PHYS 1140 Notebook

1 Overview

You keep your lab notebook in the **PHYS 1140 Notebook**, a program on the lab tablets. There is nothing to set up: no account, no sign-in, and no syncing. The notebook saves by itself while you work.

Each lab has three parts:

1. Start a new notebook for the lab.
2. Do your work in it.
3. Export it and upload the files to Canvas before you leave.

Before you start

- Your TA will check a tablet and its pen out to you at the start of lab.
- Log into the tablet with your IdentiKey.
- You make **one notebook for each lab**. You do not carry one notebook through the semester.
- You may get a **different tablet each week**. That is fine: every lab starts with a new notebook, and the copy you turn in on Canvas is how you get back to an earlier one.
- If you get stuck at any point, **ask your TA**.

2 Start a Notebook for Today's Lab

1. Double-click **PHYS 1140 Notebook** on the tablet's desktop. (It is also in the Start menu.)
2. Tap the **Notebook** menu, the button with three lines at the top left of the notebook window.
3. Tap **New notebook…** (Figure 1).
4. Type the lab's name as the title, for example `Lab 1` (Figure 2).
5. Tap **Create**.

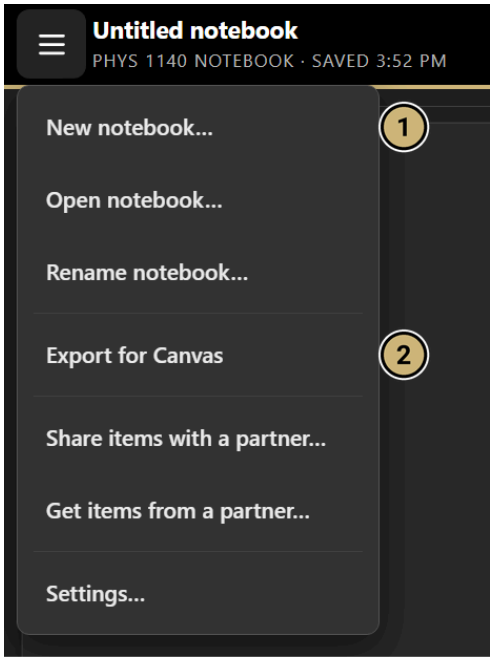


Figure 1: The Notebook menu. 1: New notebook…, to start a notebook for today's lab. 2: Export for Canvas, to turn it in.

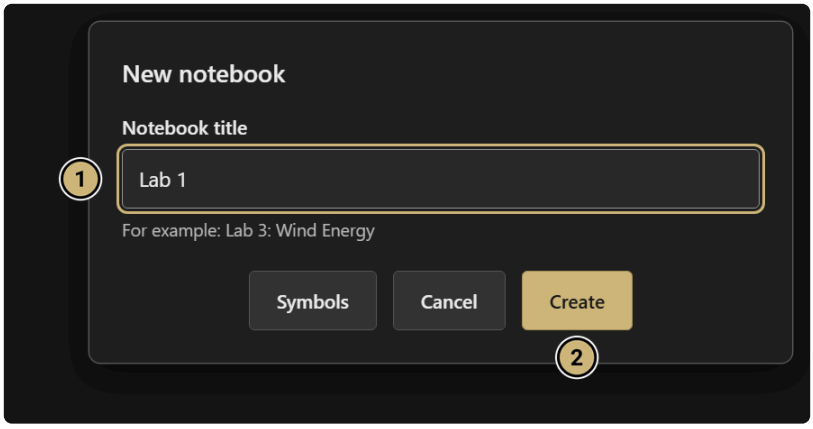


Figure 2: The New notebook window. 1: type the lab's name as the title. 2: tap Create.

Checkpoint

The top of the notebook window shows the title you typed. If it shows a different lab or "Untitled notebook," repeat the steps above before you write anything.

On a tablet you have used before, the notebook opens with whatever you had open there last, which may be an earlier lab. On a tablet that is new to you, it opens with an empty notebook. Either way, start a new notebook at the beginning of every lab.

