



what's your favorite programming language?



Start the presentation to activate live content

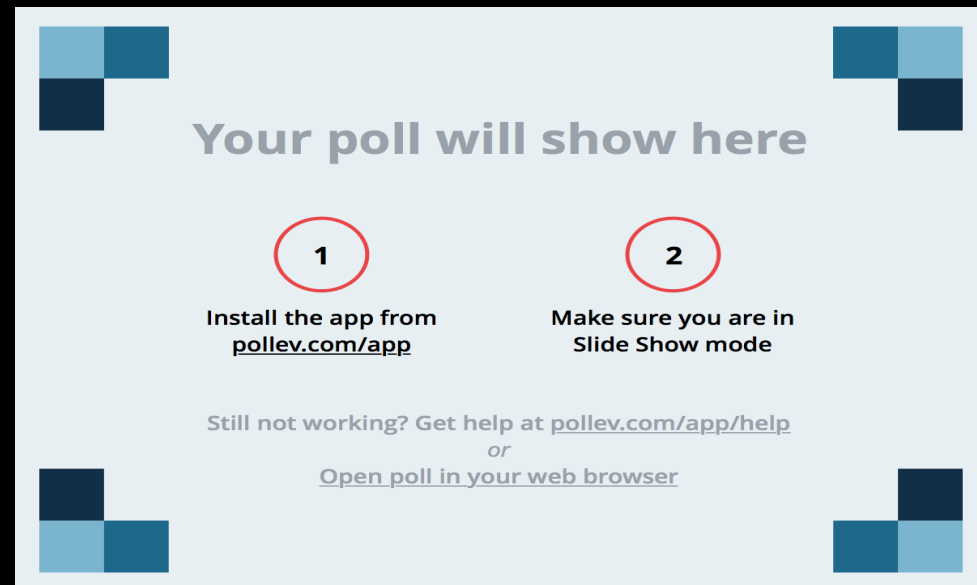


If you see this message in presentation mode, install the add-in or get help at PollEv.com/app

Do you have Polleverywhere?

A) Yes

B) No





Norms

Norms

For all $a \in R$ and all $u, v \in V$,

- $L_p(av) = |a| L_p(v)$
- $L_p(u + v) \leq L_p(u) + L_p(v)$
 - *triangle inequality or subadditivity*
- If $L_p(v) = 0$ then v is the zero vector
 - implies $|v| = 0$ iff v is the zero vector

L_p norm: $(\sum_j |x_j|^p)^{1/p}$

What is

$\|(1,2,3)\|_1$?

A) 1

B) 3

C) $\sqrt{14}$

D) $\sqrt{14/3}$

E) none of the above

A, B, C, D, or E

B

C

D

Start the presentation to activate live content

If you see this message in presentation mode, install the add-in or get help at [PollEV.com/app](https://pollEV.com/app)

The image shows a PollEv interface. At the top, a blue header bar contains the text "A, B, C, D, or E". Below this is a large white area for the poll question. On the left side of this area, there are three options labeled B, C, and D. At the bottom, a dark grey footer bar contains the text "Start the presentation to activate live content" and a small link to "PollEV.com/app".

What is

$|(1,2,3)|_2$?

A) 1

B) 3

C) $\sqrt{14}$

D) $\sqrt{14/3}$

E) none of the above



A, B, C, D, or E

B

C

D

Start the presentation to activate live content

If you see this message in presentation mode, install the add-in or get help at [PollEV.com/app](https://pollEV.com/app)

What is

$$|(1,2,3)|_{1/2} ?$$

A) 1

B) 3

C) $\sqrt{14}$

D) $\sqrt{14/3}$

E) none of the above

A, B, C, D, or E

B

C

D

Start the presentation to activate live content

If you see this message in presentation mode, install the add-in or get help at [PollEV.com/app](https://pollEV.com/app)

The image shows a PollEv interface. At the top, a blue header bar contains the text "A, B, C, D, or E". Below this is a large white area for the poll question. On the left side of this area, there are three options labeled B, C, and D. At the bottom, a dark grey footer bar contains the text "Start the presentation to activate live content" and a small link to "PollEV.com/app".

What is

$\|(1,2,3)\|_0$?

A) 1

B) 3

C) $\sqrt{14}$

D) $\sqrt{14/3}$

E) none of the above

A, B, C, D, or E

B

C

D

Start the presentation to activate live content

If you see this message in presentation mode, install the add-in or get help at [PollEV.com/app](https://pollEV.com/app)

The image shows a PollEv interface. At the top, a blue header bar contains the text "A, B, C, D, or E". Below this is a large white area for the poll question. On the left side of this area, there are three labels: "B", "C", and "D", each next to a small blue square. At the bottom of the interface, there is a dark grey footer bar. It contains the text "Start the presentation to activate live content" in white, and below that, in smaller text, "If you see this message in presentation mode, install the add-in or get help at [PollEV.com/app](https://pollEV.com/app)".

L_0 pseudo-norm

$|\mathbf{x}|_0 = \text{number of } x_j \neq 0$

How is this not a real norm?

Norms

Is $|x|_{1/2}$ convex?

Yes or no?	
Yes	
No	

Start the presentation to activate live content
If you see this message in presentation mode, install the add-in or get help at [PollEV.com/app](https://pollEV.com/app)

Distance

◆ How do norms relate to distance?

Distance

◆ How do norms relate to distance?

$$d_p(\mathbf{x}, \mathbf{y}) = \|\mathbf{x} - \mathbf{y}\|_p$$

Kernel

A symmetric function $K: \mathbf{X} \times \mathbf{X} \rightarrow \mathbb{R}$
is a positive semi-definite (psd) kernel on \mathbf{X} if

$$\sum_{i,j} c_i c_j K(\mathbf{x}_i, \mathbf{x}_j) \geq 0$$

If x is a vector containing only non-negative numbers,
is the following a norm?

$\sum_i x_i$ - the sum of the elements of x

Yes or no?

Yes

No

Start the presentation to activate live content
If you see this message in presentation mode, install the add-in or get help at [PollEV.com/app](https://pollEV.com/app)

If x is a vector containing only non-negative numbers,
is the following a norm?

$\sum_i i x_i$ - the sum of the elements of x , each weighted
by it's index, i

Yes or no?

Yes

No

Start the presentation to activate live content
If you see this message in presentation mode, install the add-in or get help at [PollEV.com/app](https://pollEV.com/app)

If x is a vector containing only non-negative numbers,
is the following a norm?

$$\sum_i x_i^2$$

Yes or no?

Yes

No

Start the presentation to activate live content
If you see this message in presentation mode, install the add-in or get help at [PollEV.com/app](https://pollEV.com/app)

If x is a vector containing only non-negative numbers,
is the following a norm?

$\text{length}(x)$ - number of the elements of x

Yes or no?

Yes

No

Start the presentation to activate live content
If you see this message in presentation mode, install the add-in or get help at [PollEV.com/app](https://pollEV.com/app)

If x is a vector containing only non-negative numbers,
is the following a norm?

$d(x,y)$ - the Euclidean distance between x and some
other (arbitrary, but fixed, vector y , also non-negative)

Yes or no?

Yes

No

Start the presentation to activate live content

If you see this message in presentation mode, install the add-in or get help at [PollEV.com/app](https://pollEV.com/app)

True or False: The only important thing you need to pick when doing k-nearest neighbors is k

Yes or no?

Yes

No

Start the presentation to activate live content
If you see this message in presentation mode, install the add-in or get help at [PollEV.com/app](https://pollEV.com/app)