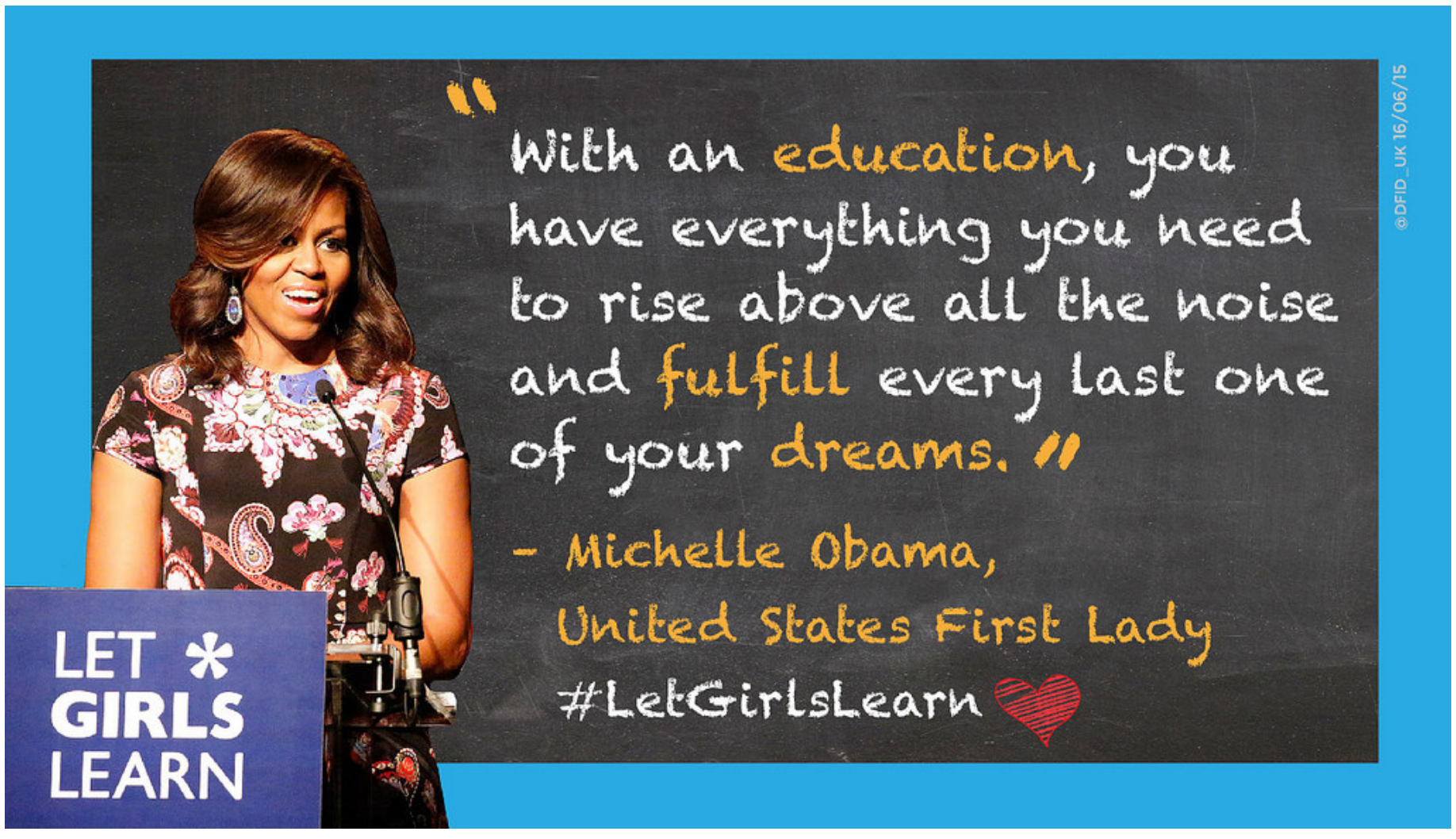
# ANNIECANNONS

## 6-Week Digital/Tech Empowerment Program
## Student Manual and Resource Book

"Life shrinks or expands in proportion to one's courage."
- Anais Nin

# Table of Contents





# What this class offers:

## Phase I: 6-Week Digital Literacy Module

**Personal Finance** → **Digital Literacy** → **Software Testing** → Hourly Income Opportunity

**Digital Literacy**

- Typing
- Email
- Office Suite
- Computer Hardware
- Software Operation
- Internet Operation
- Cloud Computing

**Software Testing**

- Software Lifecycle
- Iteration
- Human vs Automated testing
- QA Plans
- QA Testing

**Earn $15-$30 per hour**

## Phase II: Programming Modules

**Introduction to Front-End Programming**

- Algorithm basics
- HTML
- CSS
- Javascript

**Earn $50-$100 per hour**

**Web Design Principles**

- UI/UX
- User Flows
- Design Tools
- Aesthetics

**Earn $60-$120 per hour**

**Full Stack Web Development**

- Advanced Javascript
- Back End
- Mobile Apps
- Privacy and Security

**Earn $100-$250+ per hour**

Students with interest can choose to continue training to reach higher hourly income potential at each stage of our curriculum. The Programming Module allows students to increase earning potential as contract developers

# Types of Tech Jobs

There are dozens of different roles that turn a software product from an idea into a working product. These range from testing software to designing software (both drawing out the visual aspects of a website or app to analyzing where elements of a page should go) to a software developer/programmer. People in tech companies can work on visual and artistic projects, social justice projects, data analysis, or higher level math projects that allow complicated software systems to run. Some jobs are more about coordinating all the pieces of the software development process.  Making software successful requires marketing and perhaps sales, customer relations and technical support. This class focuses  on training you in Quality Assurance/Software Testing, Web Design, and Application Development.

Systems Architect
Business Systems Analyst
Database Developer
Web Designer
Programmer
Hardware Engineer
Security Specialist
UX Engineer
IT Manager
Product Manager
Program Manager
Application Developer
Software Tester

# Client Work

## Data Entry/Management

Graduates from Phase I are eligible to work on client projects for data entry or data management. You can work on projects from large firms specializing in big data analysis or a small startups in need of quick turnaround on new datasets. We will help you learn about the software development process and help you complete your tasks. Most of these projects can be done remotely on your own computer.

## Quality Assurance Testing

iSoftStone, an industry leader in human-operated testing services, and AnnieCannons have launched a joint service offering where you can work directly with iSoftStone's teams to build client test solutions. These projects are great at helping you learn more about software, earn money, and learn about interesting tech companies.

## Website and Mobile App Development

Our core driver of economic power to our talented students is building websites and mobile apps for small businesses and individuals. If you pursue this training, you will be working on the website needs for different businesses from templates or from scratch. Over time, you will be able to integrate various additional skills relating to content management systems, hosting, and site management upon client request.

# Financial Planning

## Three Pillars of Financial Planning

- **Spend money mindfully.** This means to think carefully about the ways that you are spending money and to stop, drop and think before you purchase something.
- **Save money.** This means that each month, for your own financial safety and wellbeing, it is incredibly important that you are saving some money. It does not need to be a large amount of money; it could be a couple of dollars.
- **Use financial products safely.** A financial product can be anything from a credit card to a checking account or a savings account. There are a ton of different products in the market, and you need to understand the ones you use to be able to make smart decisions so you are financially secure.

### Spending Money Mindfully

**THREE RULES-OF-THUMB FOR SUCCESSFUL MONEY MANAGEMENT**

1. **PAY YOURSELF FIRST.** Save 20% of your income

2. **SPEND LESS THAN YOU MAKE**

3. **FOLLOW THE 20/30/50 RULE!**

   20% → **Put 20% of money into savings**
   30% → **Put 30% of money into wants**
   50% → **Put 50% of money into needs**

### Spending Triggers

These can be things that happen when you are feeling a certain emotion, surrounded by certain people, in a certain place, or online

Remember to use the Stop, Think, and Wait it Out, especially when shopping online - the longer you consider your decision, the more likely you are to make a non-impulsive decision.

## Types of Mindful Spending

It does not matter how much money you make. Spending your money mindfully will always be important! In early 2015, rapper 50 Cent filed bankruptcy despite being worth tens of millions of dollars. It turned out that he owed banks and other lenders more money than he had. Here are the different types of spending:

- **Good Spending** - When a purchase is made mindfully or towards a goal
- **Bad spending**- An unnecessary or unwise purchase
- **Didn't spend**- When a person decides to not purchase something or saves money on a purchase.
- **$$ Banked**- When money is put away in a safe place like a savings account

# Saving

## Ways to Earn More By Saving

| Save this each week At | % Interest | In 10 years you'll have |
|---|---|---|
| **$7.00** | 5% | $4,720 |
| **$14.00** | 5% | $9,441 |
| **$21.00** | 5% | $14,161 |
| **$28.00** | 5% | $18,882 |
| **$35.00** | 5% | $23,602 |

## choosing a savings account

**factors that determine the dollar yield on an account:**

**Interest rate (also called rate of return, or annual yield)**

- All money earned comes from this factor.

**the following factors reduce money earned and can even turn it into a loss:**

**Fees, charges, and penalties**

- Usually based on minimum balance requirements, or transaction fees.

**Balance requirements**

- Some accounts require a certain balance before paying any interest.
- On money-market accounts, most banks will pay different interest rates for different size balances. (Higher balance earns a higher rate.)

**Balance calculation method**

- Most calculate daily. Some use average of all daily balances.

# Interest

Interest is a charge a financial institution applies when they loan an individual money.

On the most basic level, this example shows how it works:

| **Principal** (the amount you get in a loan) | **Interest Rate** (the percent of the principal you pay to get the loan, which can be fixed or variable) | **Period** (the frequency with which interest is assessed against principal) |
|---|---|---|
| $100,000 | 5% | annually |

$100,000 x .05 after year one, you owe: $105,000

---

***Compound* Interest** is used in most loans. This means you calculate interest each period based on the new balance, including the interest from the previous period. So, if we apply compound interest to the simple example above:

| | | | | | |
|---|---|---|---|---|---|
| Year 1 | $100,000 | x | .05 | after Year 1, you owe: | $105,000 |
| | | | $5000 | | |
| Year 2 | $105,000 | x | .05 | after Year 2, you owe: | $110,250 |
| | | | $5250 | | |
| Year 3 | $105,000 | x | .05 | after Year 3, you owe: | $115,762.50 |
| | | | $5512.50 | | |

As a debtor, the sooner you pay off loans, the less you pay. It makes a big difference to shop around for lower interest rates (by contrast, shopping for savings accounts - where a bank is basically borrowing YOUR money to loan to others - you should looks for HIGHER interest rates.

# Interest

## Credit Cards are a very expensive way to borrow money because of their high interest rates.

Your credit card interest rate is the rate at which you are charged for borrowing money from a credit card company if you carry a balance. For example, if you borrow $1000, and the credit card company charges you 10% interest, you will have to pay $1100 if you do not pay your bill on time. While most bank loans like mortgages or lines of credit charge an interest rate from 3-10% per year (perhaps higher if your credit score is low), credit cards sometimes charge as much as **25% per month**. Some credit card companies also charge an annual fee to have the card in the first place.

For this reason, credit card debt is one of the most expensive ways to borrow money. You should NEVER use a credit card to make a purchase without the money to pay it off if it can be avoided. Always avoid using credit cards for "wants" unless you know you have funds to pay it off before interest "accrues" (is applied and begins to build up).

## calculating interest

**directions**
Write the answers to the following questions in the blanks provided. Use the space below each problem to show how you arrived at your answers.

**1.** If you put $200 in a savings account that paid 5.5% simple interest each year, how much interest would you earn in five years?

**2.** If you put $150 in a savings account that paid 6% compounded yearly, how much interest would you earn in five years?

# Banking Accounts and Credit

## What is the right banking account and card for you?

We should talk about it! Generally, checking accounts and debits cards are the way to go. You won't have to worry about getting charged with fees (like prepaid cards) or going into debit (with credit cards). You only have to make sure that you don't spend more with your debit card than you have in your checking account (this will cause an "overdraft fee").

## advantages and disadvantages of using credit

**advantages:**

- Able to buy needed items now
- Don't have to carry cash
- Creates a record of purchases
- More convenient than writing checks
- Consolidates bills into one payment

**disadvantages:**

- Interest (higher cost of items)
- May require additional fees
- Financial difficulties may arise if one loses track of how much has been spent each month
- Increased impulse buying may occur

## What is a credit score?

It is a numerical expression based on an analysis of a person's credit files, to represent the creditworthiness of the person. Lenders, such as banks and credit card companies, use credit scores to evaluate the potential risk posed by lending money to people. Lenders use credit scores to determine who qualifies for a loan, at what interest rate, and what credit limits. A credit score takes into account payment history, amounts owed, length of credit, new debt, and types of debt.

# Credit Score

## Here are some tips to "have great credit" (a high credit score):

Credit scoring systems are complex and vary among creditors or insurance companies and for different types of credit or insurance. If one factor changes, your score may change — but improvement generally depends on how that factor relates to others the system considers. Only the business using the system knows what might improve your score under the particular model they use to evaluate your application.

Nevertheless, scoring models usually consider the following types of information in your credit report to help compute your credit score:

- **Have you paid your bills on time?** You can count on payment history to be a significant factor. If your credit report indicates that you have paid bills late, had an account referred to collections, or declared bankruptcy, it is likely to affect your score negatively.
- **Are you maxed out?** Many scoring systems evaluate the amount of debt you have compared to your credit limits. If the amount you owe is close to your credit limit, it's likely to have a negative effect on your score.
- **How long have you had credit?** Generally, scoring systems consider your credit track record. An insufficient credit history may affect your score negatively, but factors like timely payments and low balances can offset that.
- **Have you applied for new credit lately?** Many scoring systems consider whether you have applied for credit recently by looking at "inquiries" on your credit report. If you have applied for too many new accounts recently, it could have a negative effect on your score. Every inquiry isn't counted: for example, inquiries by creditors who are monitoring your account or looking at credit reports to make "prescreened" credit offers are not considered liabilities.
- **How many credit accounts do you have and what kinds of accounts are they?** Although it is generally considered a plus to have established credit accounts, too many credit card accounts may have a negative effect on your score. In addition, many scoring systems consider the type of credit accounts you have. For example, under some scoring models, loans from finance companies may have a negative effect on your credit score.
- Scoring models may be based on more than the information in your credit report. When you are applying for a mortgage loan, for example, the system may consider the amount of your down payment, your total debt, and your income, among other things.

Improving your score significantly is likely to take some time, but it can be done. To improve your credit score under most systems, focus on paying your bills in a timely way, paying down any outstanding balances, and staying away from new debt.

### Don't be afraid of credit counseling

If you're overloaded with high-interest debt and are in danger of falling behind on your payments -- or you already have -- consider working with a nonprofit agency such as Consumer Credit Counseling Service to set up a debt repayment plan. These services can negotiate lower interest rates and help you pay off your bills within a few years.

# Creating Your Financial Plan

**Establish your financial goals.**

- Decide what you want your money to do for you.
- Determine what style of living you wish to achieve.
- List savings objectives.

**Estimate and total your income.**

- Determine how much money you receive from all sources for the plan period —earnings, gifts, bonuses, interest on savings, and allowance.

**Estimate and total your expenses.**

- List all your expenses, separating them into fixed and variable expenses.
- Add these expenses to determine how much money you spend during each plan period.

**Analyze your current income and spending.**

- Carefully examine the amounts you estimated for both income and expenses. Overestimating income and underestimating expenses is very easy to do and can cause big problems for your budget.
- Subtract your expenses from your income for each plan period.
  If you come out even or need extra money, consider ways to increase your income or cut your expenses. If you have extra money, decide how you want to apply it toward your savings goal.

**Prepare a trial financial plan.**

- A written plan listing your goals, your income, and your expenses reduces the temptation to overspend or spend carelessly.
- Put your financial plan into writing.
- Revise your plan and update it on a regular basis.

**Put your plan into action and keep organized records.**

- Keep track of your spending and savings.

**Evaluate your financial plan periodically.**

- Whenever your income, expenses, or goals change significantly, review your plan to see if you need to make any changes.
- Significant events all have an impact on your financial plan. These may include starting a new job, moving, marrying, having children, changing jobs, divorcing, or death.

# Online Money Tools

## Mint

Mint is probably the most comprehensive free budgeting tool out there. After you've given it permission to look at your bank transactions, Mint automatically sorts your expenses into categories like groceries, restaurants, and bills. This helps you understand exactly what you're spending money on, which should also make it easier to decide which expenses to cut. Once you've decided how much you want to spend, you can set a detailed budget with limits on each spending category.

Mint does an excellent job of visualizing your data. It automatically creates beautiful charts and graphs that let you see your spending habits and history at a glance. Mint also does a really good job of sending alerts when something's wrong, like if you've overspent or if your bank has charged you a fee.

## PayPal

PayPal lets you make secure transactions without providing your credit card number to individual websites. Instead, you'll give your information to PayPal, which makes the payment on your behalf. PayPal was one of the first online payment systems, and it's generally seen as one of the most trustworthy. As a result, you can use it to make payments to many online stores, such as eBay, Etsy, Overstock, and a whole lot more. PayPal is also an easy way to send money to a friend or family member, as long as you both have a PayPal account.

If you're using PayPal to make a purchase from an online store, it's totally free to use. However, you may have to pay a small service fee to use PayPal to transfer funds to another person. You can review this page from PayPal to learn more about its fee structure. You will also need to connect PayPal to your bank account.

## Google Sheets (Budget Template)

Google Sheets has both a monthly and annual template for keeping track of your personal budget. You enter in certain information about expenses, income, and savings, and the template has certain calculations and mathematical operations that can be applied.

# Working as a Contractor

## What is an independent contractor?

An independent contractor is a person, business, or corporation that provides goods or services to another entity under terms specified in a contract or within a verbal agreement. Unlike an employee, an independent contractor does not work regularly for an employer but works as and when required, during which time he or she may be subject to law of agency. Independent contractors are usually paid on a freelance basis.

## Pros and Cons

### Pros

- Set your own hours and vacation time.
- Work from home or any other convenient place
- Only take the work that you want to take
- Develop clients outside of AnnieCannons
- Take tax deductions on business expenses related to your working
- Have the time to learn new skills in digital literacy and computer programming

### Cons

- No paid sick leave or vacation time
- You will not be working off a base salary, what you make is directly tied to how much you work and the projects you agree to
- Need to complete a 1099 form and deduct your expenses
- Your taxes will not be taken out of your paycheck so you must file taxes quarterly or be prepared to pay taxes once a year
- No ancillary benefits like healthcare.

When you work as an independent contractor, you have to pay income tax, just like an employee. Unlike an employee, however, you won't have any taxes withheld from your paycheck to cover income tax, Social Security, and Medicare. Also, unlike an employee, you can't wait until April 15 to pay all of your taxes due for the previous year. Instead, you have to pay estimated taxes four times a year. Fortunately, contractors can take advantage of some great tax deductions; for instance, the home office deduction can effectively reduce your taxes by a portion of your rent or mortgage.

## 1099 Form

If you perform services as an independent contractor, then you will receive Form 1099-MISC by the end of February. This form will tell you who paid you and how much. One copy of the form is sent to you and another copy is sent to the Internal Revenue Service, IRS.

When the IRS receives this form, it will cross-check to ensure you have reported all income. For example, if you receive a 1099-MISC for $50,000 and only reported $25,000 of gross receipts on your Form 1040 Schedule C, then you will most likely get audited.

# Working as a Contractor

## Business Expenses as an Independent Contractor

Business Expenses are expenses that are the cost of carrying on a trade or business, they are usually deductible if the business is operated to make a profit. To be deductible, a business expense must be both ordinary and necessary. This means they must be common in the industry and helpful and appropriate for your business.

The following image shows the gains to be made when you record your business expenses!

### KEEP TRACK OF YOUR BUSINESS EXPENSES!

| Scenario 1 | | Scenario 2 | |
|---|---|---|---|
| Income | $35,000 | Income | $35,000 |
| Business Expenses | $ 0 | Business Expenses | $25,000 |
| Taxable Income | $35,000 | Taxable Income | $10,000 |
| **Self-Employment Tax** | **$4,945** | **Self-Employment Tax** | **$1,413** |
| **Personal Income Tax** | **$3,518** | **Personal Income Tax** | **$ 318** |
| **Taxes You Owe** | **$8,463** | **Taxes You Owe** | **$1,731** |

## Examples of Business Expenses

- Clothing necessary to perform your job duties
- Food and beverages when you're on business meetings
- Supplies: Laptop, Cell phone usage. etc
- Car: Gas, Oil, Maintenance
- Health Insurance
- Home (if you work from home): A percentage of Rent, Electric, Utilities


**App of Choice: Tabby**

Free and easy to use, signup, link your credit cards, and record your business expenses

Categorize accounts based on Tax Form Schedule C

No more receipts

No more manual entry

www.trytabby.com

# Computer Basics

## Computer = Power + Simplicity

The computer has the power to do hundreds of thousands of calculations faster than any human. However, the computer must be told exactly what to do by a programmer. Computers cannot think on their own, but good programmers can have them running multiple programs and interacting on various networks as long as all of that information has been broken down for the computer to understand.

## What is <code>?

Code is the set of instructions that a computer programmer tells the computer to run. Everything you see on computers is fueled by code!

## Hardware vs. Software

Hardware is the physical components of your computer.
Software is any set of instructions that directs a computer to perform specific operations. Computer software consists of computer programs, libraries and related data. It is the non-physical stuff of the computer.

Think of it like a piano: The physical instrument part is like the hardware and the sheet music is like the software

## Computer Languages

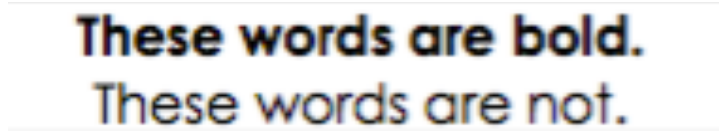
The computer can only read and understand code that is written in certain computer languages. These languages have specific words and syntax (think: punctuation) that you have to use to get a program to run. Consider two main types of computer languages: front-end languages and back-end languages. Front-end languages (HTML, CSS, JavaScript) create everything that the user of a computer sees. The back-end languages deal with databases and servers (basically, everything the user doesn't see).

# Computer Basics

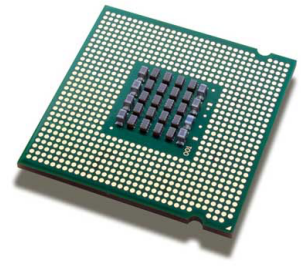
## Computer Basics and Vocabulary

**Application:** Another word for a program or software

**Bold:** A font style that names letters and words darker



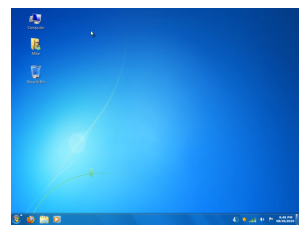

**Center Processing Unit or CPU:** Where all of the information you put into the computer is stored



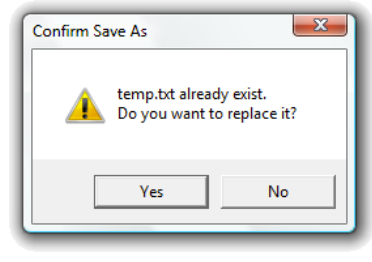
**Clicking:** Pointing to something on the screen and then pushing the button on the mouse is called clicking

**Cursor:** The line or arrow that you control by moving the mouse

**Desktop:** The screen you see first when your computer turns on. This screen has many icons



**Dialogue Box:** A window that opens and asks you questions




**Document:** Anything you create with a Word Processor and has a .doc file name

**File:** A piece of computer information such as a document or part of a computer program

# Computer Basics

**Folder:** Like a file folder in a filing cabinet, a folder is where all computer files are kept.

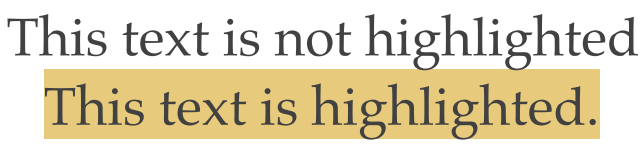
**Font:** The way letters and words look on the computer.


**Format:** Changing the way that text looks on the page.


**Hardware:** All the part of the computer that you can touch; the monitor, CPU, printer, mouse, and keyboard.

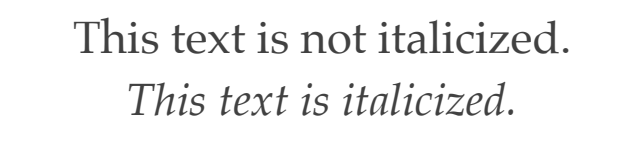
**Hard Drive:** The place inside your computer where programs and files are stored

**Highlight/Selecting:** Click and drag across a word or a sentence to highlight it. When it is highlighted, you can make changes to it.




**Icon:** Symbols or pictures that you can click on to perform an action. Each program has its own icon.

**Italics:** A font style that slants words to the right.



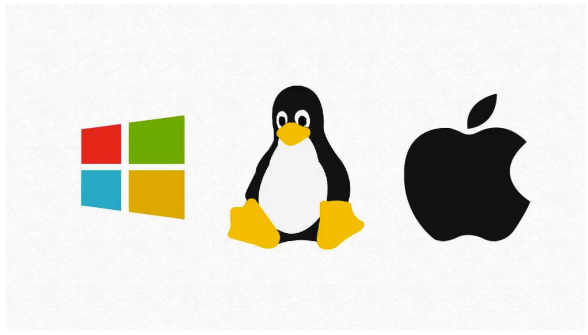

**Monitor:** Your computer's screen.

**Mouse:** The tool you can use to tell the computer what to do. For example, you can open programs and files by clicking or double clicking.

# Computer Basics

**Open:** A command on the File menu that brings files onto the screen so that you can see them.

**Operating System:** The most important program in your computer. This program is like the "manager" of all of the other programs.



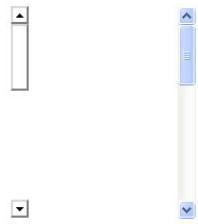
**Point:** The size of text

12 point 20 point 32 point

**Programs:** Another word for software or applications

**Screensaver:** A design on the screen that turns on if you don't use your computer for a few minutes

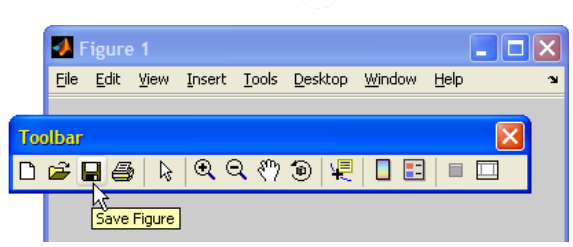
**Scroll Bars:** The bars on the sides of the screen that allow you to move up or down the page



**Software:** Another word for programs, instructions in the computer that help is do different tasks.

**Spell Check:** When you are using a Word Processor, you can click this button to look for spelling and grammar mistakes.


**Tool Bars:** The bars across the top of the screen that have icons you click on to do different things.

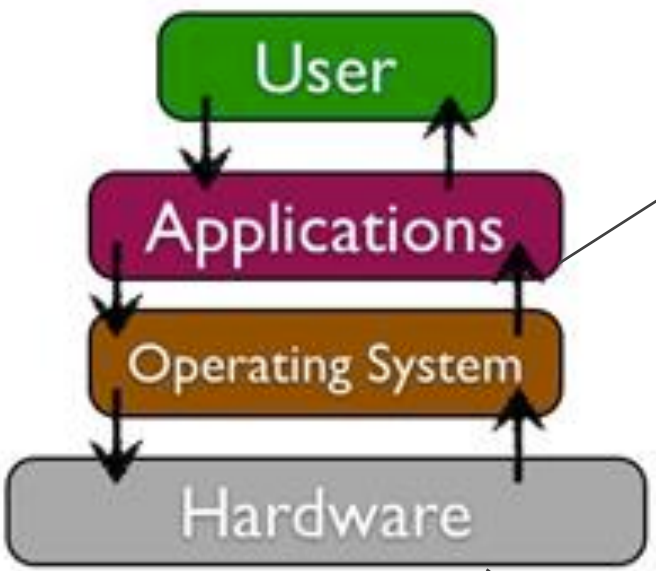


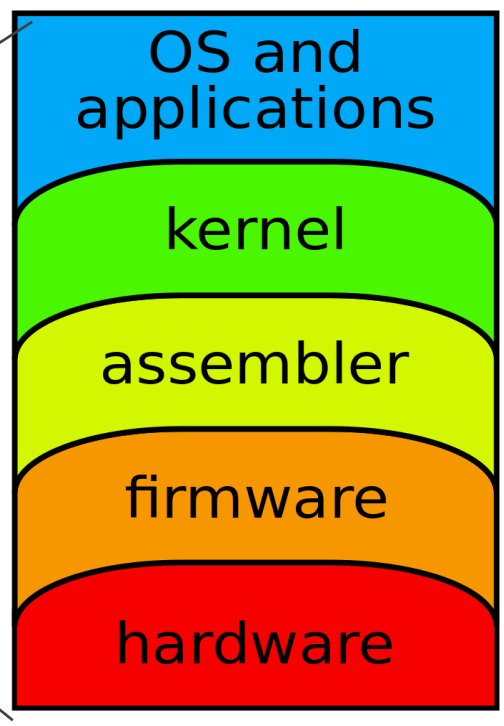
# Computer Hardware

## Understanding Computer Hardware

- Why care about hardware?
  - All of the different parts of the computer don't need to be memorized, but understanding the big picture will give you a framework for thinking about how the software you're using or learning to build interacts with the physical machine you are using - and other physical machines in the world!
  - We're previewing how software goes from what you see on a screen to the tiny bits of information that make things happen on your computer.

- Software and Hardware, working together.
  - Computer hardware is any physical device used in or with your machine, whereas software is a collection of code installed onto your computer's hard drive.
  - Applications (like Microsoft Word) are pieces of software that talk to an *operating system* (also software code), which talks to the computer's *motherboard* (with MORE code).
  - Other software helps the operating system interact with the hardware



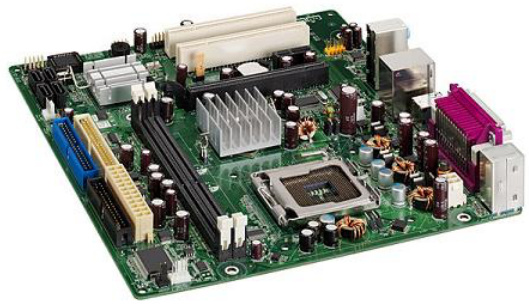

**Kernel** functions include: "booting" the operating system when hardware turns on; creating and destroying memory space as well as monitoring application access to memory; allows an application to access components like the network card; manages the file system and CPU allocation while programs run on the OS.

**Assemblers** translate *source code* into *object code* (binary code) that hardware can understand. They may be referred to as *compilers* also. The first computer programs functioned as compilers.

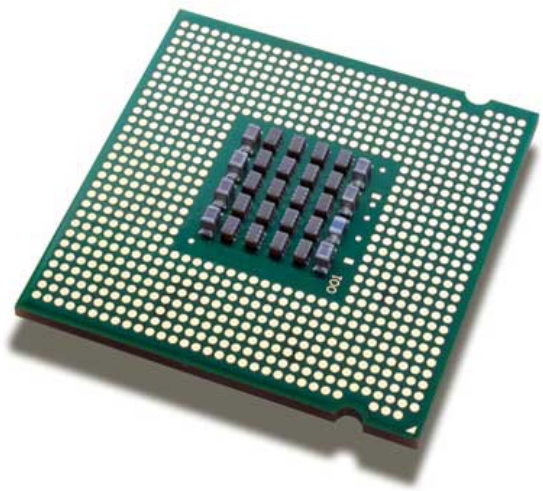
**Firmware** is software, usually custom built for each device you use, that explains to the assembler/compiler how to execute their commands on a device (ex: turn "Action" light on TV remote) and understand what user inputs on a device mean (ex: "turn the volume down").

# Computer Hardware

## The Building Blocks Of A Computer



1. **The Motherboard**
    - The Motherboard connects everything! It directs information to and from computer parts plugged into it.



2. **CPU - Central Processing Unit**
    - Called the "brains" of the computers. The CPU does the active "running" of code, manipulating data, while the other components have a more passive role, such as storing data. When we say that a computer can "add two numbers, a billion times a second" .. that's the CPU.

3. **Graphics Card**
    - This stores the GPU (Graphics Processing Unit), which is a specialized processor used for monitor displays. It is what makes your video games on your computer look really great.

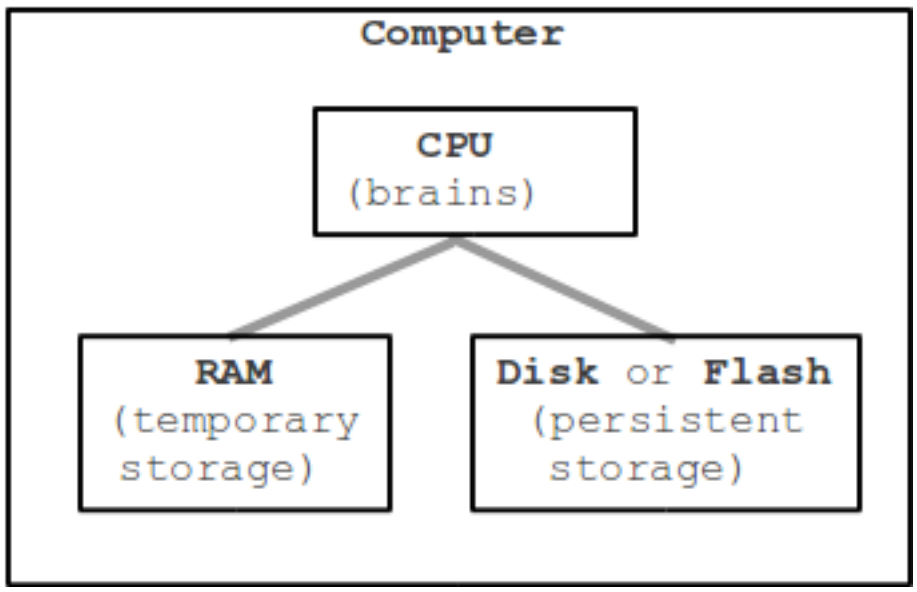
4. **BIOS - Basic Input/Output System**
    - This is one of the first parts of a computer to be built - it basically just tells the Motherboard “you’ve got power, go on.”


