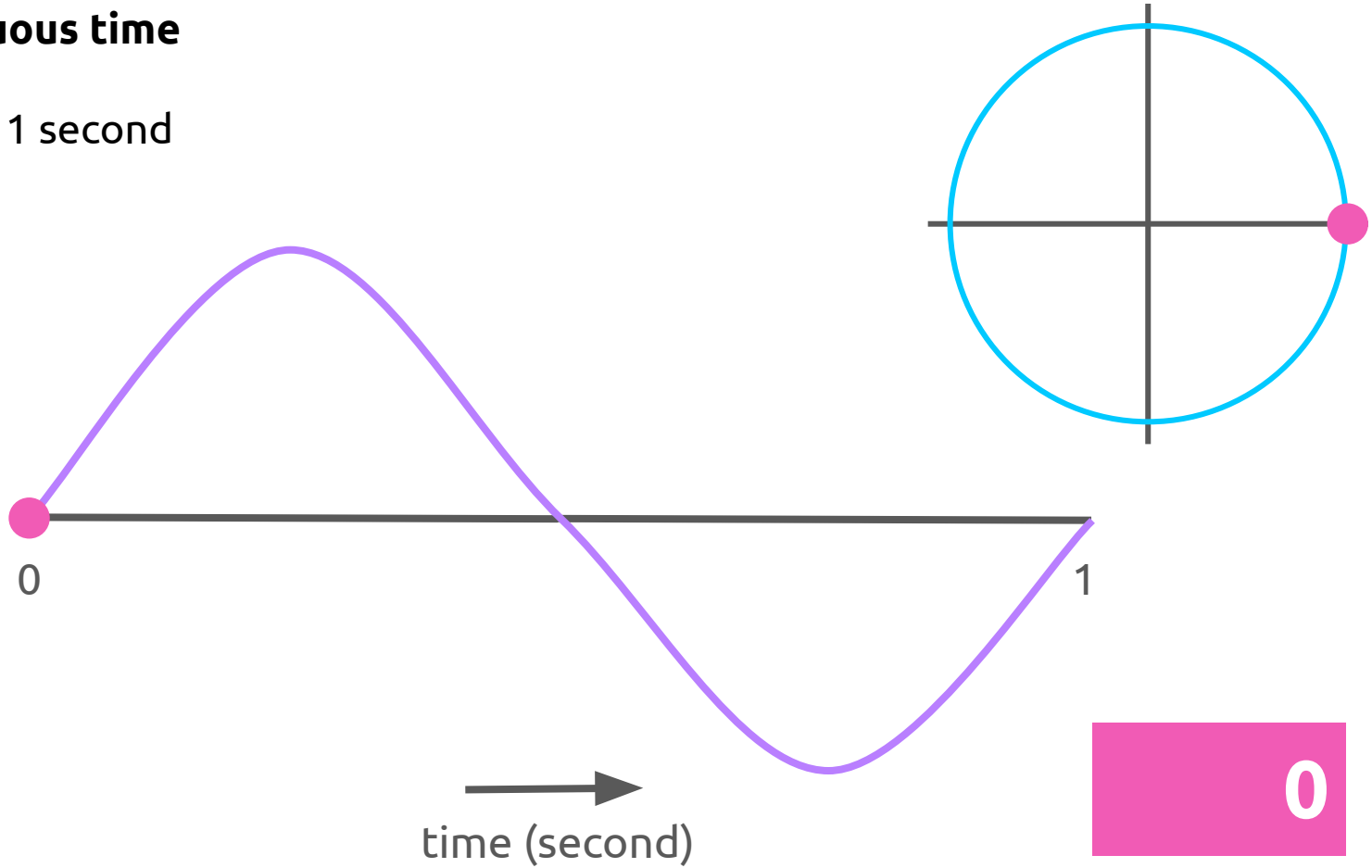
**Sine in continuous time**

- frequency = 1
- wavelength = 1 second



**Sine in continuous time**

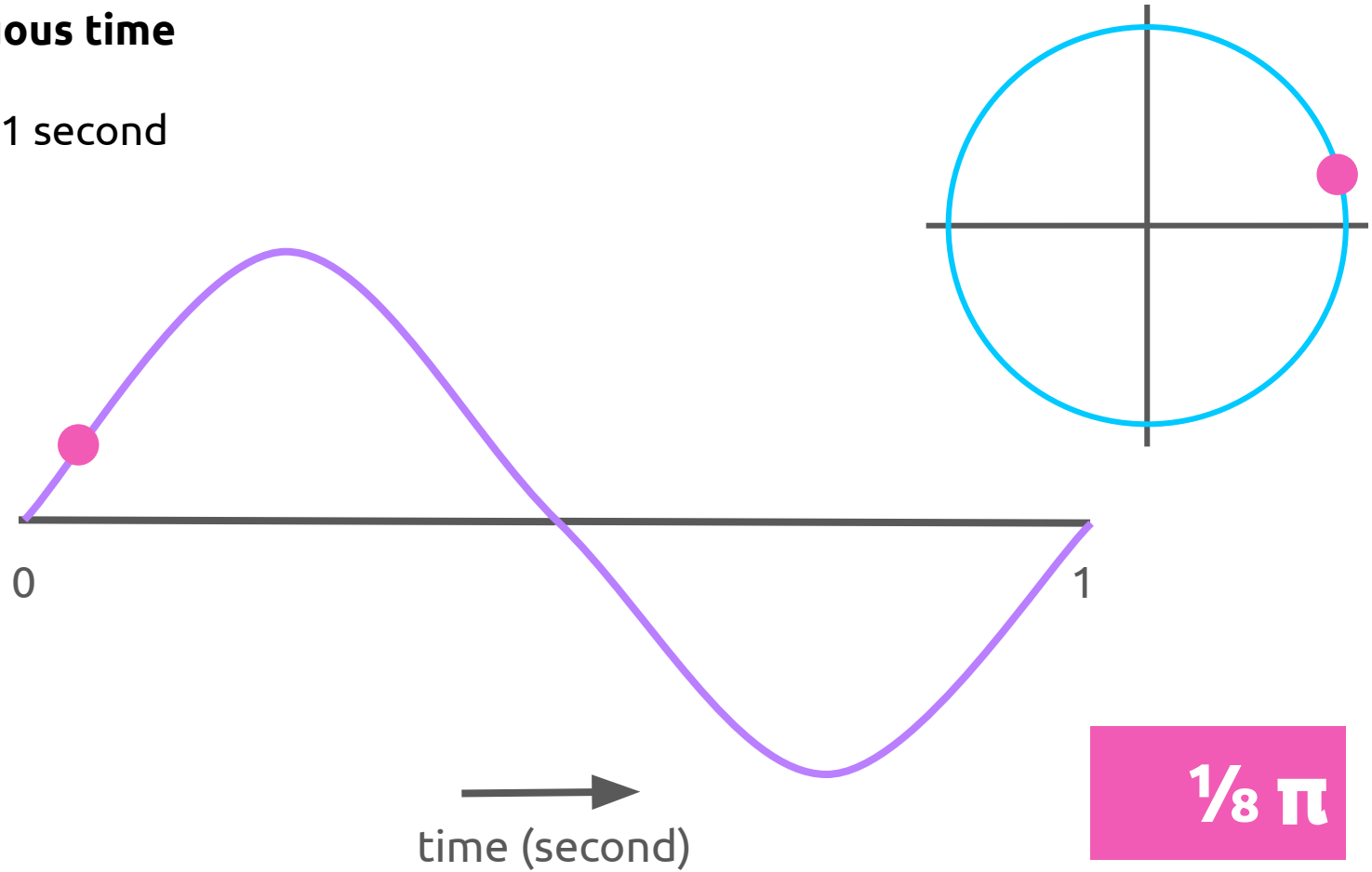
- frequency = 1
- wavelength = 1 second




0

**Sine in continuous time**

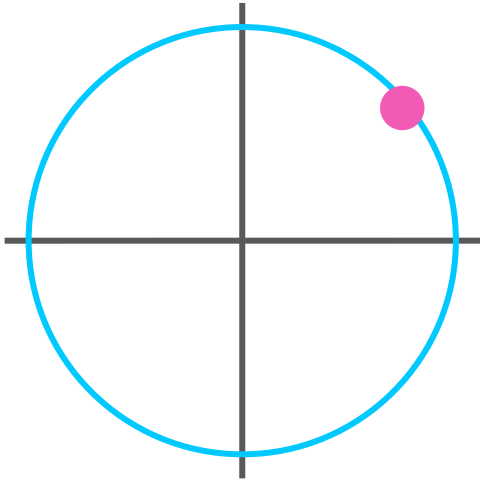
- frequency = 1
- wavelength = 1 second

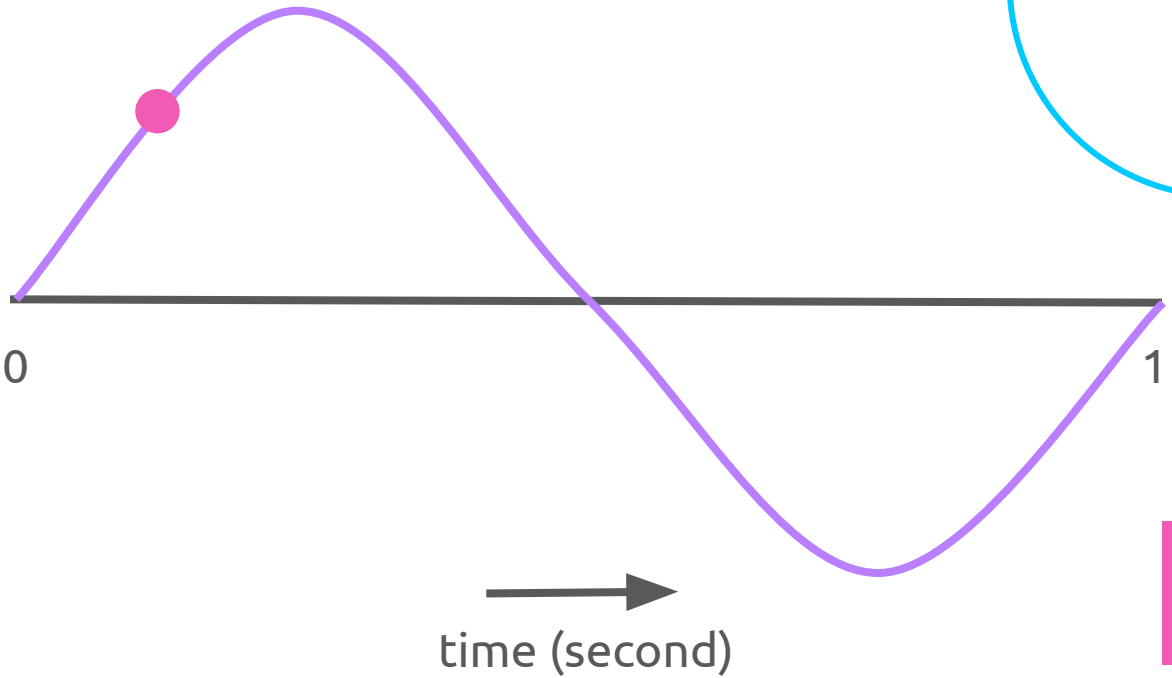



⅛ π

**Sine in continuous time**

- frequency = 1
- wavelength = 1 second

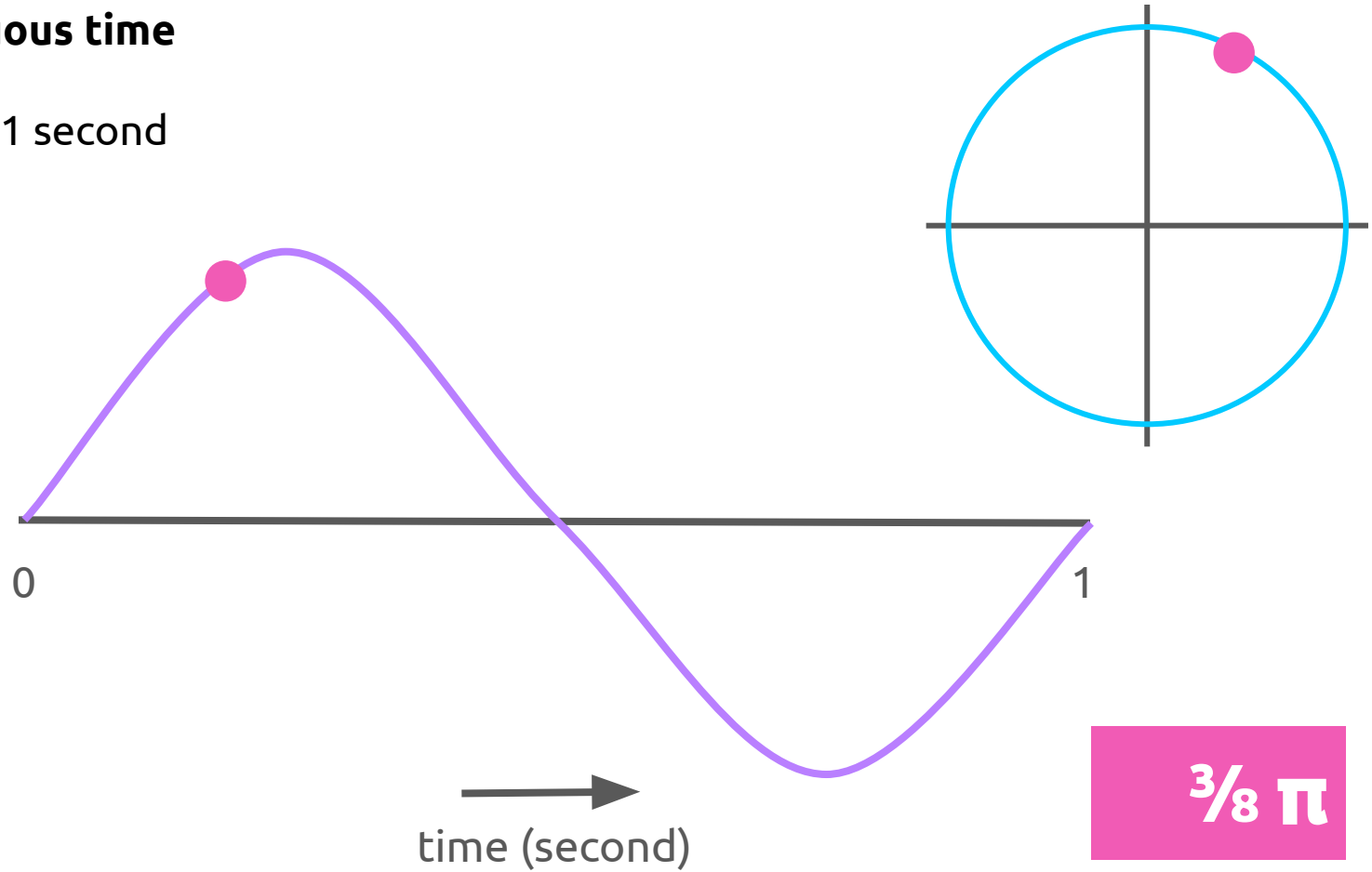





¼ π

**Sine in continuous time**

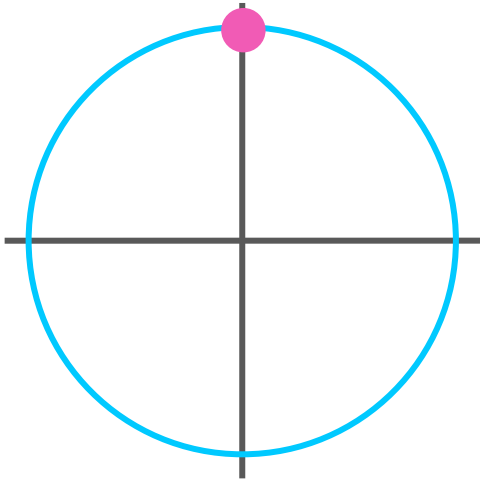