You can also open the notebook from the **PHYS 1140 Lab App**: tap **Notebook** under **Tools**. The notebook has its own window, so you can keep it open next to the lab guide or the lab app.

3 The Tools

The tool bar floats at the bottom of the notebook window (5 in Figure 3). Its tools, from left to right, with their numbers in Figure 4:

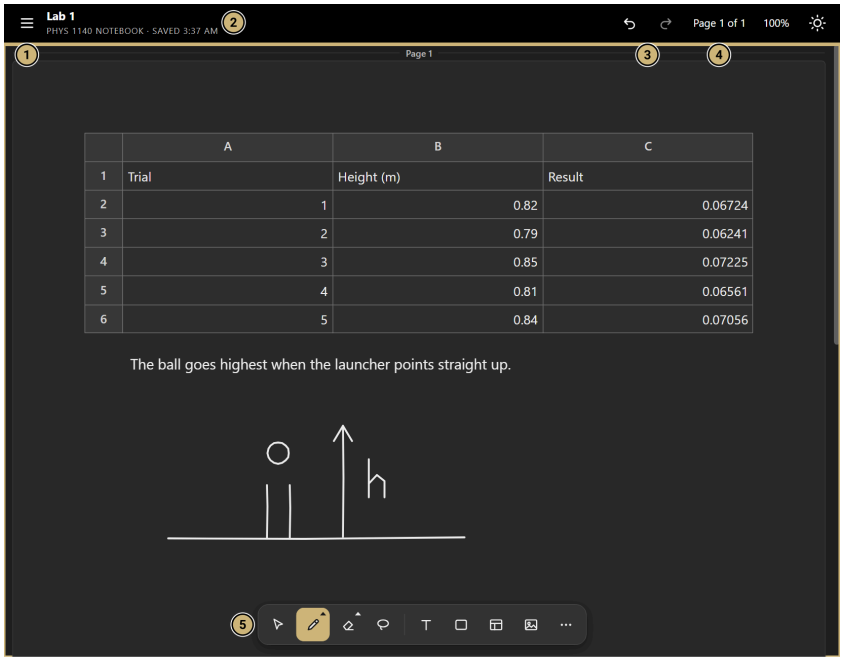


Figure 3: The PHYS 1140 Notebook window. 1: the Notebook menu. 2: the notebook's title, with the Saved line under it. 3: Undo and Redo. 4: the Page menu. 5: the tool bar.

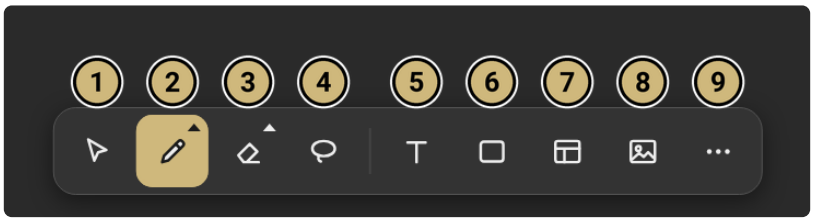


Figure 4: The tool bar. 1: Select. 2: Pen, the chosen tool. 3: Eraser. 4: Lasso. 5: Text. 6: Shape. 7: Spreadsheet. 8: Image. 9: More.

	Tool	Looks like	What it does
1	**Select**	An arrow	Tap an item to select it. Drag a selected item to move it.
2	**Pen**	A pencil	Write and sketch with the tablet's pen. This is the tool the notebook starts with. Tap **Pen** again to choose a line weight and an ink color.
3	**Eraser**	An eraser	Erase handwriting with the pen. The eraser end of the pen also erases, whichever tool is chosen.
4	**Lasso**	A loop	Draw a loop around handwriting to move, copy, or delete it. A loop drawn clockwise takes only what is wholly inside it. A loop drawn counterclockwise shows dashed and takes everything it touches.
5	**Text**	The letter T	Tap **Text**, then tap the page where the text box should go, and type.
6	**Shape**	A rectangle	Add a rectangle, an ellipse, or a diamond that can hold text.

