



How To Create a Collaborative BitPaper Whiteboard

Collaborative whiteboards are powerful tools for facilitating group interactions in online environments. Groups of students can work together on a single whiteboard, similar to how they would work on a worksheet or whiteboard in class. These whiteboards can also be an instrumental way to keep track of the progress of all groups and to help you decide which groups need the most guidance. As LAs, you can either create collaborative whiteboards for students to work in or you can help students create their own.

How To Create a Collaborative BitPaper Whiteboard:

BitPaper is an online collaborative whiteboard software that allows group members to work on a single whiteboard at one time. It is easy to use and learning a few simple keyboard shortcuts makes it efficient to use. Unlike Google Docs, you can hand draw with BitPaper to create graphs and other symbolic representations. To create a collaborative BitPaper whiteboard:

1. Go to <https://www.bitpaper.io> and sign in to your BitPaper Account.
2. Create a new whiteboard by clicking the “create paper” button in the top right corner of the screen.
3. Once you have a whiteboard open you can share it with members of your group by copying the URL of the document and sharing it via your preferred messaging service.

Note: BitPaper requires that the person creating the whiteboard (professor, TA, LA, etc.) has an account with an actively paid membership. Students can access unlimited BitPaper whiteboards and create one per month with a free student account.

Tips for BitPaper:

- **Designate group roles** (facilitator, reporter, recorder, etc.) so everyone knows who is responsible for writing in the document. You can color-code the document and assign each student a color to encourage equal participation.
- **Insert documents** into the collaborative whiteboard for students to work on, similar to how they would work on worksheets in class. Any image or document can simply be dragged and dropped into BitPaper.
- **Use audio/video calls, screenshare and chat in BitPaper** to facilitate group interactions. These features of BitPaper allow groups to work together outside of the Zoom app. This is good for groups who want privacy to work or in cases where Zoom cannot support enough breakout rooms for all the students.
- **Use the equation editor** to create equations within a BitPaper whiteboard. This equation editor is TeX based and does require that the user knows how this system works. However, you can also copy and paste premade equations into the equation editor. Many commonly used equations can be found [here](#).

Examples from BitPaper Collaborative Whiteboards:

Handwritten:

The example below contains:

- A BitPaper whiteboard that had a document uploaded to it.
- Different colors to represent different student's work within the document.
- Handwritten work that was completed by students.
- Multiple pages within the same whiteboard (second page not fully shown)

The whiteboard displays a document titled "MAT 201 Calculus I" and "Section 4.6 Part 2". The problem is an optimization problem about a box made from cardboard. The document text is as follows:

Optimization

A piece of cardboard that is 10 in x 15 in is being made into a box without a top. To do so, squares are cut from each corner of the box and the remaining sides are folded up. If the box needs to be at least 1 in deep and no more than 3 inches deep, What is the max? "Volume of the box?" What is the minimum volume?

1. Diagram:

2. Objective Function: $V = Lwh$

3. Constraints:

4. Objective Function in terms of one variable:

5. Critical Numbers:

6. Absolute Max/Min:

Handwritten work by students is shown in various colors:

- Ben:** $V(1) = 104$, $V(3) = 108$, $V(2.5 - 5\sqrt{7}) = 132$
- Carl:** $V = 4h^3 - 50h^2 + 150h$, $\frac{dV}{dh} = 12h^2 - 100h + 150 = 0$, $h = \frac{25 \pm 5\sqrt{7}}{6}$
- Isaac:** $L = 15 - 2h$, $w = 10 - 2h$, $V = h(15 - 2h)(10 - 2h)$, $V = 4h^3 - 50h^2 + 150h$
- Brian:** $V(1) = 104$, $V(3) = 108$, $V(2.5 - 5\sqrt{7}) = 132$

The whiteboard interface includes a toolbar on the left with icons for erasing, adding, copying, pasting, and zooming. On the right, there are tabs for different pages (1 and 2) and a vertical toolbar with icons for erasing, adding, copying, pasting, and zooming.

Typed:

The example below contains:

- A BitPaper whiteboard that had a document uploaded to it.
- Different colors to represent different student's work within the document.
- Typed work that was completed by students.
- Multiple pages within the same whiteboard (second and third page not fully shown)

The screenshot displays a BitPaper whiteboard interface. On the left, a vertical toolbar contains icons for a document, a grid, a phone, a person, and a list. The main workspace is divided into sections by color-coded names: Jordy (red), Gabriel (blue), John (purple), and Matt (green). The document content is titled "MAT 201 Calculus I" and "Section 4.6 Part 1". The main heading is "Optimization". The text describes a problem: "At a natural area, a group of biologists wish to reintroduce a herd of bison to their native habitat. Not wanting them to interbreed with cattle that graze nearby, they decide to enclose a rectangular field with 2400 feet of fencing. What are the dimensions of the field that has the largest area, and what is the largest area?". The steps are numbered 1 through 6. Step 1: "Diagram: Draw a diagram and assign variables to unknown quantities." A diagram of a rectangle is shown with sides labeled x and y. Step 2: "Objective Function: What is your objective, i.e. what are you trying to maximize? What is the formula?" The formula $A = xy$ is written. Step 3: "Constraints: What is your constraint? Represent the constraint with an equation and solve for one of the variables." The equation $2x + 2y = 2400$ is written, followed by the solutions $2x = 2400 - 2y$, $x = (2400 - 2y)/2$, and $x = 1200 - y$. Step 4: "Objective Function in terms of one variable: Substitute the expression in (3) into the formula in (2). Now you have a function of one independent variable." The function $A = xy = (1200 - y)y$ is written, along with the domain $0 \leq y \leq 1200$. Step 5: "Critical Numbers: Find the critical numbers." The derivative $A'(y) = 1200 - 2y$ is written, followed by $A'(y) = 0 \rightarrow 2y = 1200$ and $y = 600$. Step 6: "Absolute Maximum: Determine the absolute maximum of the function in (4). (i.e. what is the domain of function?) the absolute maximum? Apply the theorem and". The interface also includes a sidebar on the right with a list of pages (1, 2, 3) and a bottom toolbar with icons for a document, a grid, a phone, a person, and a list.

Jordy

Gabriel

John

Matt

MAT 201 Calculus I

Section 4.6 Part 1

Optimization

At a natural area, a group of biologists wish to reintroduce a herd of bison to their native habitat. Not wanting them to interbreed with cattle that graze nearby, they decide to enclose a rectangular field with 2400 feet of fencing. What are the dimensions of the field that has the largest area, and what is the largest area?

- Diagram:** Draw a diagram and assign variables to unknown quantities.
- Objective Function:** What is your objective, i.e. what are you trying to maximize? What is the formula?
- Constraints:** What is your constraint? Represent the constraint with an equation and solve for one of the variables.
- Objective Function in terms of one variable:** Substitute the expression in (3) into the formula in (2). Now you have a function of one independent variable.
- Critical Numbers:** Find the critical numbers.
- Absolute Maximum:** Determine the absolute maximum of the function in (4). (i.e. what is the domain of function?) the absolute maximum? Apply the theorem and

Diagram: A rectangle with sides labeled x and y.

Equations:

$$2x + 2y = 2400$$
$$2x = 2400 - 2y$$
$$x = (2400 - 2y)/2$$
$$x = 1200 - y$$
$$A = xy$$
$$A = xy = (1200 - y)y$$
$$0 \leq y \leq 1200$$
$$A'(y) = 1200 - 2y$$
$$A'(y) = 0 \rightarrow 2y = 1200$$
$$y = 600$$

These examples were adopted from Christy Gomez - Mathematics Faculty, Front Range Community College Boulder County Campus