

Physics.Land

Edwin Lo

CSAAPT – April 17, 2021

Physics, Loyola University MD

Physics.Land

Edwin Lo

CSAAPT – April 17, 2021



Physics, Loyola U MD

Data Sci, George Washington U

Homeschooler

1. Rationale

2. Boom

3. Features

4. Samples

5. Future

6. About

RATIONALE

- ❌ “I know the concepts, just can’t do the math!”
order of operation? unit conversion? mistaken prefix?
Radian/degree? Dot/Cross product?
- ❌ Is the same ‘ol TI-calculator still “must-have” for learning Physics?
- ✅ UI for the new generations
- ✅ Instant gratification
- ✅ Multi-tasking
- ✅ Visual, 3D, AR, ...?

UN-RATIONALE

- ❌ “I know the concepts, just can’t do the math!”
order of operation? unit conversion? mistaken prefix?
Radian/degree? Dot/Cross product?
- ✅ Is the same ‘ol TI-calculator still “must-have” for learning Physics?
- ✅ UI for the new generations
- ❌ Instant gratification
- ❌ Multi-tasking
- ✅ Visual, 3D, AR, ...?

BOOM – this is your LAND

- ✓ Physics.Land was born summer 2019
- ✓ Started as javascript site
- ✓ Later moved to Angular framework (Typescript), hosted as a Firebase project on Google Cloud Platform (GCP)

The screenshot shows the Physics.Land 101 website interface. At the top, there is a blue navigation bar with the title "Physics.Land 101" and several menu items: "UniCon", "Quadratic", "Trigs", "Vectors", "2d Vec+", and "Kinematics". Below the navigation bar, there is a clipboard status bar that says "Clipboard: empty" with a "Reveal" button. Below that, there are two action buttons: "C" for "Copy and save a physical quantity to Scratch Pad." and "P" for "Paste the clipboard quantity (Scratch Pad last entry) to where applicable." To the right of these buttons are three more buttons: "Scratch", "Phys Cons", and "Settings". The main content area features a quote in green text: "Do not worry about your difficulties in Mathematics..." attributed to Albert Einstein. Below the quote is another quote in blue text: "Who's gonna do the dirty job then, huh? You?" attributed to "Everyone else not named Einstein". Below that is a quote in pink text: "Me, Me, MeeeeeeeEEE!!!" attributed to "Physics.Land". To the right of the quotes is a video player with a play button and the title "HowTo Use Physic...". Below the video player, there are two buttons: "Our Goals" and "Notations". At the bottom of the page, there is a section titled "Why?" with a paragraph of text. The text discusses the author's experience with calculators and the importance of understanding physics concepts over just crunching numbers. At the very bottom, there is a link to "hidden dimension" and a page number "6" in a circle.

* Physics.Land 101 * UniCon Quadratic Trigs Vectors 2d Vec+ Kinematics

cb Clipboard: empty Reveal

C Copy and save a physical quantity to Scratch Pad. Scratch Phys Cons Settings

P Paste the clipboard quantity (Scratch Pad last entry) to where applicable.

Do not worry about your difficulties in Mathematics...
– Albert Einstein

Who's gonna do the dirty job then, huh? You?
– Everyone else not named Einstein

Me, Me, MeeeeeeeEEE!!!
– Physics.Land

HowTo Use Physic...

Our Goals Notations

Why?

You don't go write an article or letter without spell-checker these days. The right tools for the daily jobs have changed over the course of our lifetime.

I learned looking up four-figure tables to calculate sines and cosines. Having a Casio-3600p (which can store 36 steps in a program for, say, the quadratic formula) was a miracle to my generation. These RPN (look it up, Reverse-Polish-Notation) calculators were before the TI-83/84 taking over the world. While I would argue these RPN concepts might have made me a better scientist, for example, how I view binary operations and order-of-operations, it is simply ridiculous for today's generation to be using the same tools for their calculation tasks.