	Tool	Looks like	What it does
7	**Spreadsheet**	A small table	Add a spreadsheet to the page. See Section 4.
8	**Image**	A picture	Add a picture: **From file…**, **From camera…**, or **Paste**. See Section 6.
9	**More**	Three dots	**Add page**, **Paste**, and **Select all on this page**.

A few things to know:

- **Your finger scrolls the page. Only the pen draws.** Two fingers zoom in and out. A tap with a finger selects the handwriting or item under it, whichever tool is chosen; a tap on an empty part of the page lets go of it.
- **Undo** and **Redo** are the two curved arrows at the top of the window (3 in Figure 3). Tapping a page twice with two fingers also undoes.
- The button that reads **Page 1 of 1** (4 in Figure 3) opens the Page menu: the paper style (**Blank**, **Dot grid**, **Graph**, **Ruled**), page order, **Delete page**, and zoom.
- A new spreadsheet, picture, or plot is placed below what is already on the page. A picture or a plot that does not fit is put on a new page, and the notebook tells you. For a spreadsheet, the notebook asks you to add a page first: tap **More** in the tool bar, then **Add page**, then **Spreadsheet** again.
- When you select something on the page, it gets a small bar of its own, usually just above it. The three dots at the right of that bar open the rest of its commands.
- The line under the title shows **Saved** and the time. You never need to save by hand.

4 Spreadsheets and Formulas

To add a spreadsheet and enter data:

1. Tap **Spreadsheet** in the tool bar. A spreadsheet appears on the page, with its first cell ready for you to type in.
2. Tap a cell with your finger, or click it with the trackpad, and type. Press **Enter** to move down, or **Tab** to move right. Do not use the pen here: while **Pen** is the chosen tool, the pen writes on top of the spreadsheet.
3. Use the first row for column headings, with units, for example `Height (m)`.
4. To add a row or a column, tap the **+** under the spreadsheet or at its right side. The **+** marks show while the spreadsheet is selected. To set the size all at once, tap the three dots at the right of the bar above the spreadsheet, then **Set rows and columns…**.

Check that a cell is chosen

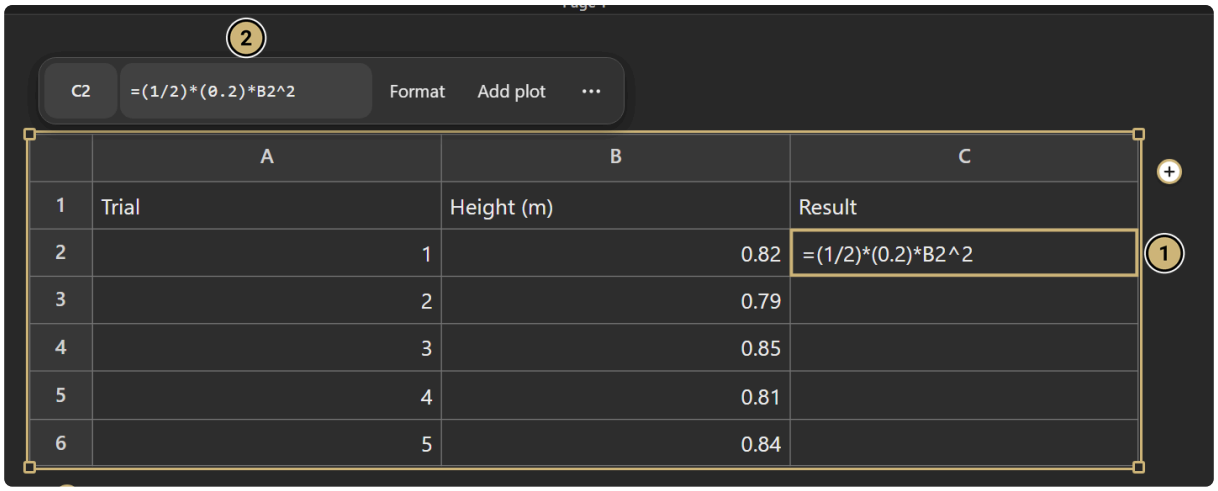
The first tap on a spreadsheet that is not selected selects the whole spreadsheet, which gets a gold outline. What you type then still goes into the cell you tapped, but a drag moves the whole spreadsheet. The next tap chooses the cell.