- frequency = 1
- wavelength = 1 second

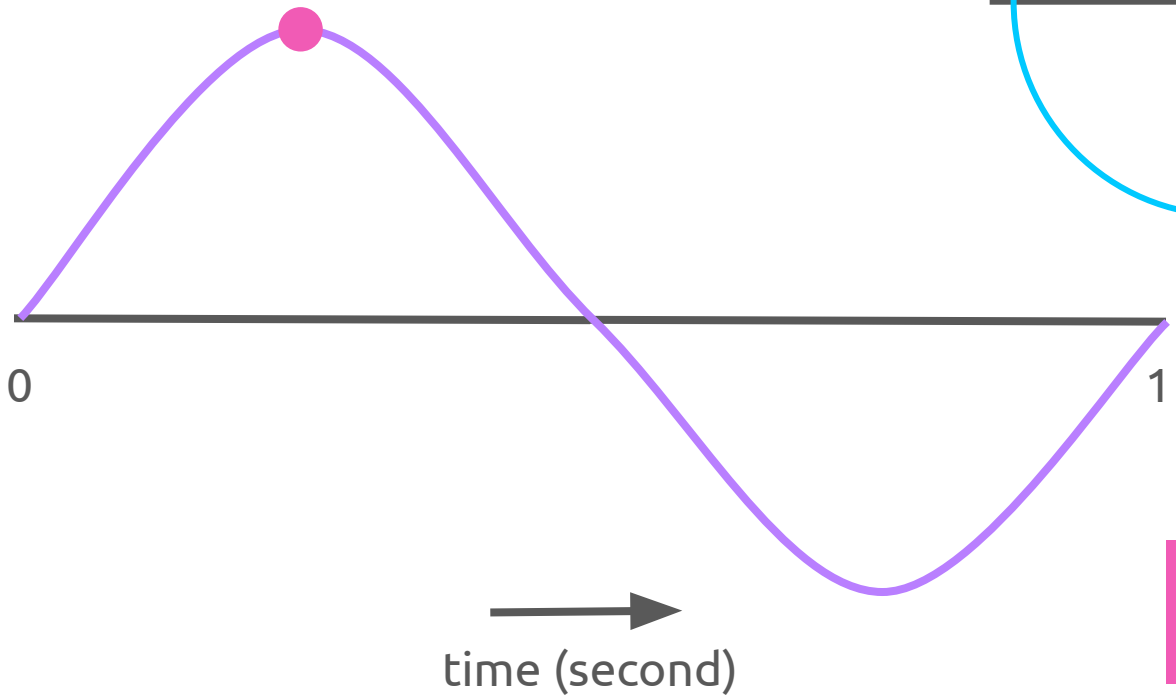



$\frac{3}{8}\pi$

**Sine in continuous time**

- frequency = 1
- wavelength = 1 second

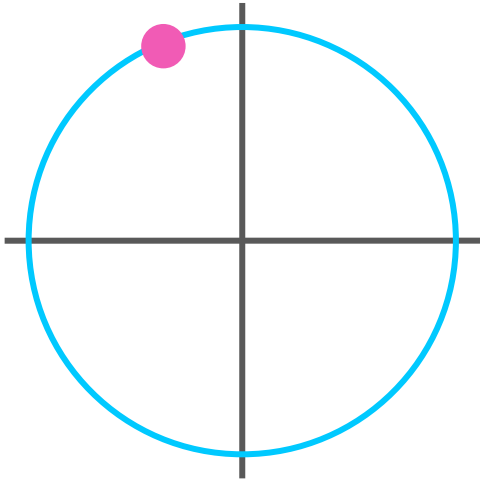


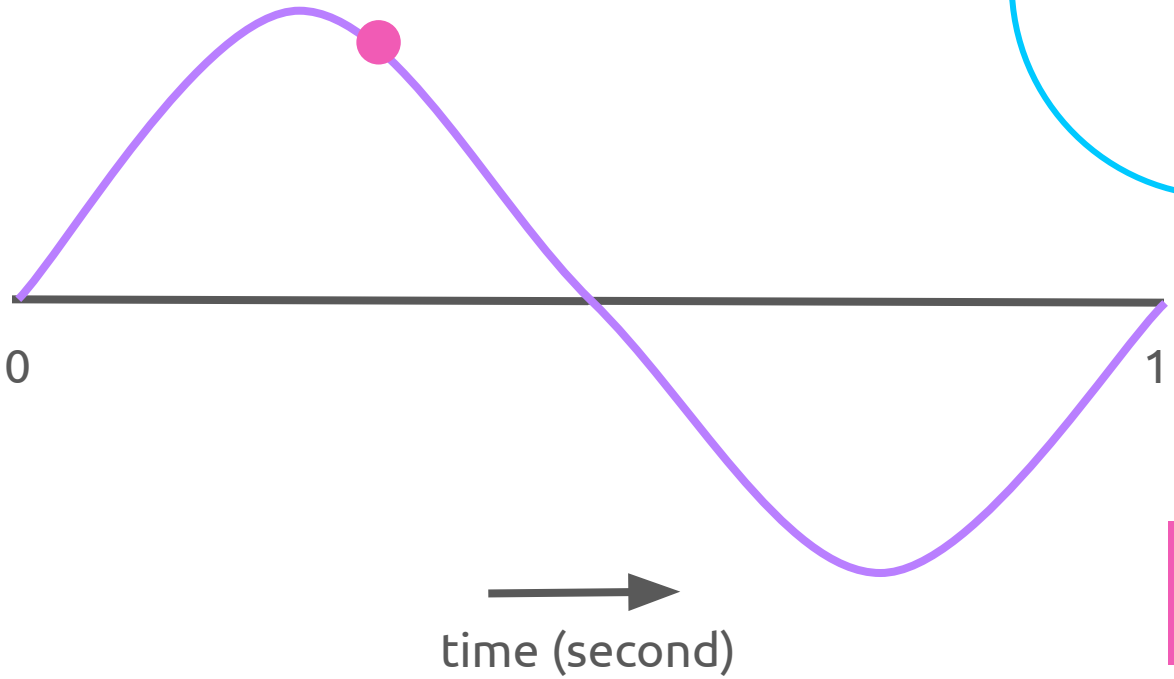



½ π

**Sine in continuous time**

- frequency = 1
- wavelength = 1 second

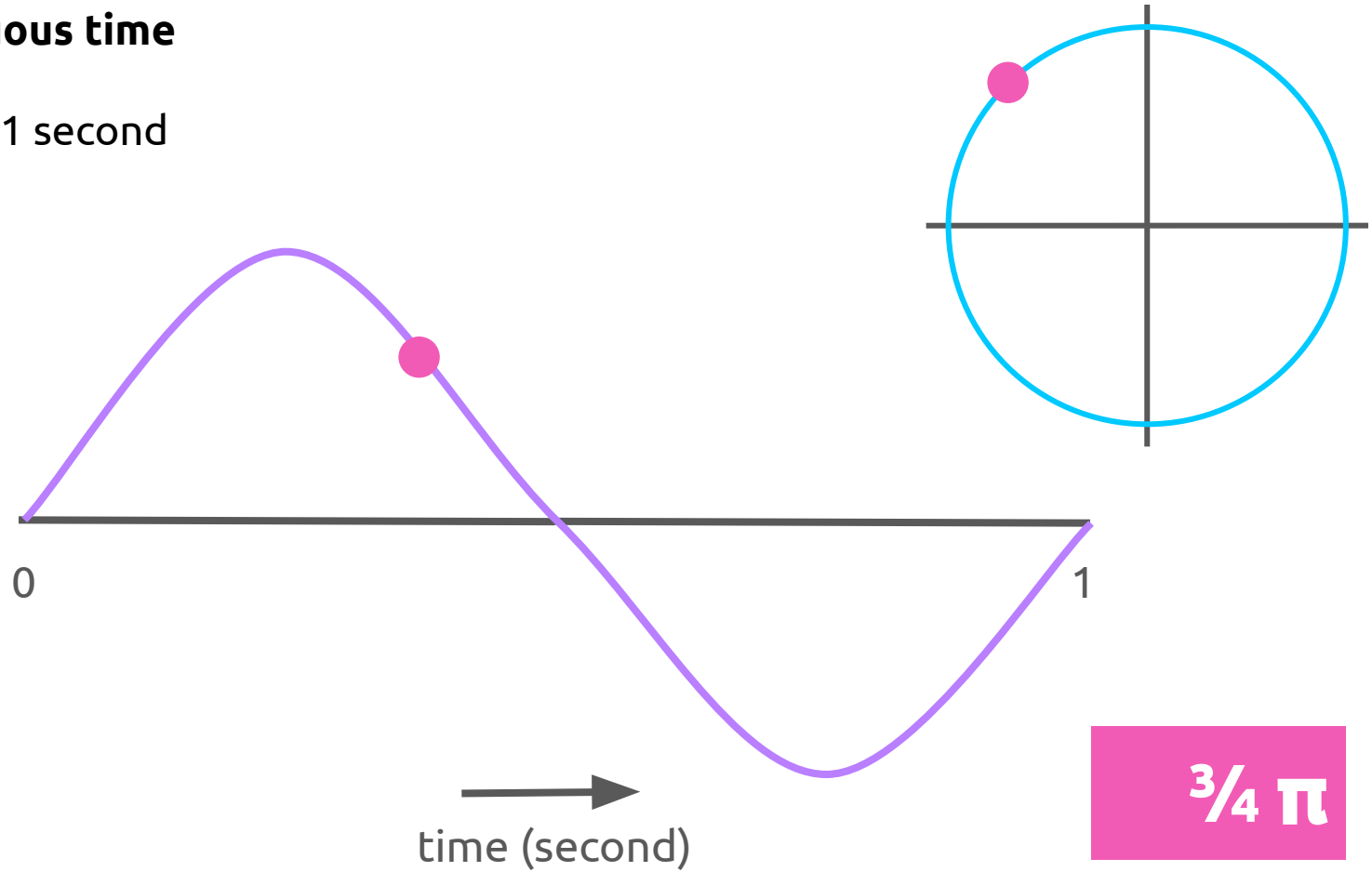





$\frac{5}{8}\pi$

**Sine in continuous time**

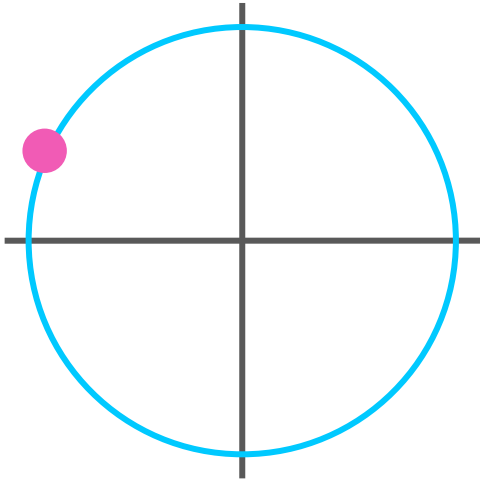
- frequency = 1
- wavelength = 1 second

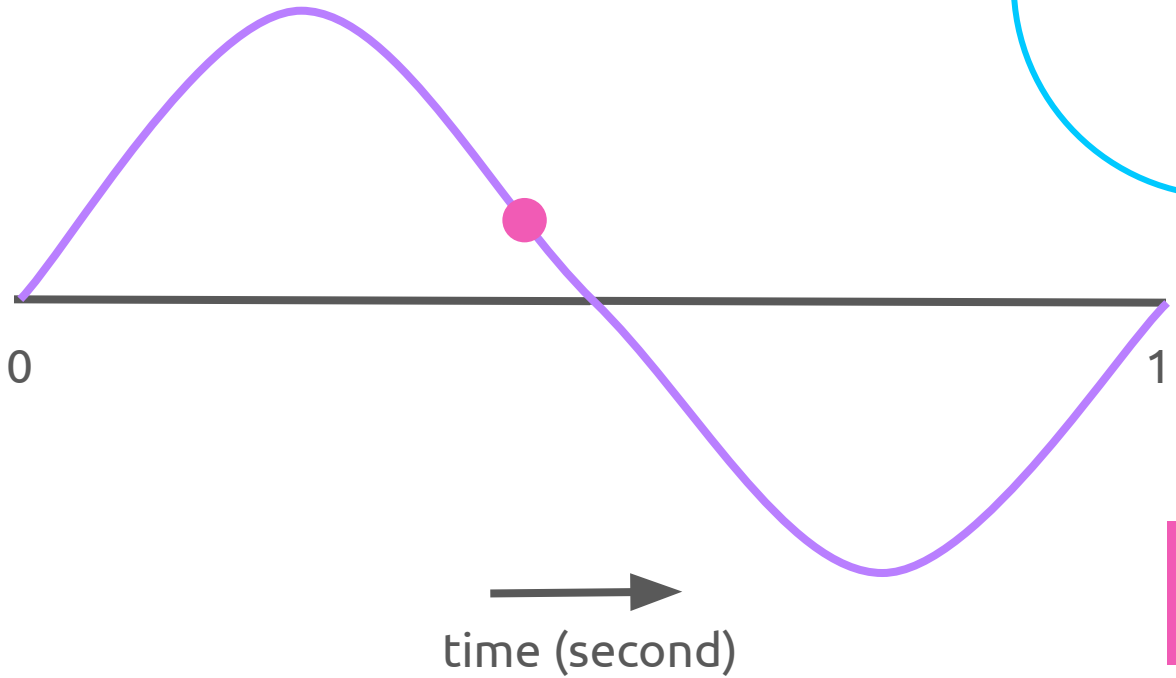



$\frac{3}{4}\pi$