- Instructions are distributed to ports, add-on cards, memory, and storage.
    - Ports as ways for other devices to plug into the computer system (like USB, your mouse, keyboard, headphones, ethernet, etc)
    - Add-on cards act like mini-motherboards with their own processors for specific processes, like producing detailed sounds or reaching out to a network.

A storage device is any computing hardware that is used for storing, porting and extracting data files and objects. It can hold and store information both temporarily and permanently, and can be internal or external to a computer, server or any similar computing device. It refers to computer components and recording media that retain digital data. Data storage is a core function and fundamental component of computers.

# Computer Hardware

## Memory




The space that data takes up in the computer is measured in by the "byte". One byte is big enough to hold a single typed letter, like 'a'.

**RAM - Random Access Memory,** or just "memory". RAM is the working scratchpad memory the computer uses to store code and data that are being actively used. RAM is effectively a storage area of bytes under the control of the CPU. RAM is relatively fast, able to retrieve the value of any particular byte in a few nanoseconds (1 nanosecond is 1 billionth of a second). Suppose you are working on your computer and it suddenly loses power and the screen goes blank. You understand that what you were working on is gone .. RAM has been wiped clean, leaving you only with what you last saved to disk.

*** **RAM is like your short term memory. I can tell you my phone number, and you will remember it for a short period of time. But if you don't write it down, you will forget it.**

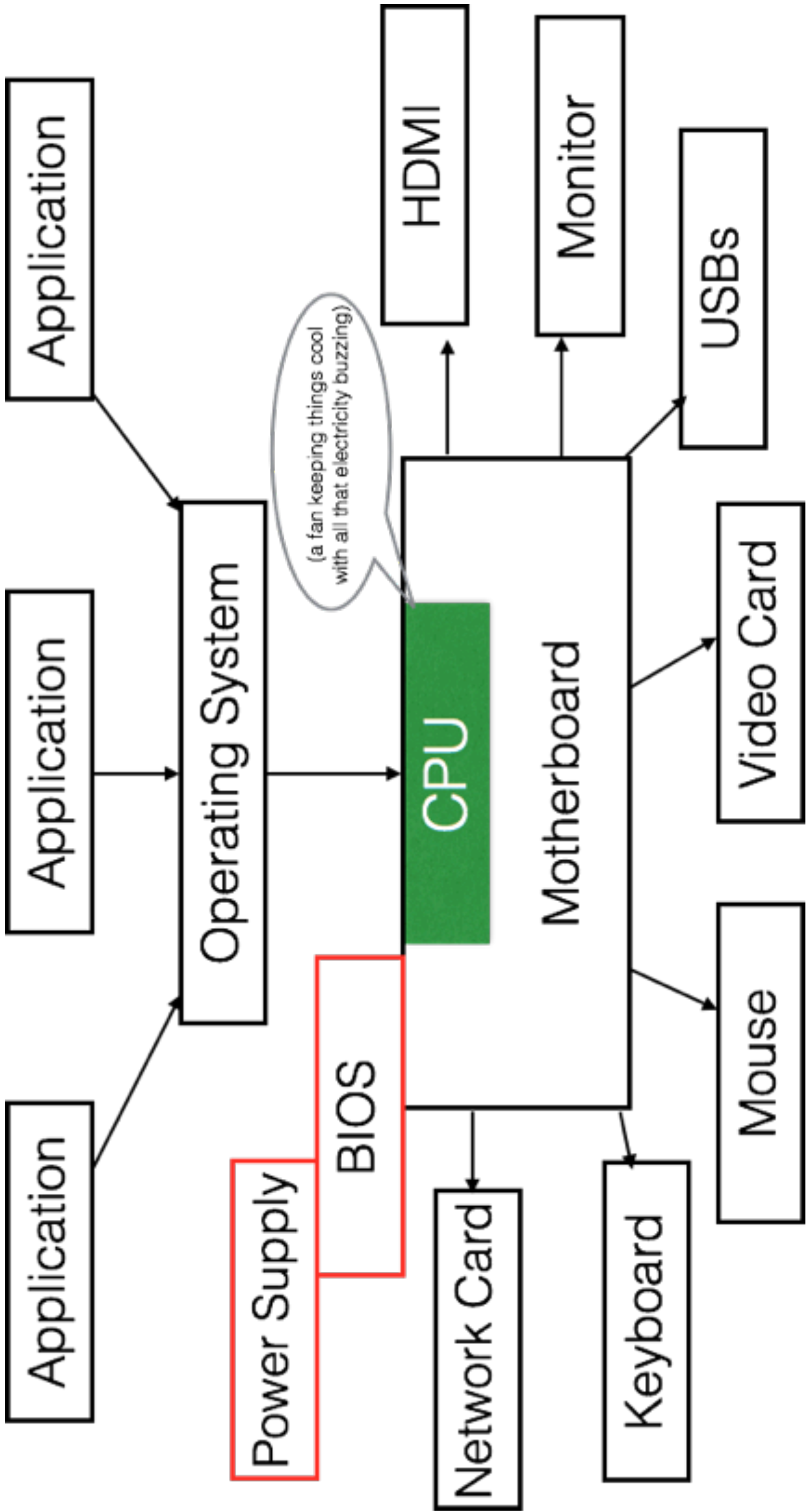
**Persistent storage** - long term storage for bytes as files and folders, sometimes called "ROM". "Persistent" indicates that the bytes are stored, even when power is removed. A laptop might use a spinning hard drive (also known as "hard disk") for persistent storage of files. Or it could use a "flash drive", also known as a Solid State Disk - SSD, to store bytes on flash chips. The hard drive reads and writes magnetic patterns on a spinning metal disk to store the bytes, while flash is "solid state" .. no moving parts, just silicon chips with tiny groups of electrons to store the bytes. In either case, the storage is persistent, in that it maintains its state even when the power is off.

A flash drive is faster and uses less power than a hard disk. However, per byte, flash is significantly more expensive than hard drive storage. Flash has been getting cheaper, so it may take over niches at the expense of hard drives. Flash is much slower than RAM, so it is not a good replacement for RAM. Flash storage is what underlies USB thumb drives, SD cards for use in cameras, or the built-in storage in a tablet or phone.

*** **Persistent storage is like your long term memory, or just writing something down.**

# Computer Hardware

## Common parts of a computer:

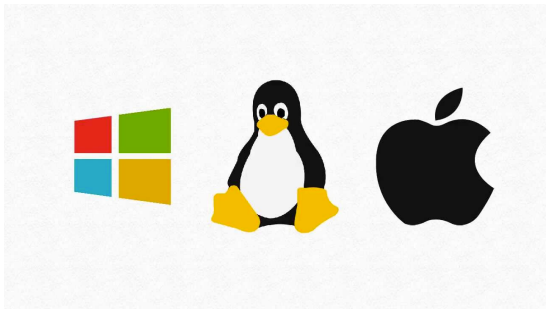


# Operating System

## The Role of the Operating System

The Operating System handles the interactions between the user (you) and the software, and between software and the hardware

### Main Operating Systems (for computers)



Mac OS X
Microsoft Windows
Linux

### Main Operating Systems (for devices)

iOS
Android


An operating system has three main functions: (1) manage the computer's resources, such as the central processing unit, memory, disk drives, and printers, (2) establish a user interface, and (3) execute and provide services for applications software. Keep in mind, however, that much of the work of an operating system is hidden from the user; many necessary tasks are performed behind the scenes. In particular, the first listed function, managing the computer's resources, is taken care of without the user being aware of the details. Furthermore, all input and output operations, although invoked by an applications program, are actually carried out by the operating system. Although much of the operating system functions are hidden from view, you will know when you are using an applications software package, and this requires that you invoke-call into action-the operating system.

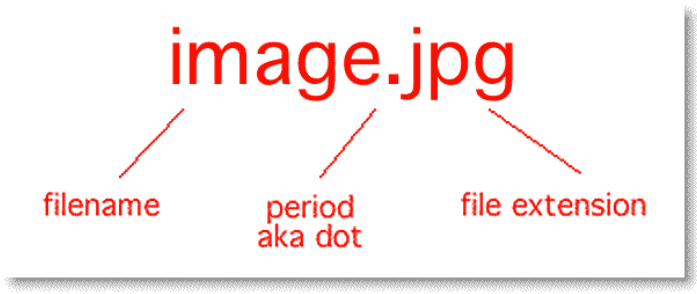
You can think of it like a bank. Whenever a user process wants something from the bank, they have to go through the bank teller. The bank teller makes sure they don't touch anything that isn't theirs and only take money from accounts they are allowed to withdraw from.

Operating systems for mainframe and other large computers are even more complex because they must keep track of several programs from several users all running in the same time frame. Although some personal computer operating systems-most often found in business or learning environments-can support multiple programs and users, most are concerned only with a single user. We begin by focusing on the interaction between a single user and a personal computer operating system.

# Types of Computer Files

## Understanding Computer Files

The structure of a computer filename (with an "extension" that tells you a lot about what the file does):




| File Extension | Description |
|---|---|
| .doc | Microsoft Word File (later versions are .docx) |
| .xls | Microsoft Excel File (later versions are .xlsx) |
| .exe | Executable File - one that starts up a software application, for instance |
| .txt | A plain text file, can be read by Word, Notepad, Wordpad and many others |
| .pdf | A file format used to present and exchange documents reliably, independent of software, hardware, or operating system. |
| **IMAGE FILE TYPES** | |
| .jpg/jpeg | A compressed picture file. It can be made VERY small but will lose detail in the compression process |
| .gif/giff | Compressed image file where no detail is lost in compression |
| .png | Portable Network Graphics, compressed, but high quality and large sized with great color retention. Similar to a GIF. |
| .tif/tiff | TIF(F) stands for Tagged Image File Format. It's a large, highly detailed type of image file. |
| .raw | Raw image files contain data from a digital camera (usually). They contain all the data, so need to be converted before images can be edited or compressed. |
| .bmp | A picture file created with paint (this one is rare) |

### AUDIO FILE TYPES

**.wav**
**.mp3 (aka MPEG)**
**.aca**

### VIDEO FILE TYPES

**.MV4** **.AVI**
**.M4A** **.AVC**

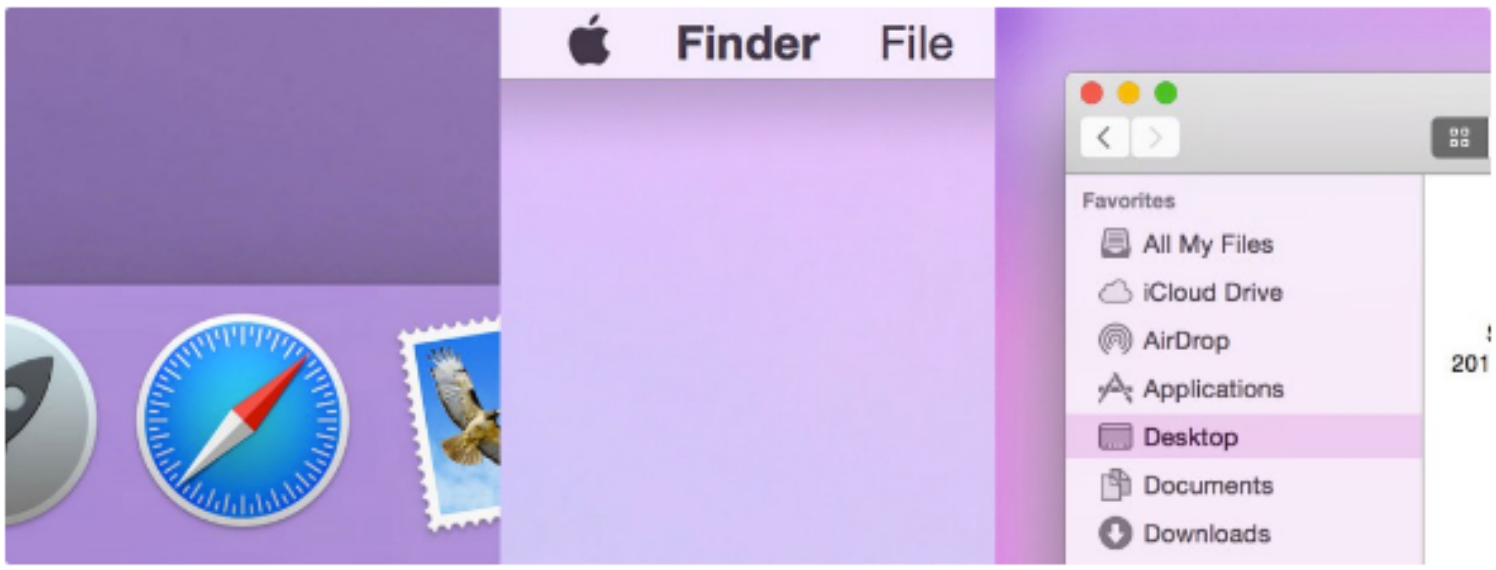

THESE ARE ONLY A FEW EXAMPLES. WHEN YOU ENCOUNTER NEW FILE EXTENSIONS YOU DON'T RECOGNIZE, GOOGLE THE EXTENSION BEFORE OPENING OR USING THEM. **PRO TIP**: NEVER OPEN EXE FILES UNLESS YOU INTEND TO INSTALL AND EXECUTE A SPECIFIC PROGRAM

# Using a Mac

## Mac OS X — An Overview

The home of your Mac is the desktop. Think of it as a physical desktop — a place where you may temporarily spread out your work while performing a task.For example, you may put an image from the internet on the desktop, make some modifications, and then drag it to an email. Just remember, while the Desktop is a great workplace it is not a good place to store things longterm.

Mac OS X is the operating system of your Mac. It's the basic system that enables your Mac to work. All the files, folders, and programs are handled by Mac OS X as well as internet connectivity, battery consumption and more.




You will use the operating system in many different ways:

- When viewing the desktop
- When you're browsing through files
- When searching for files with Mac OS X's "Spotlight"
- Through the application bar (called the "dock")
- As the system that runs your applications

# Using a Mac

## Menus

At the top of the screen, you will see some menus. These menus change depending on what application you are using at the moment. If there is every anything you want to do in a certain application, try to find it in these menus.


## Menu Extras

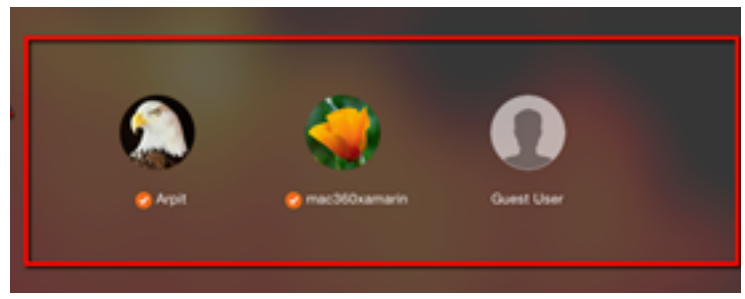
Look at the top of your screen. To the right of the menus, you will see symbols such as the WiFi icon, battery icon, time, spotlight, and sound icon.

## The Dock

In the bottom of your screen, you should see "the Dock" — a bar with convenient shortcuts to your favorite applications. The icons in the Dock are just shortcuts. You can add or remove items without affecting the actual applications just just clicking and dragging the icon into or out of the Dock.

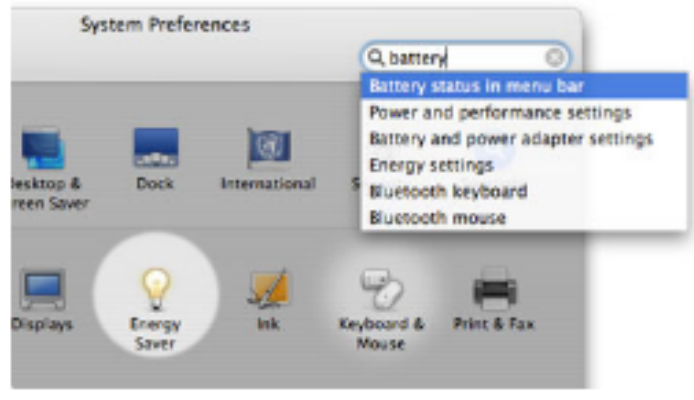
## Users

Mac OS X offers a really nice way to switch between the different users accounts on the Mac. By clicking on the Apple icon in the top left corner you can sign out of your account and into a new one on the Mac. Make sure all of your accounts are password protected.




## System Preferences

It is easy to customize your computer. Just click the Systems Preferences icon in the dock and a new window will appear with several types of settings you can change. You can easily search for the item you want to customize in top right corner, as with any Finder window.




**Try to accomplish the following tasks:**

1. Change the background image (aka wallpaper, desktop image)
2. Change your trackpad setting so that you can click by simply tapping.

Fine the name of your wireless network.

Set your "Hot Corners"

# Using a Mac

## The File System

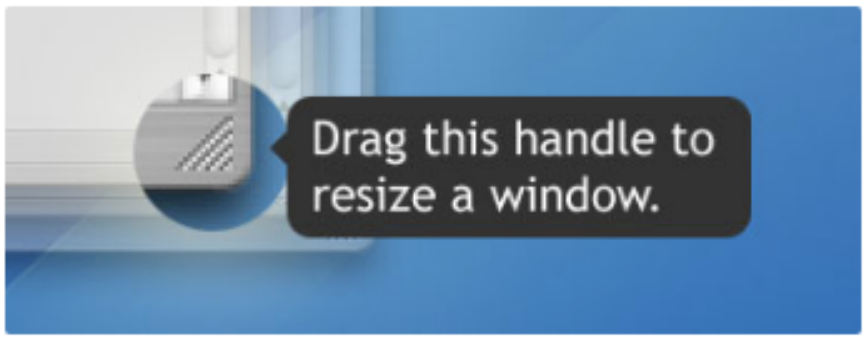
### Understanding it

Your hard drive contains millions of files - both your personal files such as documents, photos or music files, but also system files that you Mac needs to operate properly. If all these files were in the same place, it would be very hard for you to find your our material. This is why the operating systems organizes files into **folders**. You can think of a folder as a box to put your things inside. You can put folders inside other folders. For instance, you can create a folder called "coding materials" and put inside a "practice" folder.


This is called the **Finder** window. The Finder window allows you to explore the contents of your hard drive.

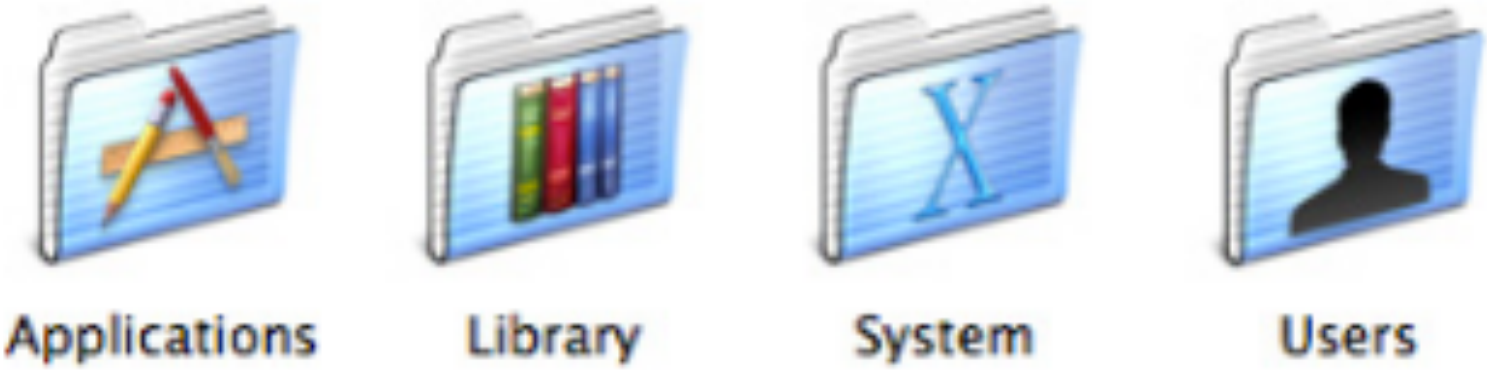
You can resize the Finder window or change the view options for how you view your files:

**Resize**




**Viewing Options**


The hard drive of a brand new Mac contains four folders:



# Using a Mac

## Inside your hard drive

### Applications

The Applications folder contains all your applications

### Library and system

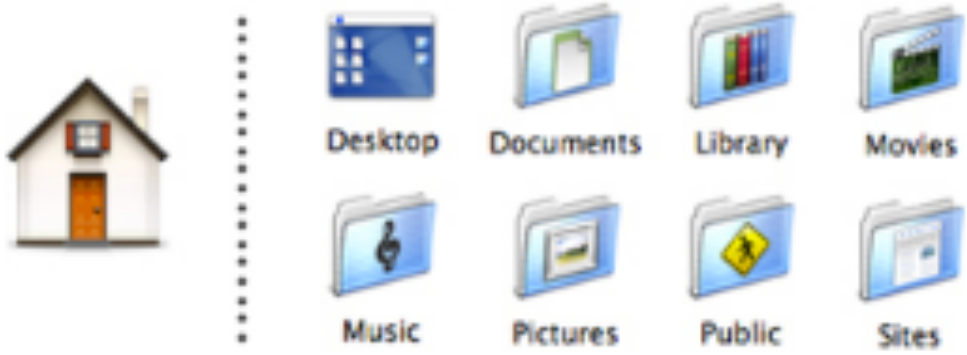
The two folders called Library and System are important for the functionality of the computer itself.

### Users

The Users folder contains one folder for each user plus a Shared folder where the users can put things that they want all the users of the computer to have access to. The folder associated with the user currently logged in (you) looks a bit different. Instead of looking like a folder, it looks like a house. This folder is called your Home Folder.

### Home Folder

Every user on a Mac has a Home Folder. It allows you to organize your files in a smart and easy way.




**Desktop**

Within your Home Folder, there is a folder called Desktop. It is an exact reflection of your real desktop. All files in that folder are visible on your real desktop.

**Downloads**

Here you will find files you have downloaded, with the most recent downloads at the top by default. All types of files (software, documents, music) will be here.

**Movies, Music, Pictures**

Remember, these folders contain large files, and too many movies can slow down your computer and fill up the storage. You can access these files in iTunes and iPhoto.

**Documents**

Put your Documents as well as your code in this folder.

**Public**

If you want to share a file with another user, just put it in the Public folder and he/she can access it (your other folders can't be accessed by other users)

**Library**

The Library folder inside Mac HD contains files for the whole computer, while the Library folder inside your Home folder contains files unique for your user account.

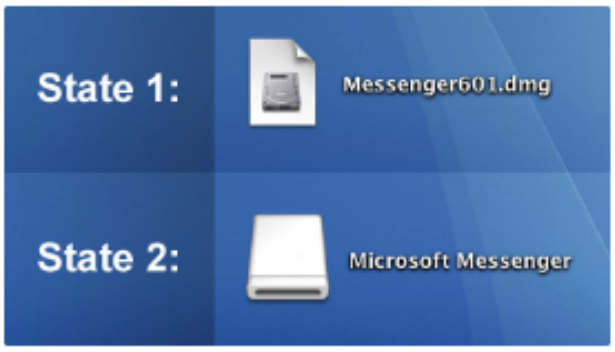
# Using a Mac

## Installing an Application

Installing applications on a Mac is very important and very straightforward to learn.

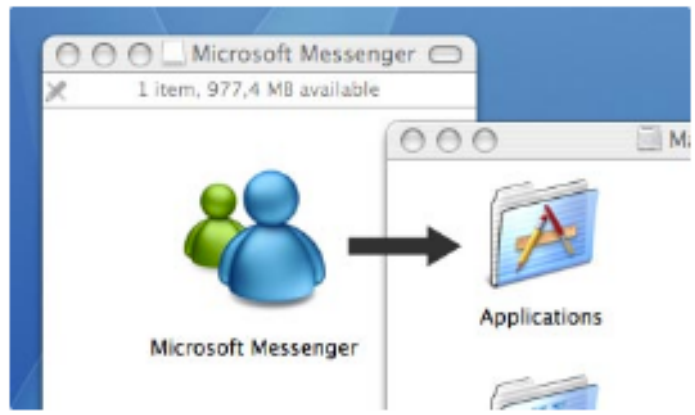
### Disc Image + Application

It is very common that applications are put in a so-called "disk image" file (.**dmg**). Sometimes you need to click a file (state 1) in order to extract the disc image, but the disc image often does this by itself (state 2). You just need to click on the state 2 icon and inside you will find your application.




All you have to do it drag the downloaded application into your Applications folder and it will be copied (installed).

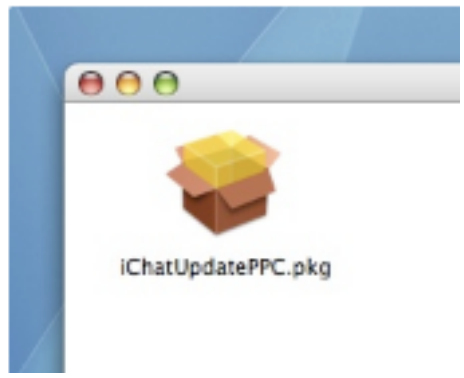
When the copying process is done, you can throw the disc image file away (move them to the Trash). Note that Mac OS X calls this "ejecting a disc image" and not "throwing it away", but don't worry, just drop the file and it will disappear. You can now find your application in the Application folder and you can drag it to your Dock, if you wish.




### Installers

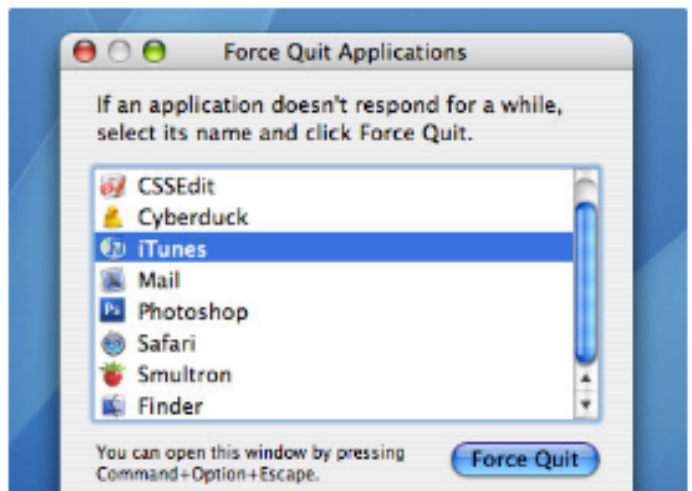
Some applications need to put a few files in different folders on your Mac. To make the process easier, the developers of these applications often create installers (.**pkg**).

When you download an application and it contains an installer, just click the installer and you will be guided through the process. When it is done, you can throw the installer away.




## How to exit an application that isn't responding

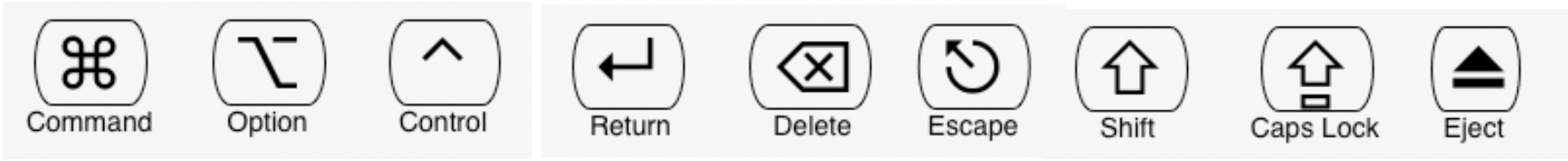
If you wish to force quit an application, press **command, alt, and escape**. After a few seconds a small window with a list of the open applications will appear. You can also access this menu by clicking on the Apple icon in the top left of your screen and clicking "Force Quit".



# Using a Mac

## The Keys

Below is a list of the most important keys on your Mac's keyboard. They may vary on different computers.




## Right-clicking

Just like PCs, the Mac supports right-clicking. However, on your Mac, press the control key and click in order to "right-click" (or set a gesture in System Preferences).

## Shortcuts for your Keyboard

Here are some useful key strokes to know:

**Save**

Most applications where you edit something (e.g. Word, Pages, Photoshop) use the command-s shortcut in order to save.

**Open**

To open a document, image or something else, most applications use the command-o.

**Copy**

In most applications, you can copy an item by using command-c.

**Paste**

If you wish to paste a copied object, just press command-v.

**Take a screenshot**

If you wish to take a screenshot, just press command-shift-3. If you wish to take a screenshot of a selection, use command-shift-4.

Practice using these commands every time you use an application! It will help dramatically with your efficiency when you start coding or working on a client project.

# Using a Mac

## Keyboard Shortcuts

### 1. Application switching

If you press command-tab, a window containing all open applications will appear. Keep command pressed down and press the tab key reportedly to browse between the applications and when the right one is selected, release the keys and the application will appear in front of the others. Timesaving!


### 2. Quitting applications

To close an application, simply press command-q and the application will quit immediately. Much faster than using the mouse. Make sure you have saved first though!

### 3. Closing windows

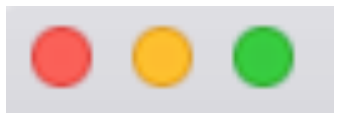
If you wish to close your current window, press command-w. Please notice that this will not cause the whole application to quit, just the active window. Most applications can be open without having an open window, like Safari for instance. To close the whole application, just press command-q.

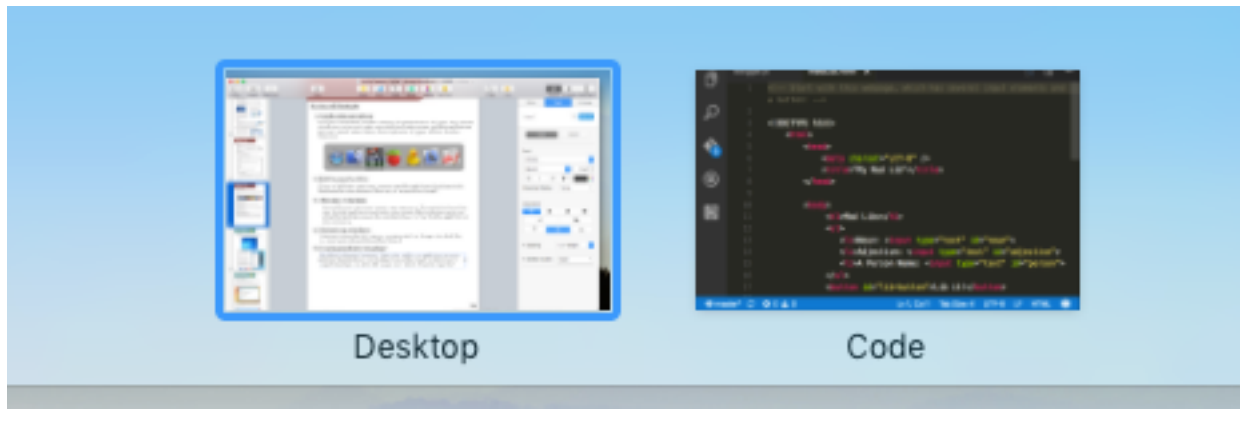
### 4. Minimizing windows

Command-m causes the active window to minimize itself into the right of the dock. This is a smart way to hide a window without closing it.

### 5. Creating multiple “desktops”

By clicking on the green “maximize” button in the top left of an application screen, you will open the application in a new desktop. If you use three fingers on the trackpad to swipe left and right, you will be able to easily move between the screens. Super fun!

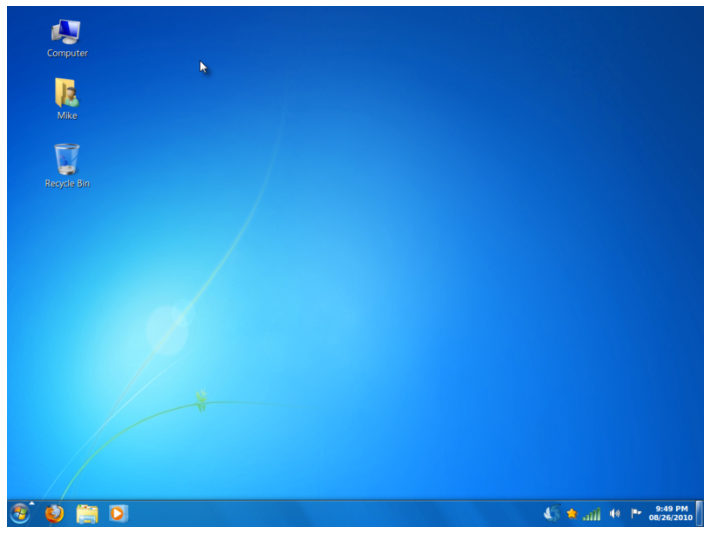


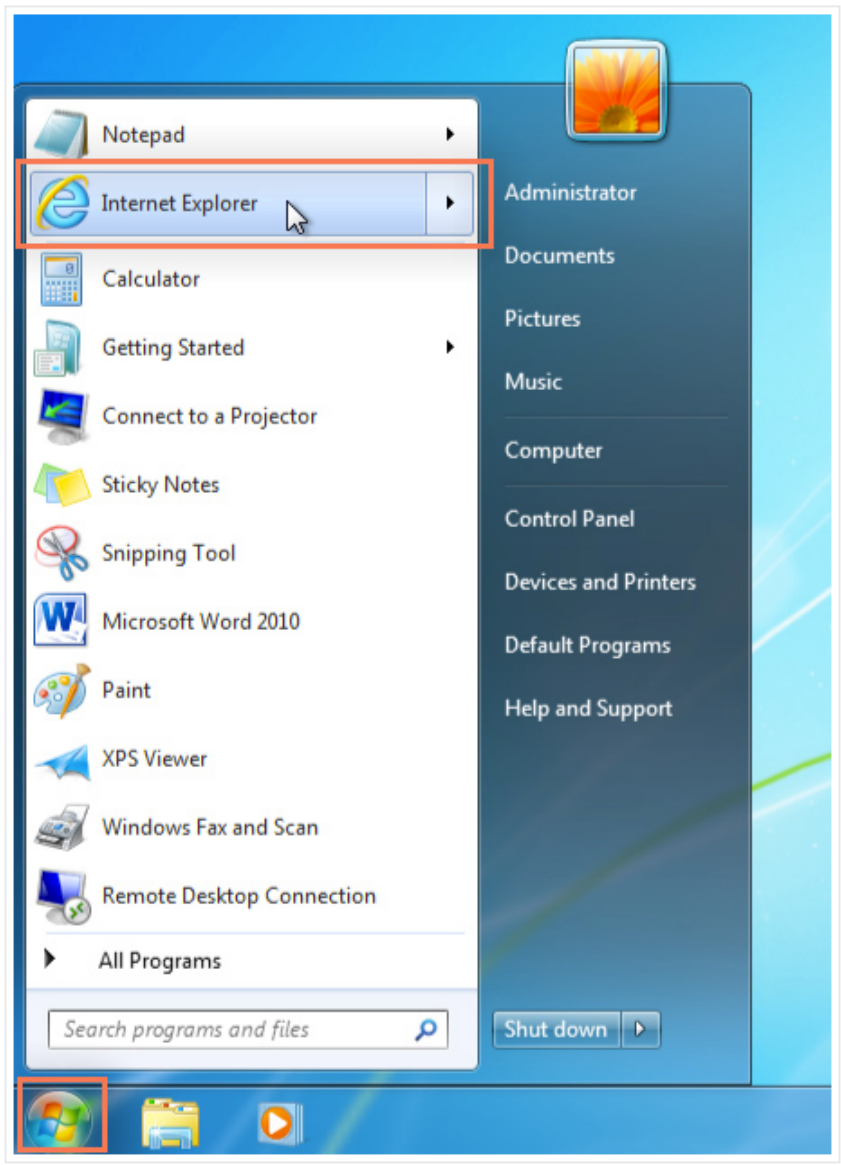


# Using Windows

## Desktop

Once your computer has finished starting up, the first thing you'll see is the desktop. This desktop is the same as the Mac—from here, you can view and manage your files, open applications, access the Internet, and much more.