Once a cell is chosen, the bar above the spreadsheet shows, from left to right, the cell's name (such as `B3`), a long box with what the cell holds, **Format**, **Add plot**, and three dots that open more commands, such as **Select range**, **Copy cells**, **Paste cells**, and **Clear cells** (Figure 5 shows this bar).

Before you drag across cells or use those tools, check that the bar shows the name of the cell you want. If it does not, tap the cell again.

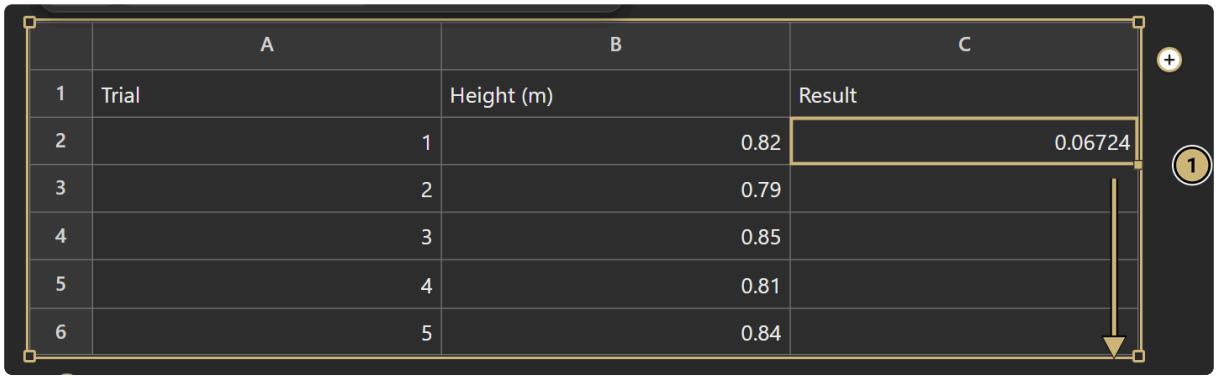
To calculate with a formula:

1. Choose an empty cell, and check that the bar shows its name.
2. Type a formula that begins with `=` (Figure 5). A formula can use other cells, for example `=B2*9.8`.
3. Press **Enter**. The cell shows the result.
4. To use the same formula in the rows below, tap the cell with the result so that the bar shows its name, then drag the small square at its bottom-right corner down the column (Figure 6). The cell names change for each row (B2 becomes B3, B4, and so on).



	A	B	C
1	Trial	Height (m)	Result
2	1	0.82	=(1/2)*(0.2)*B2^2
3	2	0.79	
4	3	0.85	
5	4	0.81	
6	5	0.84	

Figure 5: Typing a formula. 1: the cell being typed in. 2: the long box in the bar above the spreadsheet, which shows what the cell holds.



	A	B	C
1	Trial	Height (m)	Result
2	1	0.82	0.06724
3	2	0.79	
4	3	0.85	
5	4	0.81	
6	5	0.84	

Figure 6: The formula's result, selected. 1: the small square at the cell's bottom-right corner. Drag it down the column, as the arrow shows, to use the formula in every row.

A formula can use functions such as `=AVERAGE(B2:B11)`, `=STDEV(B2:B11)`, `=COUNT(B2:B11)`, `=SQRT(B2)`, and `=LN(B2)`. Put a `$` before a column letter and row number (`$B$1`) to keep that cell fixed when you drag a formula down.

To paste a formula that you copied from a lab guide:

1. Choose an empty cell, and check that the bar shows its name.
2. Tap the cell again, or press **Enter**. The cursor starts blinking in the cell.
3. Press **Ctrl+V**. The formula appears in the cell.
4. Replace each name in the formula with the cell that holds that value, then press **Enter**.