**Sine in continuous time**

- frequency = 1
- wavelength = 1 second

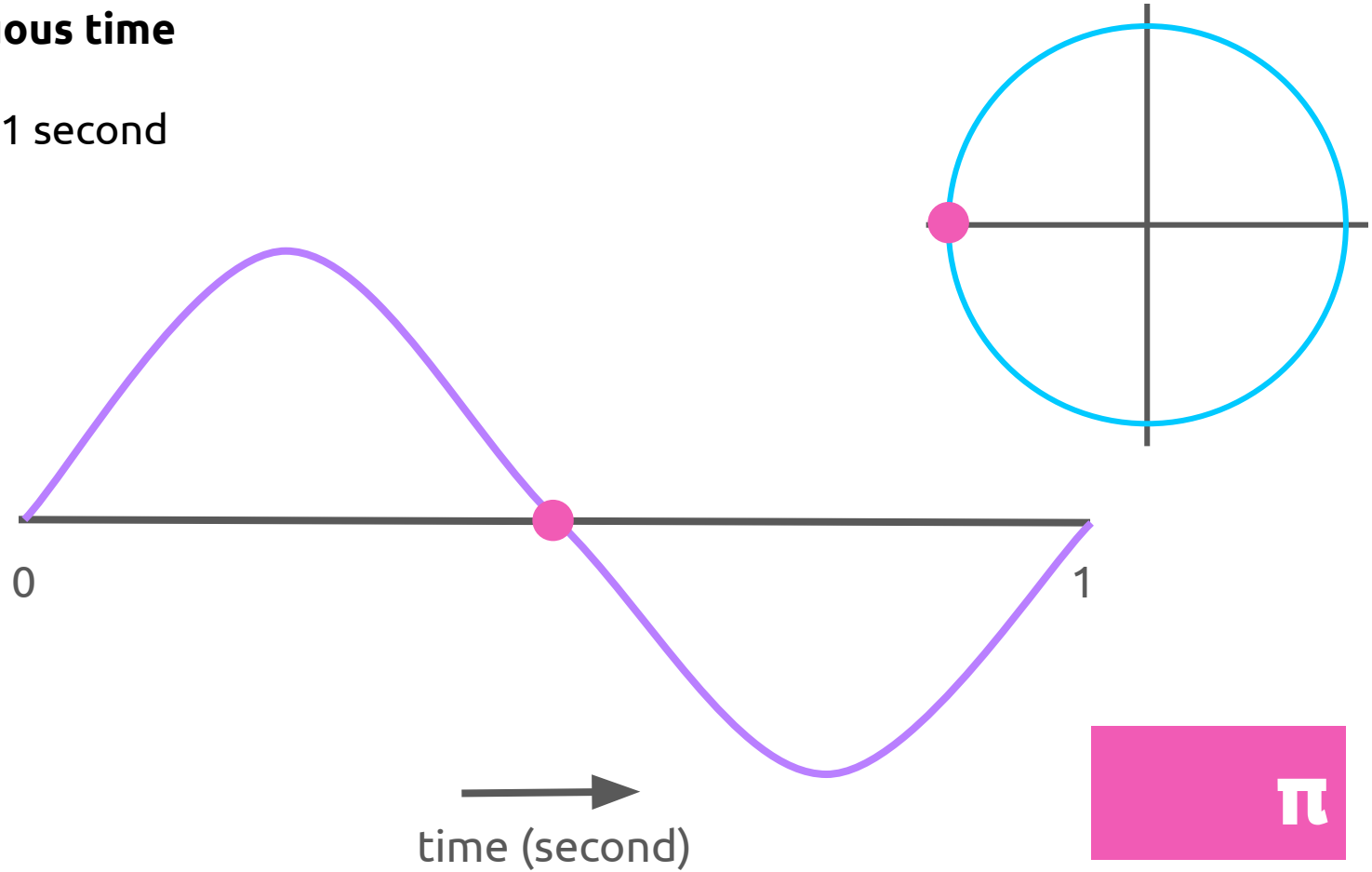





7/8 π

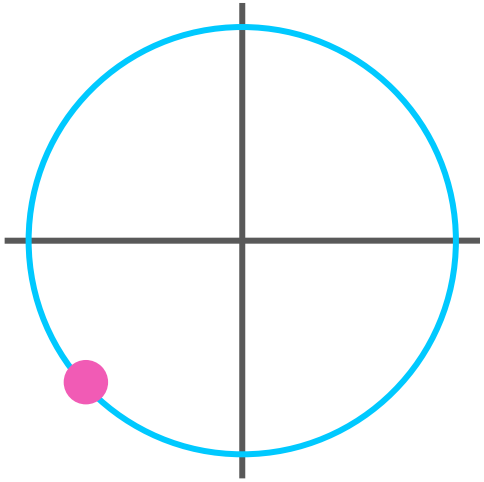
**Sine in continuous time**

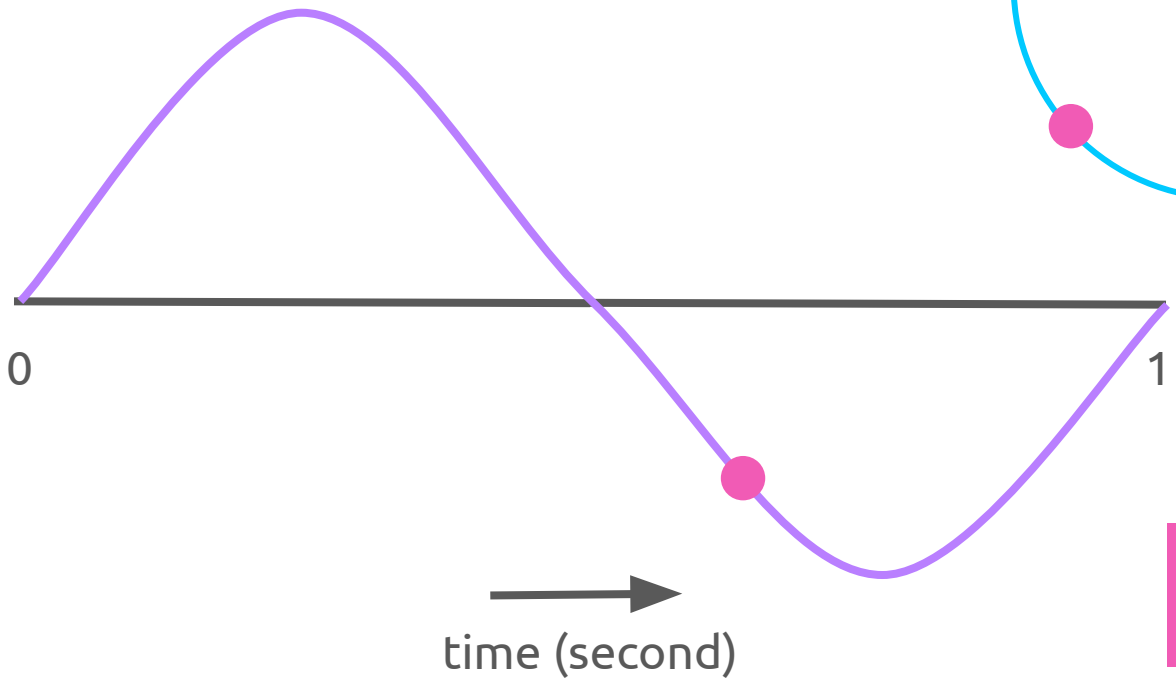
- frequency = 1
- wavelength = 1 second



**Sine in continuous time**

- frequency = 1
- wavelength = 1 second

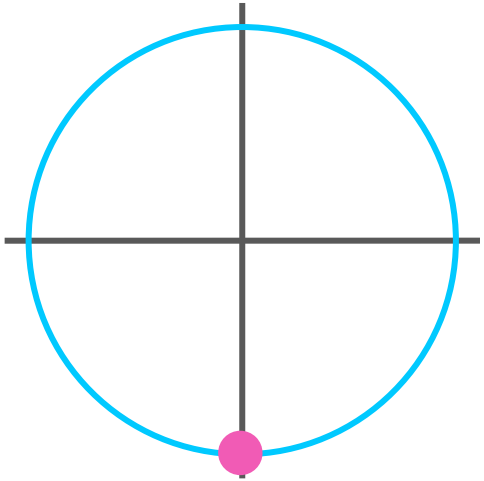


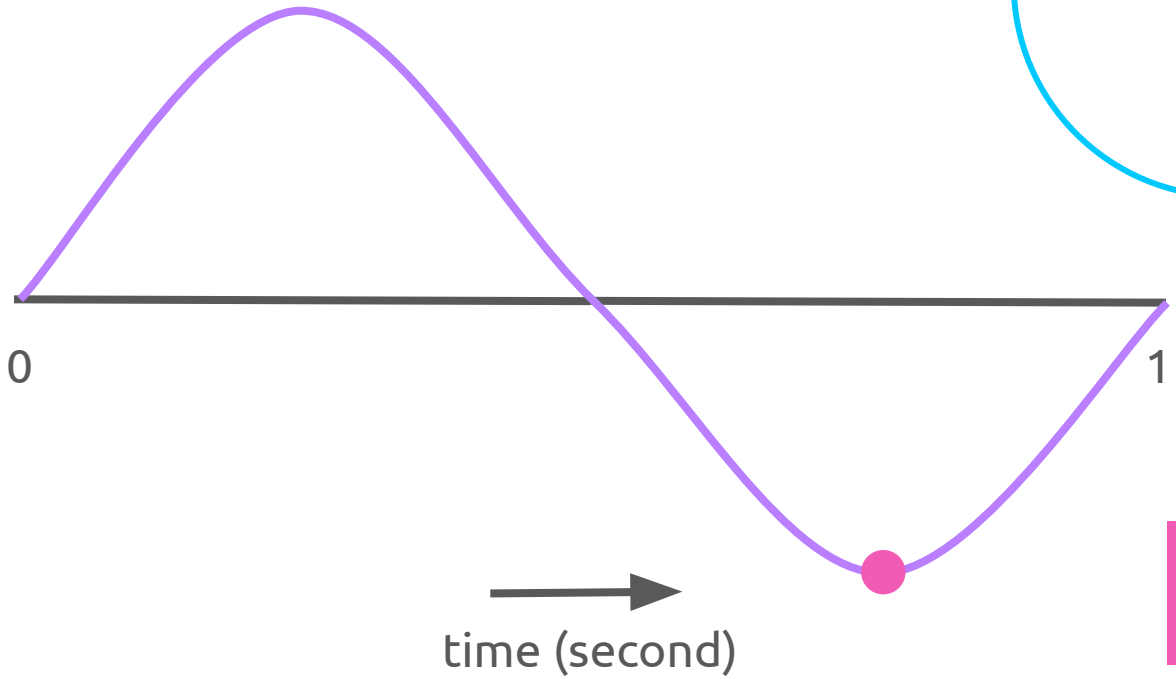



1¼ π

**Sine in continuous time**

- frequency = 1
- wavelength = 1 second

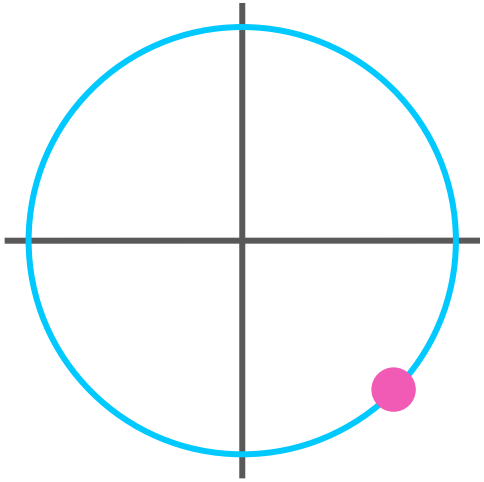