## To open an application:

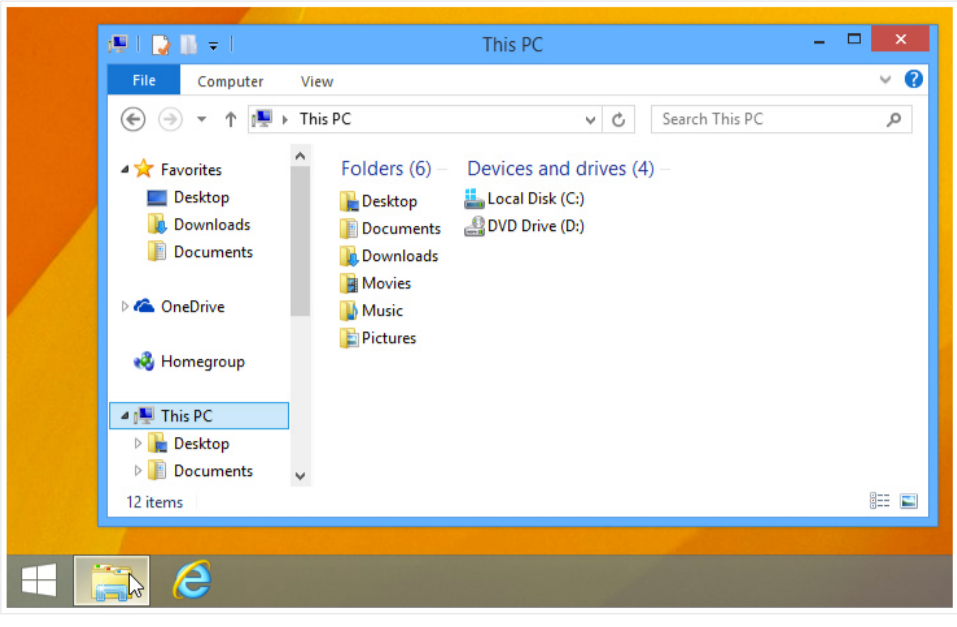
Using your mouse, click the Start button, then select the desired application. If you don't see the one you want, click All Programs to see a complete list of applications.

Whenever you open a file, folder, or application, it will appear in a new window. You can have multiple items open at the same time in different windows. You'll use windows all the time, so it's important to know how to switch between open windows, how to move and resize windows, and how to close windows when you're done using them.

**Minimize** **Maximize** **Close**

## Windows Explorer

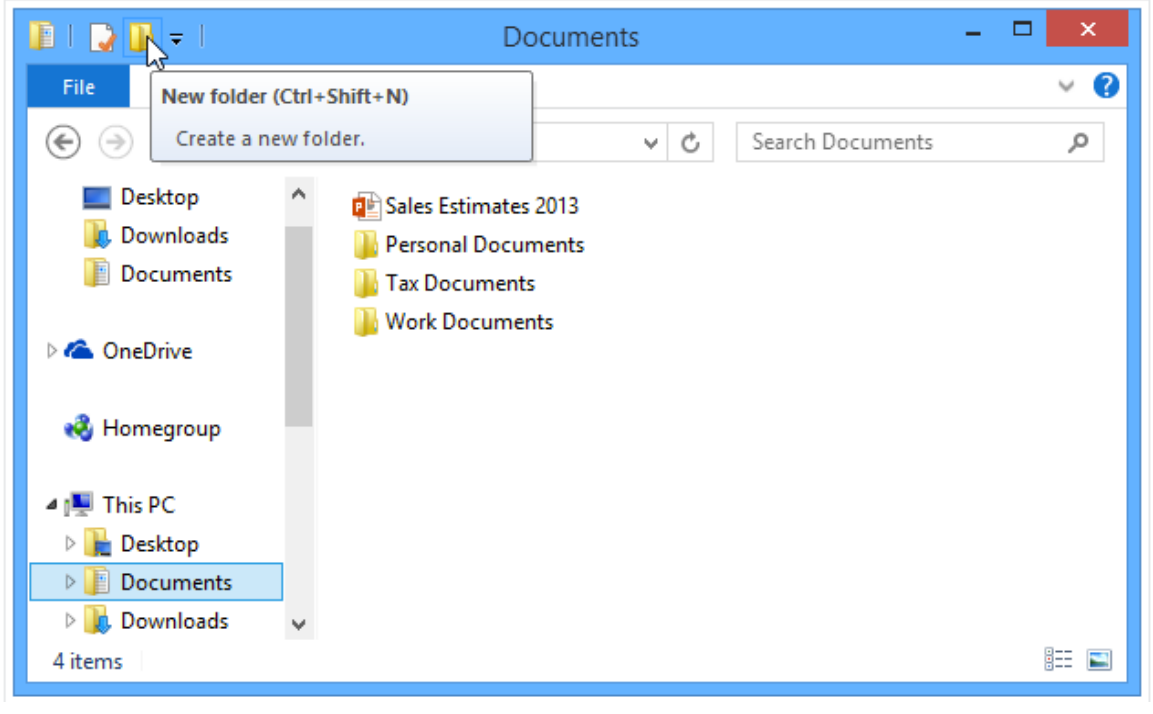
You can view and organize files and folders using a built-in application known as Windows Explorer (called File Explorer in Windows 8).




To open Windows Explorer, click the Windows Explorer icon on the taskbar, or double-click any folder on your desktop. A new Windows Explorer window will appear. Now you're ready to start working with your files and folders. From Windows Explorer, double-click a folder to open it. You can then see all of the files stored in that folder.

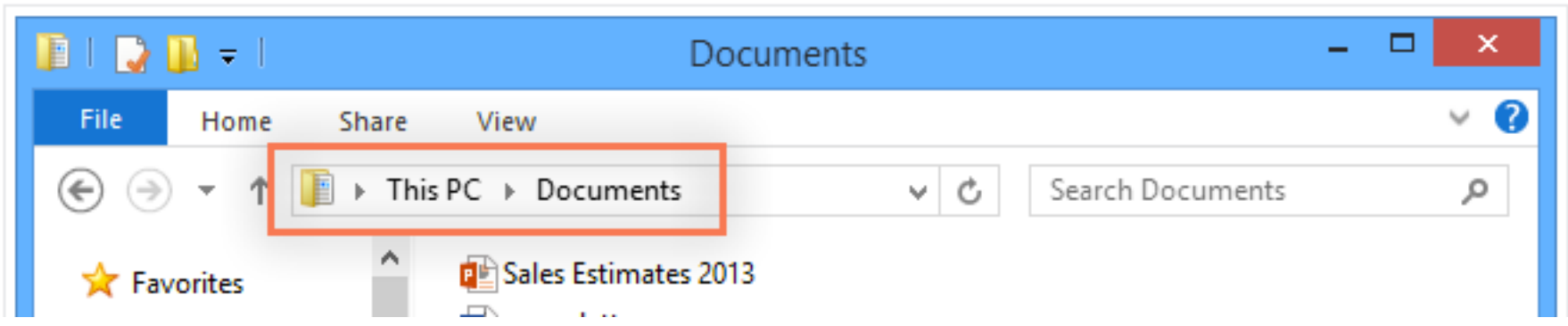
## Folder/File System

*To create a new folder:*
Within Windows Explorer, locate and select the New folder button.

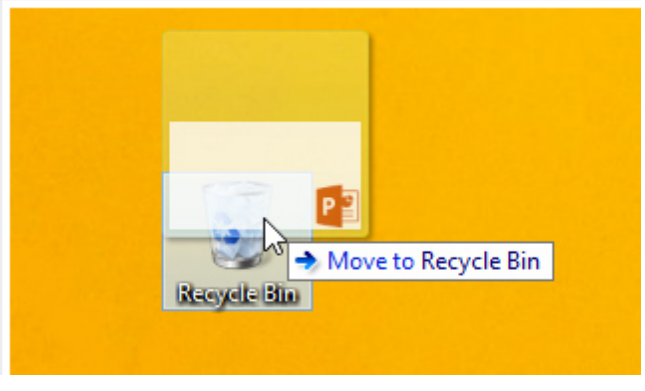


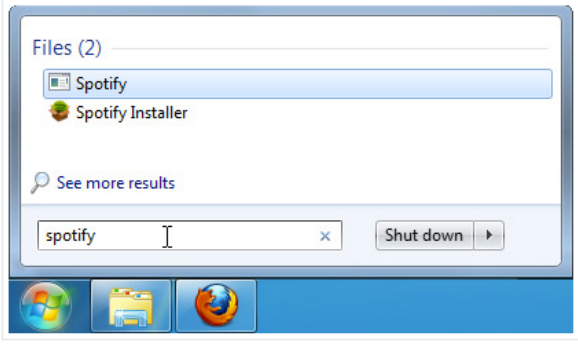

The new folder will appear. Type the desired name for the folder and press Enter. The new folder will be created. You can now move files into this folder.

Notice that you can also see the location of a folder in the address bar near the top of the window.




*To delete a file:*
If you no longer need to use a file, you can delete it. When you delete a file, it is moved to the Recycle Bin. If you change your mind, you can move the file from the Recycle Bin back to its original location. If you're sure you want to permanently delete the file, you will need to empty the Recycle Bin.



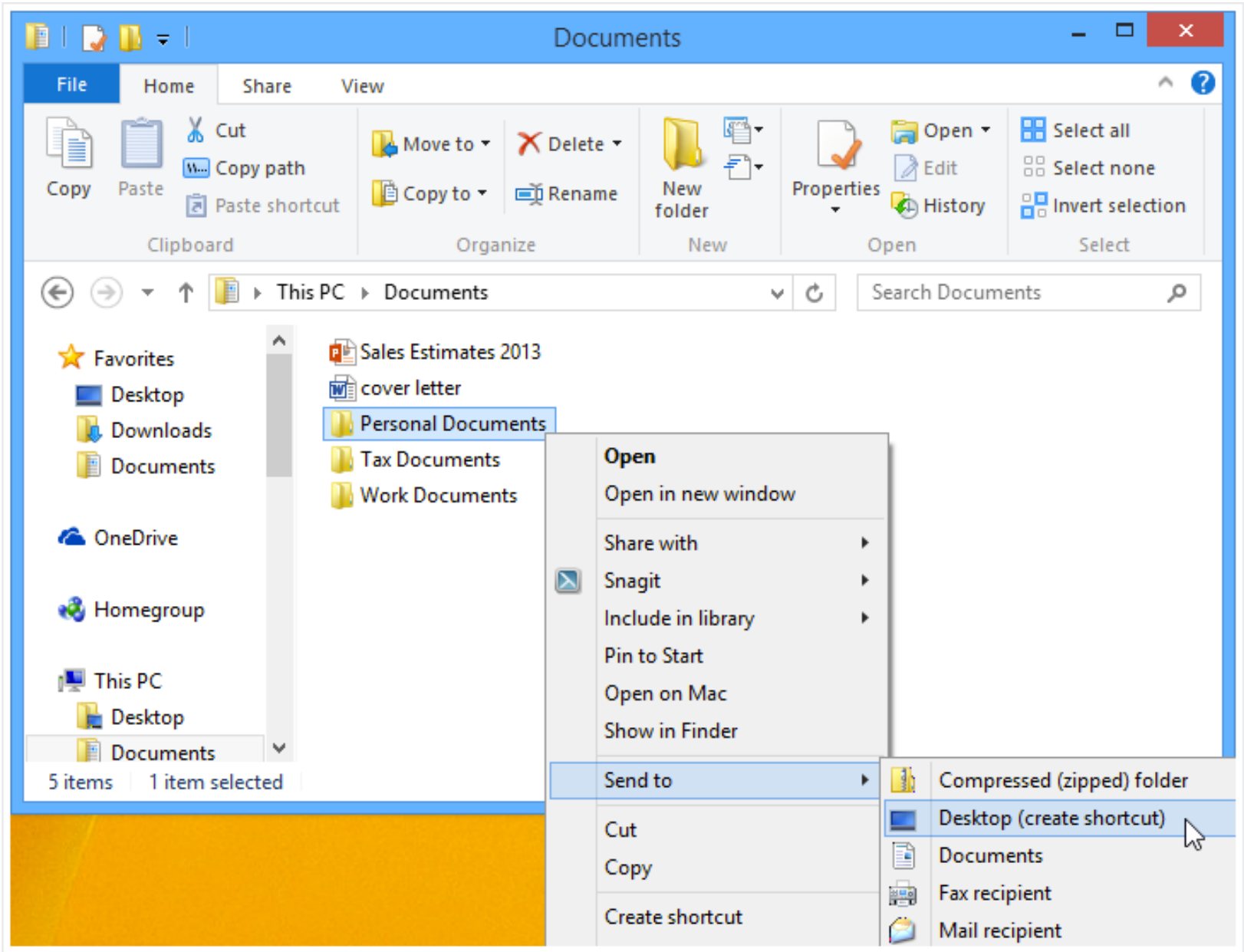

*To search for a file:*
Click the Start button, type the file name or keywords with your keyboard, and press Enter. The search results will appear. Simply click a file or folder to open it.

## Desktop Shortcuts

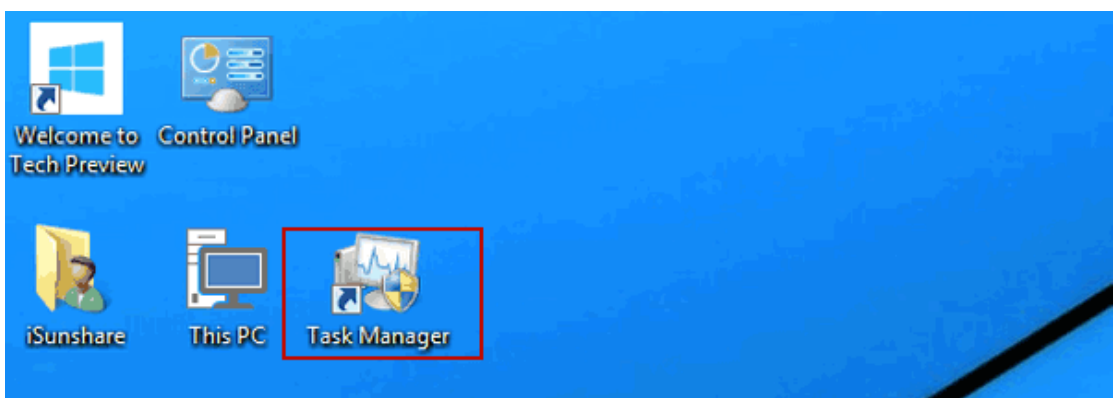
If you have a file or folder you use frequently, you can save time by creating a shortcut on the desktop. Instead of navigating to the file or folder each time you want to use it, you can simply double-click the shortcut to open it. A shortcut will have a small arrow in the lower-left corner of the icon.

Note that creating a shortcut does not create a duplicate copy of the folder—it's simply a way to access it more quickly. If you delete a shortcut, it will not delete the actual folder or the files it contains.

Locate and right-click the desired folder, then select Send —>Desktop (create shortcut).




A shortcut to the folder will appear on the desktop. Notice the arrow in the lower-left corner of the icon. You can now double-click the shortcut to open the folder at any time.

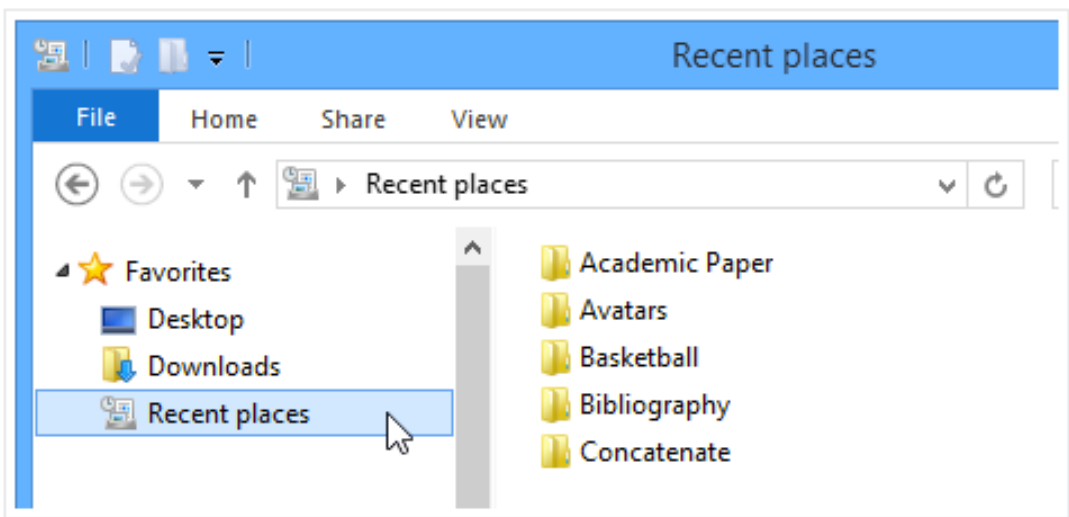


# Using Windows

## Finding Files

Here are some common places to look for files:

1. **Recent places:** If you recently edited the file you need, you can try looking in the Recent places folder. To view the Recent places folder, open Windows Explorer, then locate and select Recent places (below Favorites on the left side of the window). A list of recently used folders and settings will appear. Try looking in some of the recently used folders to see if you can locate the file.




2. **Downloads**: By default, your computer will place downloaded files in a specific folder, known as the Downloads folder. If you're having trouble finding a file you downloaded from the Internet, such as a photo attached to an email message, this is the first place you should look. To view the Downloads folder, open Windows Explorer, then locate and select Downloads (below Favorites on the left side of the window). A list of your recently downloaded files will appear.

3. **Default** folders: If you don't specify a location when saving a file, Windows will place certain types of files into default folders. For example, if you're looking for a Microsoft Word document, you could try looking in the Documents folder. If you're looking for a photo, try looking in the Pictures folder. Most of these folders will be accessible on the left side of the Windows Explorer window.

## Adjusting Settings

At some point, you may want to adjust your computer's settings. For example, you might want to change your desktop background or modify your Internet settings. You can change many different settings from the Control Panel.

To open the Control Panel: Click the Start button, then select Control Panel.

Similar to a Mac, you can scroll the different icons to see the different features of the Windows OS. You can also see the different User accounts on the computer itself.

# Working With Gmail

**Gmail** is a free email service provided by Google. In many ways, Gmail is like any other email service: You can **send and receive emails, block spam,** create an **address book,** and perform other basic email tasks. But it also has some more unique features that help to make it one of the most popular email services on the Web.

## Gmail Drop-Down Menu

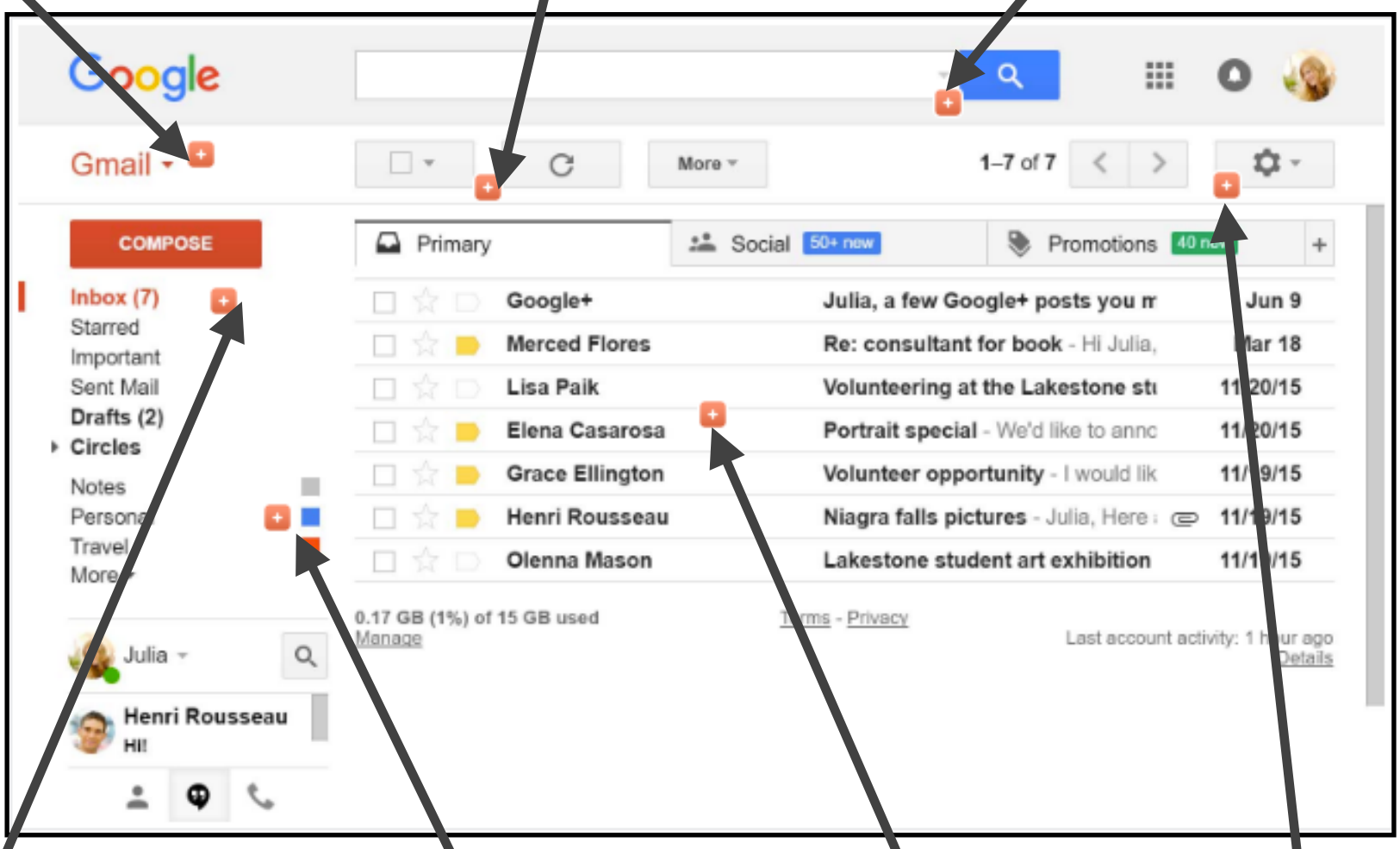
The **Gmail drop-down menu** allows you to navigate to your **Mail,Contacts,** and **Tasks List.** If you're ever lost, you can just click the Gmail option to go back to the default view.

## Action Buttons

The **action buttons** are located just above the inbox. When no message is selected the available actions are **Select all** and **Refresh.** When a message is **selected,** several buttons will appear above the inbox. You can use these options, including **Archive, Report spam,** and **Delete,** to help organize your messages.

## Search Box

If you're having trouble finding an important email, you can start typing in the **Search box** to find it.




## Left Menu Pane

The **left menu pane** allows you to **Compose** a new email, navigate to your **Mail,** view your **Sent Mail,** and manage your **Labels,** among other tasks.

## Labels

**Labels** allow you to organize the messages in your inbox. You can apply **more than one label** to any message and **create new labels** to organize your messages any way you want. You can also choose **colors** for your labels to help them stand out.

## Inbox

Your **inbox** is where your received messages will appear. You can click a message to read it.

## Gear Icon

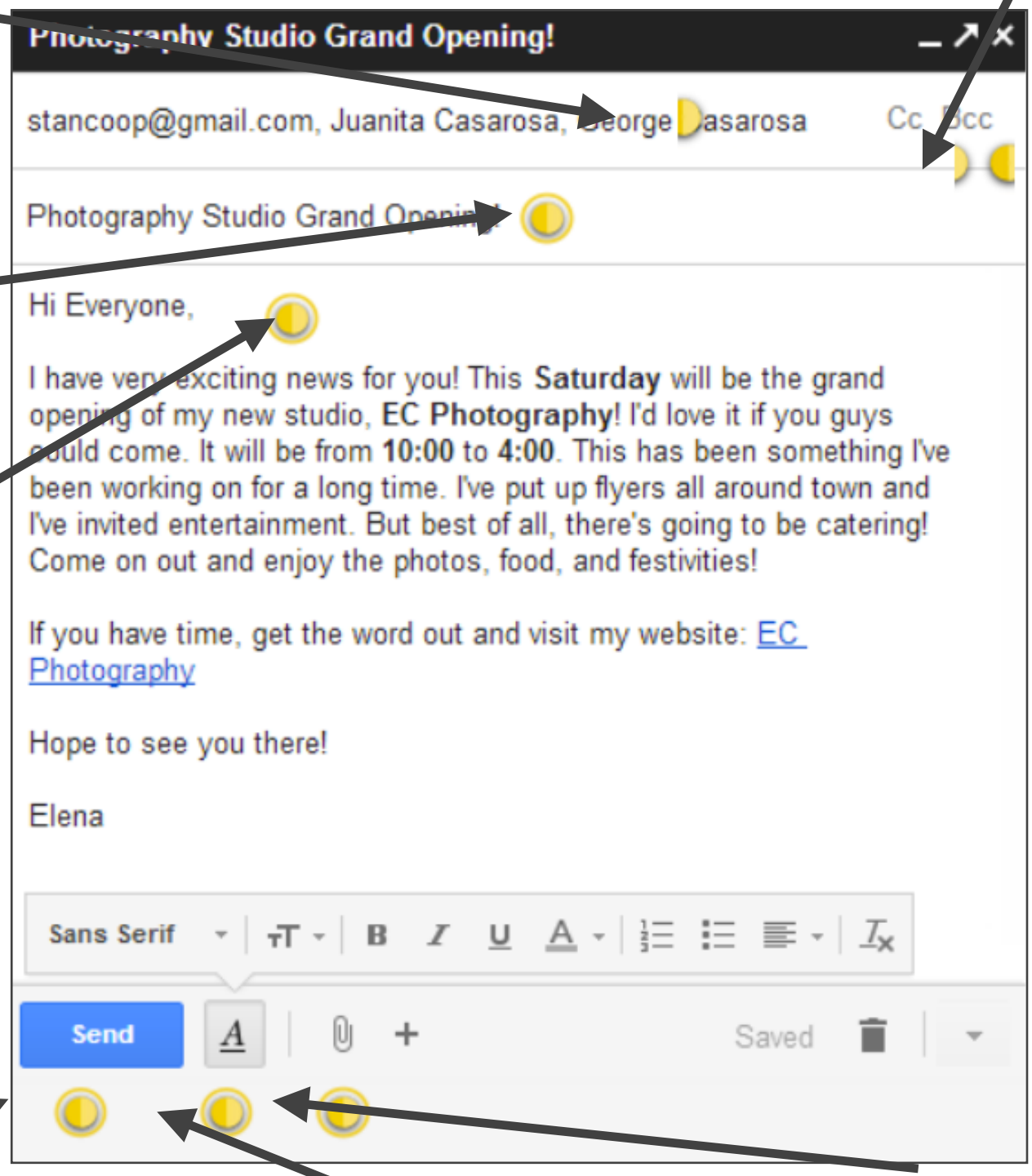
Whenever you want to change your settings, simply click the **gear icon** and select **Settings.** You can also select **Help** if you're having trouble.

# Working With Gmail

**Recipients**
Recipients are the people you are sending the email to. You will need to type the email address for each recipient. Most of the time, you'll add recipients to the To: field, but you can also add recipients to the Cc: or Bcc: fields.

**Cc and Bcc**
Cc stands for carbon copy. This is used when you want to send an email to someone who is not the main recipient. This helps to keep that person in the loop while letting them know that they probably don't need to reply to your message. Bcc stands for blind carbon copy. It works almost the same way as Cc, except all of the email address in the Bcc fields are hidden, making it ideal when emailing a large number of recipients or when privacy is needed.

**Subject**
The subject should say what the email is about. Keep the subject brief, but give the recipients a reasonable idea of what's in the message.




**Body**
The body is the actual text of the email.
Generally, you'll write this just like a normal letter, with a greeting, one or more paragraphs, and a closing with your name.

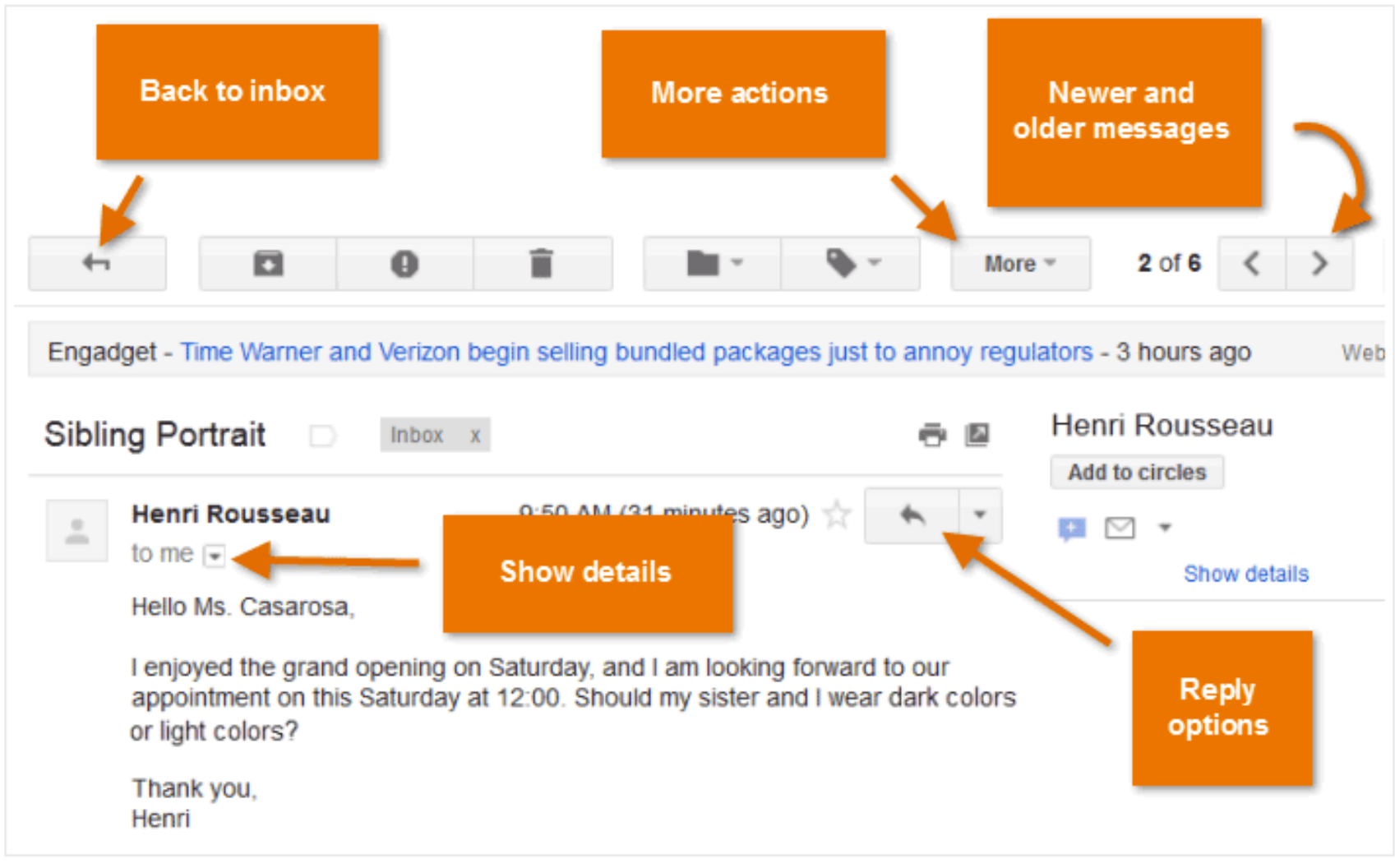
**Send Button**
When you are satisfied with your message, click Send to send it to the recipients.

**Formatting Options**
Click the Formatting button to access formatting options. Formatting allows you to change the look and feel of your message. For example, you can change the font style, size, and color, and include links.

**Add Attachment**
An attachment is a file (such as an image or a document) that is sent along with the email message. Gmail allows you to include multiple attachments. Click the Attachment button to include an attachment with the email.

# Working With Gmail

## Reading Emails

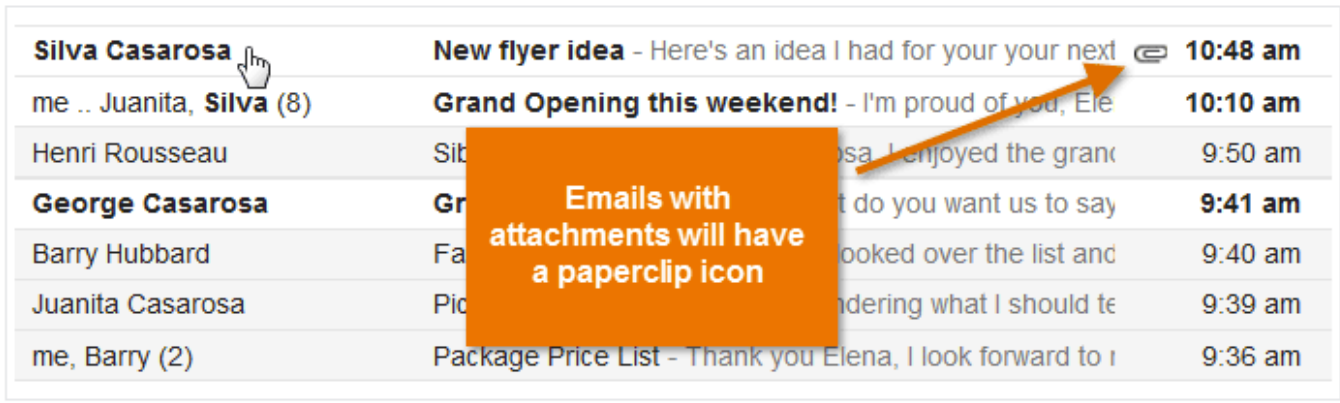



## Opening Attachments

Sometimes you'll receive emails that contain **attachments**. Generally, you will need to **download** the attachment to view it. However, many common file types like **Word documents** and **images** can be viewed within a browser window. If the attachment is an image, you'll also see a smaller copy of the image—called a **thumbnail**—inside the body of the email. You can tell which emails contain attachments because they will have a **paperclip** icon to the right of the **subject**.