The cell shows `#NAME?` until every name is replaced with a cell: tap the cell, and the notebook says which name it does not know. To change the formula, put the cursor back in the cell the same way. If the cell

shows the formula itself as text, the cursor was not in the cell when you pasted: clear the cell (with the bar showing its name, the three dots, then **Clear cells**) and start again.

If a cell shows an error such as `#DIV/0!`, tap the cell. The notebook explains the problem in a sentence under the spreadsheet.

To move numbers between your notebook and the lab app:

- **From the lab app to your notebook:** in the lab app, use **Copy to Clipboard**. In the notebook, choose the cell where the values should start, check that the bar shows its name, and press **Ctrl+V** (or tap the three dots at the right of the bar above the spreadsheet, then **Paste cells**).
- **From your notebook to the lab app:** select the two columns of numbers (not their headings): choose the first number, check that the bar shows its name, and drag to the last. Press **Ctrl+C** (or tap the three dots, then **Copy cells**). In the lab app, tap **Paste data**, paste them into the box that opens (**Ctrl+V**), and click **OK**. **Paste data** takes two columns that sit side by side. Its window says which one it expects on the left and which on the right, with their units.

5 Plots

A plot is made from the cells of a spreadsheet in your notebook, and it updates when you change those cells.

1. The notebook reads the columns you select from left to right. Two columns are X, then Y. Three columns are X, then Y, then the uncertainties in Y (the error bars). Four or more columns are X, then one series for each of the other columns.
2. Choose the first cell of your X column, the one that holds its heading. Check that the bar shows the cell's name; if it does not, tap the cell again.
3. Drag from that cell to the last cell of your Y column (or of the uncertainty column), using your finger or the trackpad, not the pen. The cells in between are selected (Figure 7). If dragging is awkward, tap the three dots at the right of the bar above the spreadsheet, then **Select range**, then the last cell.
4. Tap **Add plot** in the bar above the spreadsheet.
5. In the **Add plot** window (Figure 8), check **X cells**, **Y cells**, and **Y error bar cells (optional)**. Each one is a range such as `A1:A11`. If a box holds the wrong column, type the right range in it.
6. For a trendline, choose a **Fit**: **Linear, with uncertainties**, **Quadratic**, or **Cubic**. The equation of the fit is shown with the plot.
7. Type an **X axis label** and a **Y axis label** with units, or leave them empty to use your column headings.
8. Tap **Add plot**.