As far as we know, the brains of the new generations are wired differently for multitasking and other things. Whether it is for better or for worse, I can only say, "Who am I to judge." As such, I am hoping to develop this new tool you can count on for solving basic physics problems. You will then have more time to learn physics. The concepts, the visuals, the units, the order-of-magnitudes, the sig.figs... These are far more important to spend your time on than to crunching numbers into your 30-year-old TI-calculators.

See our [hidden dimension](#) here.

6

FEATURES

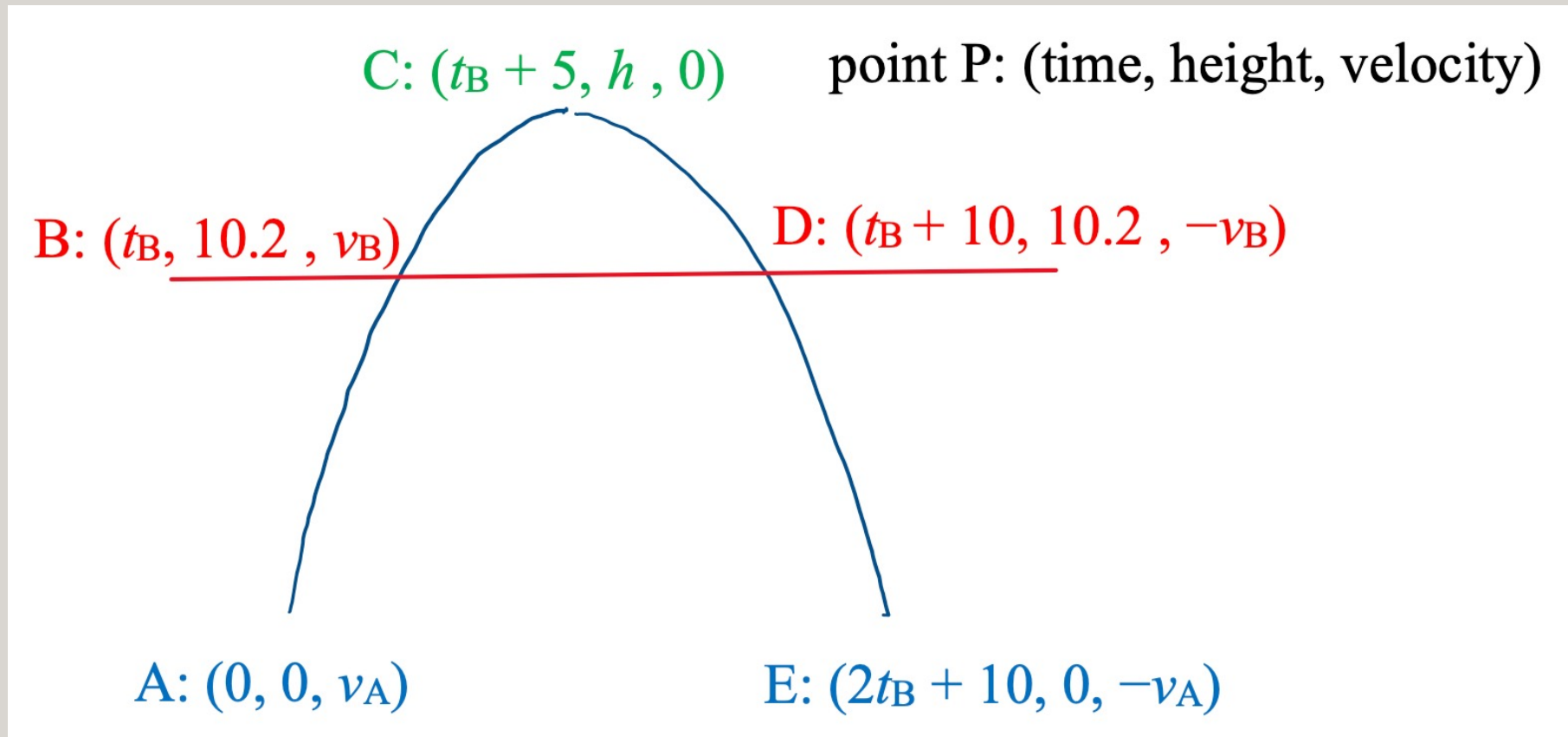
- ✓ Responsive app and UI/UX
- ✓ Units front and center for every physical quantity
- ✓ Sig figs, metrics, all built in
- ✓ Instant results and feedback (“fail-fast” cycle)
- ✓ Visual (& animation) available whenever possible
- ✓ Steps and explanations provided for all calculations
- ✓ Mobile device friendly

SAMPLES

Try <https://physics.land>

SAMPLES

A body thrown upward from the ground vertically passes the height of 10.2m twice in an interval of 10s. What was its initial velocity?



