Episode 09
Using variations to order numbers

European section, season 1

- Each of you has been given a number.
- Rank you on the first line according to your number.
- Hey look at this ! What a beautiful variation table.
- Return your card and rank you according to your new number.

Move 1

x	-10	10
$f(x)$	↗	

Move 2

x	-10	10
$f(x)$	$\searrow$	

Move 3

x	-10		0		10
$f(x)$		↘		↗	

Move 4

x	-10		-5		0		5		10
$f(x)$		↗		↘		↗		↘	

Move 5

x	-10		-7		-3		1		4		5		10
$f(x)$		↘		↗		↘	‖	↘		↗		↘	

The quizz : an example

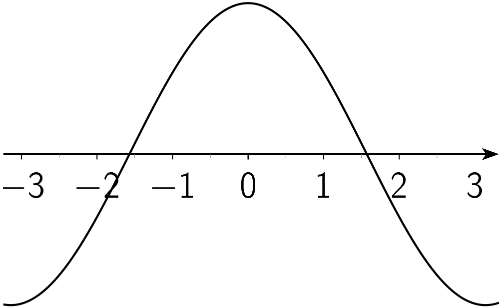
Compare the numbers $\cos(1)$ and $\cos(2)$.

An example (continued)

What function do we need ?

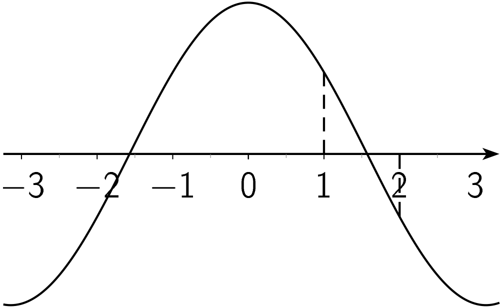
$$x \mapsto \cos x$$

The graph of this function :



An example (continued)

What interval do we need ?



The interval $[0, \pi]$.

An example (continued)

Over the interval $[0, \pi]$, the functions $x \mapsto \cos x$ is **decreasing**.

So, as $1 < 2$,

$$\cos(1) \geq \cos(2).$$

The Quizz

π^2 and 9

$\sin(2.3)$ and $\sin(2.7)$.

$$\left(\frac{3}{4}\right)^2 \text{ and } \left(\frac{5}{4}\right)^2.$$

$$\left(\frac{1}{4}\right)^3 - \frac{1}{4} \text{ and } \left(\frac{4}{17}\right)^3 - \frac{4}{17}.$$

$$0.98^3 - 0.98 \text{ and } 1.02^3 - 1.02.$$

$$\frac{1}{2.17} \text{ and } -\frac{1}{2.17}.$$

$$(-2.5)^3 + 2.5 \text{ and } (-\pi)^3\,\pi.$$

$$\frac{1}{(-2.01)^2} \text{ and } \frac{1}{(-1.99)^2}.$$

$$\frac{1}{\pi} \text{ and } \frac{1}{4}.$$

$\sqrt{7}$ and $\sqrt{10}$.

$\sin(0)$ and $\sin(-\pi)$.

$$\sqrt{5.17} \text{ and } \sqrt{5.71}.$$

$$(-2.17)^2 \text{ and } (-1.5)^2.$$

$$\sin(-3) \text{ and } \sin(-2).$$

$$-\frac{1}{\sqrt{7}} \text{ and } -\frac{1}{\sqrt{10}}.$$

$\sin(-1)$ and $\sin(1)$.

$$\frac{1}{\pi^2} \text{ and } \frac{1}{3.15^2}.$$

$$1.1^2 \text{ and } (-1.1)^2.$$

$$\sqrt{\pi + 2} \text{ and } \sqrt{6}.$$

$$\frac{1}{0.75^2} \text{ and } \frac{1}{0.66^2}.$$

The answers

Mark 1 point for every good answer.

$$\pi^2 \geq 9$$

$$\sin(2.3) \geq \sin(2.7).$$

$$\left(\frac{3}{4}\right)^2 \leq \left(\frac{5}{4}\right)^2.$$

$$\left(\frac{1}{4}\right)^3 - \frac{1}{4} \leq \left(\frac{4}{17}\right)^3 - \frac{4}{17}.$$

$$0.98^3 - 0.98 \leq 1.02^3 - 1.02.$$

$$\frac{1}{2.17} \geq -\frac{1}{2.17}.$$

$$(-2.5)^3 + 2.5 \geq (-\pi)^3\,\pi.$$

$$\frac{1}{(-2.01)^2} \leq \frac{1}{(-1.99)^2}.$$

$$\frac{1}{\pi} \geq \frac{1}{4}.$$

$$\sqrt{7} \leq \sqrt{10}.$$

$$\sin(0) = \sin(-\pi).$$

$$\sqrt{5.17} \leq \sqrt{5.71}.$$

$$(-2.17)^2 \geq (-1.5)^2.$$

$$\sin(-3) \geq \sin(-2).$$

$$-\frac{1}{\sqrt{7}} \leq -\frac{1}{\sqrt{10}}.$$

$$\sin(-1) \leq \sin(1).$$

$$\frac{1}{\pi^2} \geq \frac{1}{3.15^2}.$$

$$1.1^2 = (-1.1)^2.$$

$$\sqrt{\pi + 2} \le \sqrt{6}.$$

$$\frac{1}{0.75^2} \leq \frac{1}{0.66^2}.$$