### To open an attachment:

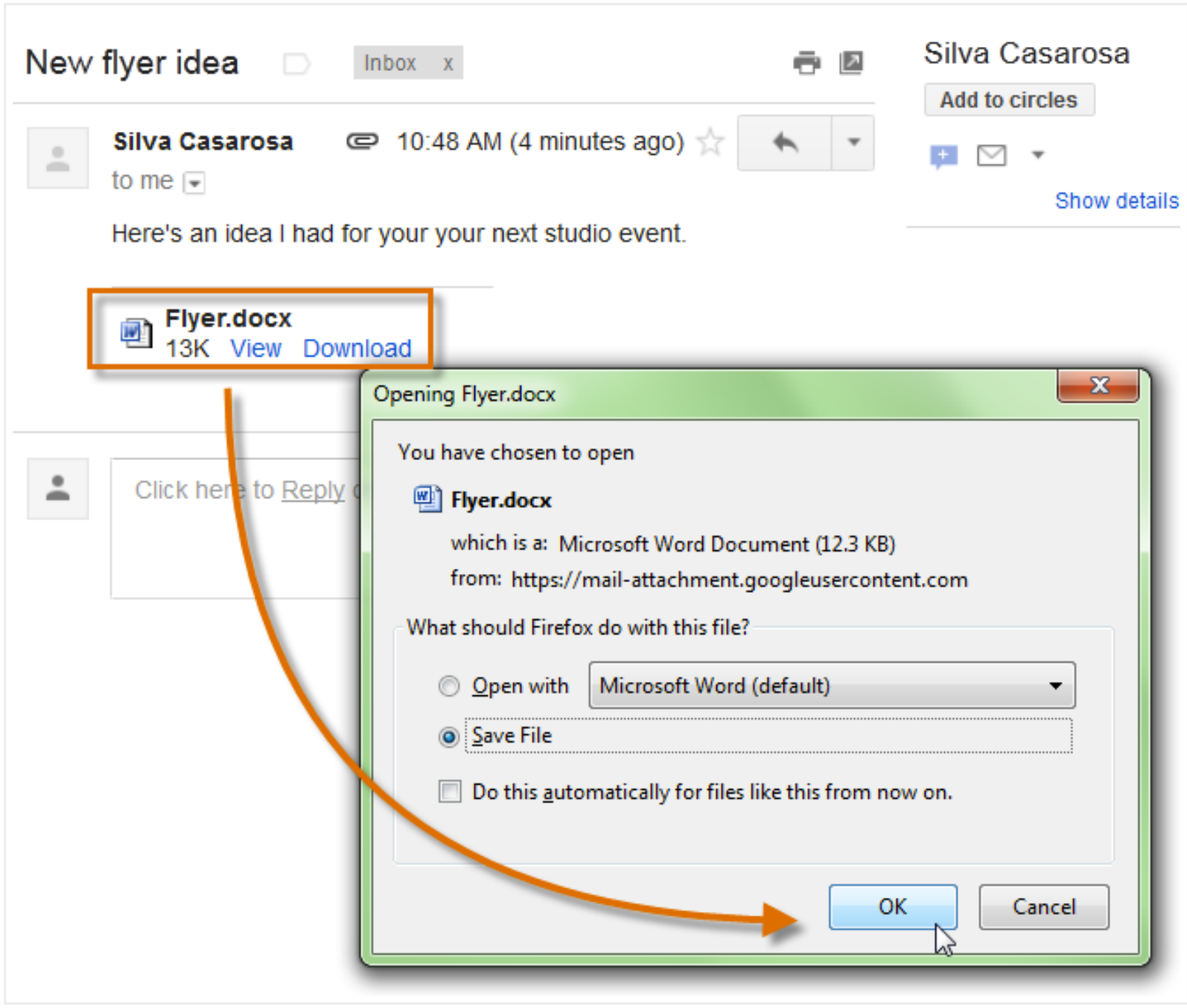
1. Open the **email message** that contains the attachment.




2. Click **Download** or the **icon** of the file to save the attachment to your computer. If your computer asks whether you want to **Open** or **Save** it, choose **Save**. You can then locate the file on your computer and double-click it to open it. Alternatively, you can click **View** to open the file within your browser if it is a file type Gmail recognizes.

# Working With Gmail

## Opening Attachments

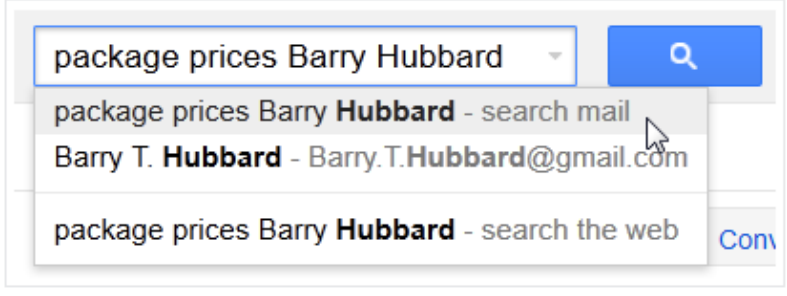



## Searching Mail

The **Search Mail** feature allows you to perform a **Google Search** in your email. This means you can find any message, no matter how new or old. It searches every part of the message, so you can find a message even if you **don't remember who sent it** or if you never **labeled** it.

### To search for a message:

1. At the top of the page, type some search terms in the Gmail **search box**, then click **search Mail**.



# Using A Word Processor

**A Word Processor** is a program or machine for storing, manipulating, and formatting text entered from a keyboard and providing a printout. Word Processors offer many features that help you edit (change) text in a document.

You can add, delete, and rearrange text, as well as check your document for spelling and grammar errors. You can also format a document to enhance the appearance of the document by using various fonts, styles, and colors to emphasize important text. You can also center text on a page, adjust the spacing between lines of text, change the margins and create newspaper columns. Processors come with many types of pictures, or graphics, that you can use to make a document more interesting and entertaining.

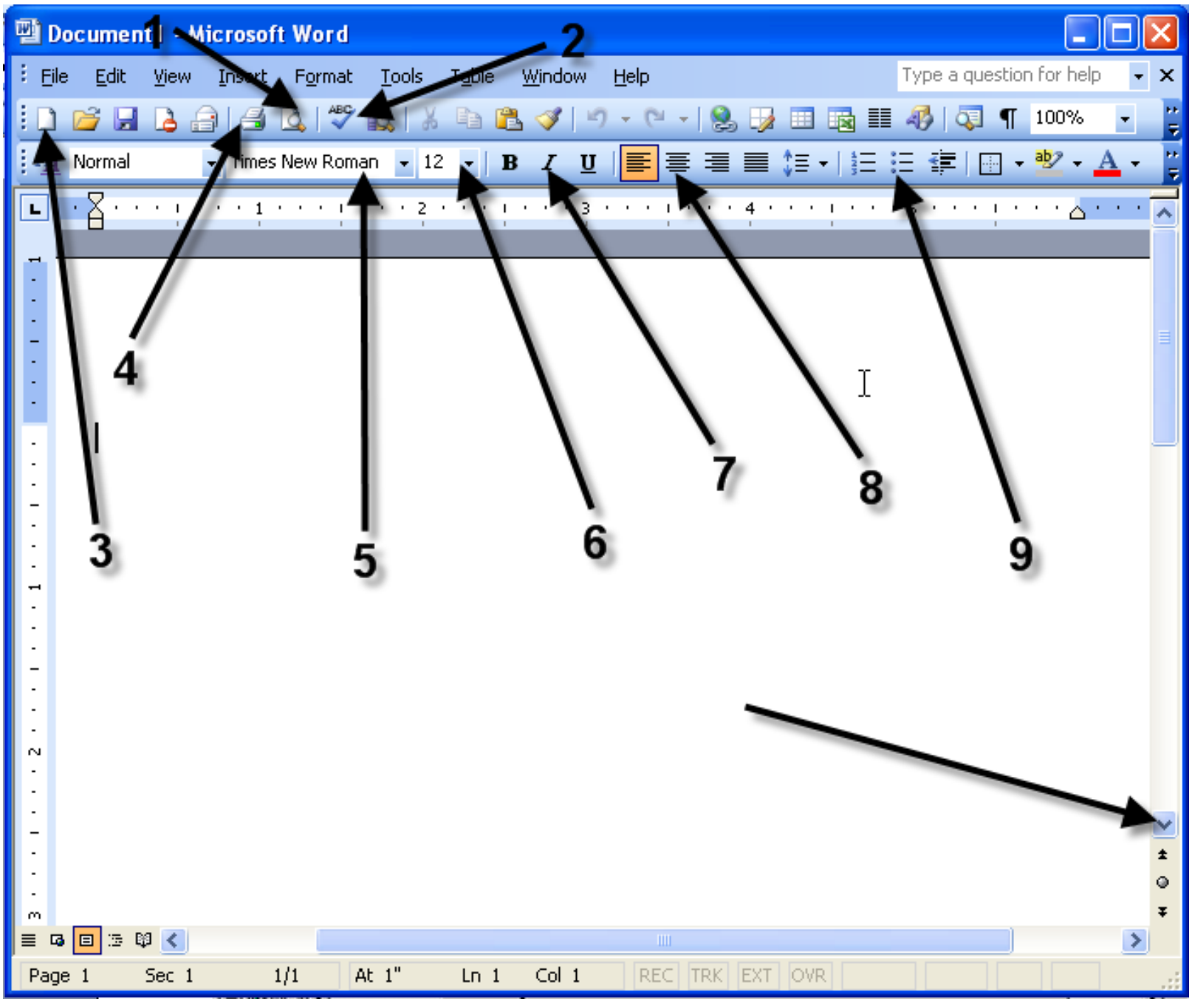
**Microsoft Word** is one of the most common word processors. We will also use **Google Docs.**


| Features | Google Docs | Microsoft Office™ 2010 |
|---|---|---|
| Create documents, spreadsheets, drawings and presentations | ✓ | ✓ |
| Advanced (niche) formatting features | ⊘ | ✓ |
| Multi-user editing and real-time update capabilities | ✓ | ⊘ |
| Cursor presence and instant messaging | ✓ | ⊘ |
| Storage in the cloud | ✓ | ⊘ |
| Mobile web access | ✓ | ⊘ |
| No patches or updates to manage | ✓ | ⊘ |
| Cost | Included with Google Apps | $499 per user before discounts, plus administrative overhead |

# Using A Word Processor

## Understanding the Word Processor

**Everything it can do!**




1. _____ 2. _____

3. _____ 4. _____

5. _____ 6._____

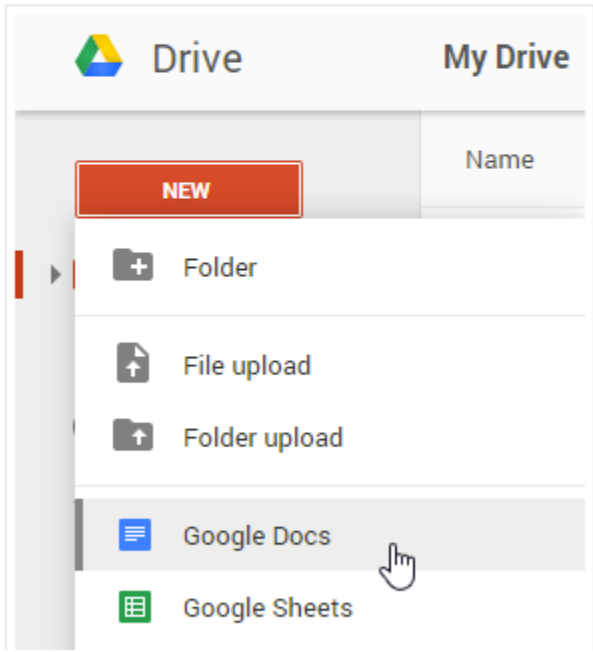
7._____ 8._____

9._____ 10. _____

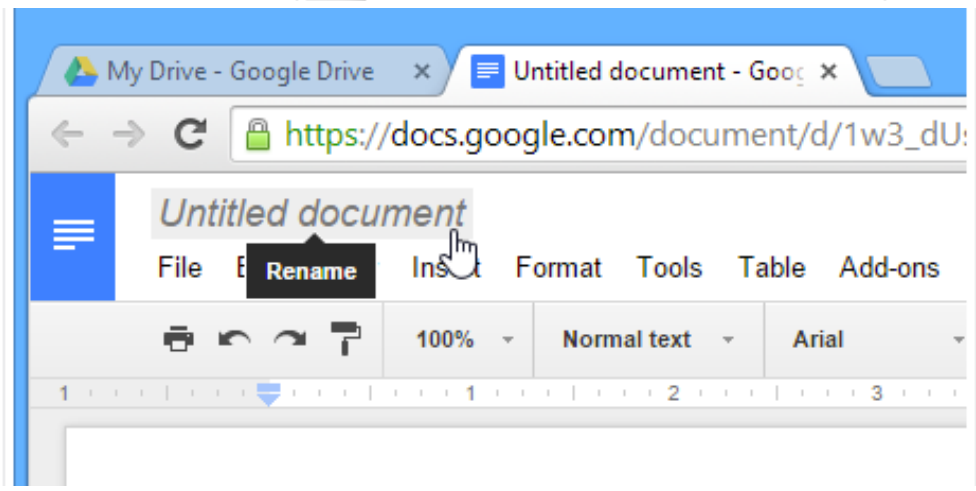
# Exploring Google Docs

## To create a new file:

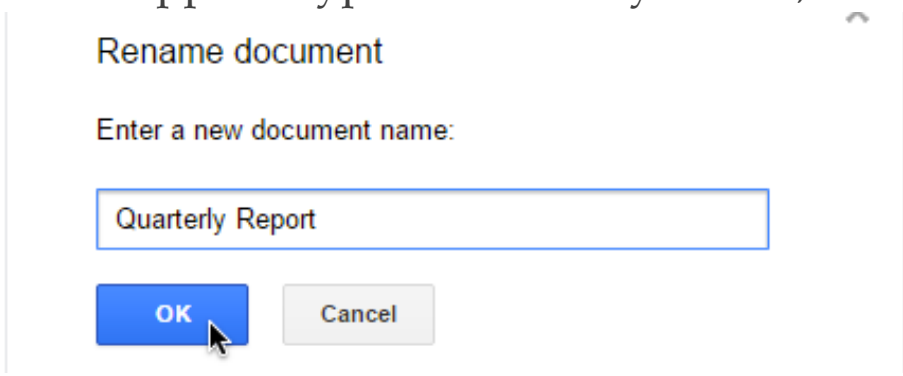
1. From Google Drive, locate and select the **New** button, then choose the type of file you want to create. Select Google Docs to create a new document.



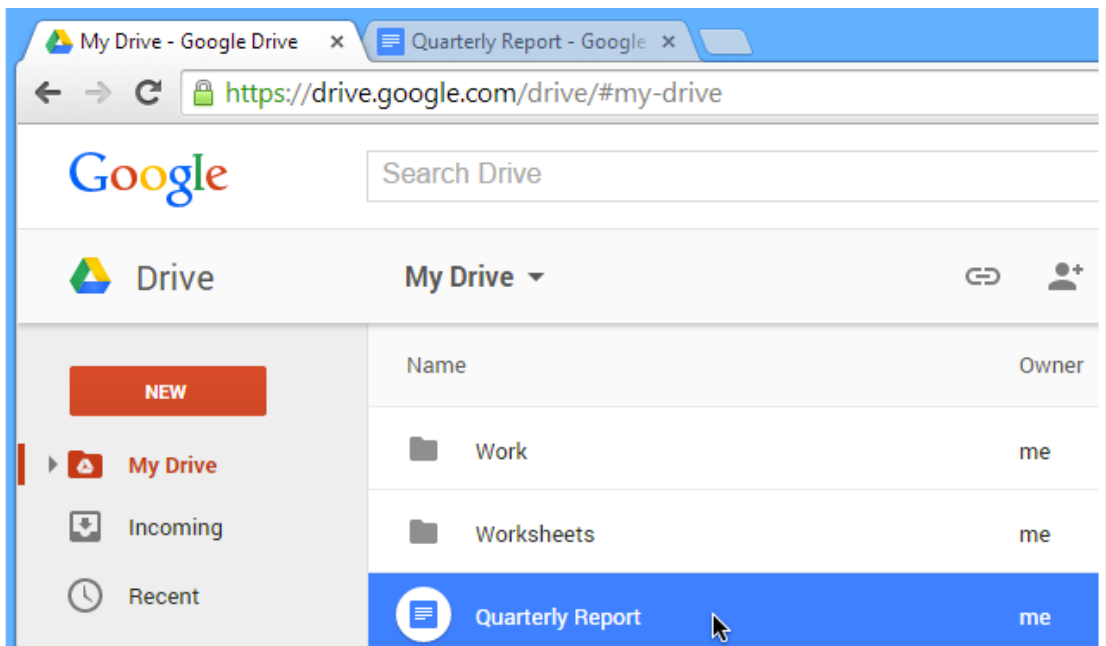

2. Your new file will appear in the new tab on your browser. Locate and select **Untitled document** in the upper-left corner.




3. The **Rename** dialog box will appear. Type a **name** for your file, then click **OK**.




4. Your file will be renamed. You can access the file at any time from your Google Drive, where it will be saved automatically. Simply double-click to open the file again.



# Exploring Google Drive

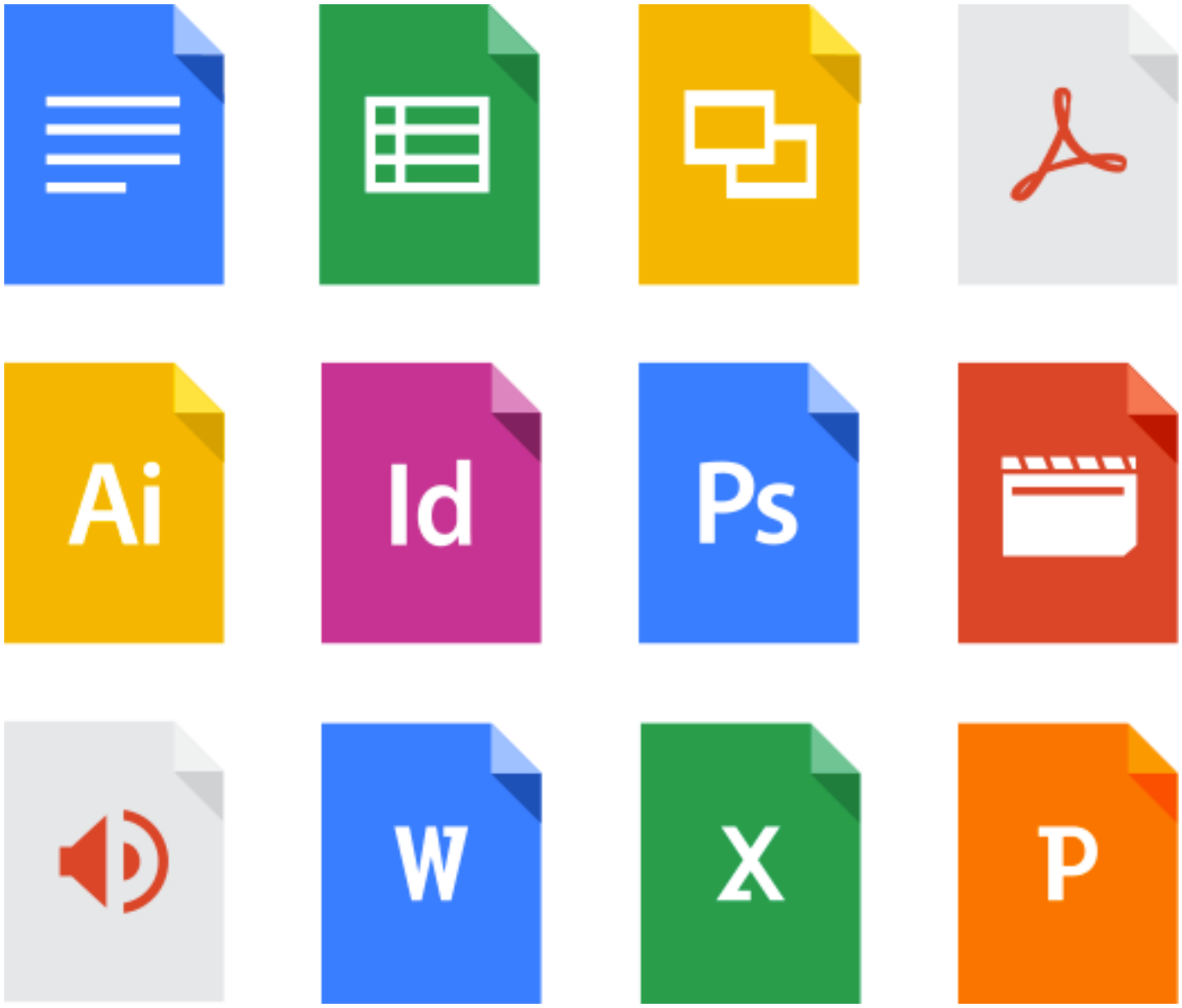
## Uploading files to Google Drive

Google Drive gives you **15 gigabytes** (15GB) of free storage space to upload files from your computer and store them in the cloud. There are two main types of files you can store on your Google Drive:

- **Files you can edit**, like Microsoft Office files, PDFs, and other text-based files
- **Files you cannot edit**, like music, videos, compressed archives (.zip files), and most other files

Once you upload a file — no matter what type of file it is — you'll be able to manage, organize, share, and access it from anywhere. And because the files on Google Drive are synced across your devices, you'll always see the most recent version of a file.

You can also preview many different file types, even if you don't have the software required on your computer. For example, you can use Google Drive to preview a Photoshop file, even if Photoshop is not installed on your current computer.




Can you name all of the different Apps that come with Google (also known as the G Suite?)

# Google Docs Exercises

## Practice with Google Docs

**Complete the following tasks, and explore all of the options available to you in Google Docs.**

1. Navigate to the Google Docs webpage in your browser.

2. Click to add a Blank Document.

3. Rename the document to “Practice File”.

4. Slowly Move the Cursor across the Standard Toolbar. It looks like the picture below. Don’t Click. When you point to a picture, you will see the name for that picture or tool.


5. Type the alphabet in lower-case letters. No spaces.
   Like this: abcdefghijklmnopqrstuvwxyz

6. Click and Drag from the “a” to the “z”. This is called Highlighting (when all the letters are highlighted). There is another way to highlight the letters. Use your left hand to Hold Down the SHIFT key. Use your right hand to Press the Right Arrow Key many times until all the letters are highlighted.

7. Copy the text - to do this, you can hold “command” and the letter “c” at once (fastest and preferred), or go to Edit —> Copy. The computer will remember the text that is highlighted. (if you want to remove the text the computer remembers, use Edit—> Cut or “command” + “x”)

8. Now, select the line under your first text and click the Paste button (Edit —> Paste OR COMMAND V). Look at what happened. You should now have two alphabets.

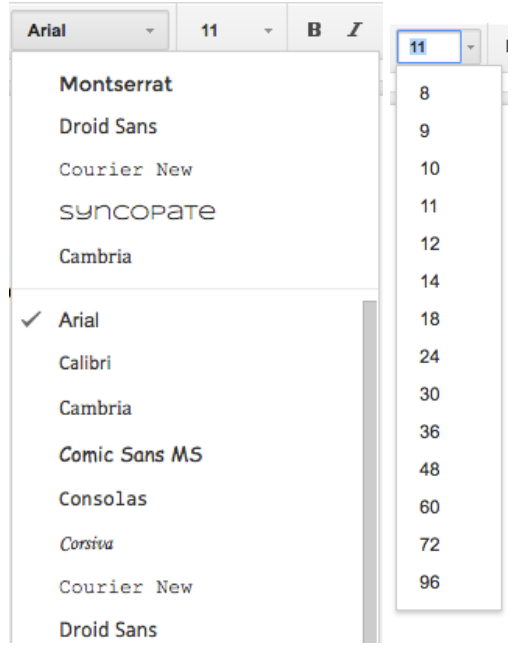
9. Click on the EDIT menu. You will see a drop down menu. Click on SELECT ALL (or “COMMAND” + “a”). This will select all of the content in the area where your cursor currently sits.

BONUS: Command” + “z” or Edit —> Undo will reverse the last action you took. “Command” + “y” will redo what you just undid.

10. Now, look at your Formatting Toolbar.
    Click on the little arrow next to “Arial”. Click on another font name to change the way the letters look. Change the font 3 times for practice.

11. Click on the arrow next to the number 11. Click on a larger number. This will change the size of the letters.

12. Click between the “n” and “o” in the first alphabet to place the cursor there. On your keyboard, Press the DELETE key several times to erase everything before “o.”



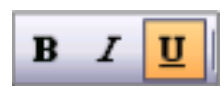
# Google Docs Exercises

13. Highlight all of the text. (Click and drag across the letters), and click on the Center button from the Formatting Toolbar.

14. When the text is highlighted, Click on the B to make the text bold.


15. Click on the I button on the Formatting Toolbar to make the text italic.


16. Click on the Underline button to add a line under the words.




17. Click on the UNDO button on the toolbar.
    This button will let you go back one step. It is a good way to correct your mistakes.

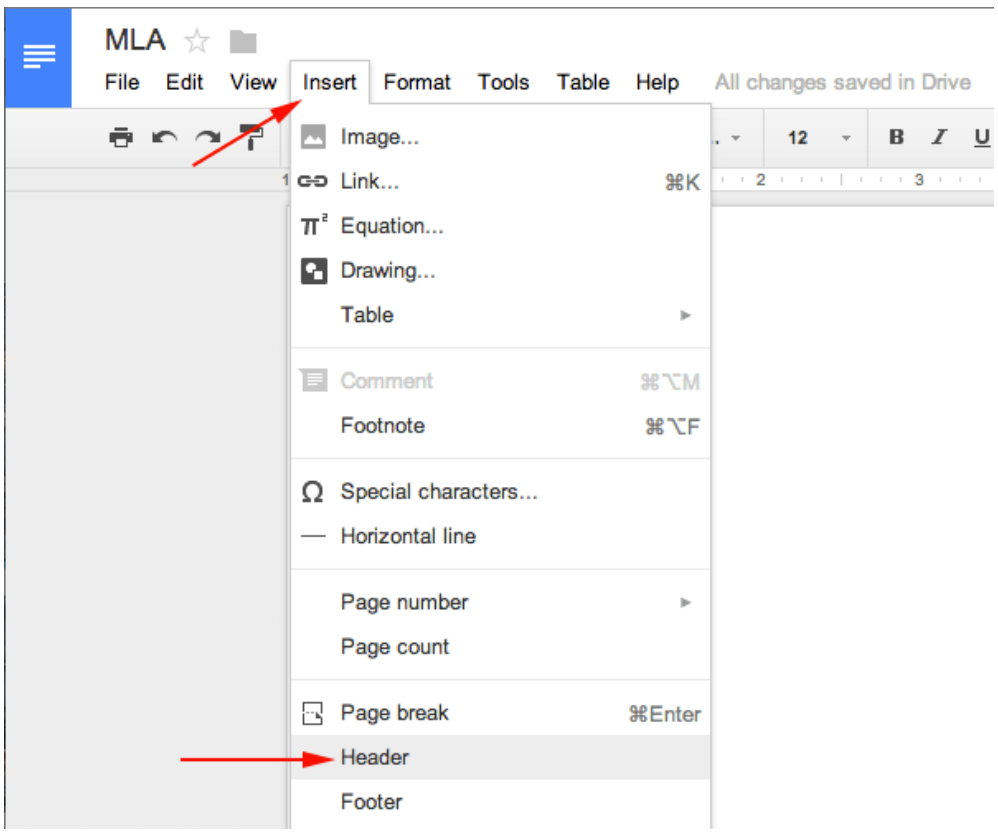
18. Click the REDO button on the toolbar.
    This button will let you go forward one step after you have used the undo button.

19. Share the file with your instructor.

BONUS! Add a header/footer/page numbers

## Headers and footers and page numbers

You can modify the layout of your document by utilizing the header and footer sections and inserting page breaks. Headers and footers usually contain additional information like page number, date, document name, and footnotes. Page breaks and horizontal lines create separation in the text and can increase readability.




**To insert a header or footer:**

Click Insert, then select either Header or Footer from the drop-down menu. Depending on your selection, the insertion point will relocate to either the top or bottom margin of the page. Type the desired text. When you're finished, press the Esc key on your keyboard to close the header or footer. After you close the header or footer, it will still be visible, but it will be locked. To edit it again, just click anywhere on the header or footer, and it will become unlocked.

**To insert a page number:**

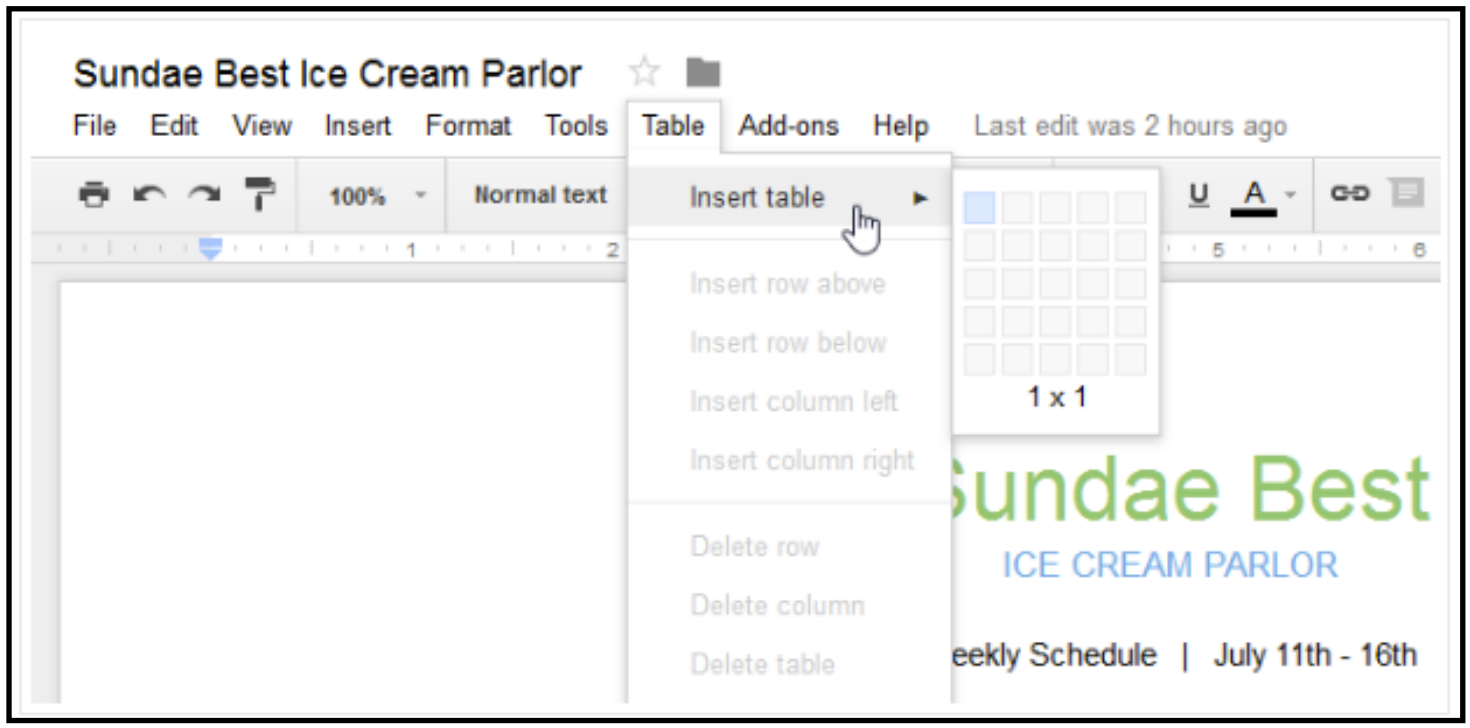
Google Docs can automatically label each page with a page number and place it in a header or footer. If you want to display the word Page as part of the page number, you will need to type Page at the desired location in the header. Click Insert and hover the mouse over Page number, then select Top of page or Bottom of page.

# Exploring Google Docs

## Creating a Table

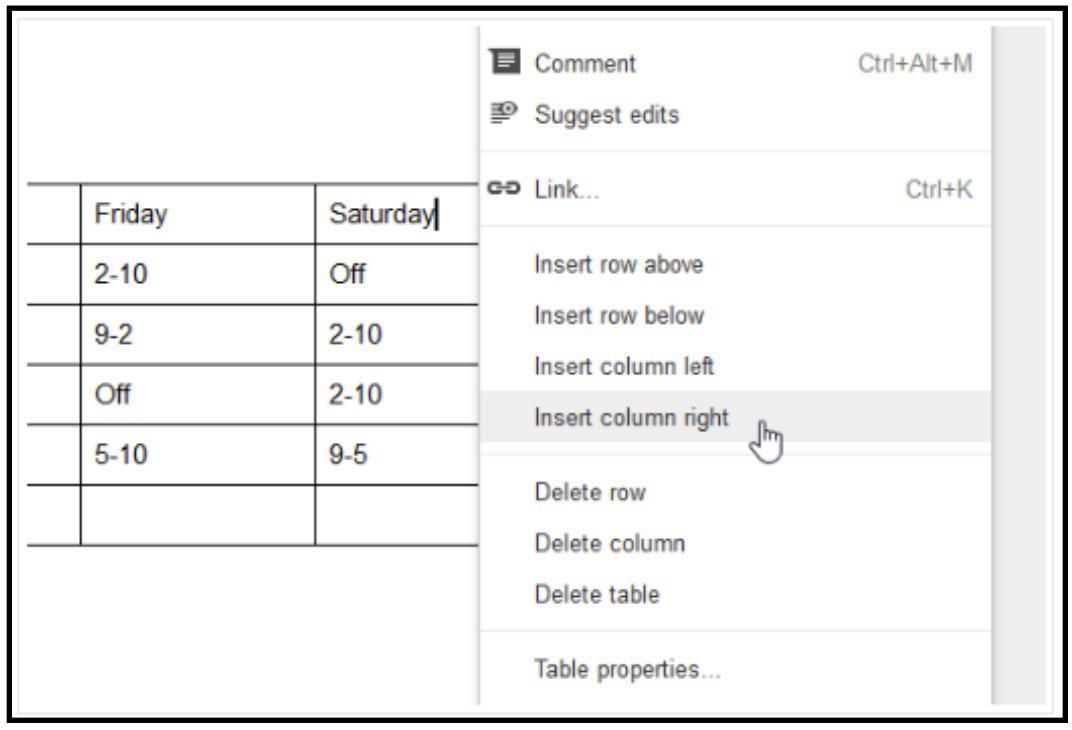
A table is a grid of cells arranged into rows and columns. Tables can be customized and are useful for various tasks, like presenting text information and numerical data.