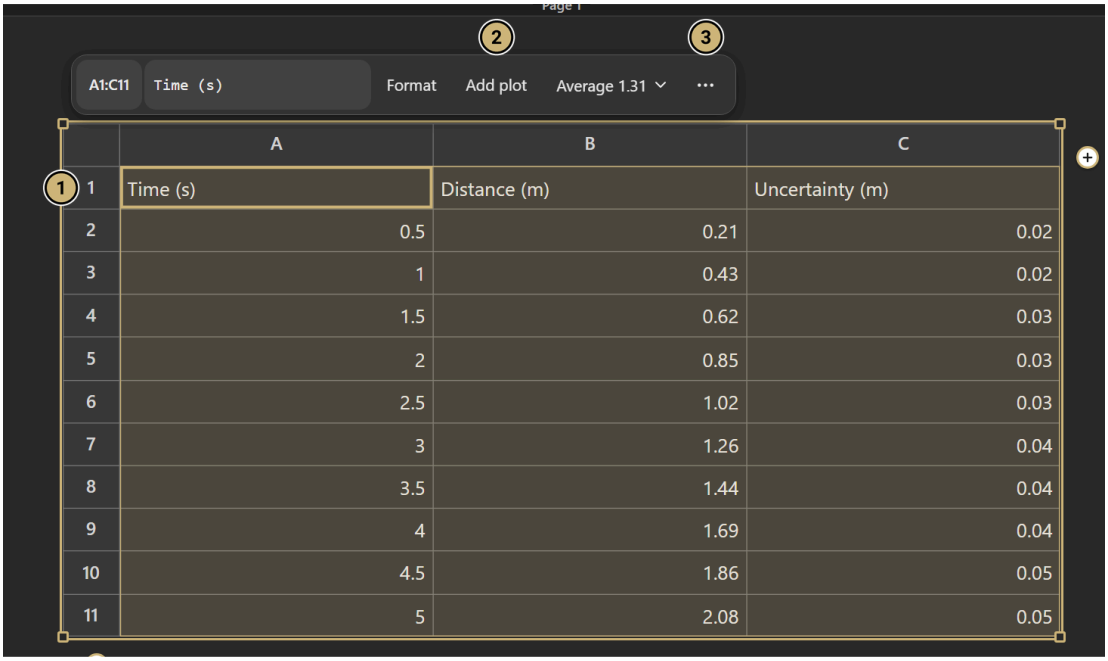


Figure 7: Three columns selected for a plot. 1: the first cell, where the drag starts. 2: Add plot. 3: the three dots, which hold Select range, Copy cells and Paste cells.

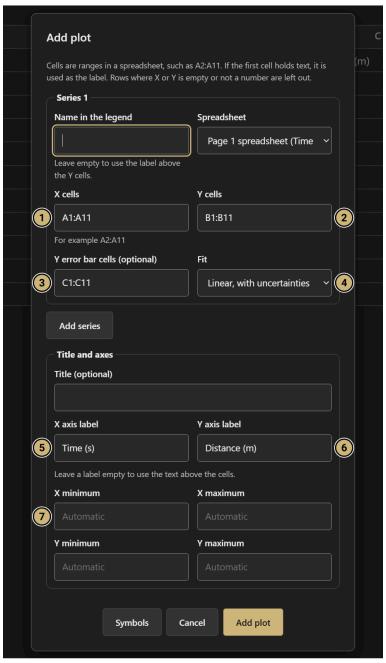


Figure 8: The Add plot window, filled in from the three selected columns. 1: X cells. 2: Y cells. 3: Y error bar cells. 4: Fit. 5: X axis label. 6: Y axis label. 7: the axis ranges. On a tablet, scroll the window to reach the lower boxes.

If your columns are not side by side, or not in that order, choose any cell of the spreadsheet so that the bar shows its name, tap **Add plot**, and type the ranges in **X cells**, **Y cells**, and **Y error bar cells (optional)** yourself.

The plot chooses the range of each axis from your data. To set a range yourself, type an **X minimum**, **X maximum**, **Y minimum**, or **Y maximum** in the same window.

To change a plot later, tap it, then tap **Edit plot**.

To put several sets of data on one plot, add a series for each set: tap the plot, tap **Edit plot**, tap **Add series**, and fill in that series' **X cells** and **Y cells**. When four or more columns are selected, the notebook starts with

one series for each column after the first, named by its heading. With exactly three columns selected, the third is read as error bars, not as a second series.

To add a caption to a plot or a picture, tap it, tap the three dots at the right of its bar, then **Add caption**. Type the caption, then press **Esc**. A spreadsheet can have a caption too, but only while the whole spreadsheet is selected rather than a cell: with a cell chosen, press **Esc**, and then use the three dots and **Add caption**. A sketch or handwriting has no caption box of its own: write the caption under it with the pen, or with the **Text** tool.

6 Pictures

- **A photo of your setup:** tap **Image**, then **From camera…**, point the tablet, and tap **Take photo**.
- **A plot from the lab app:** in the lab app, tap the copy button (the copy icon) below the plot. In the notebook, tap **Image**, then **Paste**.
- **A picture file:** tap **Image**, then **From file…**.

You can write on top of a picture with the pen to label it.

7 Turn In Your Notebook

Do this before you leave the lab.

1. Tap the **Notebook** menu, then **Export for Canvas**. If it asks for a title first, type the lab's name and tap **Continue**.
2. A window titled **Files saved for Canvas** (Figure 9) lists two files with the same name (your notebook's title and your IdentiKey username). One is a **PDF**, which your TA grades. The other is your **notebook file**, which lets you open your work again later, on any tablet.
3. Open a web browser (Chrome and Firefox are installed) and go to Canvas.
4. Open the assignment for this lab.
5. Upload **both** files and submit. The files are in the **Downloads** folder. If the browser's upload window does not show them, choose **Downloads** at the left of that window.
6. Check that Canvas shows both files in your submission.
7. Back in the notebook, tap **Done**.