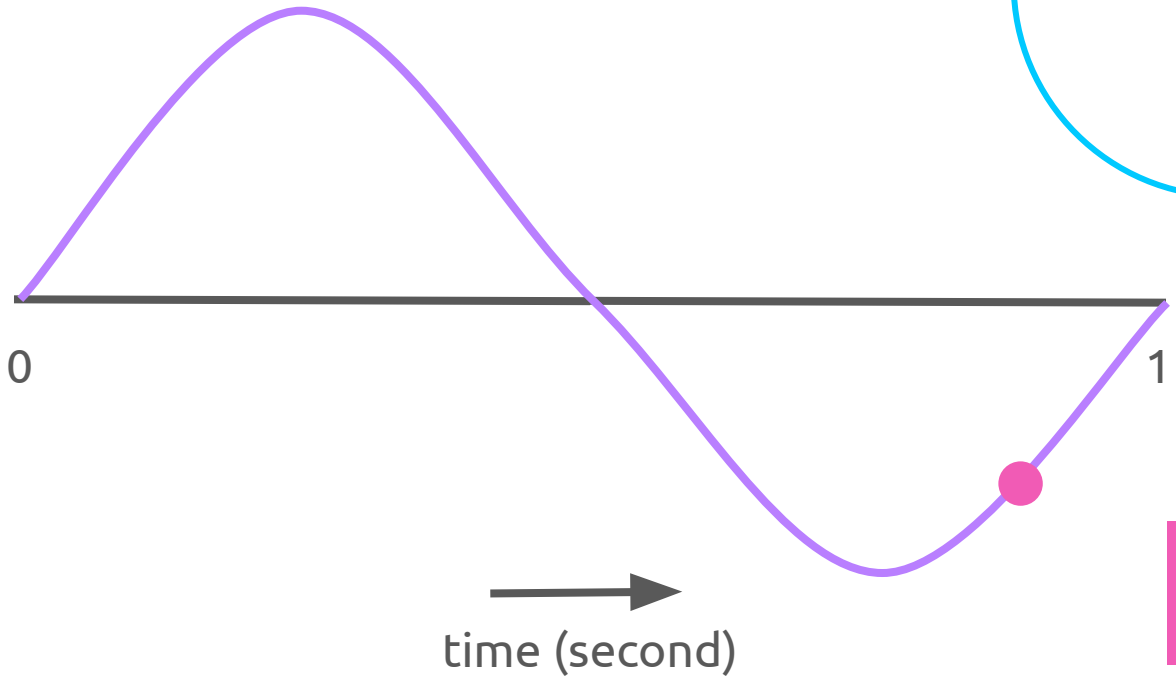



1½ π

**Sine in continuous time**

- frequency = 1
- wavelength = 1 second

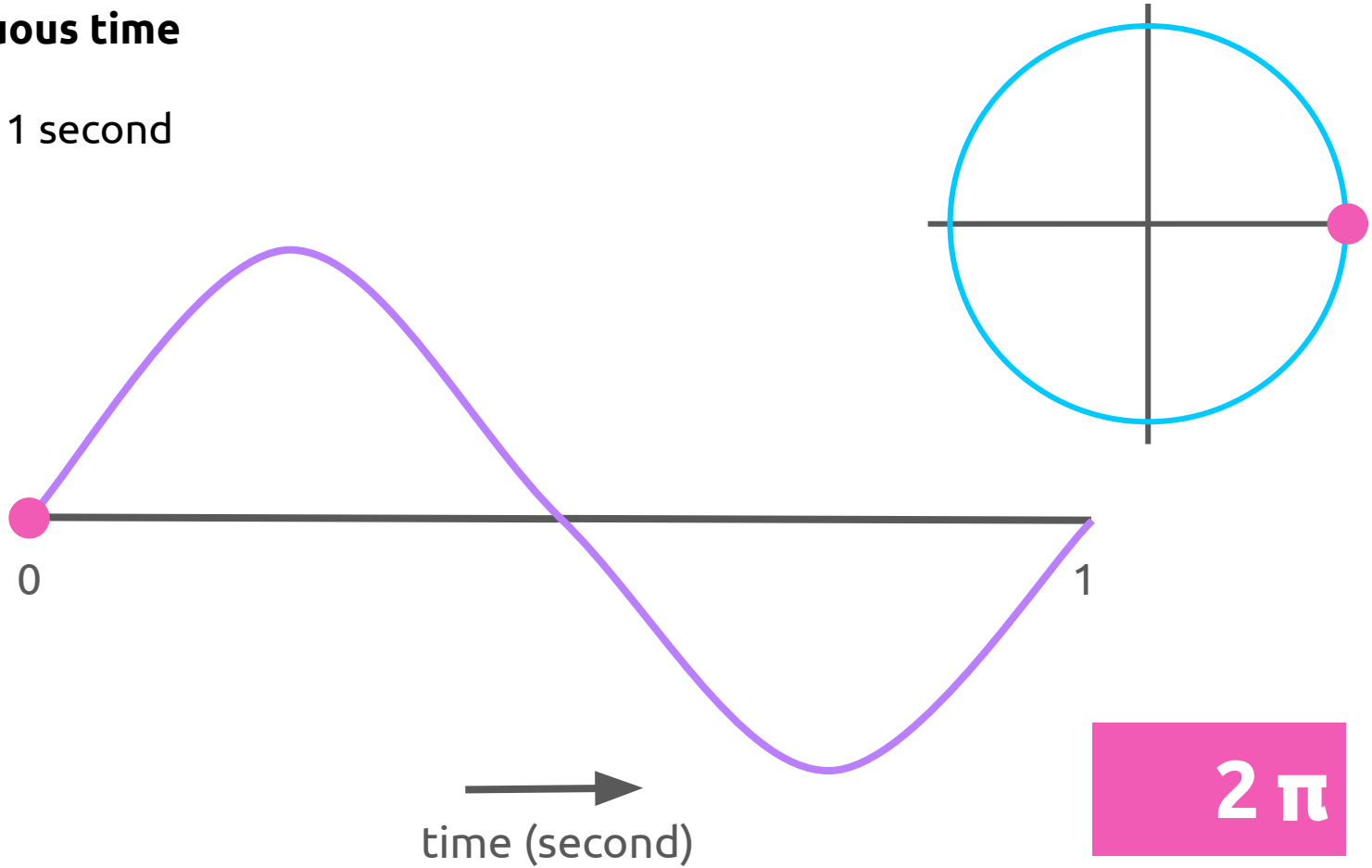





$1\frac{3}{4}\pi$

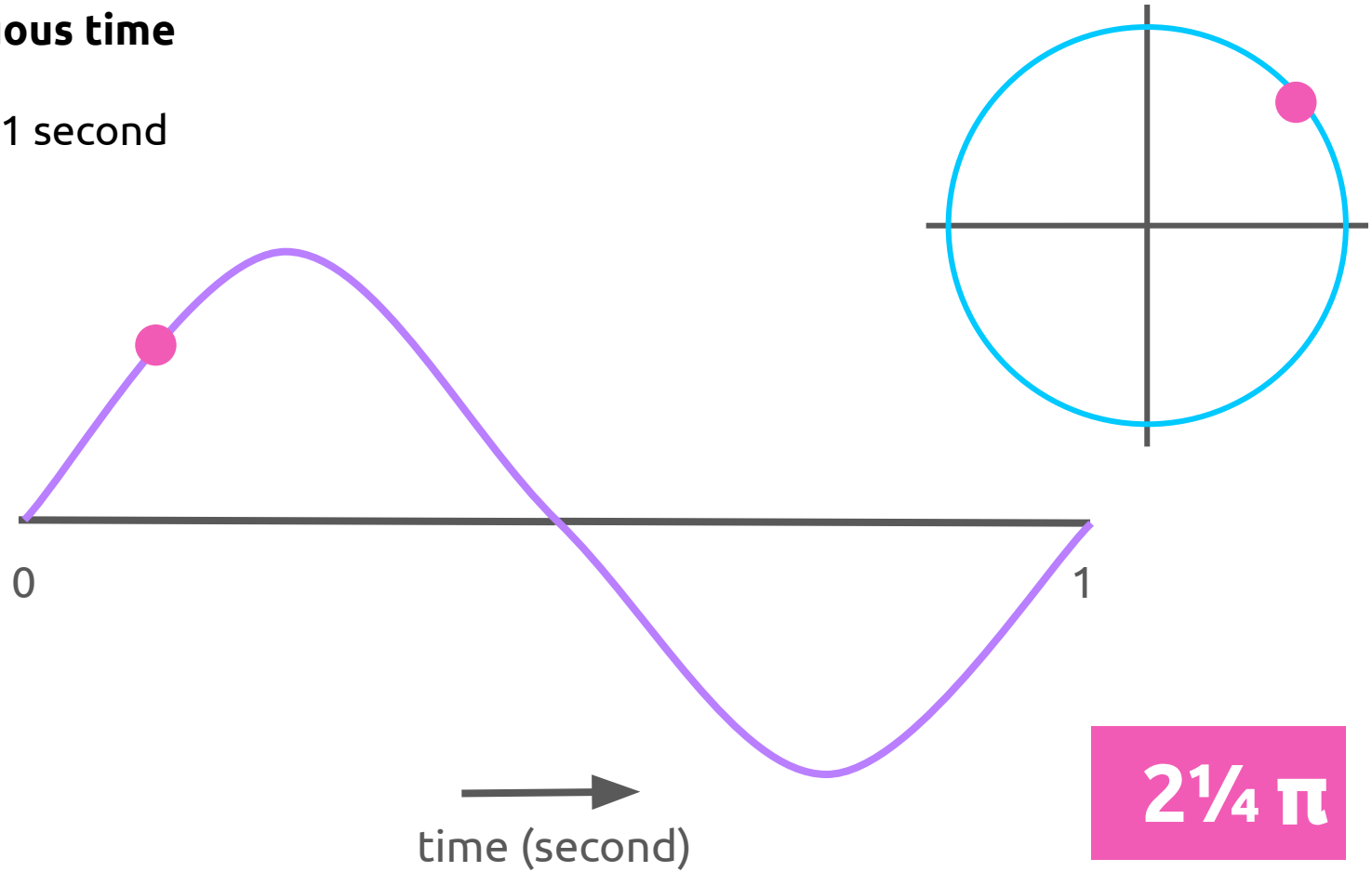
**Sine in continuous time**

- frequency = 1
- wavelength = 1 second



**Sine in continuous time**

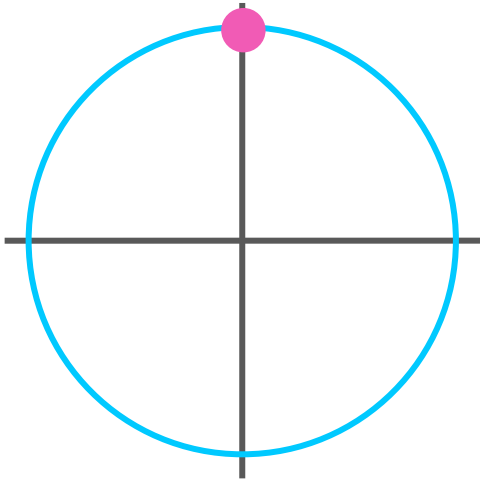
- frequency = 1
- wavelength = 1 second

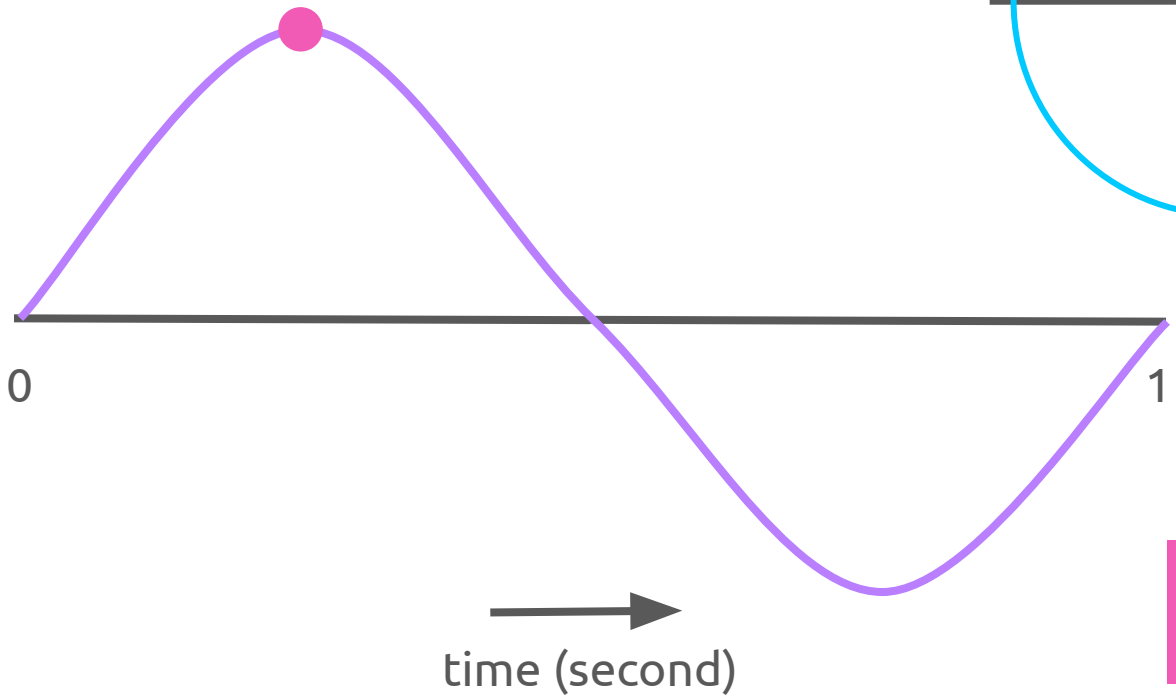



$2\frac{1}{4}\pi$

**Sine in continuous time**

- frequency = 1
- wavelength = 1 second

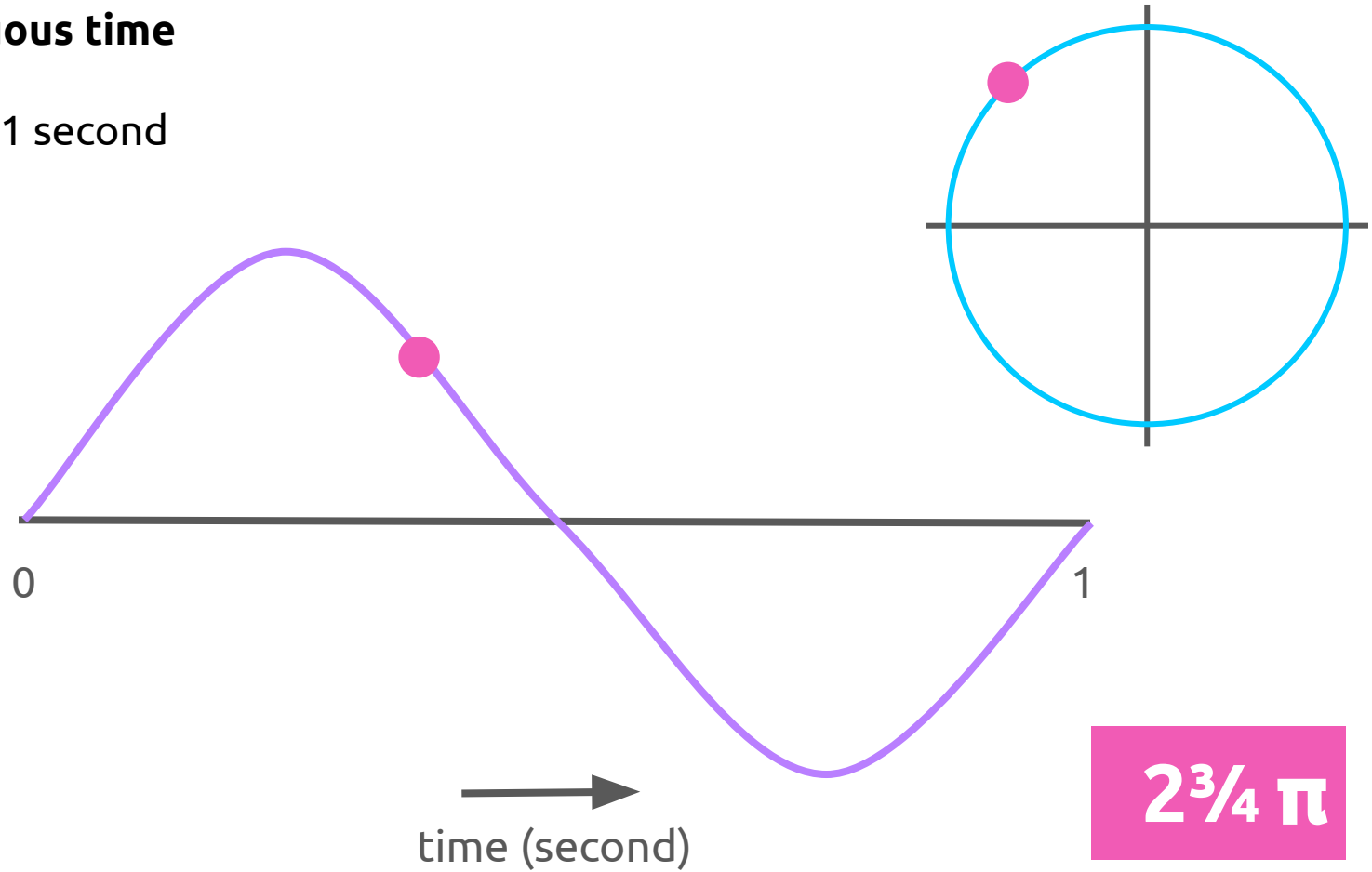