**To insert a table:**
Place the insertion point at the location where you want to insert a table.
Click the Table drop-down menu and hover the mouse over Insert table. A grid of squares appears.




Drag the mouse over the grid of squares to select the number of columns and rows in the table. Click the mouse, and the table appears in the document. The insertion point will now be in the top-left cell.

To edit or delete the table, right-click anywhere on the table and select from the menu that appears. You can also add comments, links, or edit the table properties such as cell dimensions, alignment, border size, and color.

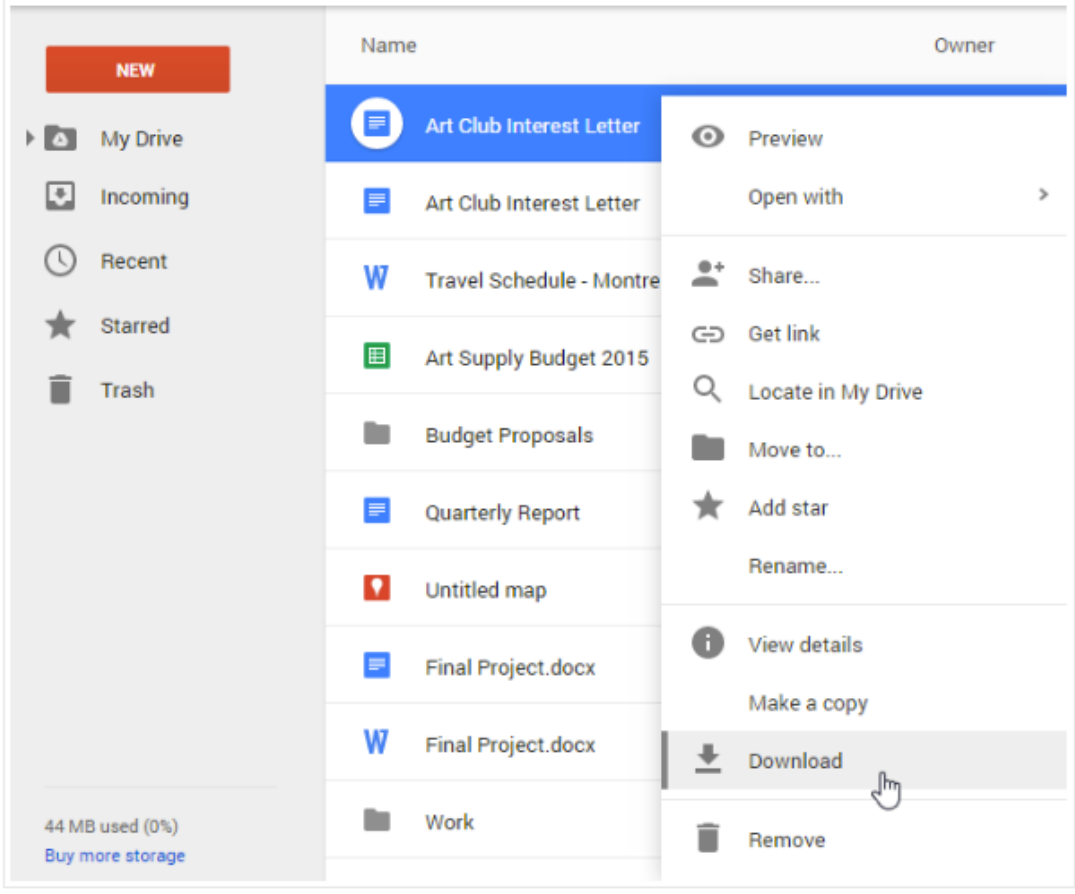



**To merge cells:**
Highlight the cells that you would like to merge and click on the Table key in the Menu. You will be able to click on "Merge Cells". This is helpful for formatting your table to make it easier for users to read.

# Downloading and File Type

## To download a file:

1. Locate and right-click the file you want to download, then select **Download.**

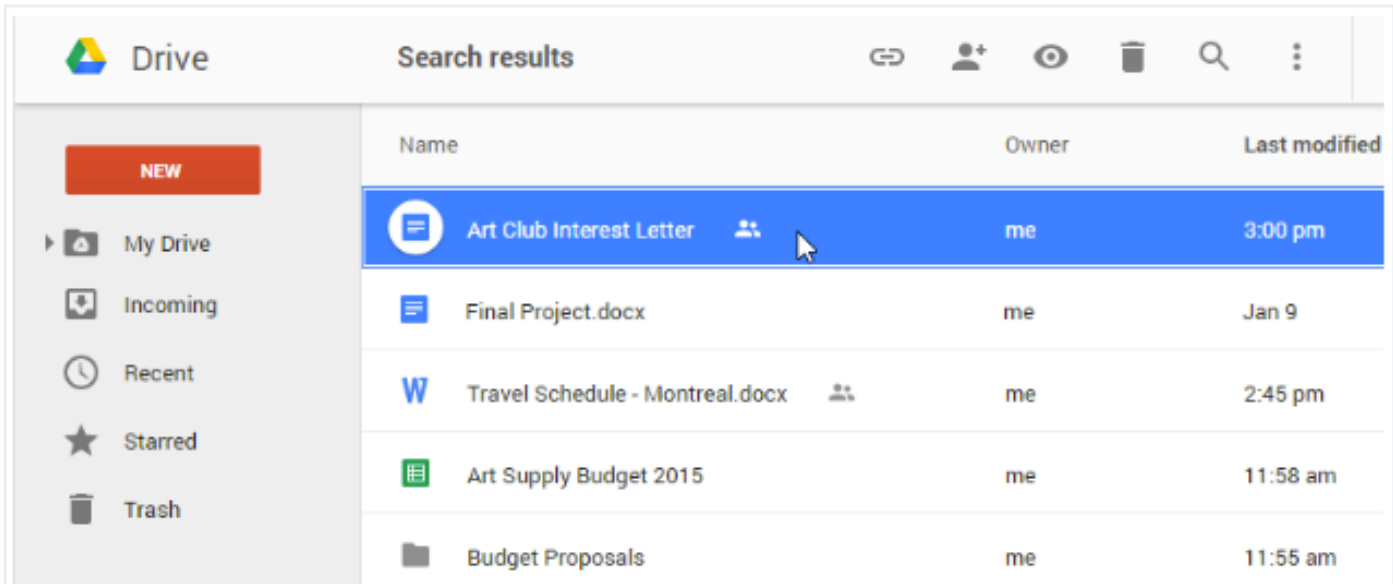



2. The file will be downloaded to your computer.

## To choose a file format:

By default, Google Drive will choose the most common file format whenever you download a file. For example, if you download a Google Document, it will automatically be saved as a .docx file, which is used by Microsoft Word and most other word processors. However, there may be times when you want to choose a different format, such as a PDF.

3. Double-click the desired file to open it.



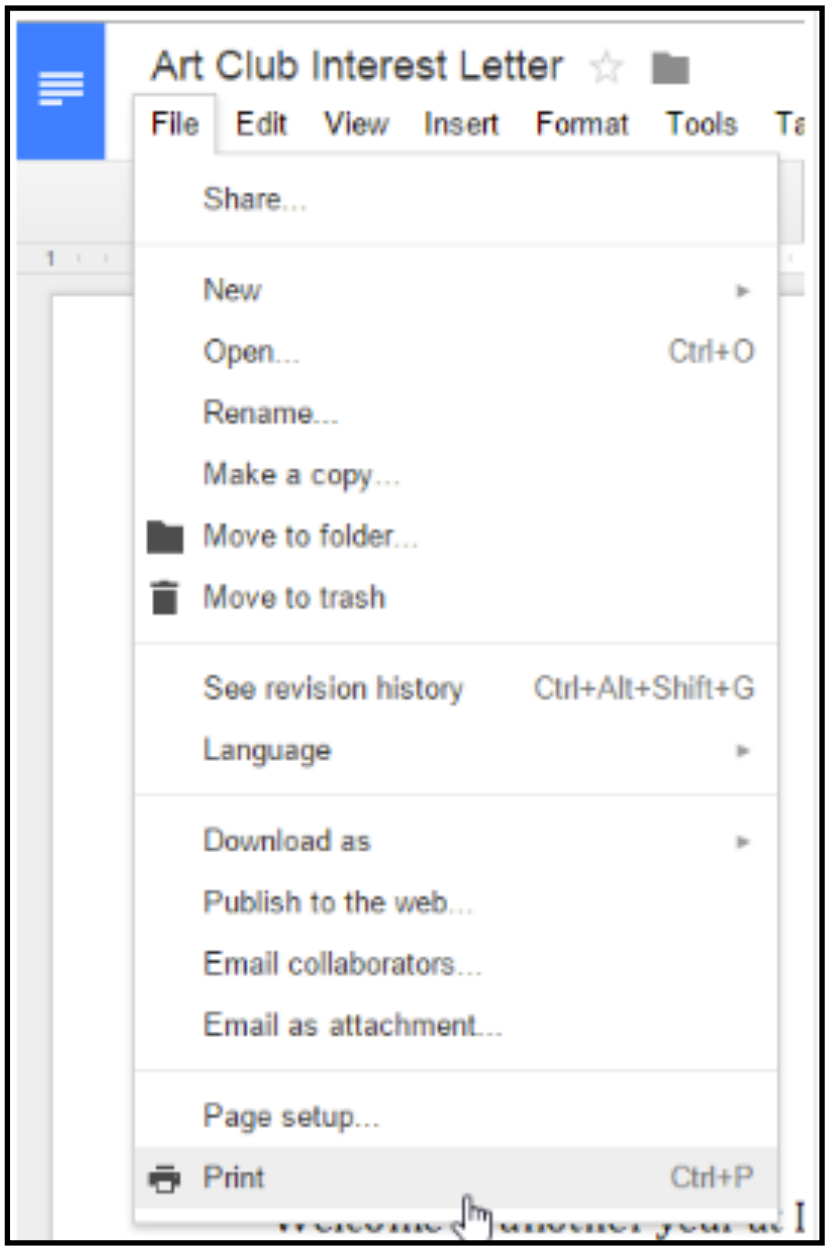

4. The file will appear in a new tab, **Select File — Download as**, then choose the desired file type.

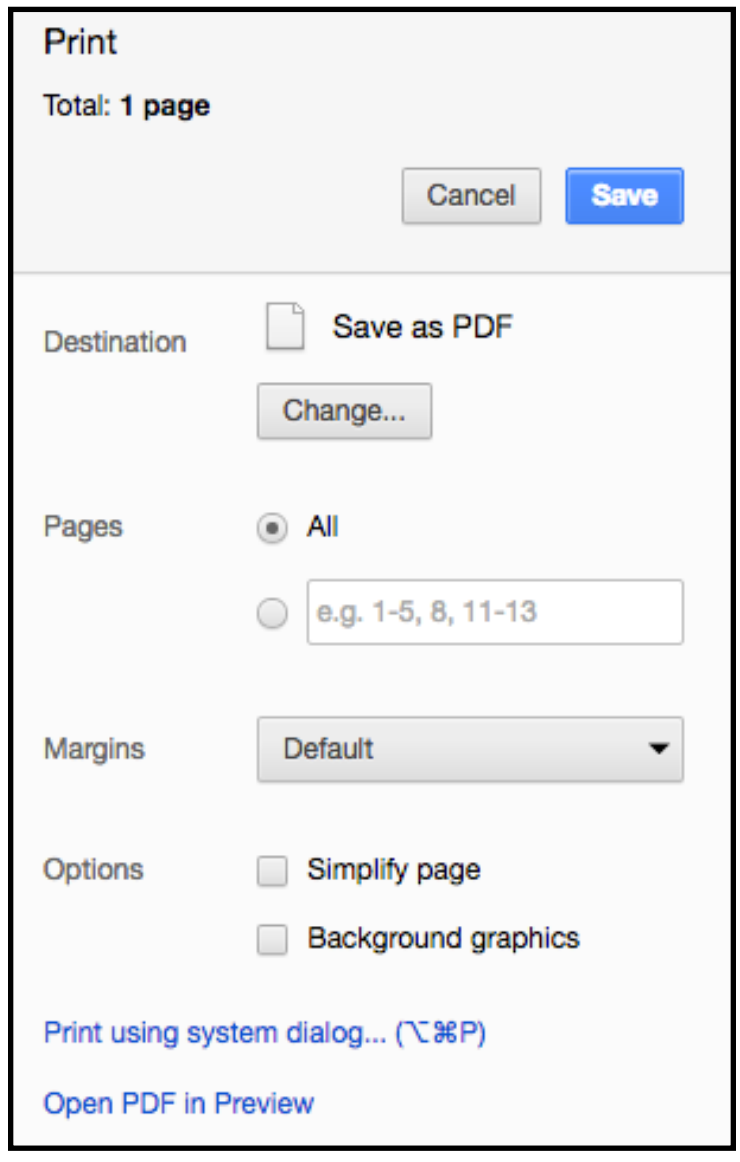
5. The file will be downloaded to your computer in the desired type.

# Printing a Google Doc

## To print a file:

1. Double-click the desired file to open it.
2. Select File —>Print or click Ctrl + P




3. The Print dialog box will appear with a preview of your file on the right.

4. Choose the desired options
   - Which printer to send to
   - Single or double-sided
   - The number of copies
   - Color vs black and white
   - Size of margins
   - Which pages to print
   - Preview the document you are about to print as a PDF

and then click **Print**.

If your computer is not connected to an available printer, you will only be able to save the document. You can choose which type of file format is most appropriate to save the file as (.doc or .pdf). You can also choose to open the PDF in a preview to mode to see what the file looks like.

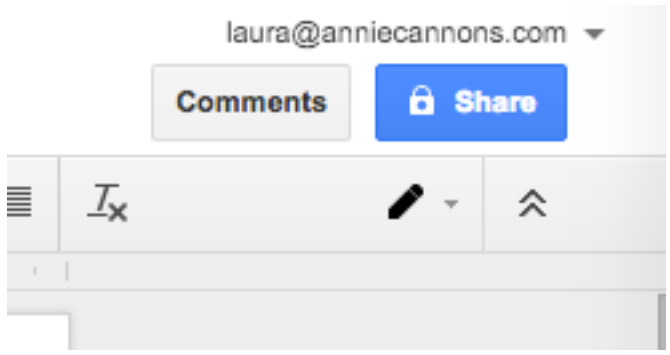
# Sharing Google Docs

## To share a doc

When you create a Google document or upload an existing document, this document stays private to you only on the server. You decide the visibility of the documents, that is, whether you want to keep the documents private or share them with others. You are in control of the permission access of the documents, namely, whether others can edit, comment, or view only. Sharing Google documents allows you to collaborate with others to edit or view comments in real time or at any time. Another advantage is to avoid email attachments. You can share your documents with as many or as few people as you want.

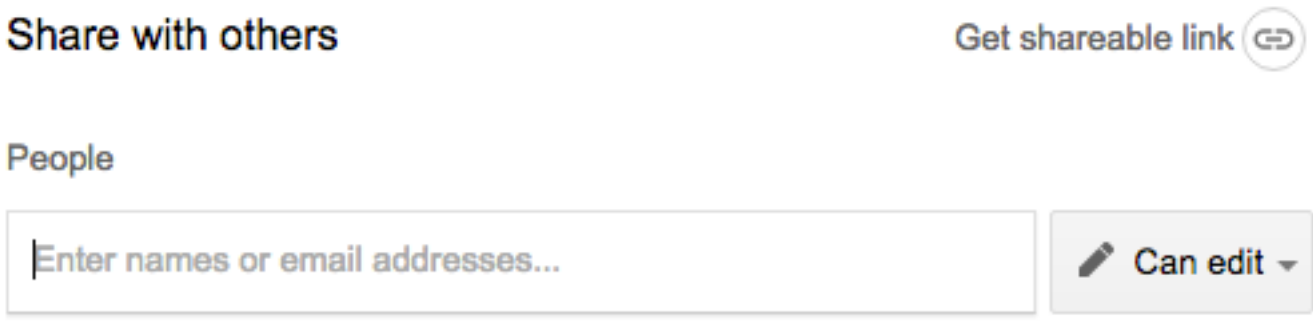
1. Click the Share button at the upper right corner.

2. A Sharing settings window will open as below. To share your document with specific people, add their email addresses in the Invite people box at the bottom.




3. Determine what access permission you want to assign to your guests, such as, Can edit, Can comment, Can view, and select your desirable option. If you want include a message when you notify people via email, click the Add message blue text link to open the message box to enter your message. If you want to send a copy to yourself, check the box next to Send a copy to myself.

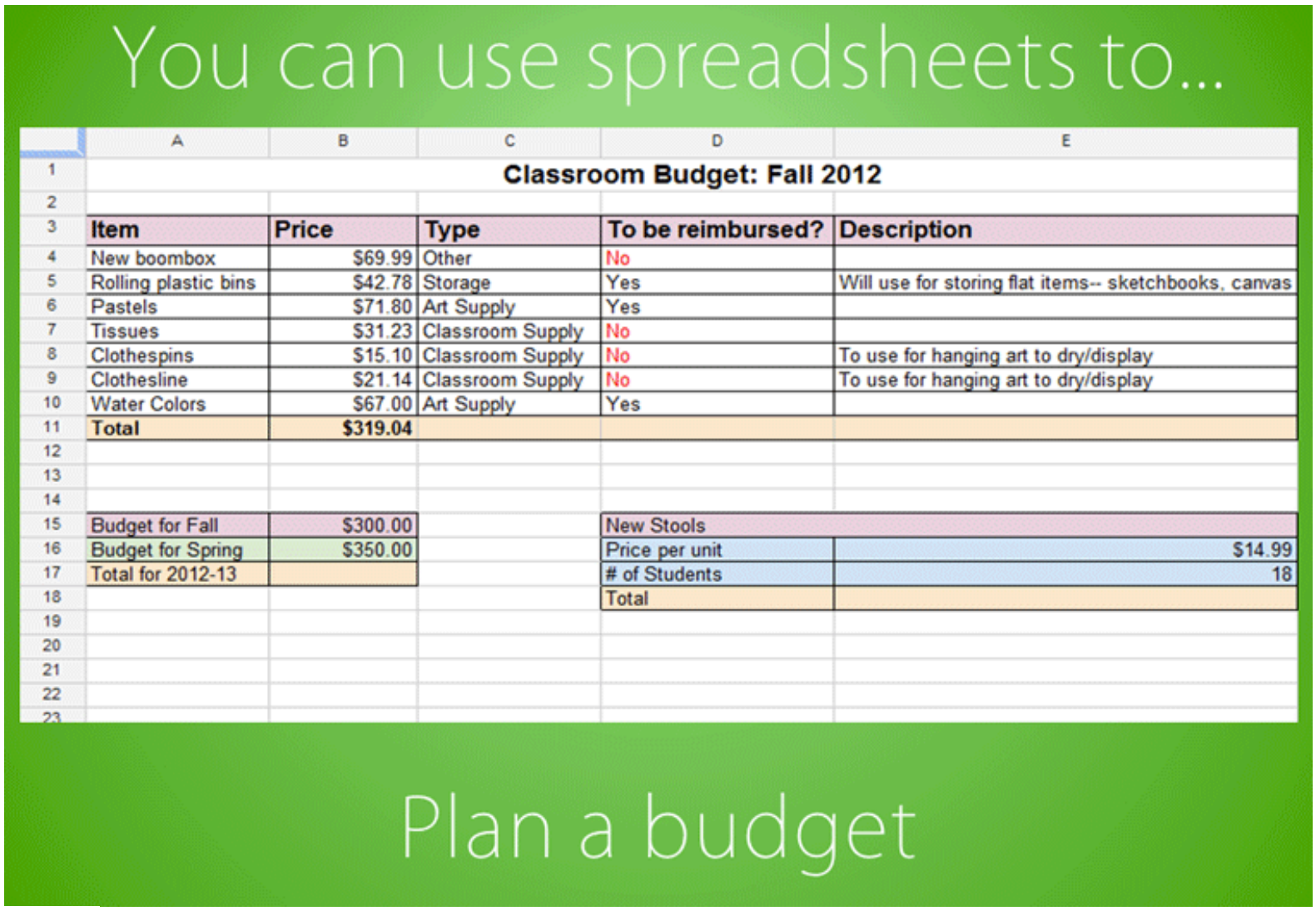
4. Click Share & save button when done and a new window will open. A list of your guests will appear in the Who has access area with the appropriate access permission you have assigned.




You can also select “Get sharable link”. This allows you to create a URL of the document that you can send to anyone by email or post online. Be careful that you check the permissions, especially if you don’t want people to be able to edit your document.

# Spreadsheets

**Spreadsheets** (either Microsoft's Excel or Google Sheets) allow you to organize, edit, and analyze different types of information. In order to be proficient at Spreadsheets, you will learn the basic ways to work with cells and cell content, including how to select cells, insert content, and copy and paste cells. Spreadsheets can also be used to run math operations on sets of rows and columns. Like other Google applications, you can easily share your spreadsheets with others to collaborate.

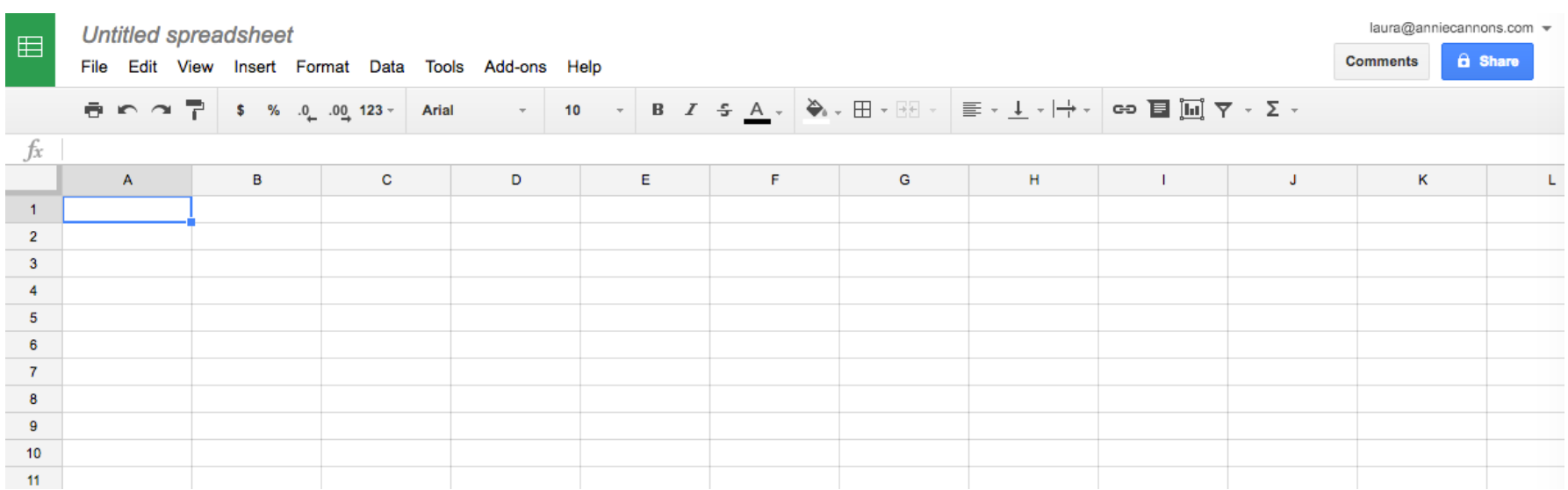



Sheets

You create a new Google Sheet the same way that you create a new Google Doc Page by clicking "Add Blank". You can also select a Google Sheets Template. This has formatted sheets that make certain tasks like budgeting or making a calendar easier.

Drive

## Creating a New Spreadsheet

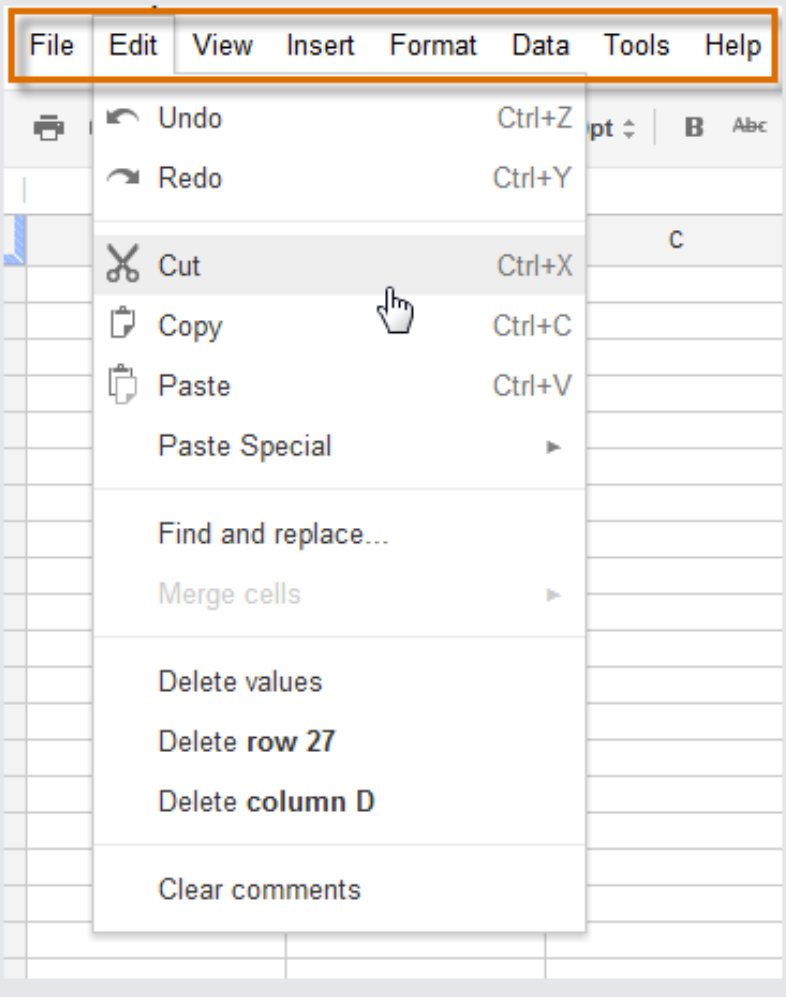


# Spreadsheets

## Tools you can use in Google Sheets

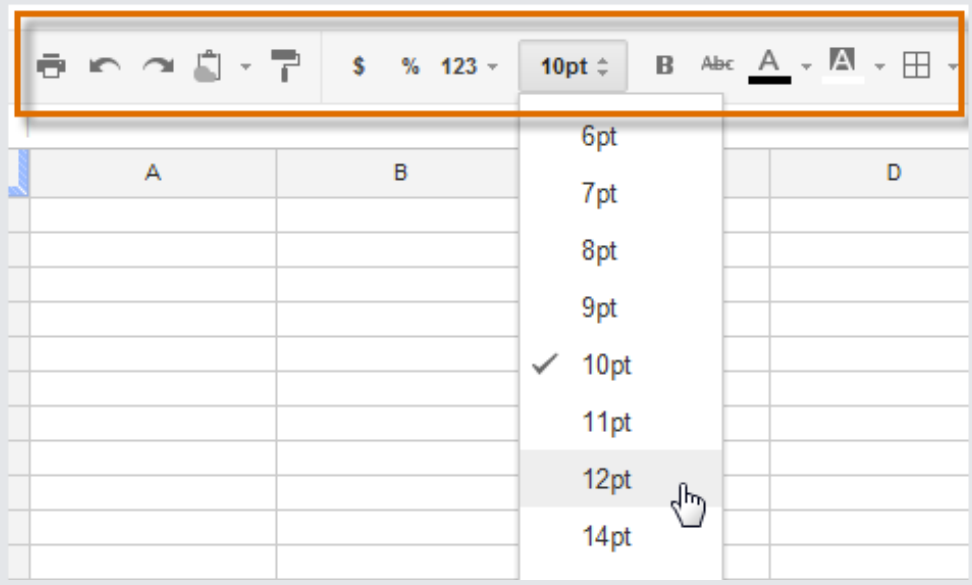
### Toolbar Menu

You can use the toolbar menu options to edit and modify your spreadsheet in various ways. Click a menu and select the desired action from the drop-down list.



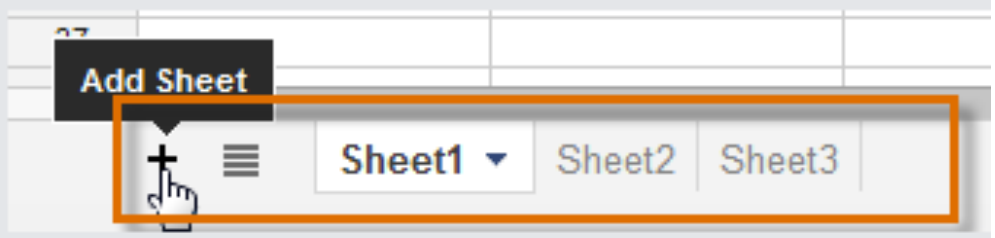

### Shortcut Toolbar

This toolbar provides convenient shortcut buttons for formatting the data in your spreadsheet, like font size, text alignment, and text color.

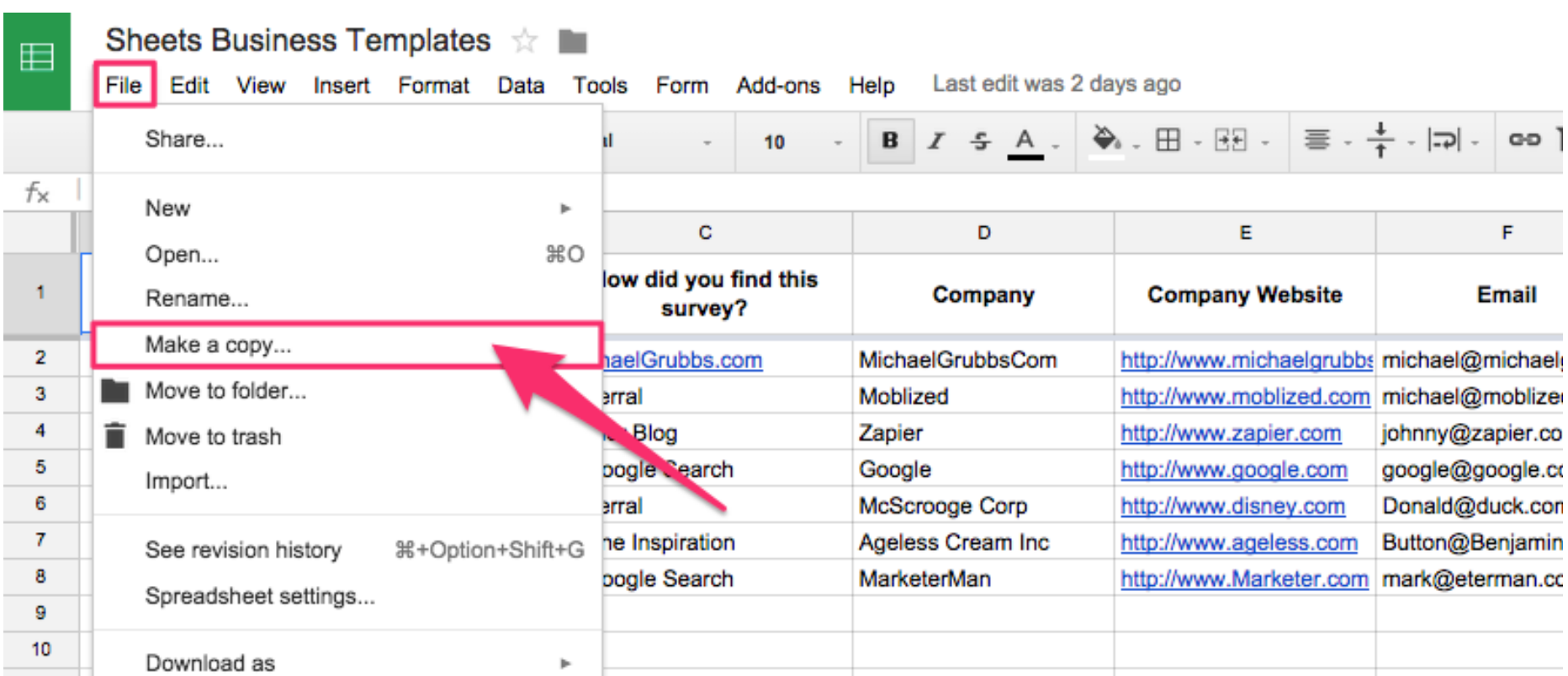



### Sheets Toolbar

Every spreadsheet can have multiple sheets. Select the sheet tabs to navigate among sheets, and click the Add Sheet + command to add a new sheet.