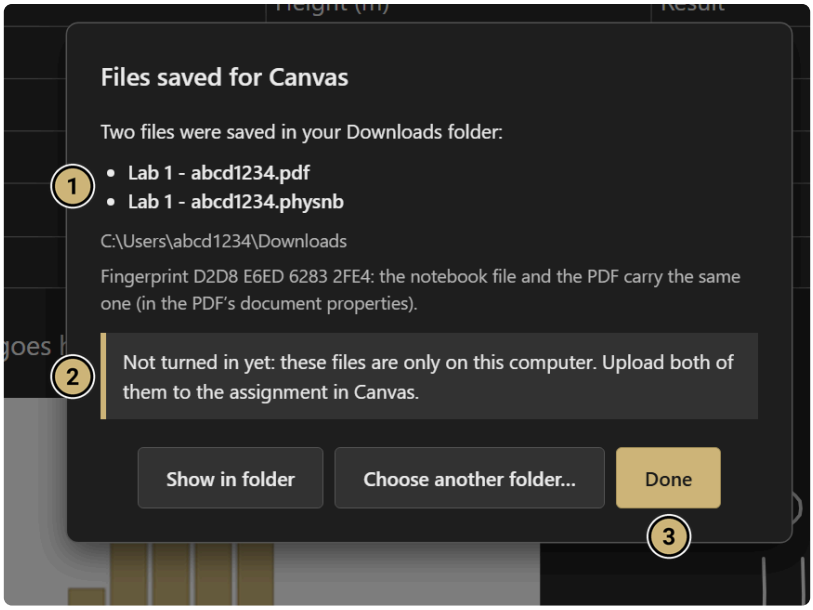


Figure 9: The Files saved for Canvas window. 1: the two files to upload, a PDF and a notebook file. 2: the reminder that nothing is turned in until both are uploaded. 3: Done, once they are uploaded.

> Exporting does not turn in your work
>
> **Export for Canvas** only saves the two files on the tablet. Your notebook is not turned in until both files are uploaded to the Canvas assignment.

If you change your notebook after exporting, the top of the window shows **Changed since the last Export for Canvas**. Export again and upload the new files, so Canvas has your latest work.

If you close the notebook before exporting, it asks **Export for Canvas before closing?** Tap **Export for Canvas** and follow the steps above.

When you are finished, sign out of the tablet (double-click the "LogOut" icon on the Desktop), then check it back in with your TA, along with its pen.

8 Open an Earlier Notebook

You may not get the same tablet each week, and a notebook stays on the tablet where you made it. The notebook file you turned in on Canvas works on any tablet, which is why you upload both files at the end of every lab.

1. In Canvas, open your submission for that lab and download the notebook file. It is the one that is not the PDF.
2. Open the downloaded file. It opens in the PHYS 1140 Notebook as a copy.

If the file does not open that way, tap the **Notebook** menu, then **Open notebook…**, then **Open a notebook file…**, and choose it.

If you are on the tablet where you made the notebook, you can skip the download: tap the **Notebook** menu, then **Open notebook…**, and tap the notebook in the list.

9 Share Data with Your Lab Partner

Each partner keeps their own notebook. You can give your partner the data you took together, such as a spreadsheet of your measurements, a photo of your setup, or a graph copied from the lab app. Text boxes and handwriting are never shared: they stay in your own notebook.

To send:

1. Tap the **Notebook** menu, then **Share items with a partner…**.
2. Check the items to share (Figure 10).
3. Tap **Send with a code**. The notebook shows a six-digit code that works for 10 minutes (Figure 11).