$2\frac{1}{2}\pi$

**Sine in continuous time**

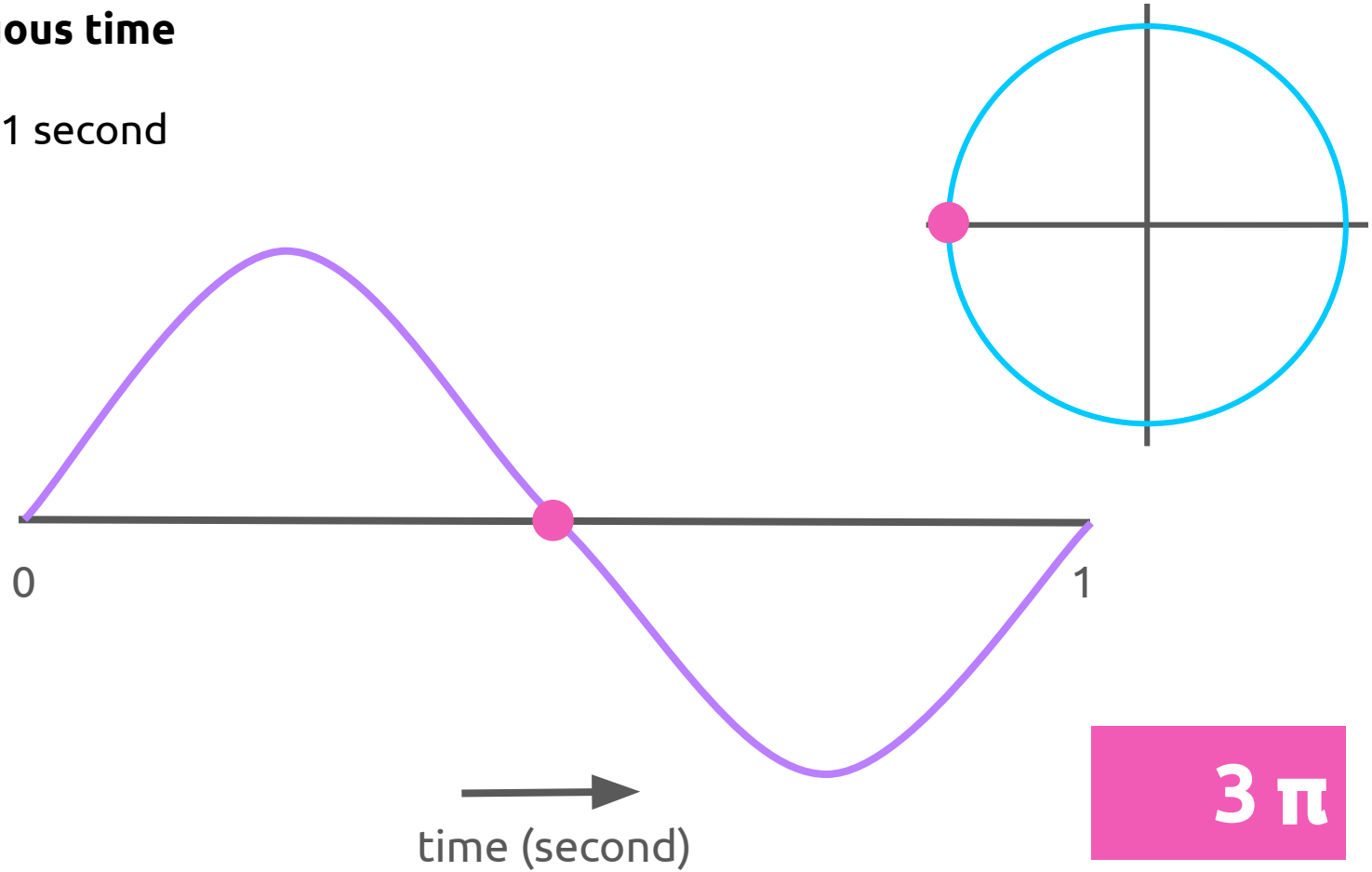
- frequency = 1
- wavelength = 1 second




$2\frac{3}{4}\pi$

**Sine in continuous time**

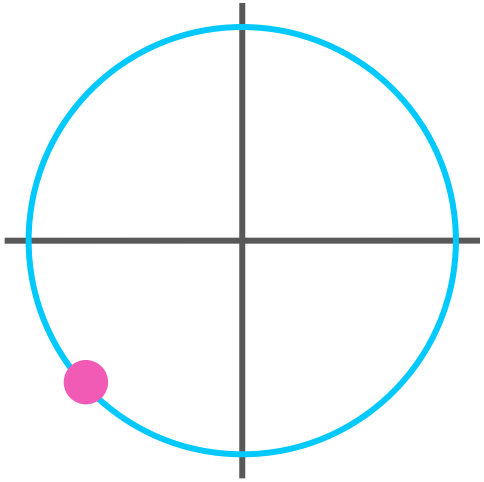
- frequency = 1
- wavelength = 1 second

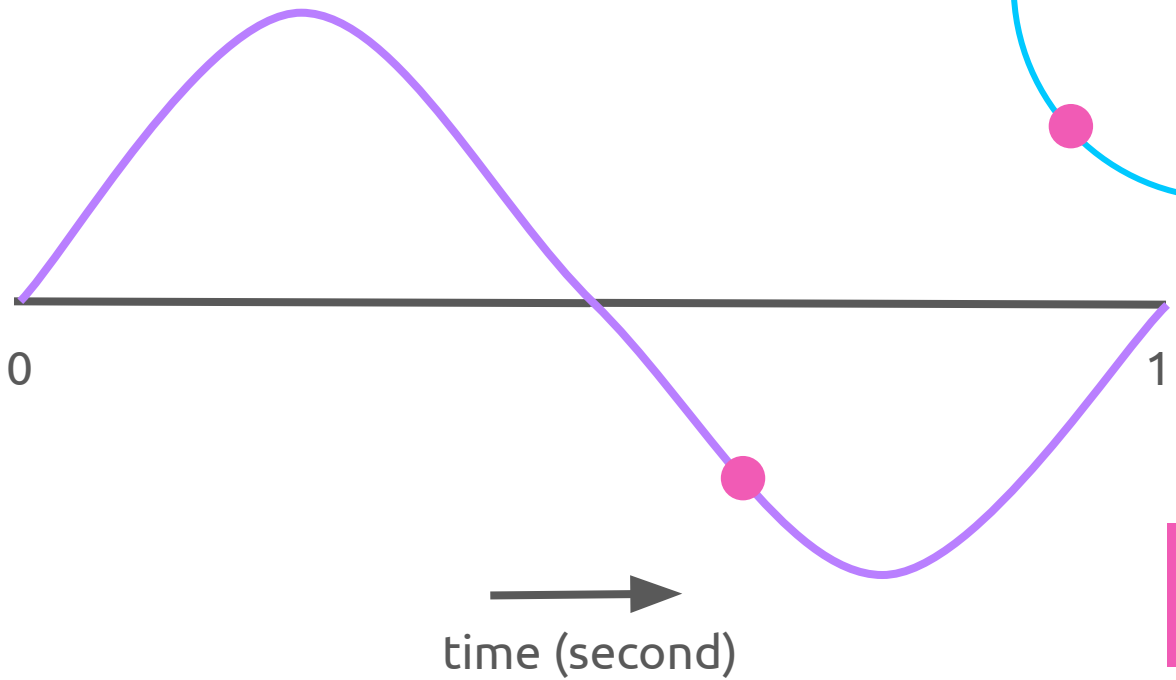



3 π

**Sine in continuous time**

- frequency = 1
- wavelength = 1 second

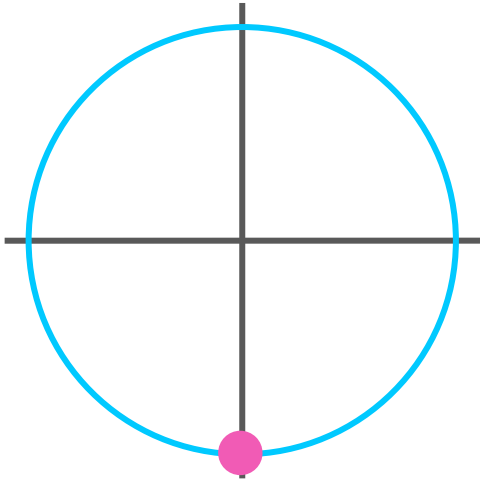


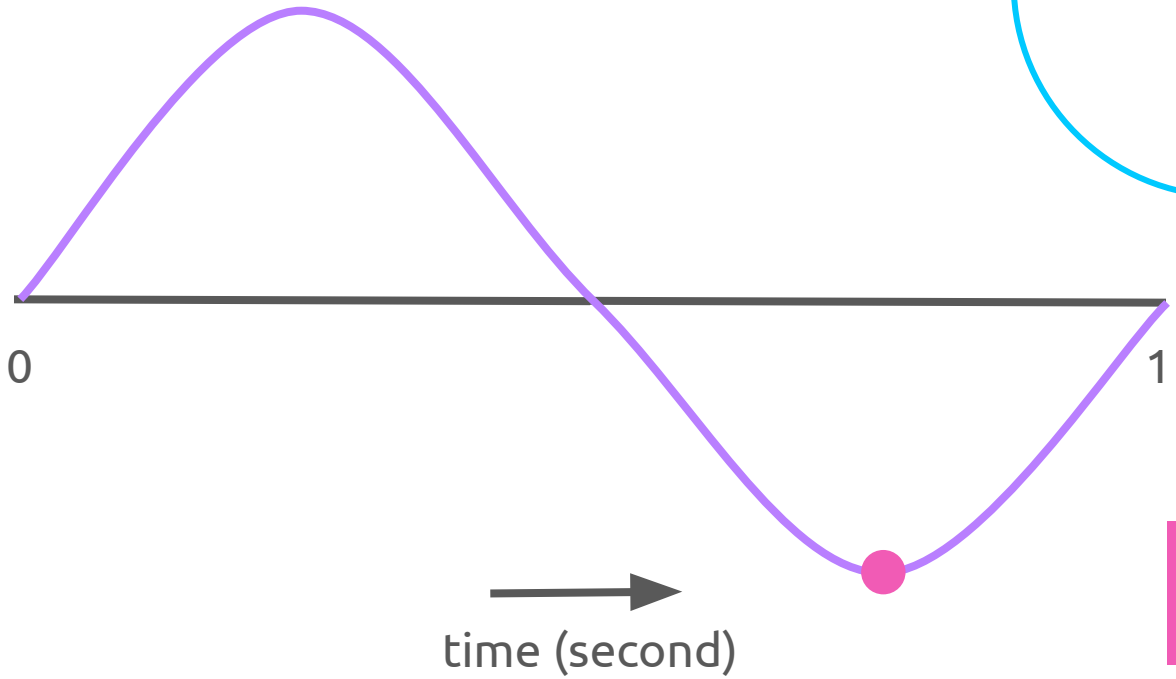



3¼ π

**Sine in continuous time**

- frequency = 1
- wavelength = 1 second

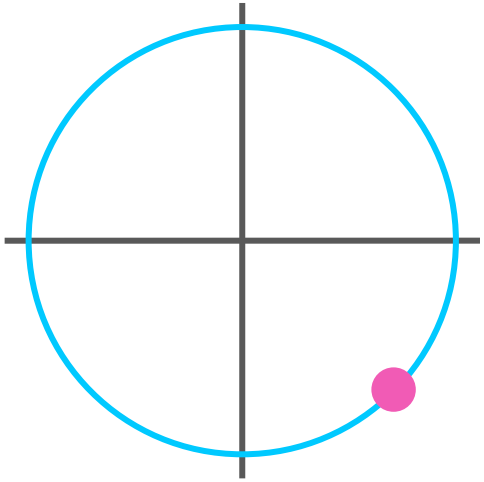