## You can easily make copies of Google Sheets to work on!



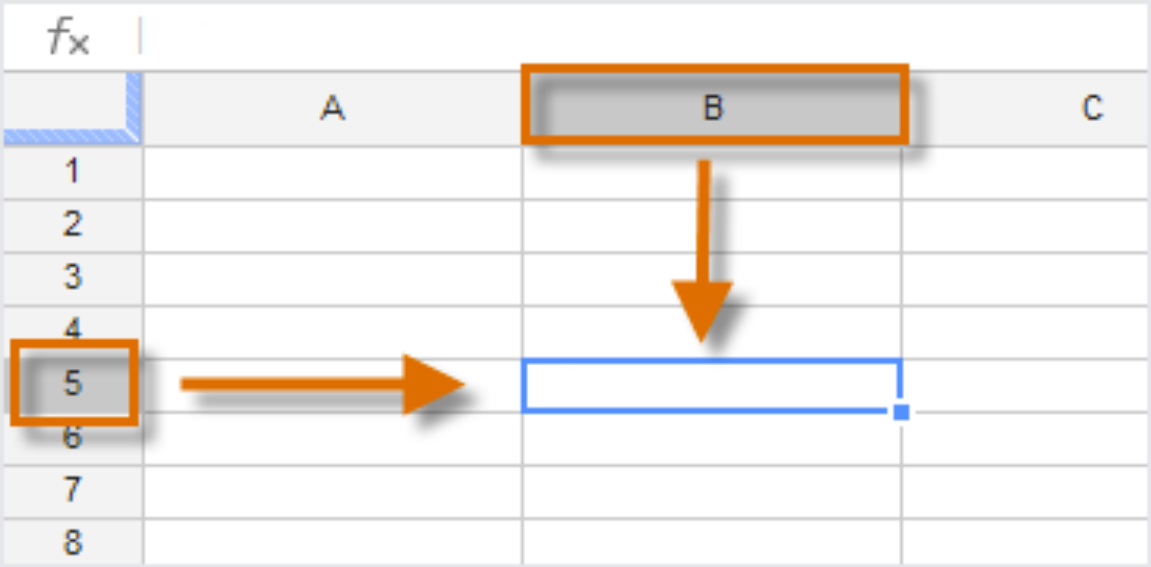
# Cell Basics

## Cell

Each rectangle in a spreadsheet is called a cell.

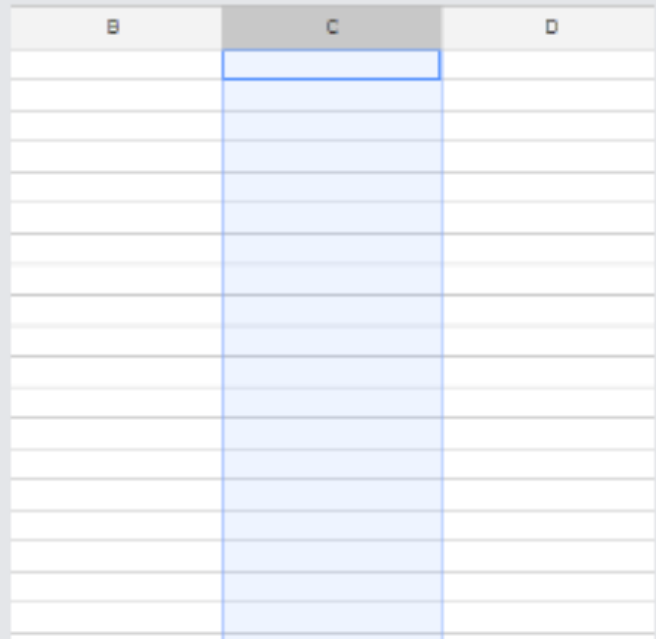
A cell is the intersection of a row and a column.

Click to select a cell. Cell B5 is selected in this example.



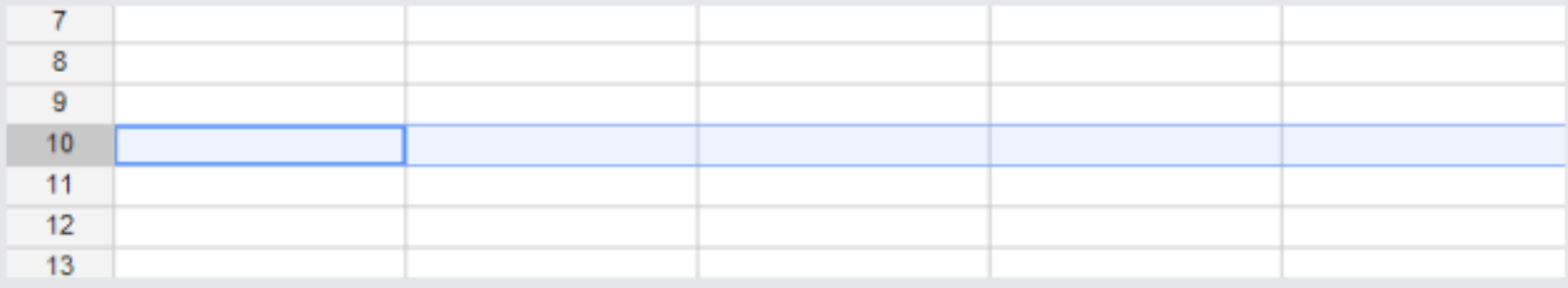

## Column

A column is a group of cells that runs vertically from top to bottom. Columns are identified by letters. Column C is selected in this example.




## Row

A row is a group of cells that runs horizontally from side to side. Rows are identified by numbers. Row 10 is selected in this example.




Every spreadsheet is made up of thousands of rectangles, which are called cells. A cell is the intersection of a row and a column. Columns are identified by letters (A, B, C), while rows are identified by numbers (1, 2, 3).

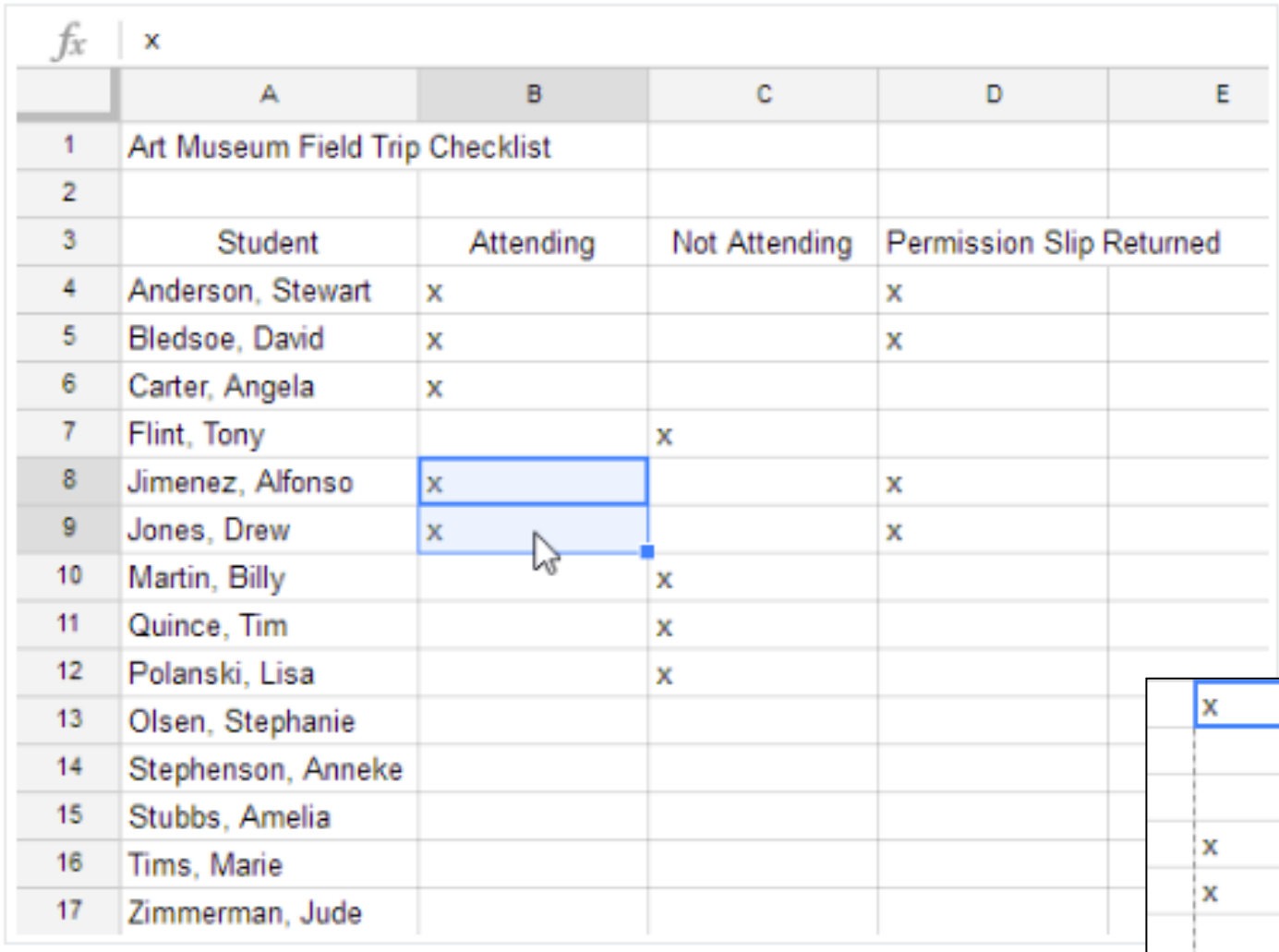
Each cell has its own name—or cell address—based on its column and row. In this example, the selected cell intersects column C and row 10, so the cell address is C10. Note that a cell's column and row headings become darker when the cell is selected.

# Cell Basics

## To copy and paste cells:

It's easy to copy content that is already entered into your spreadsheet and paste this content into other cells.

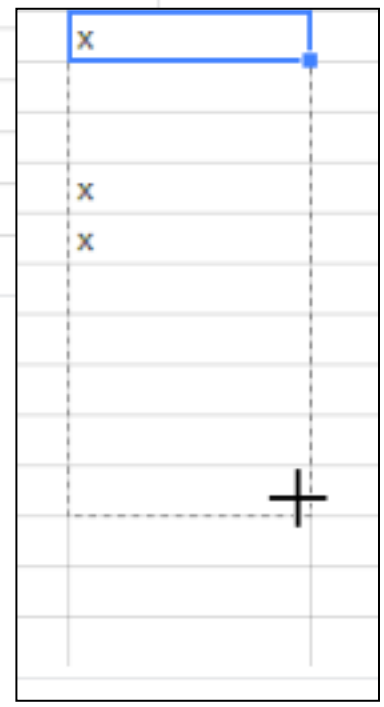
1. Select the cells you want to copy.
2. Press Ctrl + C (Windows) or Command-C (Mac) on your keyboard to copy the cells.



| | A | B | C | D | E |
|---|---|---|---|---|---|
| 1 | Art Museum Field Trip Checklist | | | | |
| 2 | | | | | |
| 3 | Student | Attending | Not Attending | Permission Slip Returned | |
| 4 | Anderson, Stewart | x | | x | |
| 5 | Bledsoe, David | x | | x | |
| 6 | Carter, Angela | x | | | |
| 7 | Flint, Tony | | x | | |
| 8 | Jimenez, Alfonso | x | | x | |
| 9 | Jones, Drew | x | | x | |
| 10 | Martin, Billy | | x | | |
| 11 | Quince, Tim | | x | | |
| 12 | Polanski, Lisa | | x | | |
| 13 | Olsen, Stephanie | | | | |
| 14 | Stephenson, Anneke | | | | |
| 15 | Stubbs, Amelia | | | | |
| 16 | Tims, Marie | | | | |
| 17 | Zimmerman, Jude | | | | |

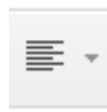
3. Click and drag the fill handle over the cells you want to fill. A dotted black line will appear around the cells that will be filled.

4. Release the mouse to fill the selected cells.




After you have added a lot of content to a spreadsheet, it can sometimes be difficult to view and read all of your information easily. Formatting allows you to customize the look and feel of your spreadsheet, making it easier to view and understand.

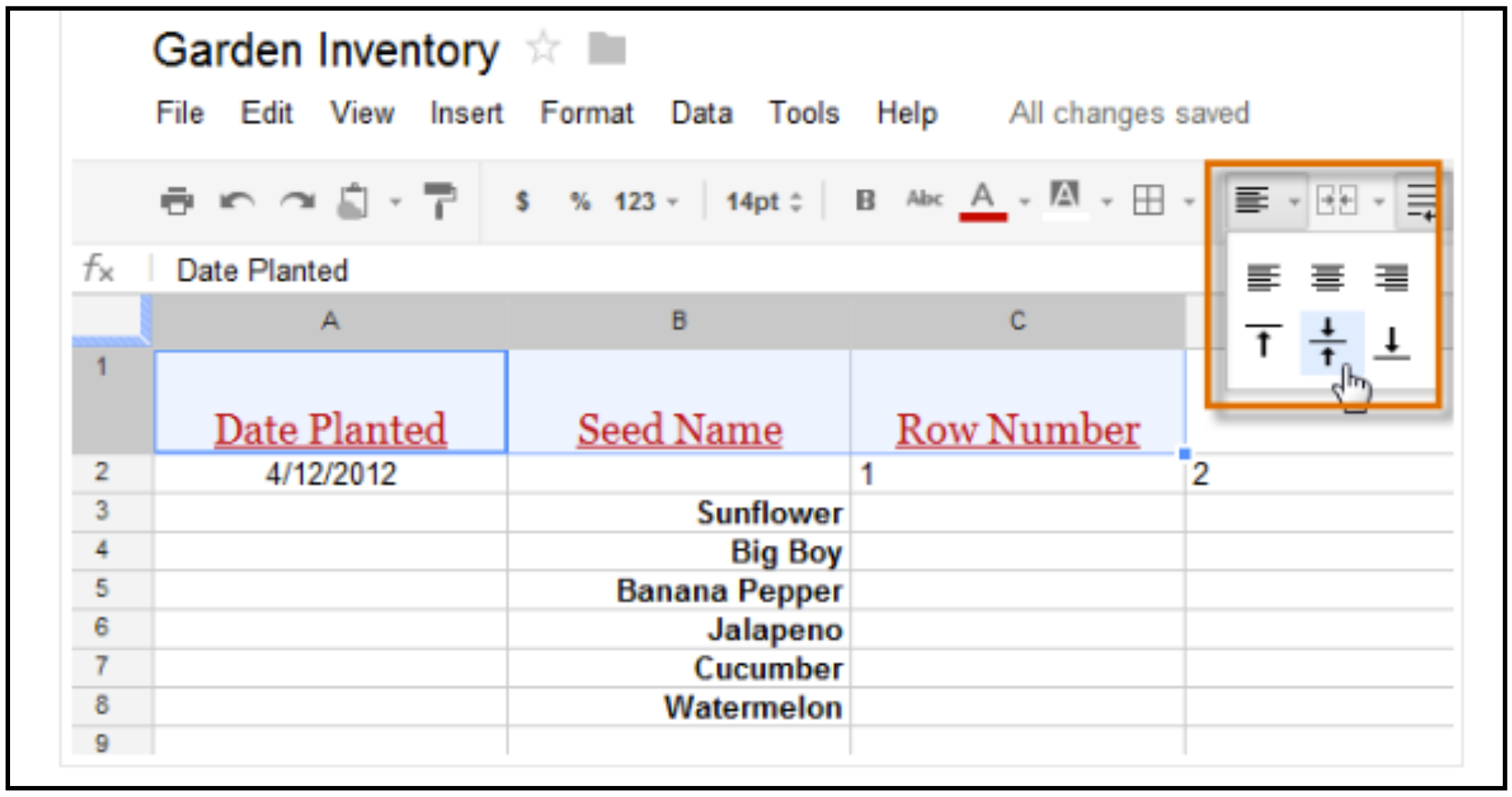
Like Google Docs and other word processors, you can change a font's size, style, color, boldness, and alignment.


You can also modify the vertical alignment of the text (not just the horizontal 

# Cell Formatting

## Vertical alignment

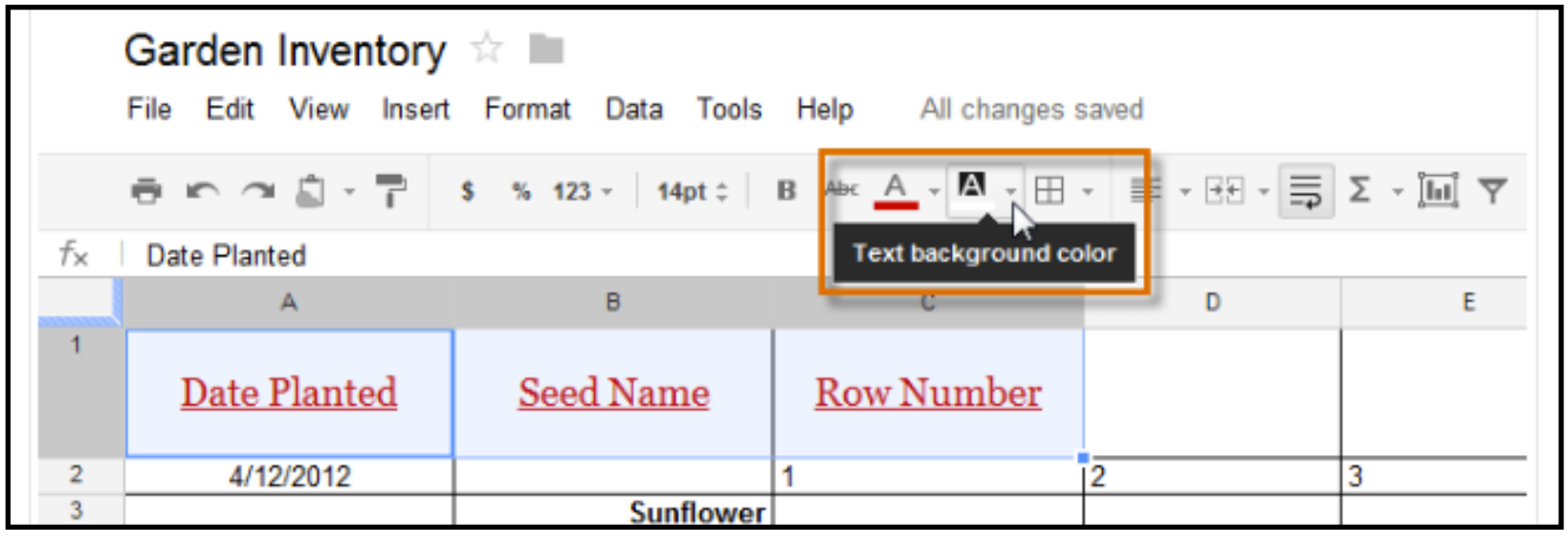
1. Select the text you want to modify, then click the Align button in the shortcut toolbar.
2. Choose the desired alignment from the drop-down menu.
    1. Top align: Aligns content to the top border of the cell.
    2. Center align: Aligns content an equal distance from the top and bottom borders of the cell.
    3. Bottom align: Aligns content to the bottom border of the cell.




## Change text background color:

You can change the background color of any cell, which is known as the text background color.

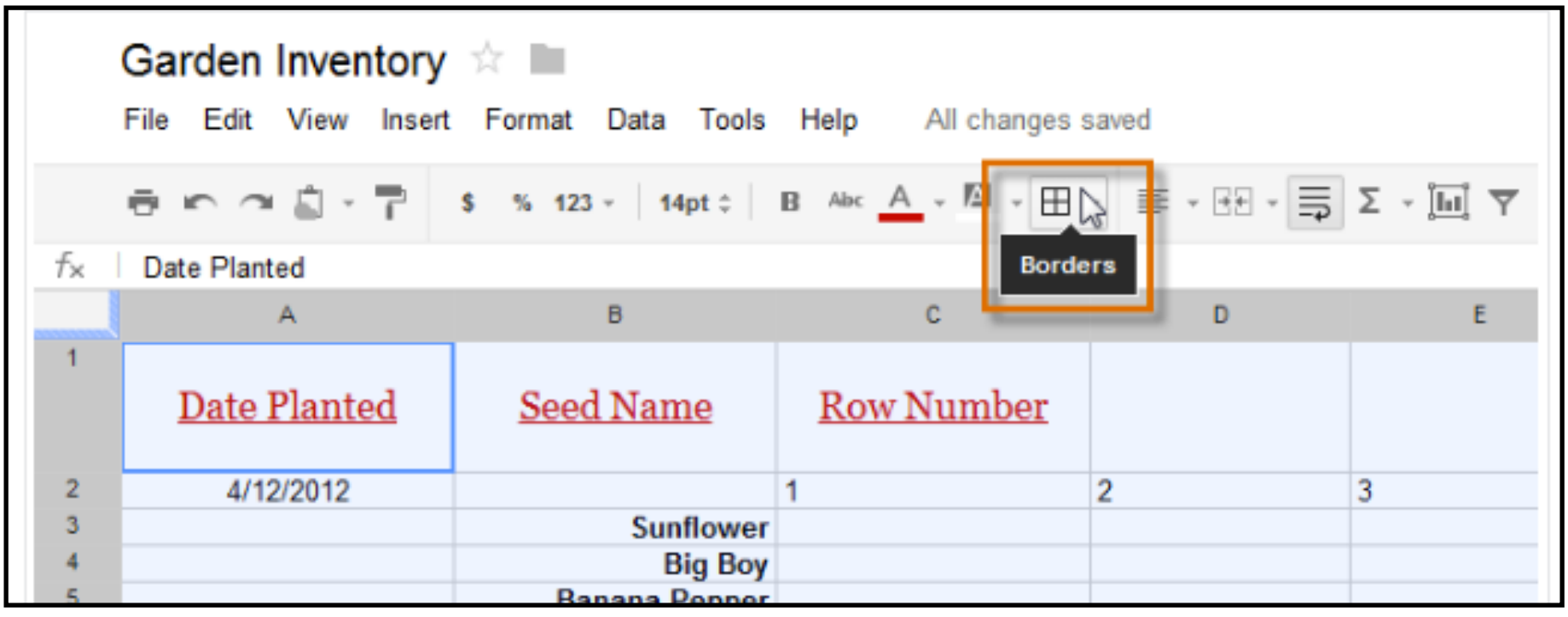
1. Select the cell or cells you wish to modify.
2. Locate and select the Fill button from the shortcut toolbar.
3. Select a color from the drop-down menu.



# Cell Formatting

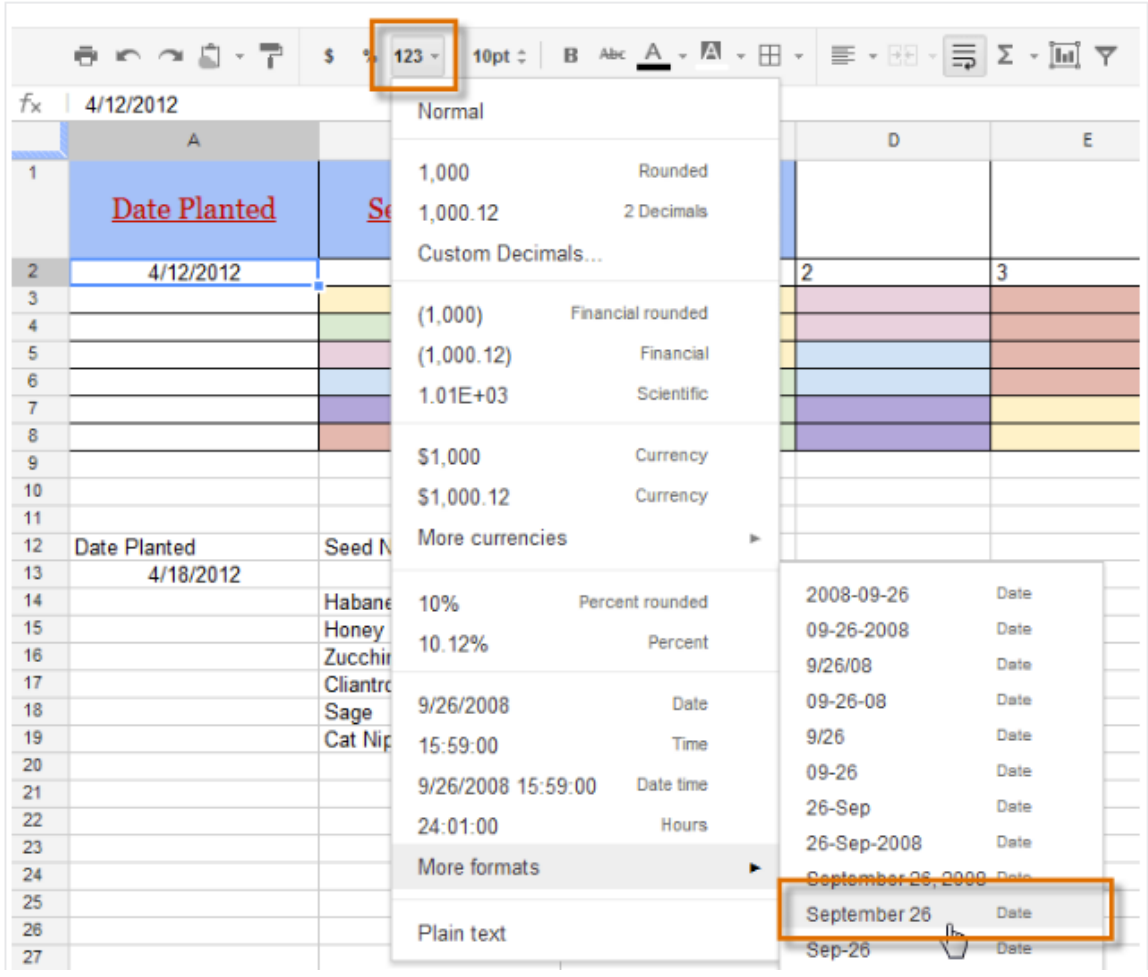
## To add cell borders:

1. Select the cell or cells you wish to modify.
2. Locate and select the Borders button from the shortcut toolbar.
3. Choose the desired border options. “All” is often a popular choice.




## To apply number formatting:

1. Select the cell or cells you wish to modify.
2. Locate and select the Number Formatting button from the shortcut toolbar.
3. A drop-down menu will appear with various number formatting options.
4. Select the desired formatting.




This is very helpful when you are working with a budget or using dates. Google sheets will often apply number formatting without you telling it to. If this formatting is incorrect (ie, it is displaying a number as a date instead of a plain number), you can always use this menu to change it back.

# Spreadsheet Formulas

## Creating simple formulas

A convenient and time-saving feature of Google Sheets is its ability to add, subtract, multiply, and divide numerical information for you. Google Sheets uses mathematical expressions called **formulas** that make handling these calculations easy. Most of the time, you will be using a cell's address in the formula. This is called using a cell reference. The advantage of using cell references is that you can change a value in a referenced cell and the formula will automatically recalculate. Using cell references in your formulas will make sure the values in your formulas are accurate.

## Mathematical operators

Google Sheets uses standard operators for formulas: a plus sign for addition (+), minus sign for subtraction (-), asterisk for multiplication (*), forward slash for division (/), and caret (^) for exponents.

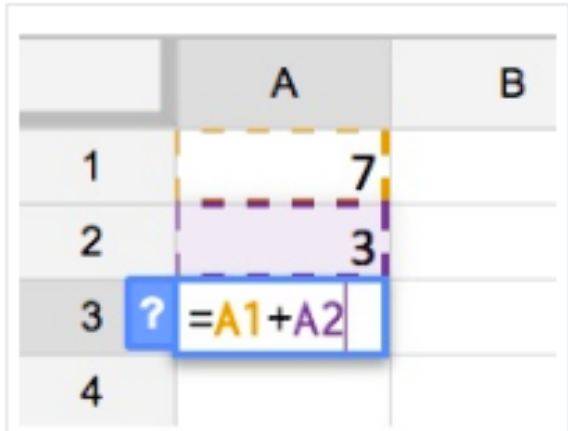
All formulas must begin with an equals sign (=). This is because the cell contains—or is equal to—the formula and the value it calculates.

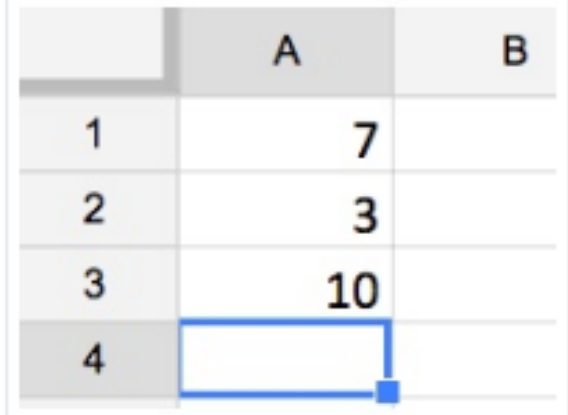
## Using cell references

When a formula contains a cell address, it is using a **cell reference**. Creating a formula with cell references is useful because you can update the numerical values in cells without having to rewrite the formula.

By combining a mathematical operator with cell references, you can create a variety of simple formulas in Google Sheets. Formulas can also include a combination of a cell reference and a number.

| | |
|---|---|
| =A1+A2 | Adds cells A1 and A2 |
| =C4-3 | Subtracts 3 from cell C4 |
| =E7/J4 | Divides cell E7 by J4 |



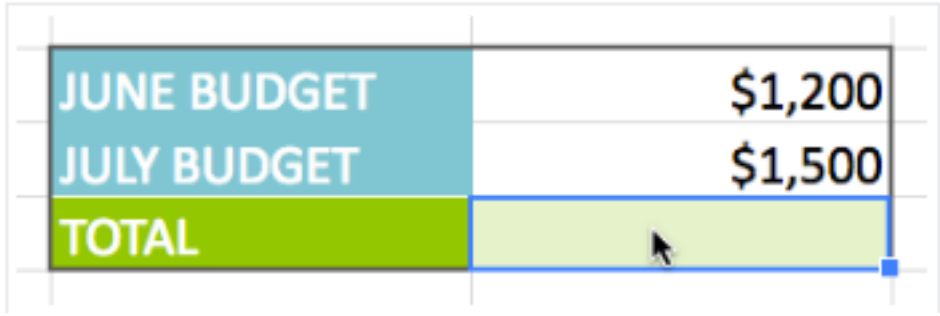




Google Sheets will not always tell you if your formula contains an error, so it's up to you to check all of your formulas.

# Spreadsheet Formulas

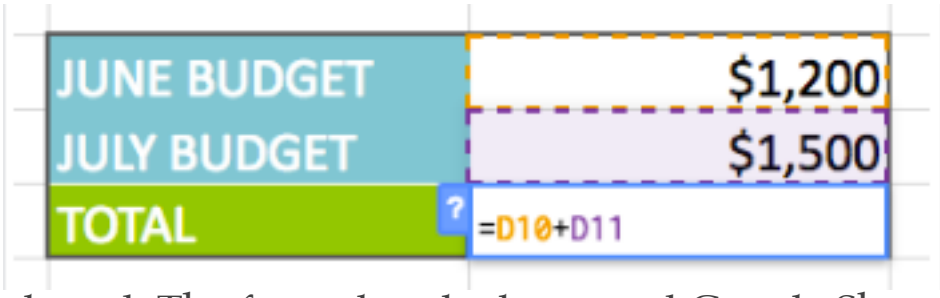
## Creating formulas

1. Select the cell that will display the calculated value.

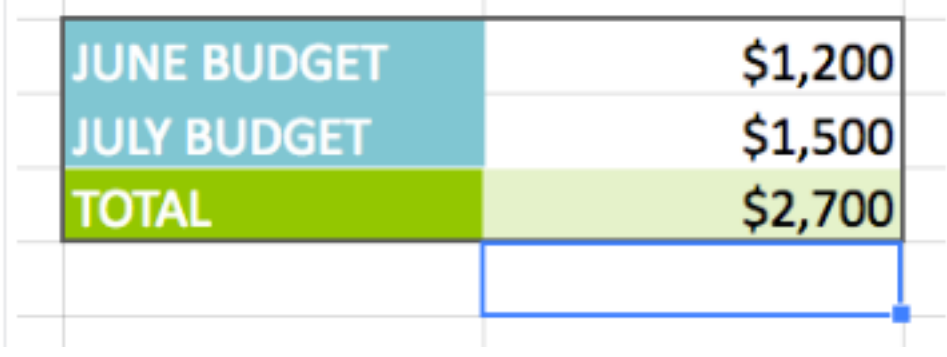



2. Type the equals sign (=).
3. Type the cell address of the cell you want to reference first in the formula. A dotted border will appear around the cell being referenced.


4. Type the operator you want to use. For example, type the addition sign (+).
5. Type the cell address of the cell you want to reference second in the formula.




6. Press the Enter key on your keyboard. The formula calculates, and Google Sheets displays the result.




To see how the formula recalculates, try changing the value in either cell. The formula automatically displays the new value. Rather than type cell addresses, you can point and click the cells you want to include in your formula. To edit a formula, double-click the cell containing the formula you want to edit. The formula will be displayed in the cell. Make the desired edits to the formula and press the Enter key on your keyboard. The formula recalculates, and the new value displays in the cell.

# Spreadsheet Formulas

## Complex Formulas

More complex formulas can contain several mathematical operators, such as 5+2*8. When there's more than one operation in a formula, the order of operations tells Google Sheets which operation to calculate first. To write formulas that will give you the correct answer, you'll need to understand the order of operations.

### Order of operations

Google Sheets calculates formulas based on the following order of operations:

1. Operations enclosed in **parentheses**
2. **Exponential** calculations (3^2, for example)
3. **Multiplication** and **division**, whichever comes first
4. **Addition** and **subtraction**, whichever comes first

It's especially important to follow the order of operations when creating a formula. Otherwise, Google Sheets won't calculate the results accurately.