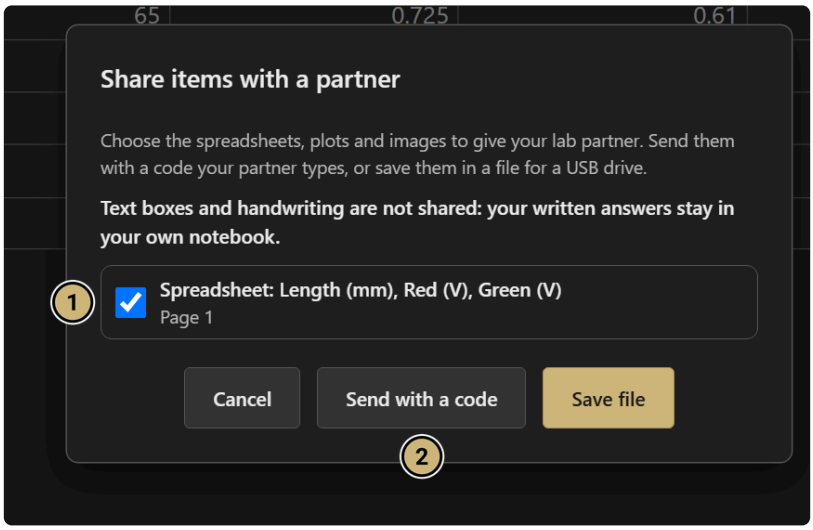


Figure 10: The Share items with a partner window. 1: check the items to share. 2: Send with a code.

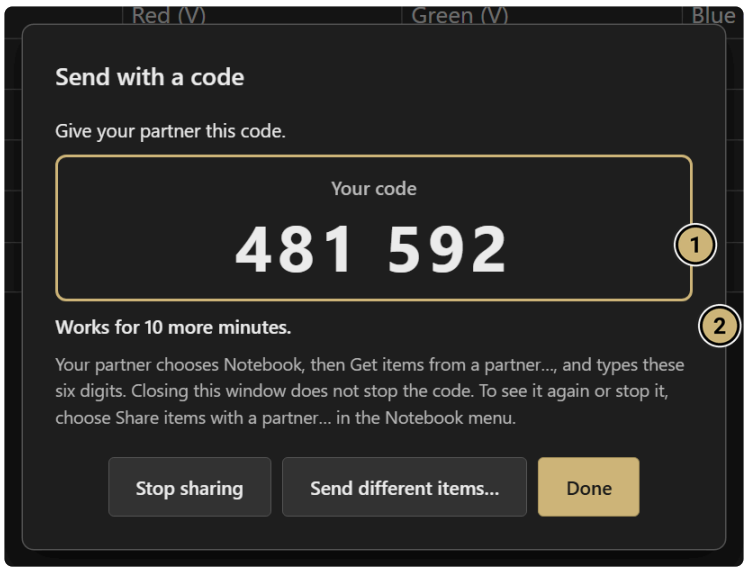


Figure 11: The Send with a code window. 1: the six-digit code your partner types. 2: how long the code works.

To receive:

1. Tap the **Notebook** menu, then **Get items from a partner…**.
2. Type the six digits from your partner's screen.
3. Tap **Get items**. The items are added to your notebook, marked with who they came from.

If there is no **Send with a code** button, tap **Save file** instead and save the file to a USB drive. Your partner taps **Get items from a partner…** and chooses that file (tap **Open a file instead…** first if it asks for a code). Do the same if the notebook says that sending with a code is not set up on this computer, and tell your TA.

10 If Something Goes Wrong

- **The pen does not draw.** Check that **Pen** is the chosen tool in the tool bar.
- **My finger does not draw.** That is on purpose: a finger scrolls, so your hand can rest on the screen while you write with the pen.
- **The page will not scroll, and something moves instead.** A tap selected it. Tap an empty part of the page, then scroll. **Undo** puts back anything that moved.
- **I wrote in last week's notebook.** Tell your TA before you export.
- **The line under the title says "Not saved."** Keep the notebook open and tell your TA right away.
- **Export says a file is open in another program.** Close the PDF if you opened it, then choose **Export for Canvas** again.

For anything else, ask your TA.