Clipboard: (SI, Velocity) $v_1 = 49\text{m/s}$ (exact) Reveal

C Copy and save a physical quantity to Scratch Pad. Scratch Phys Cons Settings
P Paste the clipboard quantity (Scratch Pad last entry) to where applicable.

Kinematics

Instructions

a m/s² P C

Δx m C

Δt s P C

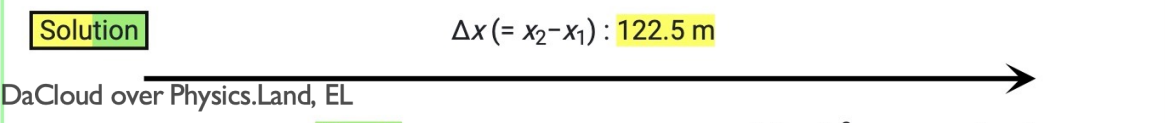
v_1 m/s C

v_2 m/s P C

Reset All Inputs

Kinematics equation	Absent
$\Delta x = v_1 \Delta t + (1/2) a (\Delta t)^2$	v_2
$v_2 - v_1 = a \Delta t$	Δx
$v_2^2 - v_1^2 = 2 a \Delta x$	Δt
$(v_1 + v_2)/2 = \Delta x / \Delta t$	a
$\Delta x = v_2 \Delta t - (1/2) a (\Delta t)^2$	v_1

1-D Constant Acceleration Kinematics Visual results Refresh Hide



Clipboard: (SI, Velocity) $v_1 = 49\text{m/s}$ (exact) Reveal

C Copy and save a physical quantity to Scratch Pad. Scratch Phys Cons Settings
P Paste the clipboard quantity (Scratch Pad last entry) to where applicable.

Kinematics

Instructions

a m/s² P C

Δx m P C

Δt s C Δt_a C

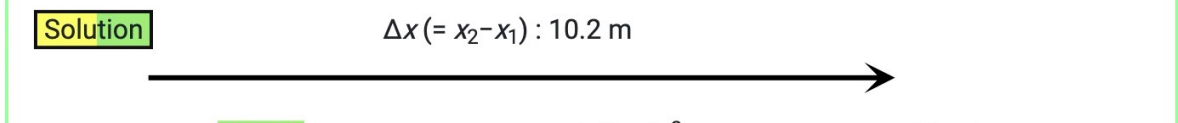
v_1 m/s C v_{1a} C

v_2 m/s P C

Reset All Inputs

Kinematics equation	Absent
$\Delta x = v_1 \Delta t + (1/2) a (\Delta t)^2$	v_2
$v_2 - v_1 = a \Delta t$	Δx
$v_2^2 - v_1^2 = 2 a \Delta x$	Δt
$(v_1 + v_2)/2 = \Delta x / \Delta t$	a
$\Delta x = v_2 \Delta t - (1/2) a (\Delta t)^2$	v_1

1-D Constant Acceleration Kinematics Visual results Refresh Hide



FUTURE

- ❑ More topics/modules (freshmen physics)
- ❑ Error propagation
- ❑ 3D visuals
- ❑ Artificial neural network (ANN) layers behind the scene

ABOUT

- The app: <https://physics.land>
- Git info: <https://physicsland.github.io>
- App resides on Google Cloud Platform (GCP) as a Firebase project.
- App built from Angular/Typescript framework.
- Contacts: Edwin Lo, the1@physics.land
(Physics, [Loyola U MD](#) ; Data Sci, [George Washington U](#))

OUR LAND IS YOUR LAND

Thank You!