P
E
M
D
A
S

**How would you solve the following equation?**

$$x = 10 + (6-3)/2^2*4-1$$

## Example

| MENU ITEM | UNIT PRICE | QUANTITY | LINE TOTAL |
|---|---|---|---|
| Tamales: Carnitas | $2.29 | 20 | $45.80 |
| Tamales: Vegetable | $2.29 | 30 | $68.70 |
| Empanadas: Nutella & Banana | $3.99 | 40 | $159.60 |
| | | TAX | =(D3+D4+D5)*0.055 |
| | | TOTAL | |

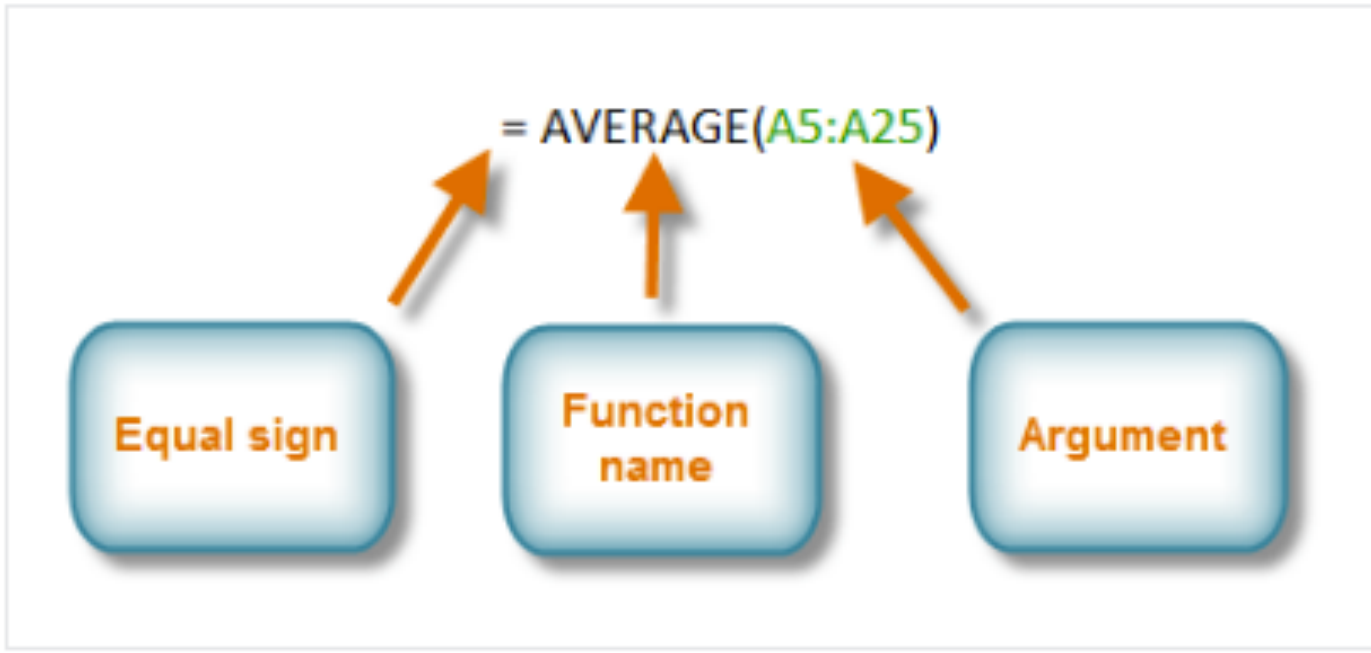
Google Sheets follows the order of operations and first adds the values inside the parentheses: (D3+D4+D5) = $274.10. Then it multiplies by the tax rate: $274.10*0.055. The result will show that the tax is $15.08.

Write out the order of operations as well as what this equation would look like below:

# Spreadsheet Functions

Google Sheets provides a variety of common functions that can be useful for quickly finding the sum, average, count, maximum value, and minimum value of a range of cells. It also provides access to hundreds of functions for financial, statistical, and other complex calculations.

A **function** is a predefined formula that performs calculations using specific values in a particular order. One of the key benefits of functions is that they can save you time because you do not have to write the entire formula yourself. Google Sheets has several functions readily available and provides access to hundreds of other functions to assist with your calculations.




## Types of Functions

**SUM**: The SUM function adds all of the values of the selected cells in the argument. This function is useful for quickly adding values in a range of cells.

**AVERAGE**: The AVERAGE function will find the average of the values included in the argument. It calculates the sum of the cells and then divides the sum by the number of cells in the argument.

**COUNT**: Using the COUNT function will display the number of cells that have been included in the argument. This function is useful for quickly counting items on the sheet.

**MAX**: The MAX function displays the highest cell value included in the argument.

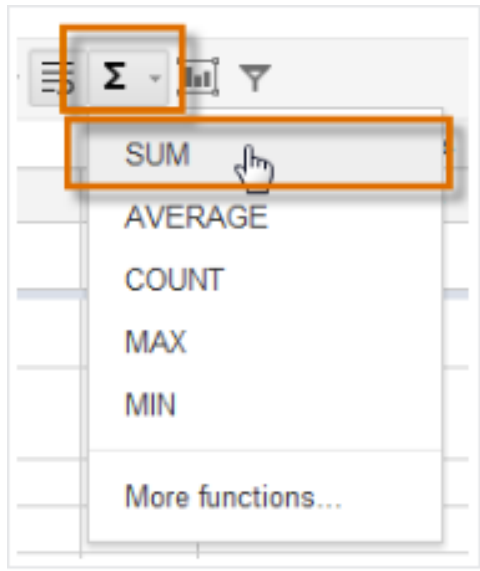
**MIN**: The MIN function displays the lowest cell value included in the argument.

Think of a function like a washing machine. You put in different inputs (like light cloths or dark clothes), tell the function what you want to do with the input (like wash with detergent, or slow cycle), and then get an output (your clean clothes!).

# Spreadsheet Functions

## Creating a Function

The Function button allows you to automatically return the results for a range of cells. The answer will display in the cell below the range.



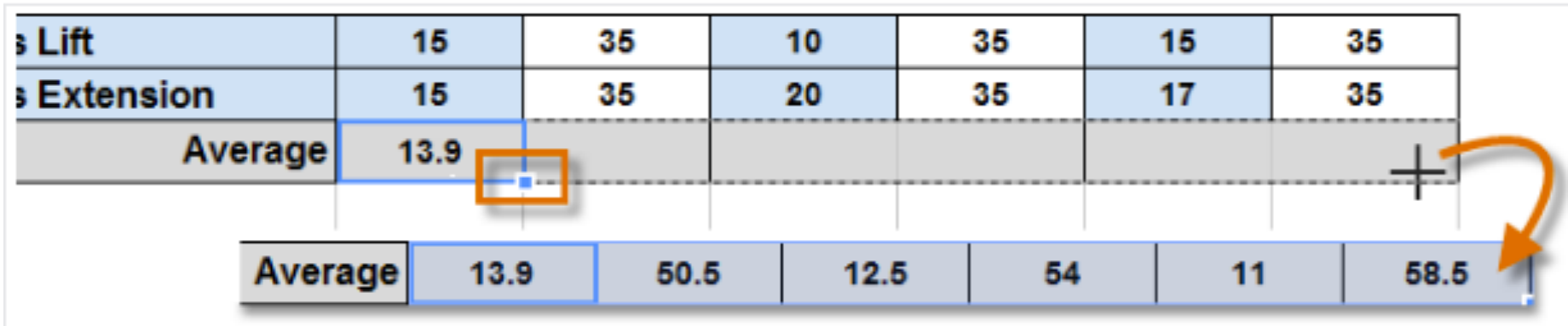

1. Select the range of cells you want to include in the argument.

2. Click the Functions button, then select the desired function from the drop-down menu (SUM, for example). In the cell directly below the selected cells, the function appears. Press the Enter key on your keyboard, and the answer appears.

| | C | D | E |
|---|---|---|---|
| 1 | | | |
| 19 | Running Log | | |
| 20 | Date | Distance (miles) | Time (hrs:mins) |
| 21 | 6/25 | 3.50 | 0:45 |
| 22 | 6/26 | 4.00 | 0:44 |
| 23 | 6/27 | 4.25 | 0:42 |
| 24 | 6/29 | 5.00 | 0:44 |
| 25 | 6/30 | 5.00 | 0:45 |
| 26 | 7/2 | 3.80 | 0:44 |
| 27 | 7/3 | 4.50 | 0:30 |
| 28 | Total | =SUM(D21:D27) | |
| 29 | | | |

| | C | D | E |
|---|---|---|---|
| 1 | | | |
| 19 | Running Log | | |
| 20 | Date | Distance (miles) | Time (hrs:mins) |
| 21 | 6/25 | 3.50 | 0:45 |
| 22 | 6/26 | 4.00 | 0:44 |
| 23 | 6/27 | 4.25 | 0:42 |
| 24 | 6/29 | 5.00 | 0:44 |
| 25 | 6/30 | 5.00 | 0:45 |
| 26 | 7/2 | 3.80 | 0:44 |
| 27 | 7/3 | 4.50 | 0:30 |
| 28 | Total | 30.05 | |
| 29 | | | |

Similar to formulas, functions can be copied to adjacent cells. Select the cell that contains the function, and the fill handle displays. Click, hold, and drag the fill handle over the cells you want to fill.



# Spreadsheet Sorting

## Sorting

Google Sheets allows you to analyze and work with a significant amount of data. As you add more content to your spreadsheet, knowing how to locate specific information in it becomes important. Google Sheets allows you reorganize your data by sorting and applying filters to it. You can sort your data by arranging it alphabetically or numerically, or you can apply a filter to narrow down the data and hide some of it from view.

**Types of sorting: When sorting data, it's important to first decide if you want the sort to apply to the entire sheet or to a selection of cells.**

Sort sheet organizes all of the data in your spreadsheet by one column. Related information across each row is kept together when the sort is applied. In the image below, the Name column has been sorted to display client names in alphabetical order. Each client's address information has been kept with each corresponding name.

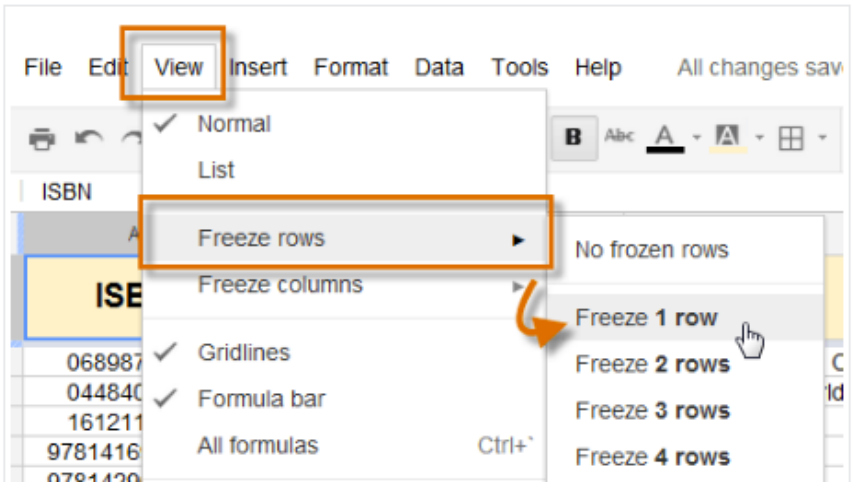
| | A | B | C |
|---|---|---|---|
| 1 | **Name** | **Address** | **City, State and Zip** |
| 2 | Cotton, Freda | 4996 Tennessee Ave | Southfield, MI 48034 |
| 3 | Machado, James | 4539 Harley Brook Ln | Salisbury, PA 15558 |
| 4 | Sanchez, Billy | 2381 Wildrose Ln | Southfield, MI 48075 |
| 5 | Schoolcraft, Rafael | 862 Browning Ln | Syracuse, NY 13221 |
| 6 | Ward, Monica | 1979 Davisson St | Indianapolis, IN 46225 |

Sort range sorts the data in a range of cells. When working with a sheet that contains several tables, you may want to sort the data of a single table. Sorting a range will not affect the data on the rest of the sheet, and it will keep related information across the row together.

# Spreadsheet Sorting

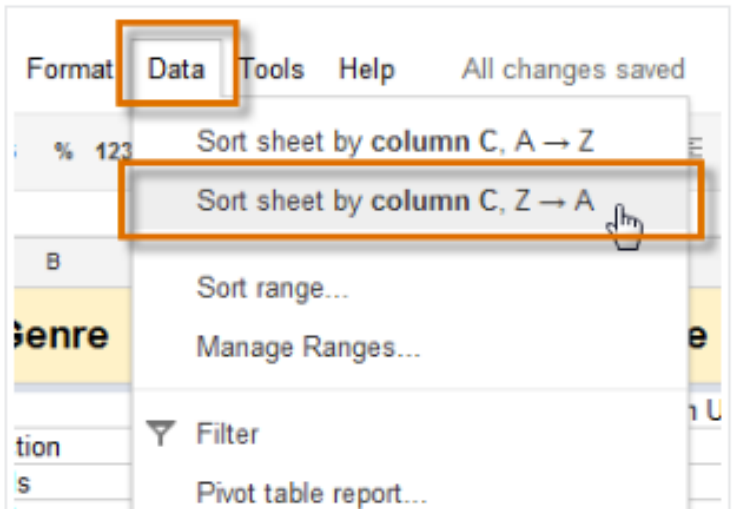
## To sort a sheet

Freeze the header row so the header labels will not be included in the sort. Click View and hover the mouse over Freeze rows. Select Freeze 1 row from the menu that appears.




The header row freezes. Decide which column will be sorted, then click a cell in the column.

Click Data and select Sort Sheet by column, A-Z (ascending) or Sort Sheet by column, Z-A (descending). The sheet will be sorted according to your selection.



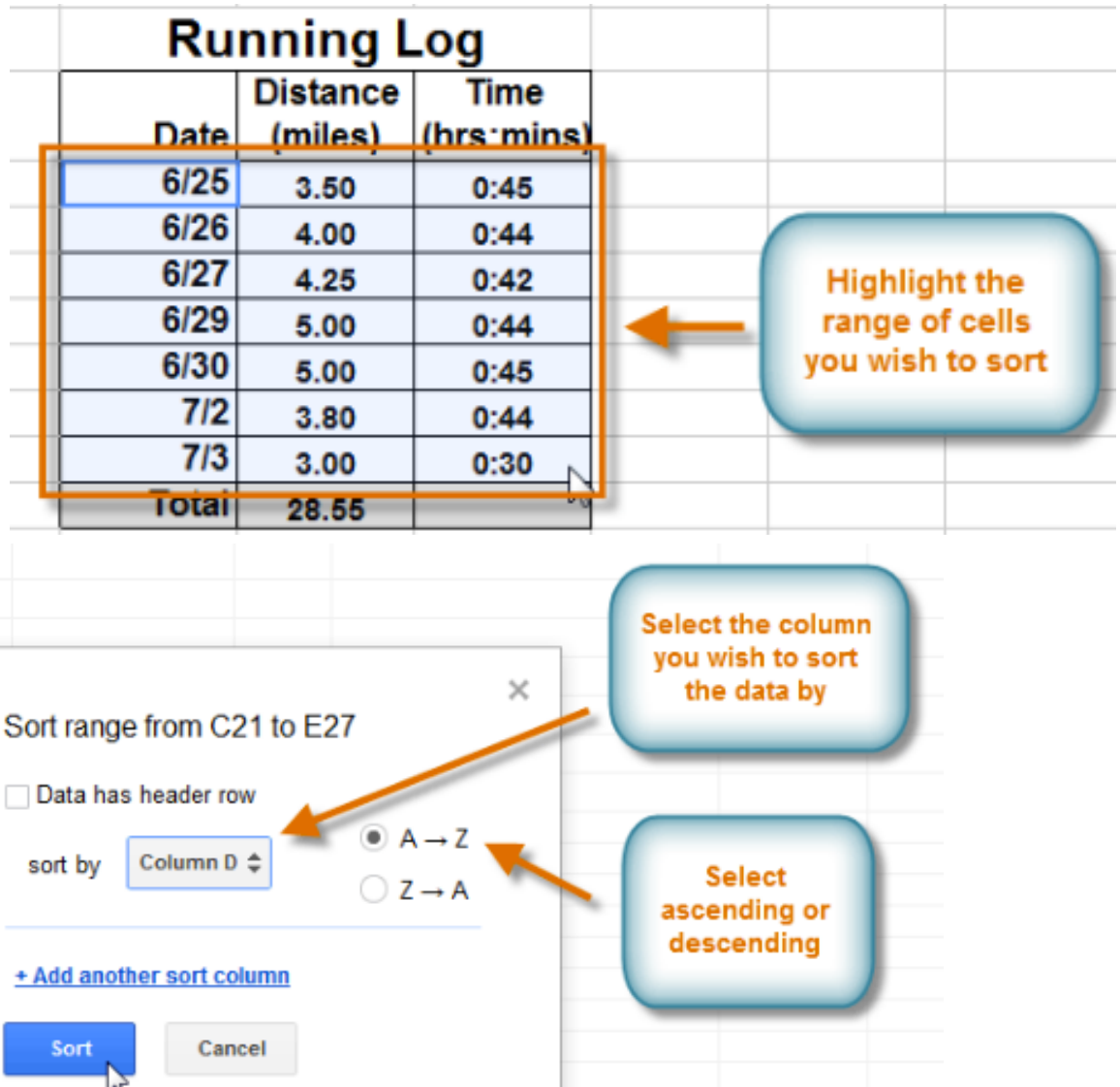

| B | C | D |
|---|---|---|
| **Genre** | **Loan Count** | **Title** |
| Fiction | 8 | The Adventures of Captain Under |
| Non-fiction | 8 | Two Trains Running |
| Animals | 7 | Ants |
| Animals | 7 | Chameleons |
| Nature | 7 | Volcano |
| Non-fiction | 6 | All Around the World |
| Fiction | 6 | Magic Tree House Collection |
| Nature | 5 | Fun with Nature |

## To sort a range

Highlight the range of cells you want to sort.

Click Data and select Sort range... from the drop-down menu. The Sorting dialog box appears. Select the desired column you want to sort by, then select ascending or descending.

Click Sort.

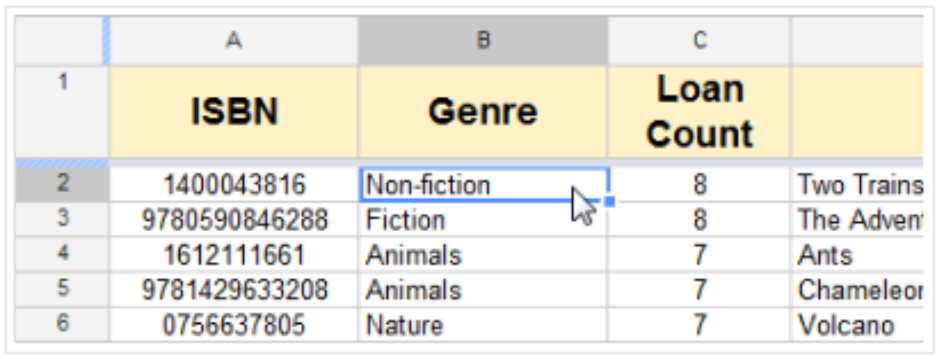


# Spreadsheet Filters

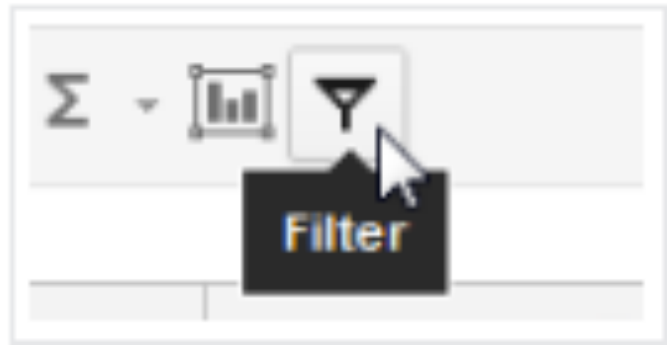
## Filters

Filters can be applied in many different ways to improve the performance of your worksheet. They are useful for displaying only the data that interests you. For example, you could apply a filter to a party guest list to view only the people who responded to the invitation, or sort the genres of a song list to display only rock-and-roll songs or classical music.

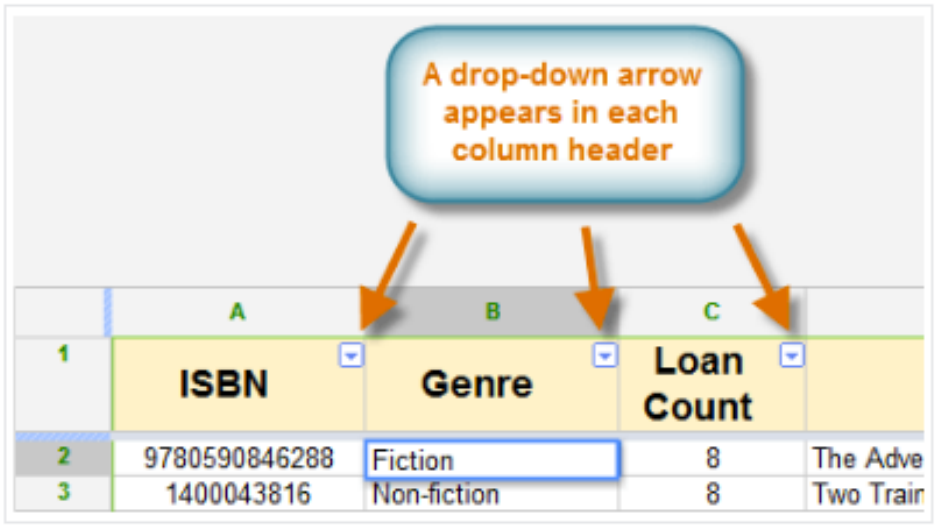
To create a filter: Click any cell that contains data, and then click the Filter button.

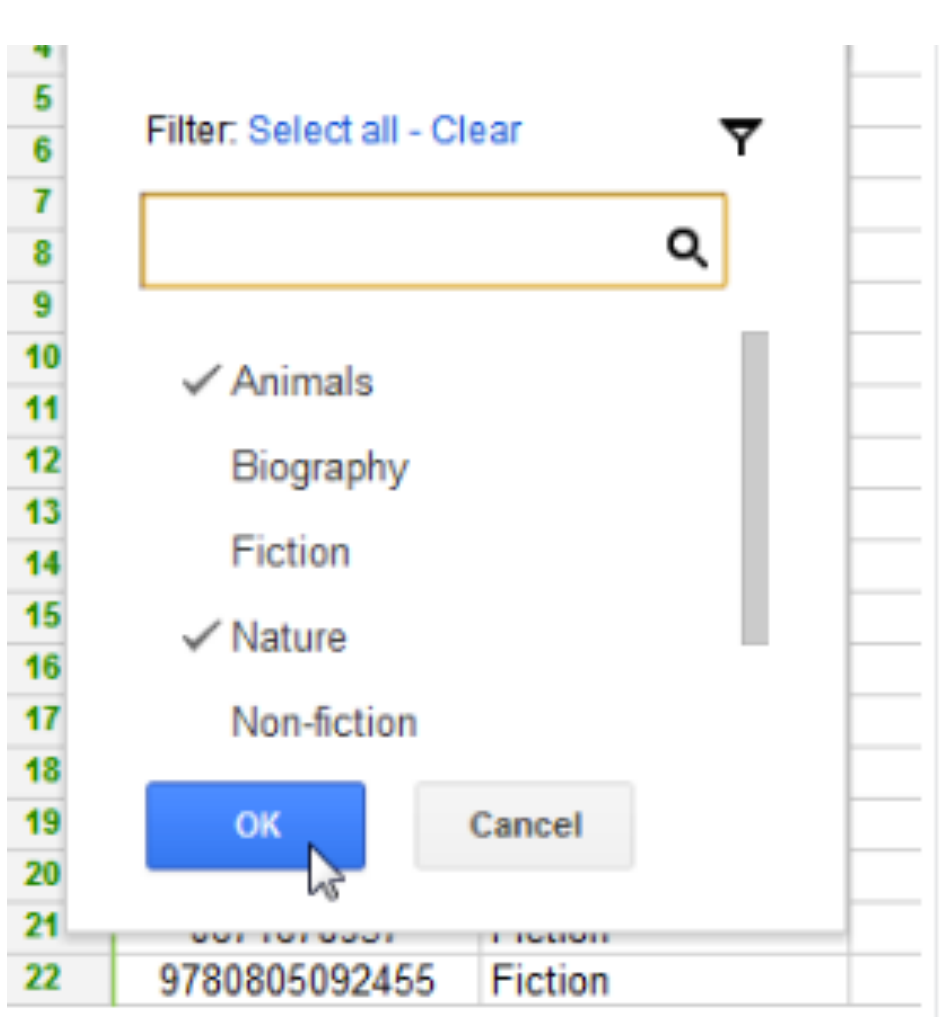


| | A | B | C | |
|---|---|---|---|---|
| 1 | ISBN | Genre | Loan Count | |
| 2 | 1400043816 | Non-fiction | 8 | Two Trains |
| 3 | 9780590846288 | Fiction | 8 | The Adven |
| 4 | 1612111661 | Animals | 7 | Ants |
| 5 | 9781429633208 | Animals | 7 | Chameleor |
| 6 | 0756637805 | Nature | 7 | Volcano |




A drop-down arrow appears in each column header.

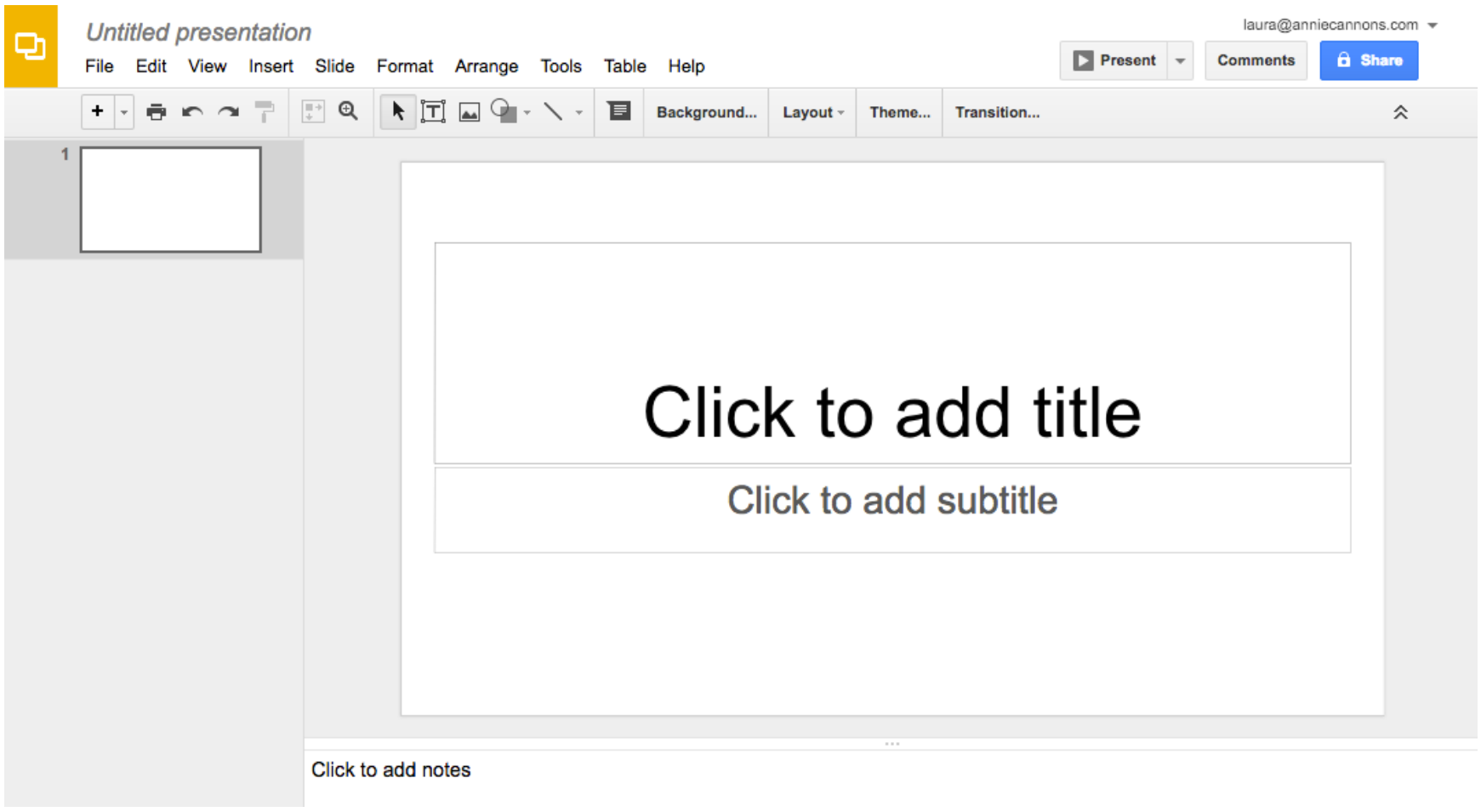



Decide which column you will apply a filter to. Click the column's drop-down arrow, and a filtering options box appears. You will see the values from that column as a checklist inside the box. Select the data you want to display on the spreadsheet. In this example, we'll select Animals and Nature. Click OK. The sheet will be filtered according to your data selection. A filter symbol  appears in the filtered column's header cell.

# Google Slides

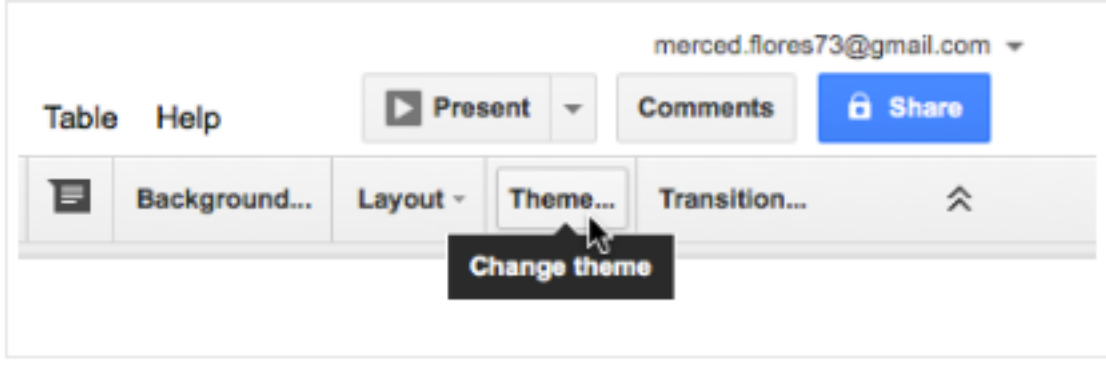
Google Slides allows you to create dynamic slide presentations. These presentations can include animation, narration, images, videos, and much more. It is important to know about the Google Slides interface and the basics of setting up your document, including the menu and shortcut toolbars, zoom settings, and choosing a theme.




## Choose a Theme

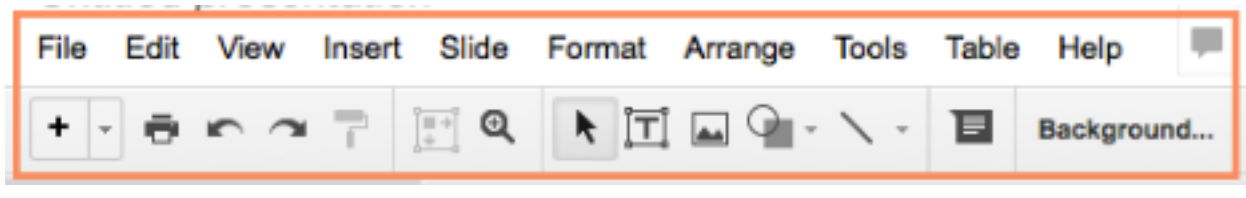
When you first create a new presentation, Google Slides will prompt you to choose a theme. Themes give you a quick and easy way to change the overall design of your presentation. Each theme has a unique combination of colors, fonts, and slide layouts. Select a theme from the panel on the right side of the window, and it will be applied to your entire presentation.

You can choose from a variety of new themes at any time, giving your entire presentation a consistent, professional look. If you want to change your theme, you can open the Themes panel again by clicking the Theme command on the shortcut toolbar.




## Main Menu

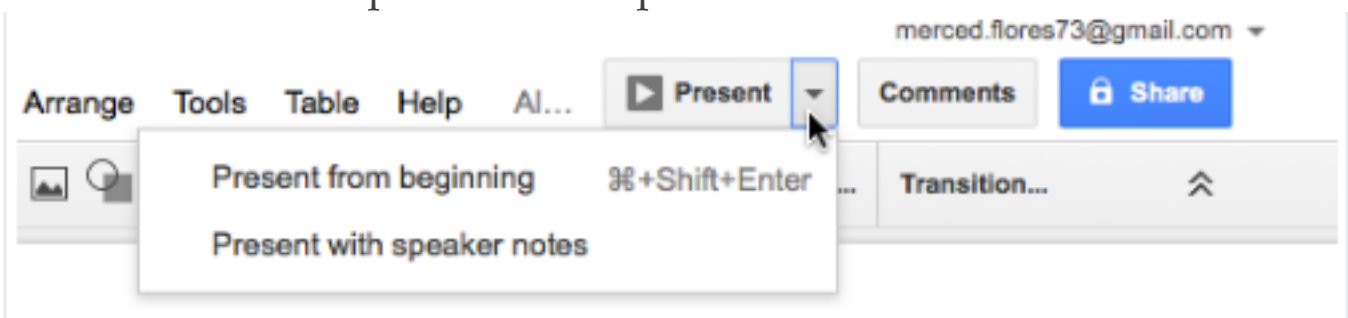
Google Slides has a standard menu that let's you insert, format, and arrange your slides.



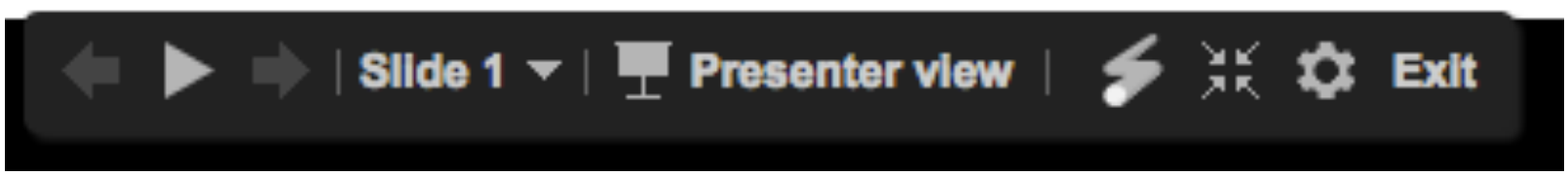
# Google Slides

## Presenting

When you are ready to show your presentation—or if you want to see what it will look like during a presentation—click the Present button to the right of the menus. You can also click the drop-down arrow for additional presentation options.




The presentation will appear in a maximized window. A navigation bar in the lower-left corner provides you with several options for displaying your presentation.




You can advance to the next slide by clicking your mouse or pressing the spacebar on your keyboard. Alternatively, you can use the arrow keys on your keyboard to move forward or backward through the presentation. This navigation bar also lets you activate laser pointers and use the Presenter View. The Presenter View allows you to see a timer, your notes, as well as the next slide that will be shown. You can also click the gear wheel to see more options.

Press the Esc key to exit presentation mode.