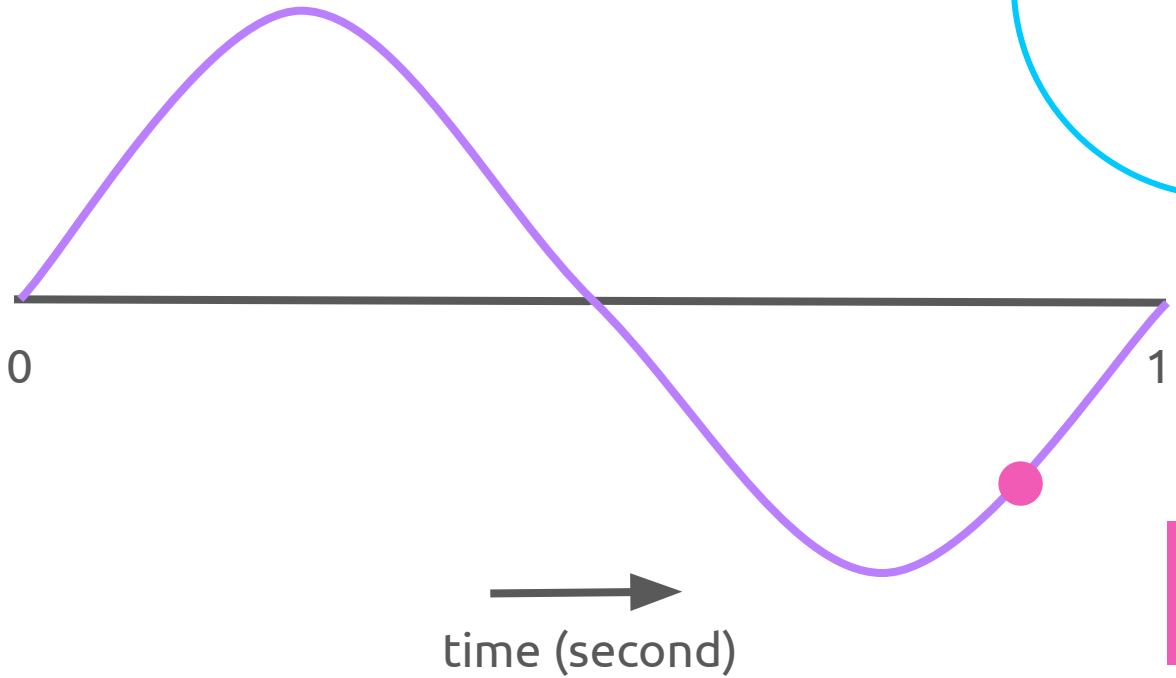



3½ π

**Sine in continuous time**

- frequency = 1
- wavelength = 1 second

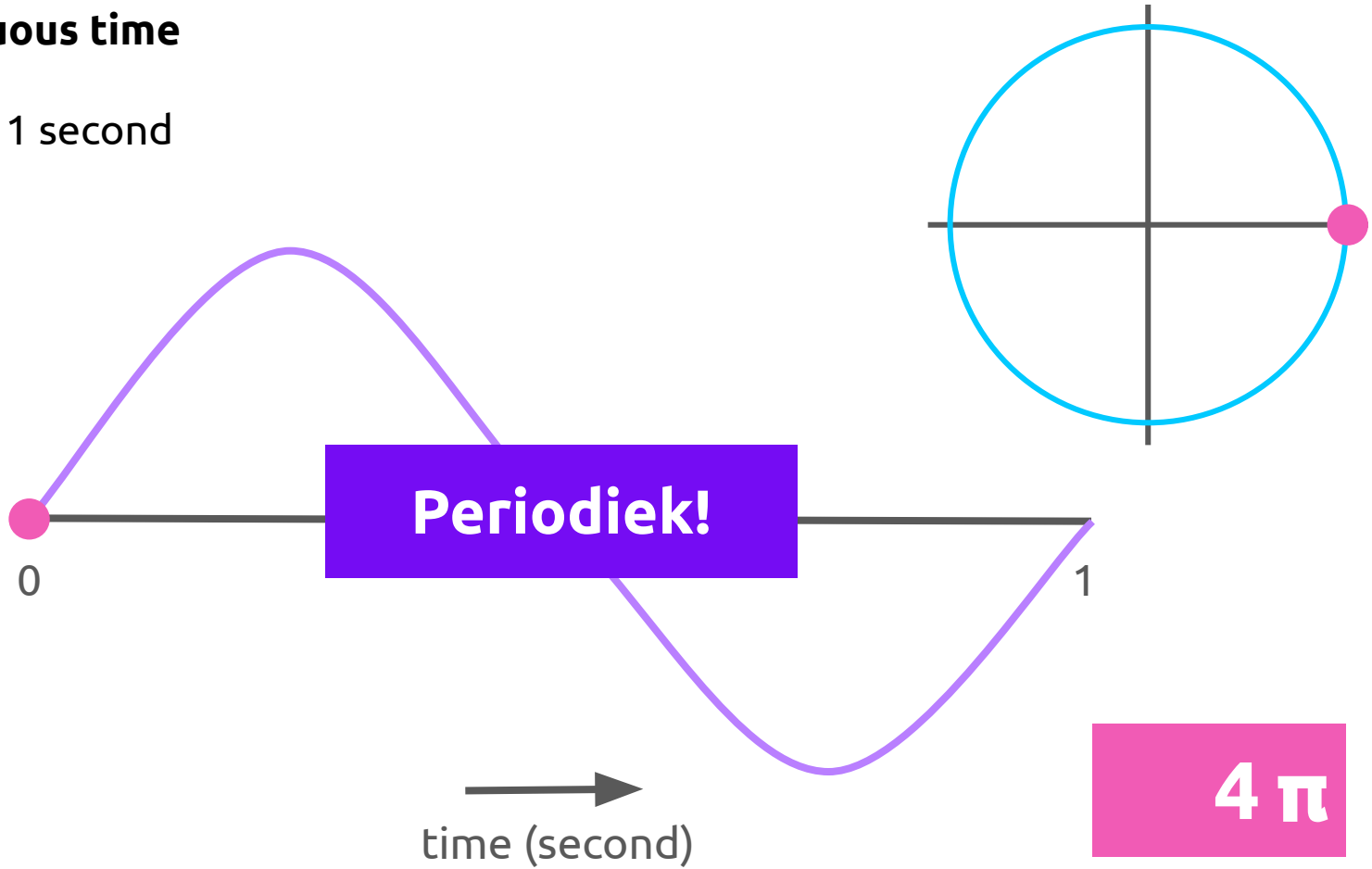





$3\frac{3}{4}\pi$

**Sine in continuous time**

- frequency = 1
- wavelength = 1 second

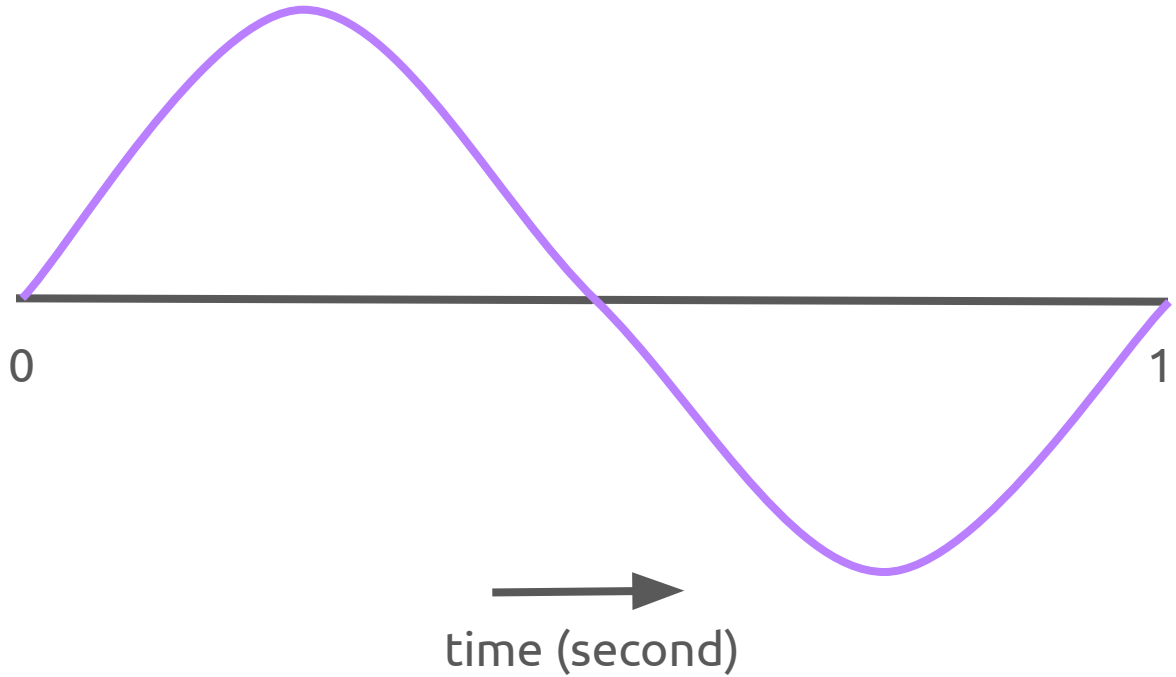


# Sine

continuous- to discrete time domain

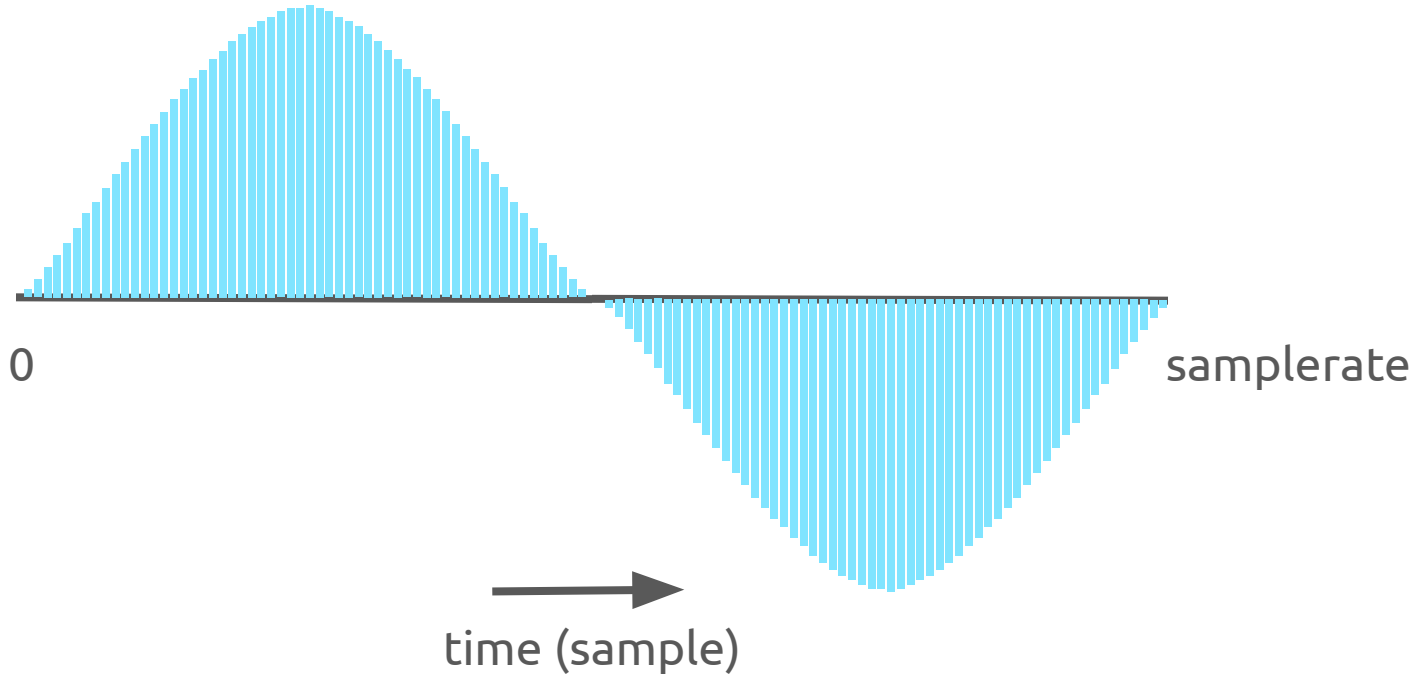
**Sine in continuous time**

- frequency = 1
- wavelength = 1 second



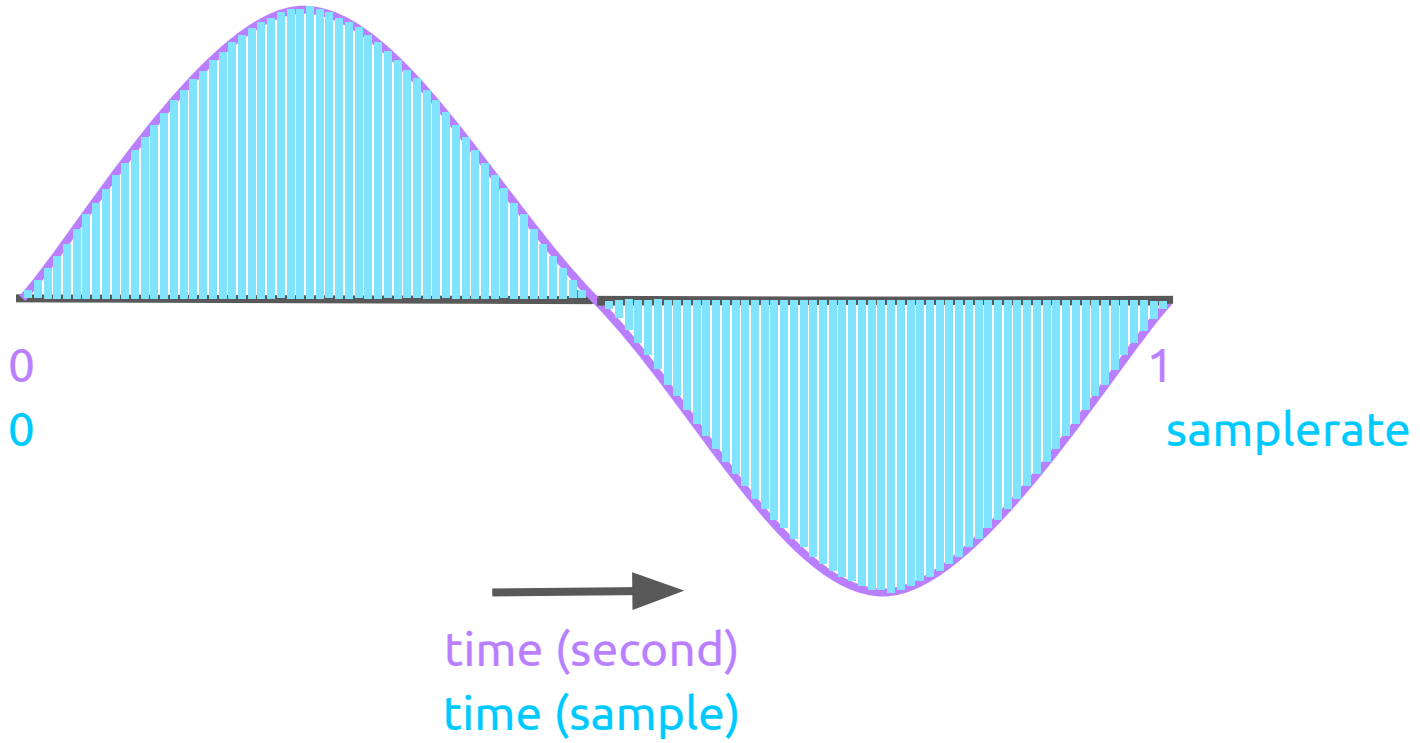
**Sine in discrete time**

- frequency = 1
- wavelength = 1 second → samplerate



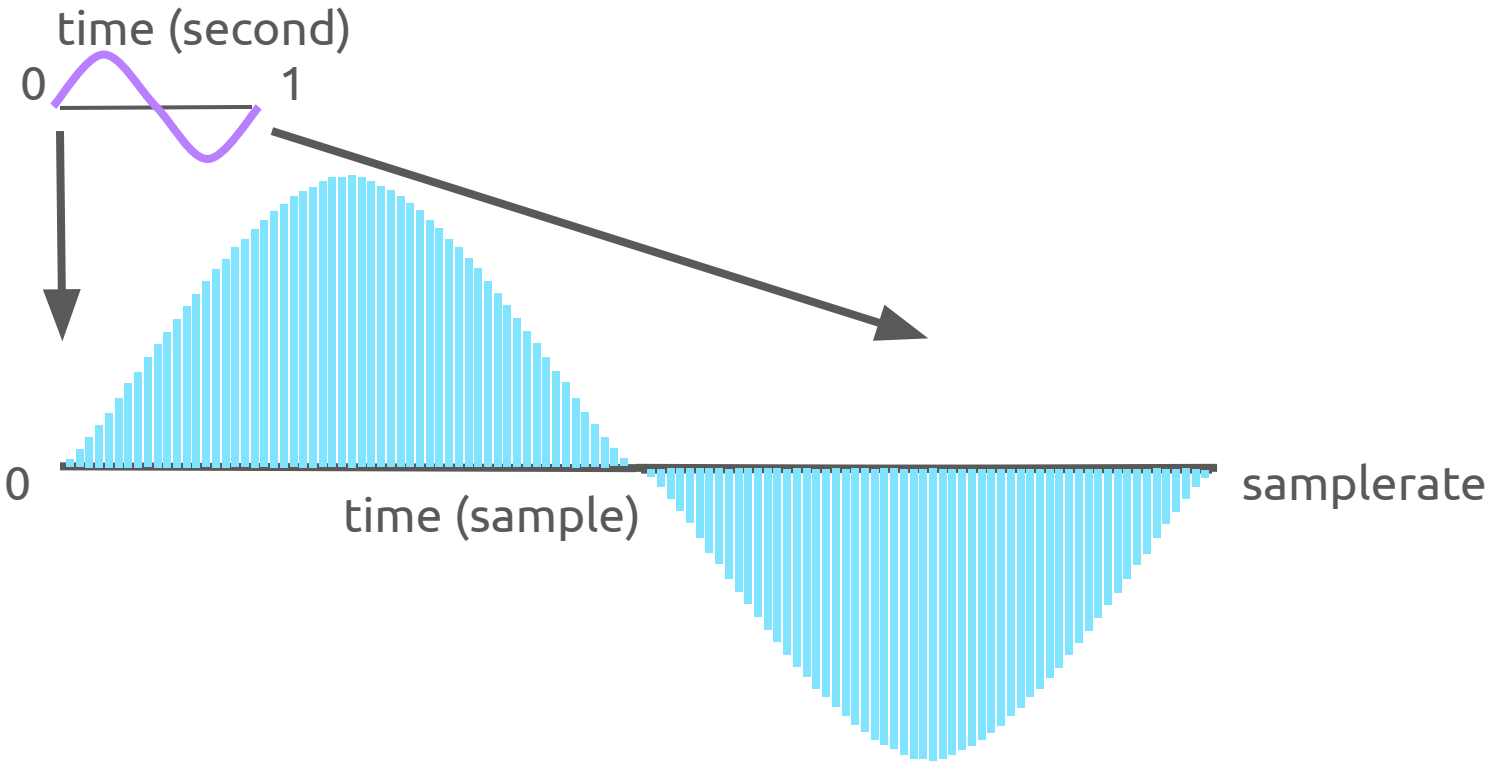
**Sine in discrete time**

- frequency = 1
- wavelength = 1 second → samplerate



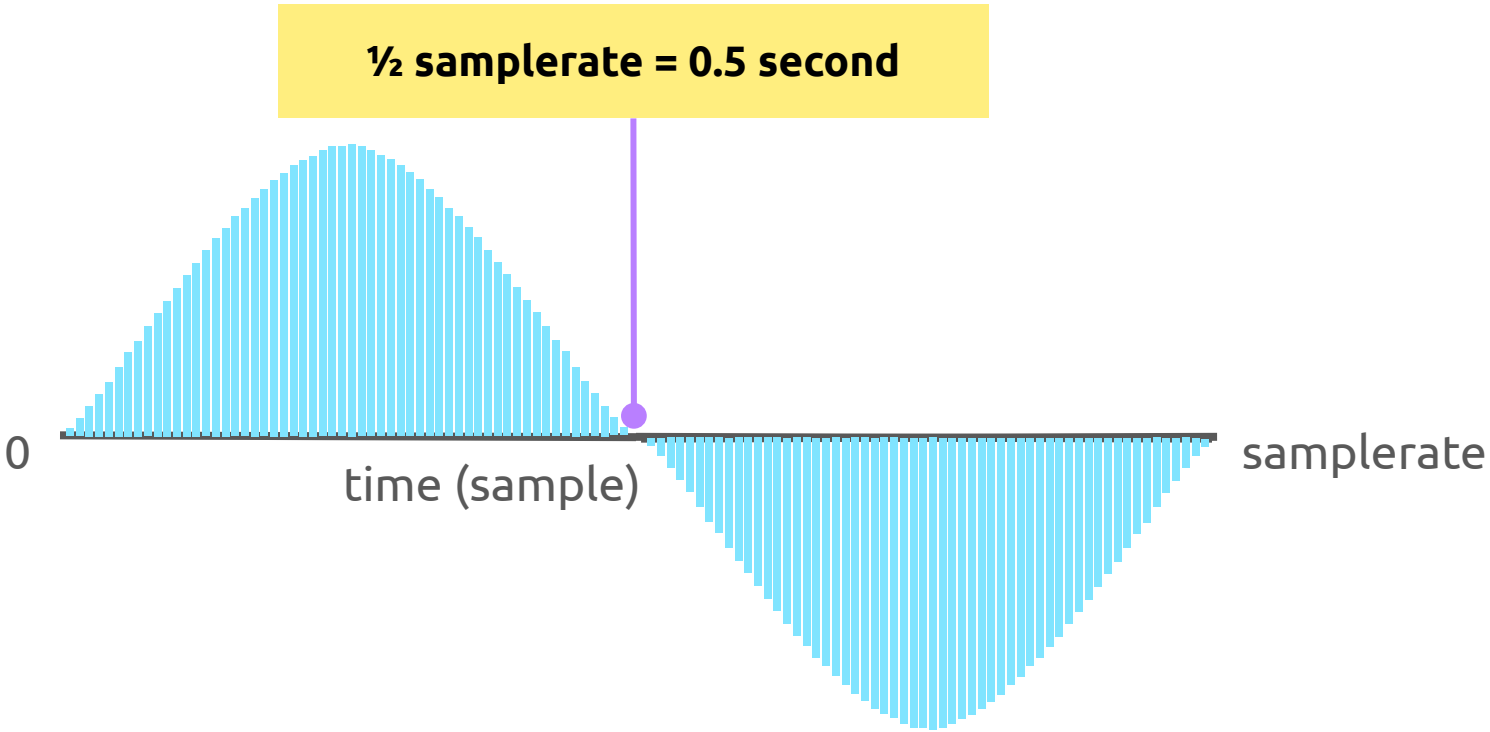
**Continuous time → discrete time**

interval [0, 1] (second) → interval [0, samplerate] (sample)



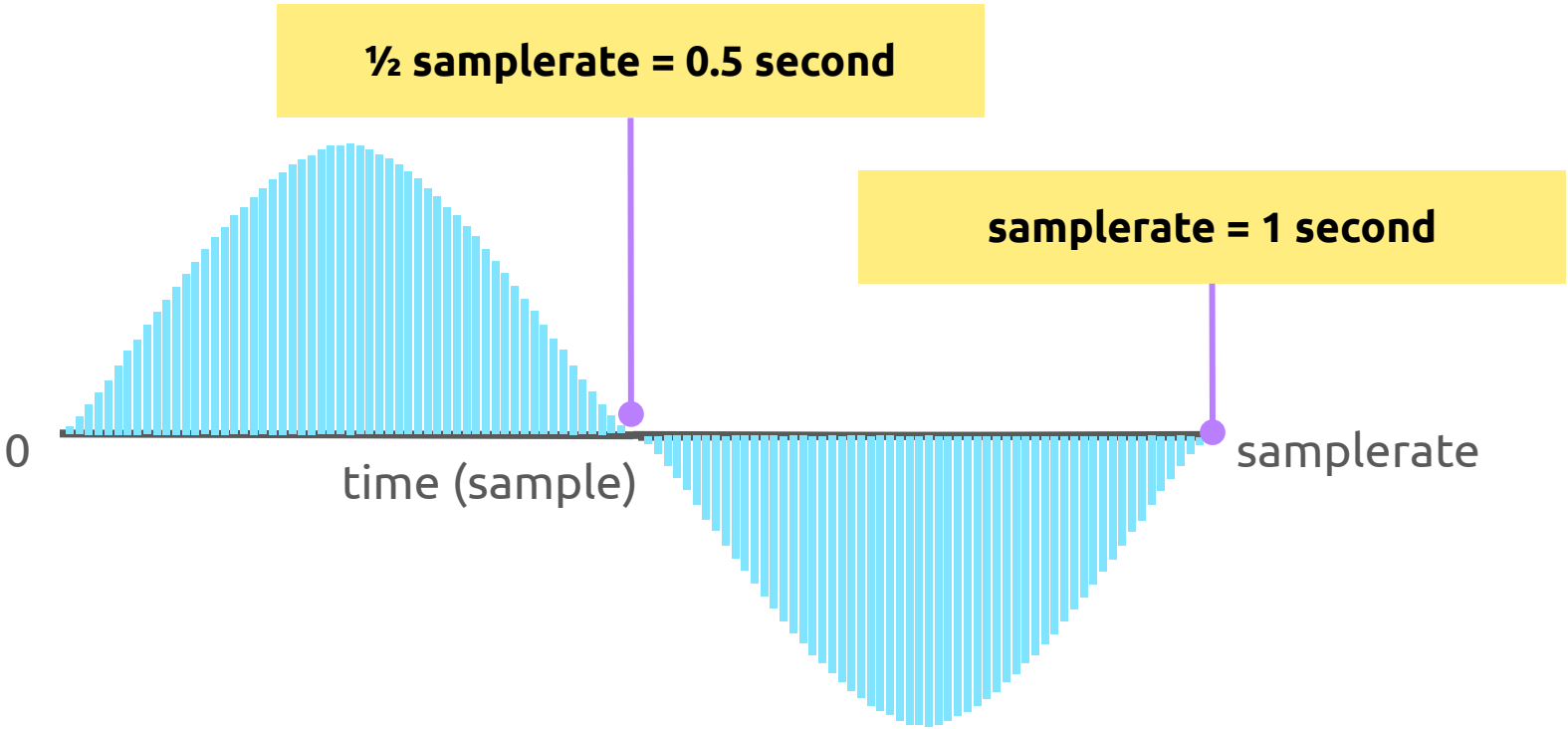
**Continuous time → discrete time**

interval [0, 1] (second) → interval [0, samplerate] (sample)



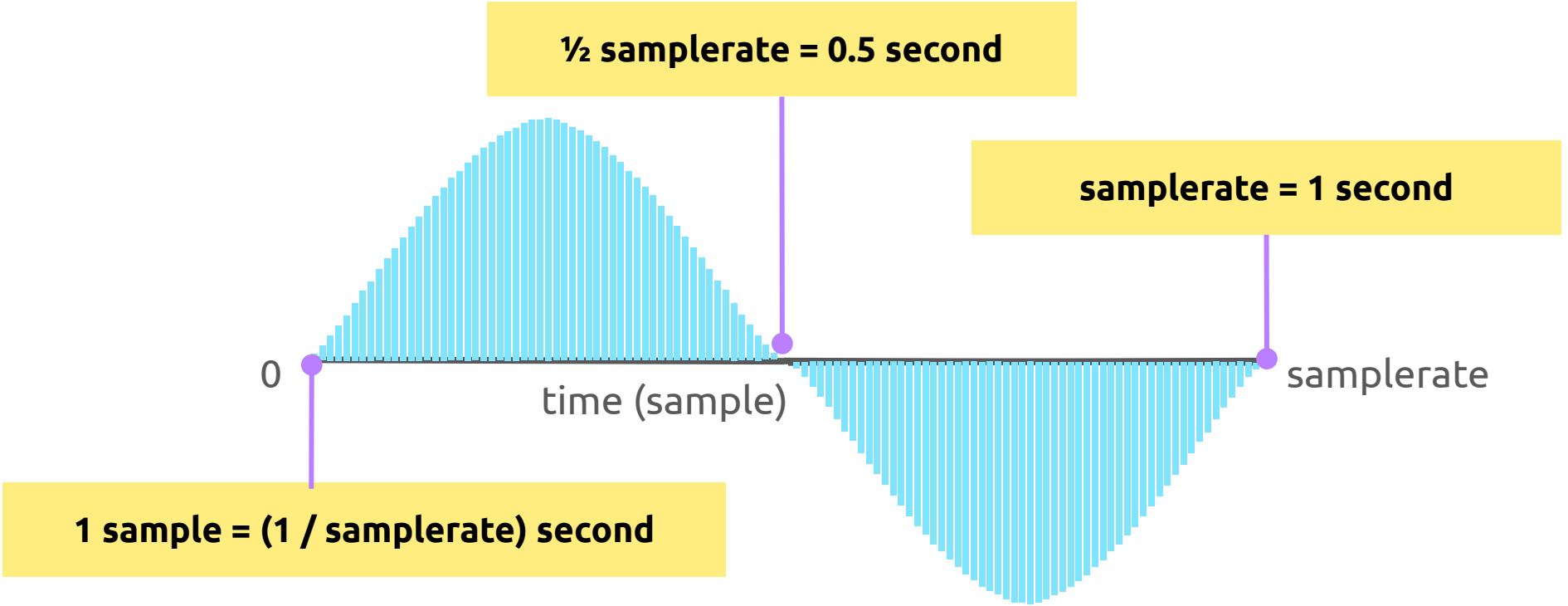
**Continuous time → discrete time**

interval [0, 1] (second) → interval [0, samplerate] (sample)



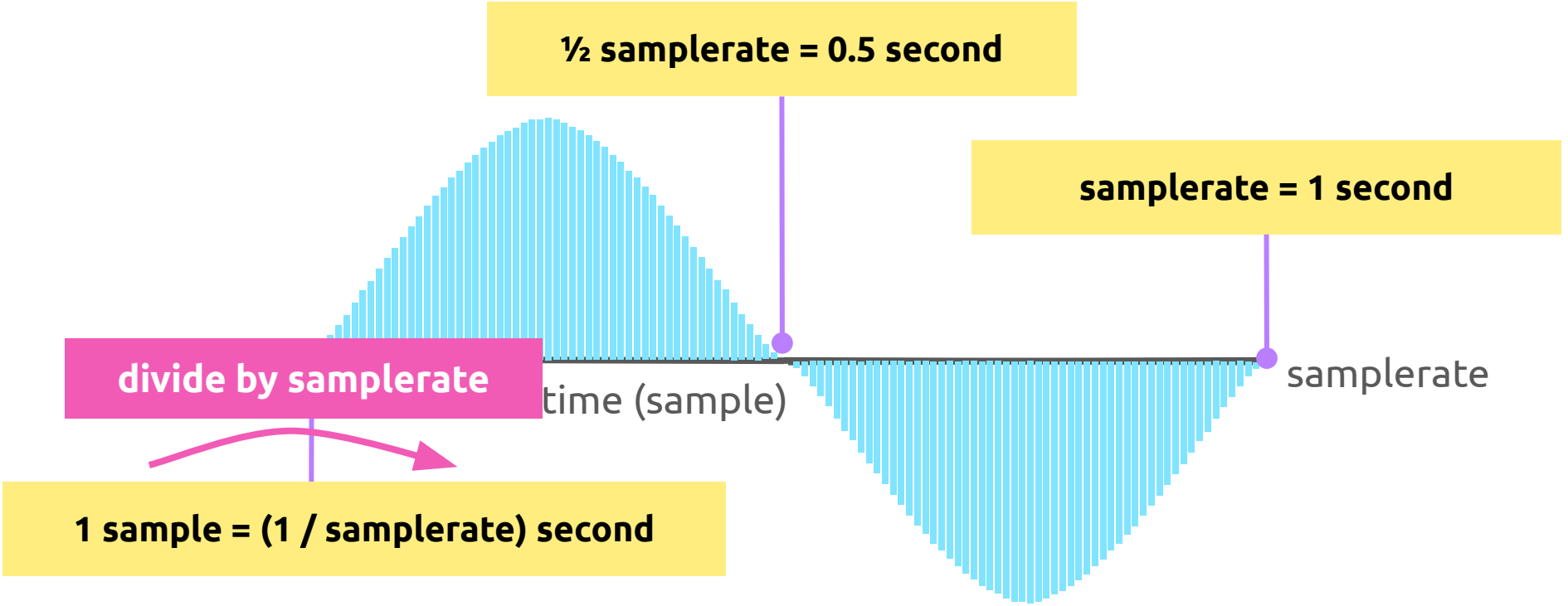
**Continuous time → discrete time**

interval [0, 1] (second) → interval [0, samplerate] (sample)



**Continuous time → discrete time**

interval [0, 1] (second) → interval [0, samplerate] (sample)

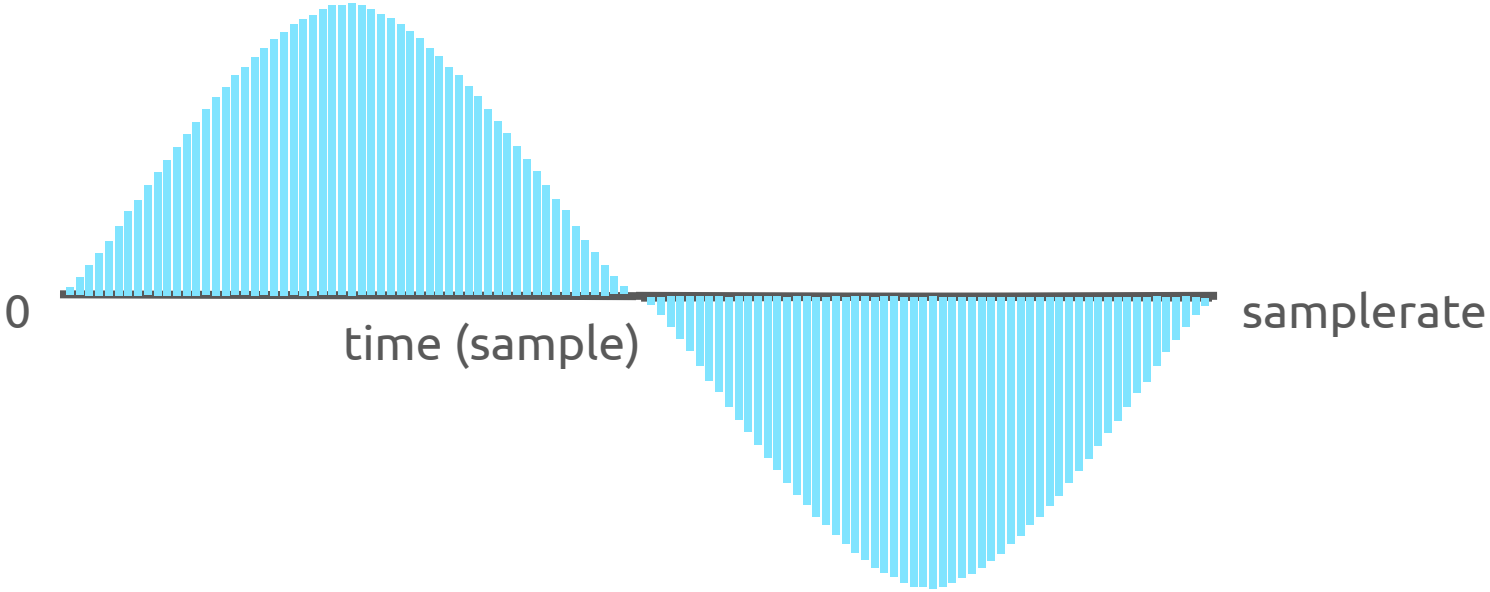


# Sine

phase

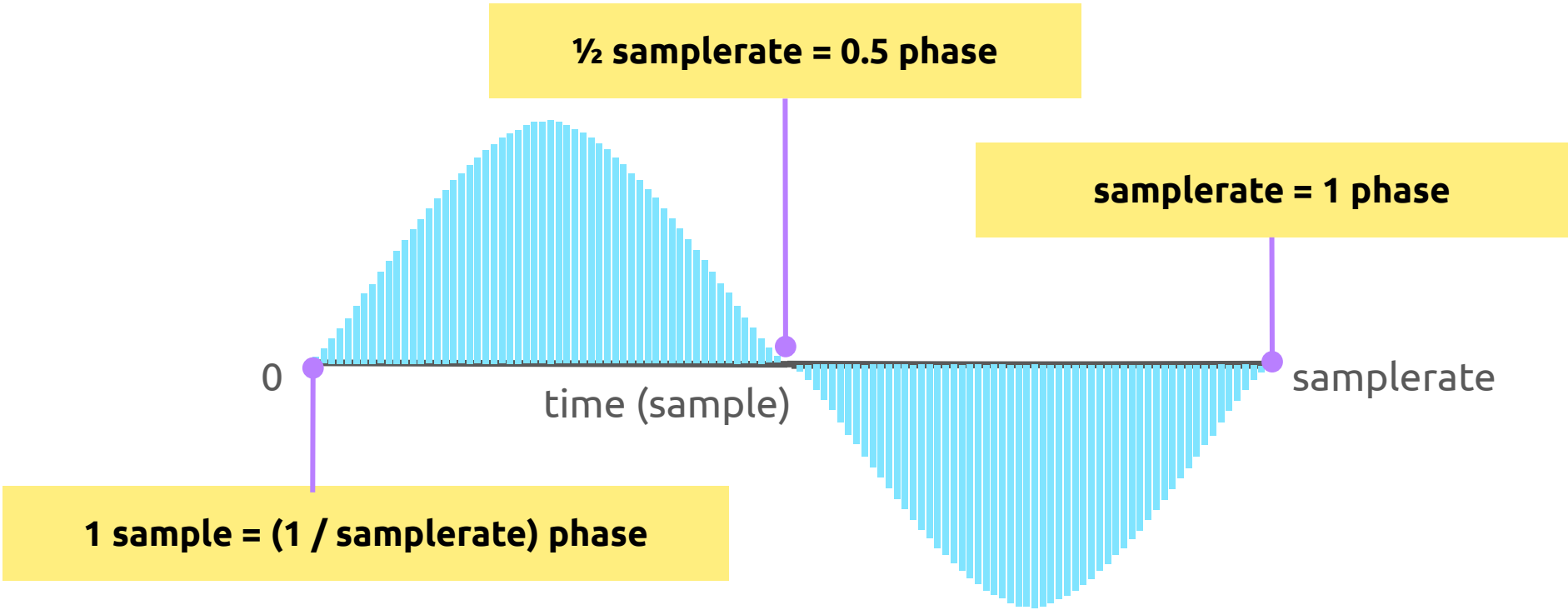
**Sine in discrete time**

[0, samplerate] samples → [0, 1] phase



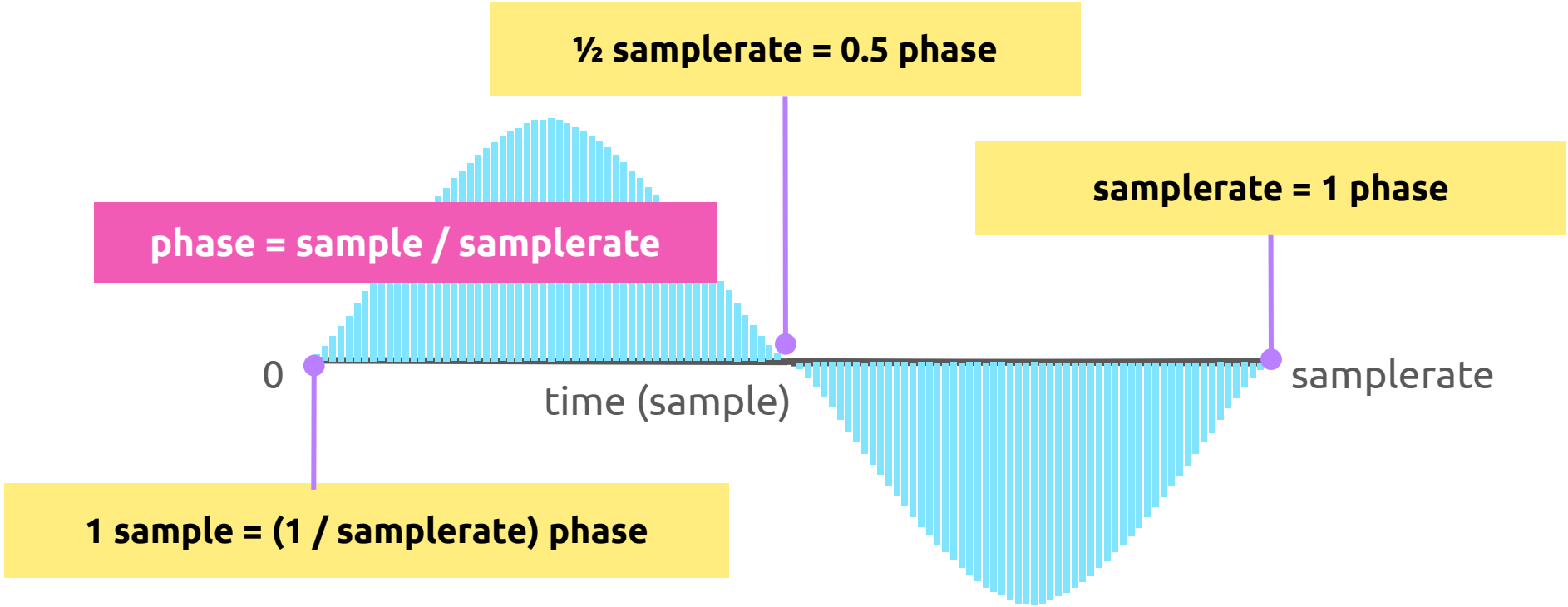
**Sine in discrete time**

[0, samplerate] samples → [0, 1] phase



**Sine in discrete time**

[0, samplerate] samples → [0, 1] phase



# To sum up

- Continuous time

$$f(t) = \sin(t * 2\pi)$$

- Discrete time

$$f(sample) = \sin( t / samplerate * 2\pi)$$

- Discrete time, expressed as function of the phase

$$f(phase) = \sin((phase * 2\pi)$$