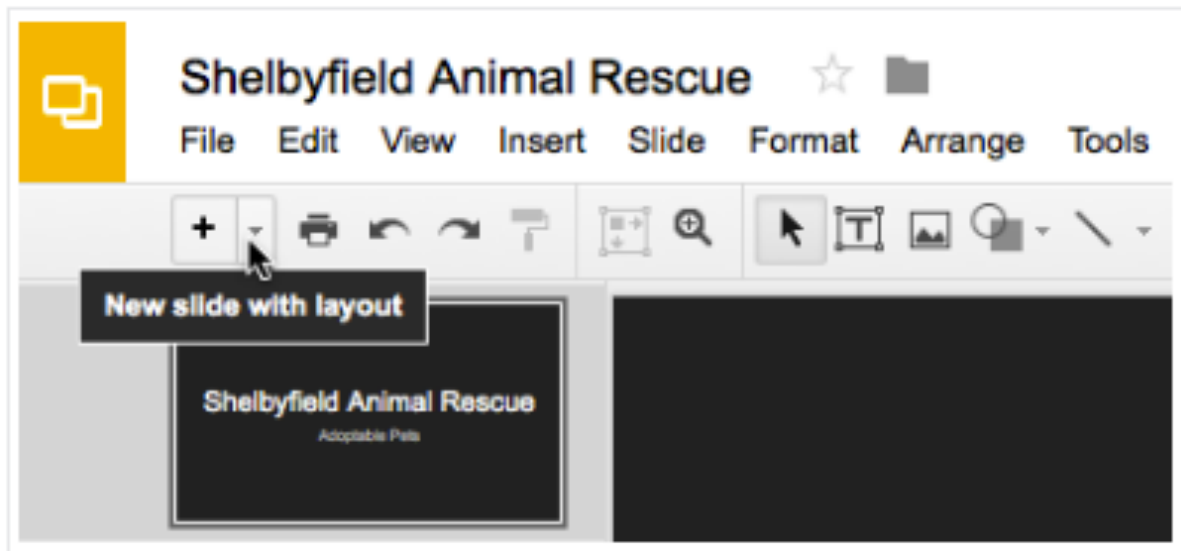
## Slide basics

Every Google Slides presentation is composed of a series of slides. To begin creating a slide show, you'll need to know the basics of working with slides.

When you insert a new slide, it will usually have placeholders to show you where text will be placed. Slides have different layouts for placeholders, depending on the type of information you want to include. Whenever you create a new slide, you'll need to choose a slide layout that fits your content.

Whenever you start a new presentation, it will contain one slide with the Title Slide layout. You can insert as many slides as you need from a variety of layouts.

Click the drop-down arrow next to the New slide command.



# Google Slides

## Slide basics

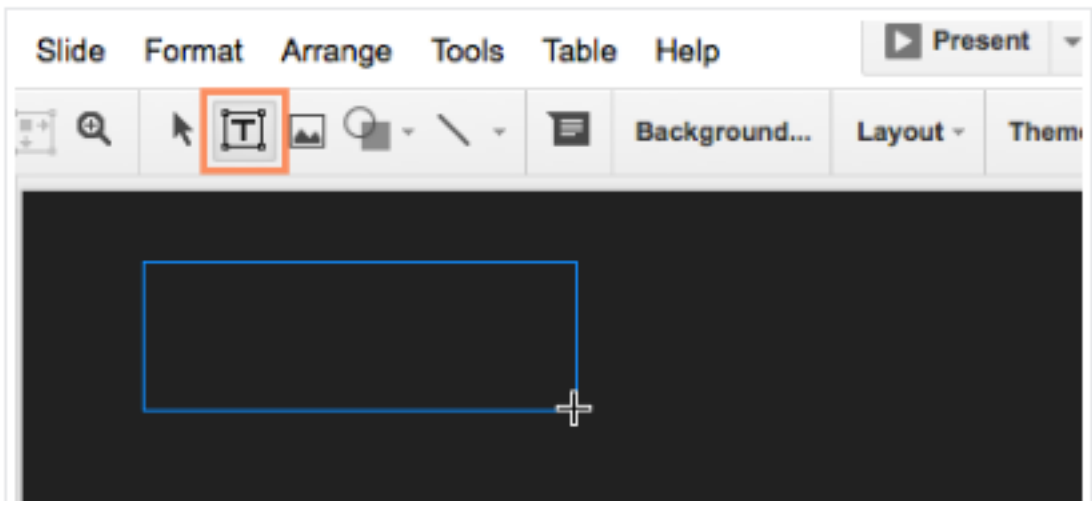
Choose the desired slide layout from the menu that appears. The Slide Navigation pane on the left side of the screen makes it easy to organize your slides. From there, you can duplicate slides, drag slides to rearrange, and delete slides in your presentation.

Sometimes you may find that a slide layout doesn't exactly fit your needs. For example, a layout might have too many—or too few—placeholders. You might also want to change how the placeholders are arranged on the slide. Fortunately, Google Slides makes it easy to adjust slide layouts as needed.

## Text basics

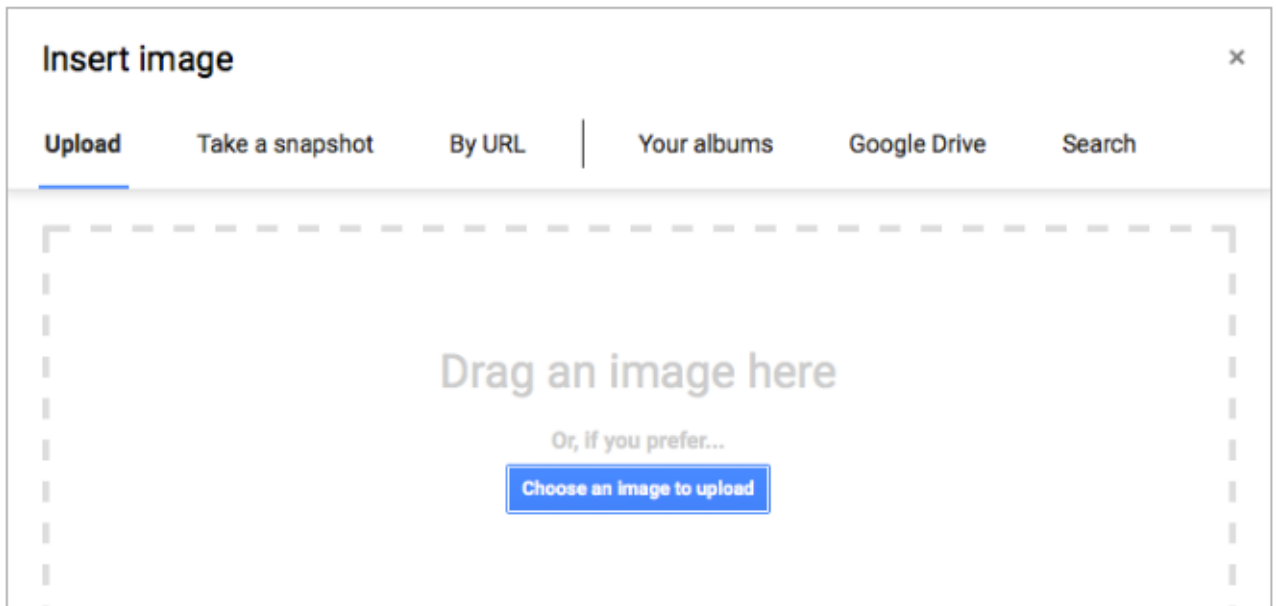
When you create a new slide, you can enter text in any of the placeholders on that slide. Just click the placeholder, and the insertion point should appear. Then you can type whatever you want.

You aren't confined to entering text only in the placeholders. You can also create a text box anywhere on the slide. To do this, click the text box command, then click and drag to draw the text box on the slide. Then you can click the text box and start typing.




## Inserting Images

You can insert a picture from a file on your computer onto any slide. Google Slides even includes tools for finding online pictures and adding screenshots to your presentation. To insert a picture, open the Insert menu, then select Image. The Insert image dialog box will appear. You can upload your own picture, take a screenshot, or find a picture online.



# Google Slides

## Formatting Images and Shapes

There are a variety of ways to format the pictures in your slide show. Google Slides has tools to resize and rotate the picture, crop the picture, adjust the image, and more.

**To crop an image:** Select the image you'd like to crop, then click the Crop command. Cropping handles will appear around the image. Click and drag one of the handles to crop the image. Make sure the mouse is right over the black cropping handle so you don't accidentally select a resizing handle. Click the Crop command again. The image will be cropped.

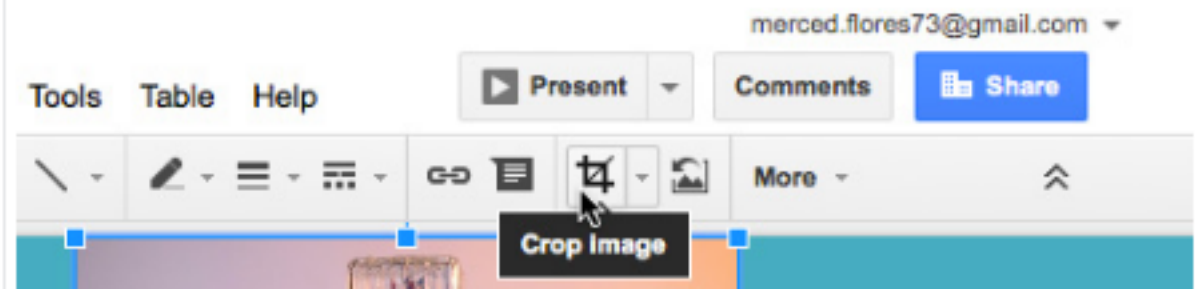
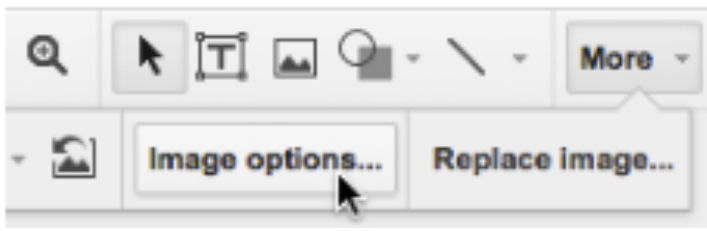
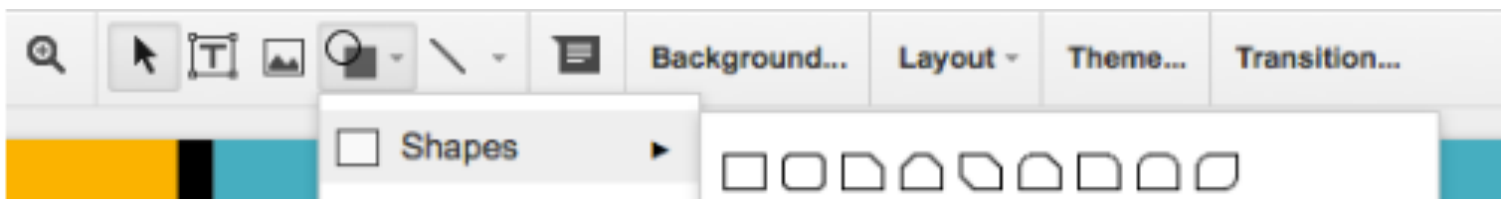



**Image options:** You can adjust the transparency, brightness, and contrast of an image, as well as recolor the image. To do this, select the image, then click Image options on the toolbar or in the Format menu. The Image Options pane will open.

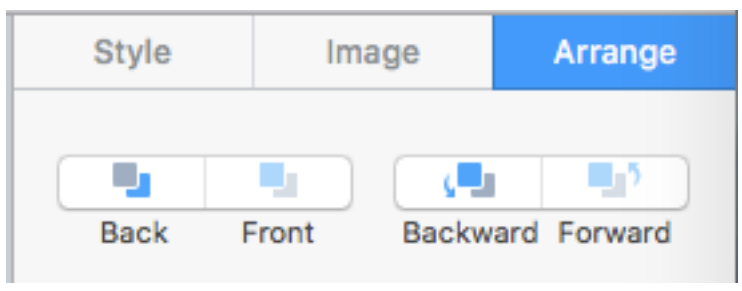



Shapes are a great way to make your presentations more interesting. Google Slides gives you a lot of different shapes to choose from, and they can be customized to suit your needs, allowing you to use your own color palette, preferences, and more.




**To insert a shape:** Click the Shape command on the toolbar to open the Shape menu. Select one of the categories, then select the desired shape. Some shapes have the option to change their dimensions and proportions. To adjust the proportion of a shape, select it, then click and drag the diamond handle.

You can arrange multiple overlapping objects using the Order commands.

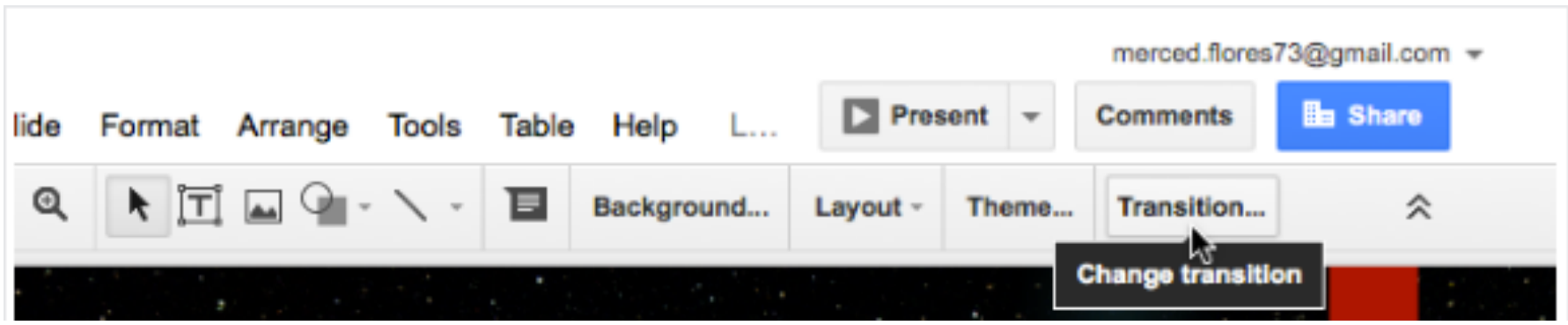


# Google Slides

## Transitions and Animations

Presentations don't have to be a series of static slides. You can add animations to objects on slides or transitions to entire slides. A transition can be as simple as fading to the next slide, or it can be a more flashy effect. Any object can be animated, making it move or fade in or out of the slide. The **Animations pane** will allow you to configure the transition and all animations for the current slide.

Select the desired slide, then click the Transition command on the toolbar.

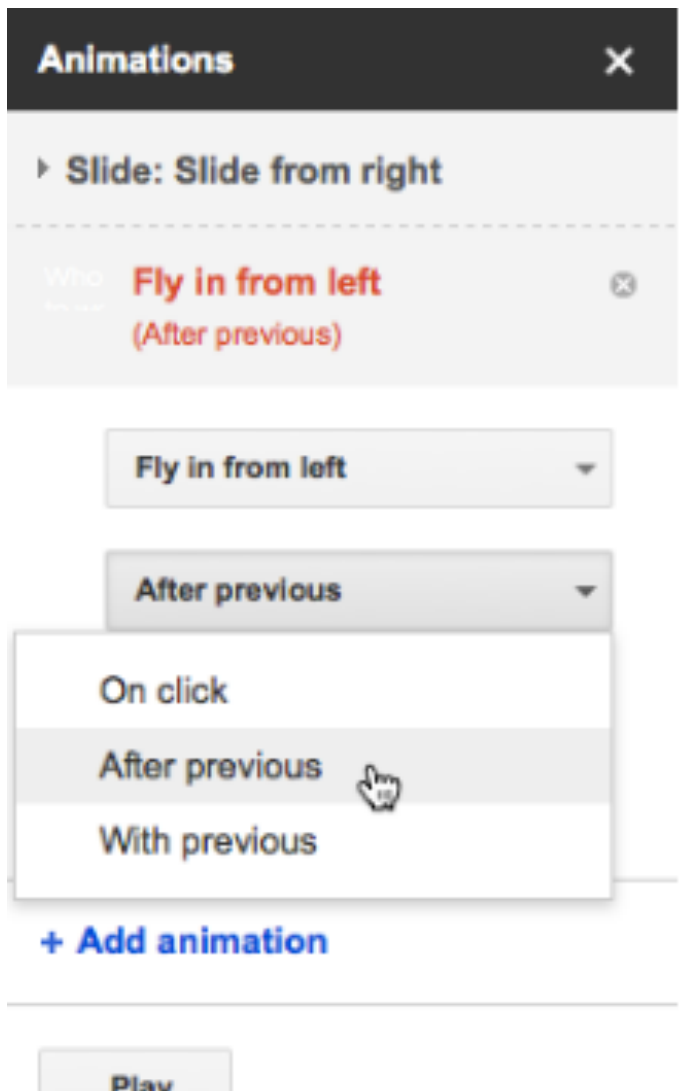



The Animations pane will appear. Open the drop-down menu at the top of the pane, then select a transition. The transition will be applied to the current slide. You also can adjust the speed of the transition or apply the same transition to all slides.

If the Animations pane is already open and you want to add more animations, you can select an object and click Add animation. You can also add multiple animations to one object.

By default, an effect starts playing when you click the mouse during a slide show. If you have multiple effects, you will need to click multiple times to start each effect individually. However, by changing the start option for each effect, you can have effects that automatically play after the previous effect or with the previous effect.

The best way to get better at adding animations is to practice yourself. Try creating blank slides that transition, and only add animations or transitions if it adds value to your presentation. You don't want them to be too distracting.



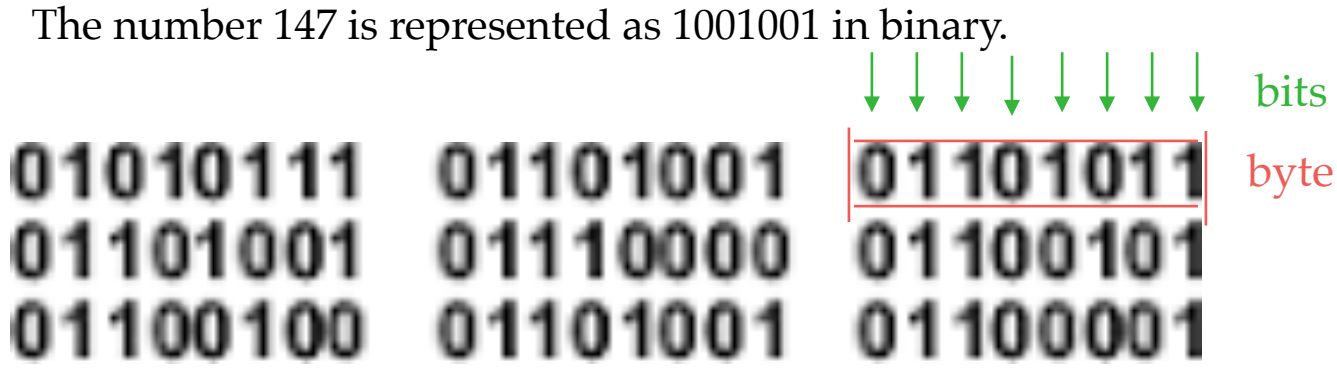
# What is the Internet?

The Internet is the global system of interconnected computer networks that is used to link billions of devices worldwide.

## Bits and Binary Code

**Bit**s are the atoms for information for the Internet - in fact, they are the basic unit of information in computing and digital communications. A bit can have only one of two values, and these values are most commonly represented as either a 0 or 1. Binary code is the combination of these 0's and 1's - of bits - to communicate information.

- Example: Every number can be represented by just 0's and 1's on the Internet. The number 147 is represented as 1001001 in binary.




## Measuring Bits of information

- Bytes: A byte is made up of eight bits and is the basic unit of measurement for the size and storage of information on the Internet. (All you need to know is 1 Byte=8 Bits, and Bits are very small pieces of information)
- Kilobytes: 1 Kilobyte= 1,000 Bytes
- Megabytes: 1 Megabyte = 1,000 Kilobytes. Most songs you download are about 3 to 4 Megabytes

## How do we talk about data speed?

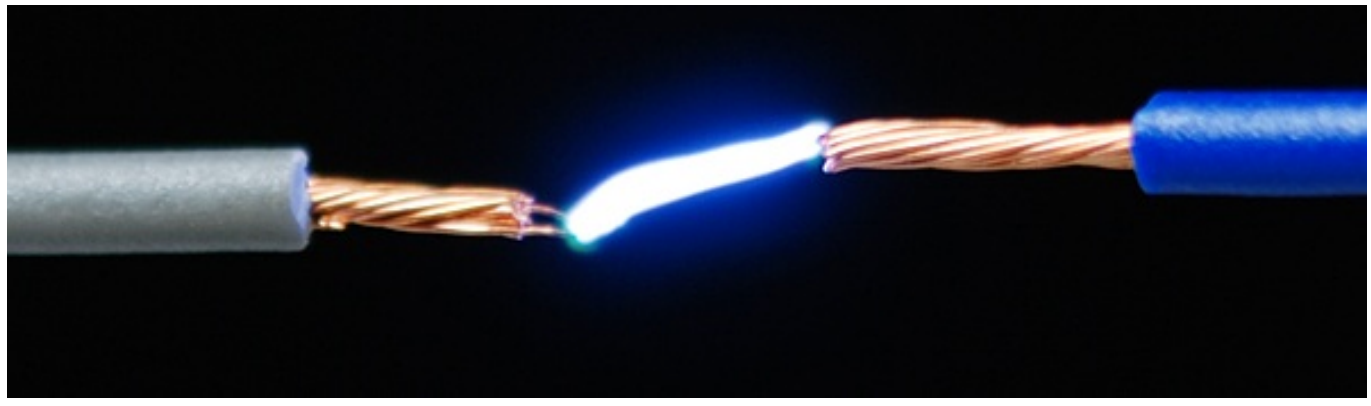
- **Bandwidth** is the transmission capacity of a certain device or system. This is most often explained by bitrate and is helpful to know because it allows you to analyze how fast a system will work or how much memory your device will need to store or run the programs you are creating.
- **Bitrate** is a measurement of bits transmitted by time until of measure (usually, in bits per second). Bitrate tells you how many bits your device transfer in the span of one second. Most computers can send hundreds of thousands if not millions of bits per second!
- **Latency** is the time it takes to send megabytes from one sender to one receiver. This is a different way of measuring how quickly information can be sent over the Internet. It is more often used to measure the amount of delay in a transmission getting to its destination, where bitrate is more concerned with the speed of release to the bits' ultimate destination.

# What is the Internet?

## How are bits transmitted over the Internet?

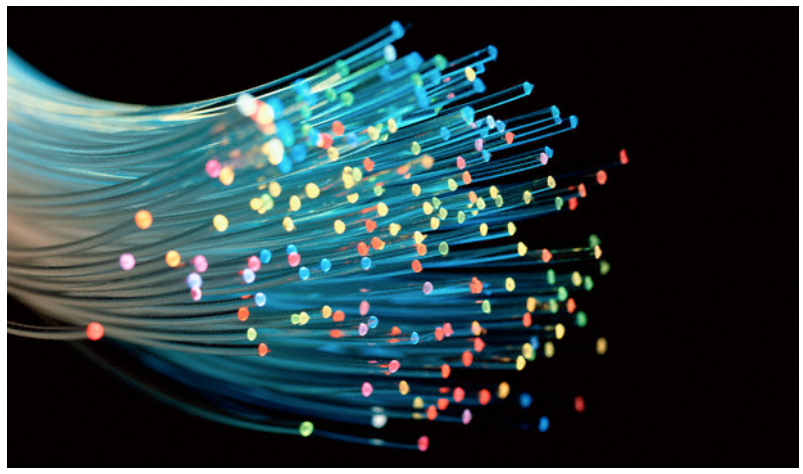
There are three main types that we use to send bits (aka pieces of information) across the Internet:

**Electricity**: We use electrical signals to represent the 1's and 0's (as current "on" or "off") and these signals are transmitted through copper wires. If you have to plug your computer into an Ethernet Cable to be connected to the Internet, you are using electricity to receive the electrical currents.



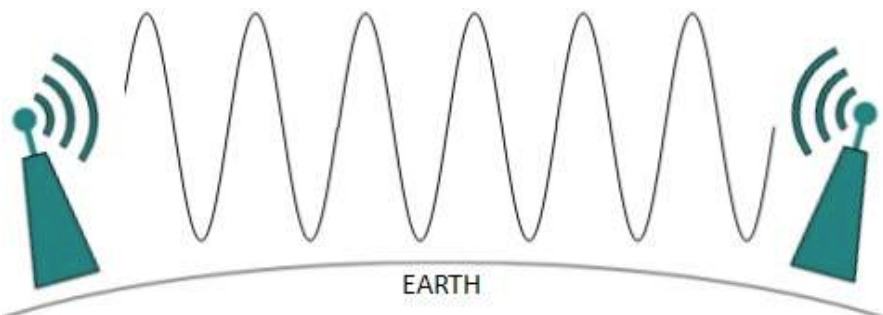
*electricity through copper wires*

- **Light:** Light is used in fiber optic cables to send the 1's and 0's over very long distances (these cables are hundreds of miles long and placed at the bottoms of oceans). By traveling at the speed of light, information can be sent very quickly, but it is also very expensive.



*glass strands that allow light to bounce back and forth*

- **Radio Waves:** We use radio waves when we are using Wi-Fi. Radio waves have two different frequencies which represent the 1's and 0's. The radio waves cannot travel very far, so that is why you can lose Wi-Fi signal so easily. Most Wi-Fi receivers (also called routers) are connected to modems which connects the user to the electrical system (see #1) of the internet so that you can access information at farther distances.



# What is the Internet?

## Where is the information of the Internet stored and how does my computer access it?

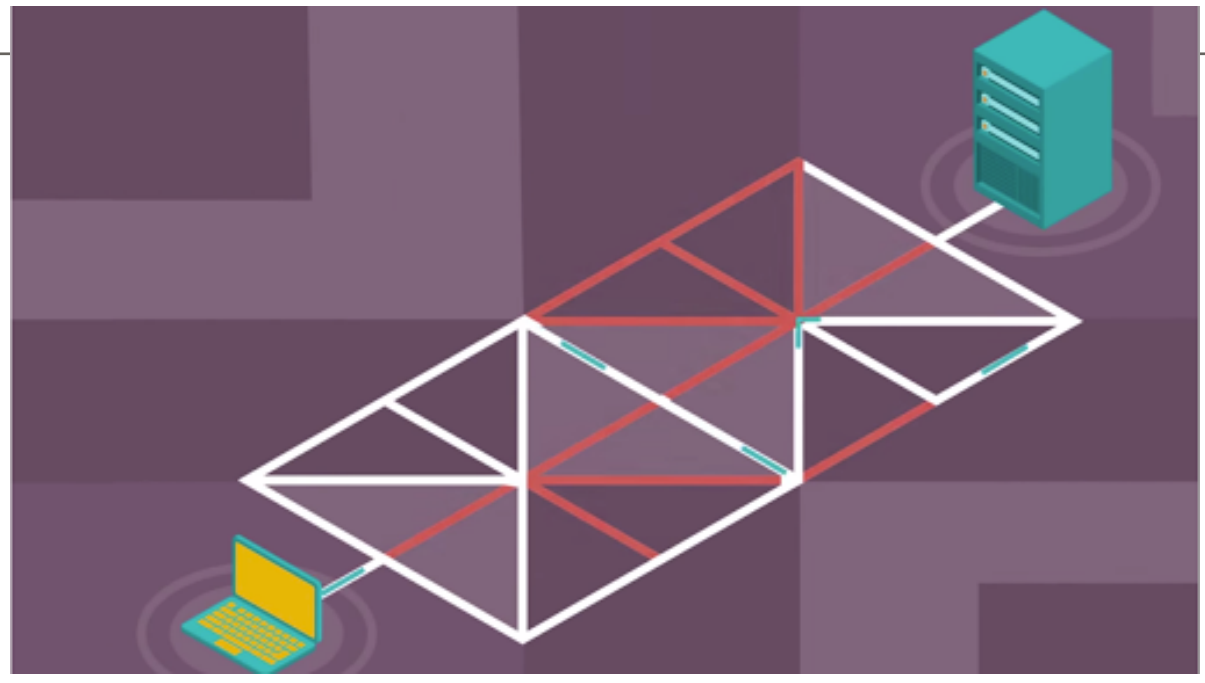
**HTTP: Hyper-Text Transfer Protocol:** This is the language that the computer (more specifically the web browser) uses to send and receive information from servers over the Internet.

**Get Requests:** These are types of requests that allow the web browser to pull information (aka code) from a server to load into a page.
The web browser can also send "**Post Requests,**" which give the servers a piece of information and ask for a response that relates to that information.

For example, when you fill out your username and password on Facebook, your Web Browser sends a Post Request with that information to Facebook. Facebook then knows to send you all the information that corresponds with your specific Facebook page to load.

**Servers**: In its simplest form, a server is a computer or a machine that waits for requests from other machines or software (clients) and responds to them. Servers often store a lot of information that other computers access all the time. We covered two different types of servers so far:

- **DNS Servers**: These servers store the IP Addresses that correspond with the domain name of a website. When your computer is looking to find an IP address, it will go to a DNS Server. These servers are grouped by region according to the end of the domain name (such as .com, .org and .net).
- **Content Servers**: These are servers that store the information of a website or application. For example, companies like Google have tons of servers around the world that store all the data that your computer will access every time you go on their website.



# What is the Internet?

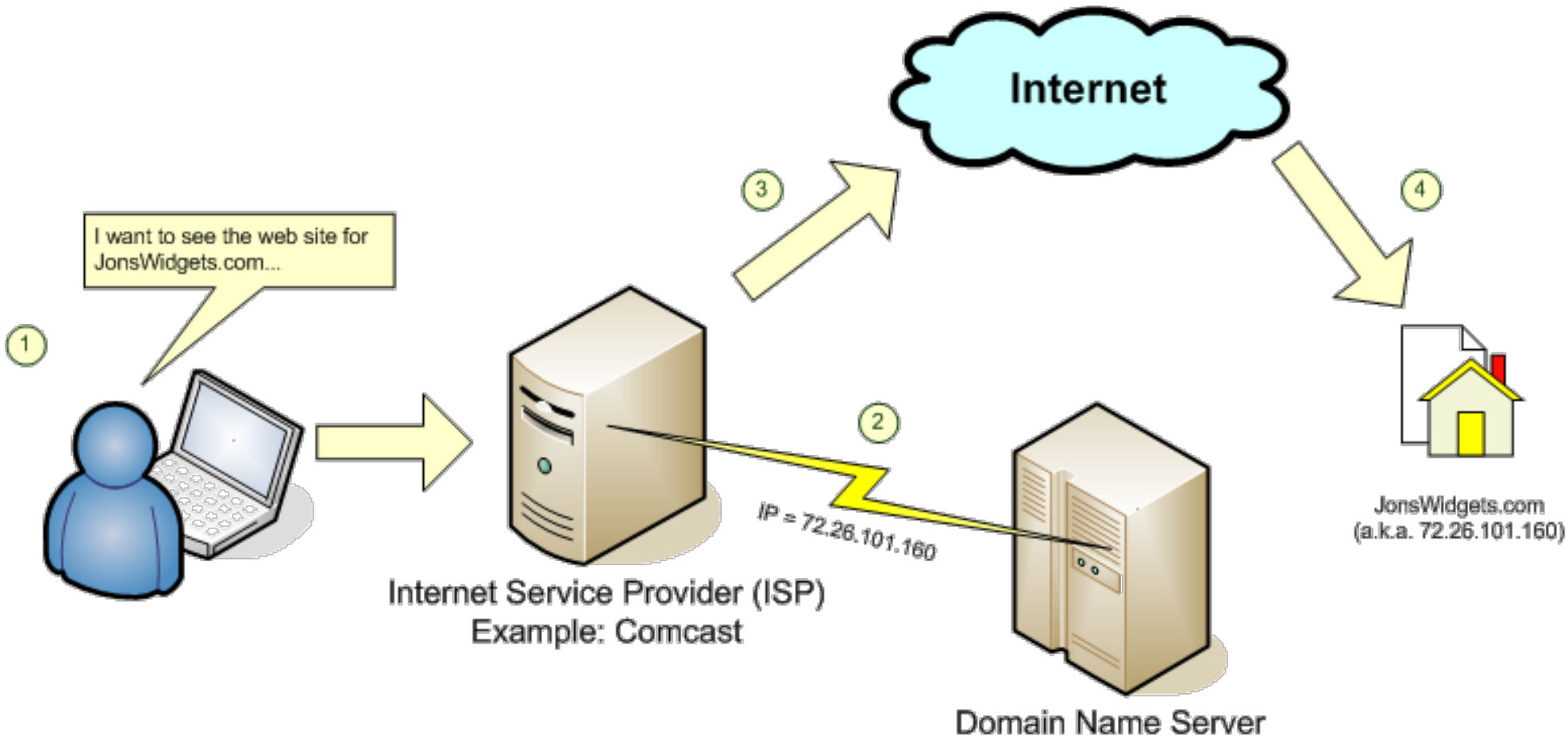
## How do computers know where to send and receive information?

- **Internet Protocol:** The Internet Protocol was set up as a way for devices and servers all over the world to communicate over the Internet. This Protocol has certain rules and procedures that ensure that the Internet remains for the most part open and free.

- **IP addresses:** An IP address is a numerical label assigned to each device (e.g., computer, printer) participating in a computer network that uses the Internet Protocol for communication. You are able to surf the Web by finding the other IP Addresses of websites. Most IP addresses look like this: 154.64.257.35

- **DNS: Domain Naming System.** Every device and website has an IP Address, but we needed a way to refer to these addresses besides memorizing all the numbers. So, the Domain Naming System was created to give websites domain names to go along with their IP Addresses. This way, we can enter a domain name that is much easier to remember (like "google.com"), and we can be directed by a DNS Server to the proper IP Address. Once the DNS server has told us the corresponding IP Address for "google.com", our computer can immediately find the server that hold all of the Google webpage information and access it.

Check the flow below to see how Jon can get access to the internet from his home computer.



# What is the Internet?

In your own words….

1. Megabytes:

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2. Bandwidth:

---

3. DNS:

---

4. HTTP:

---

5. Internet Protocol:

---

6. Cybersecurity:

---

7. Wi-Fi:

---

8. Bits:

---

9. Servers:

---

10. Computer Networks:

# What is the Internet?

In your own words….

1. “Get” Requests:

2. Latency:

3. Hacking:

4. URL:

5. Bytes:

6. Binary Code:

7. “Post” Requests:

8. IP Address:

9. Web Browsers:

10. HTML:

# What is the Internet?

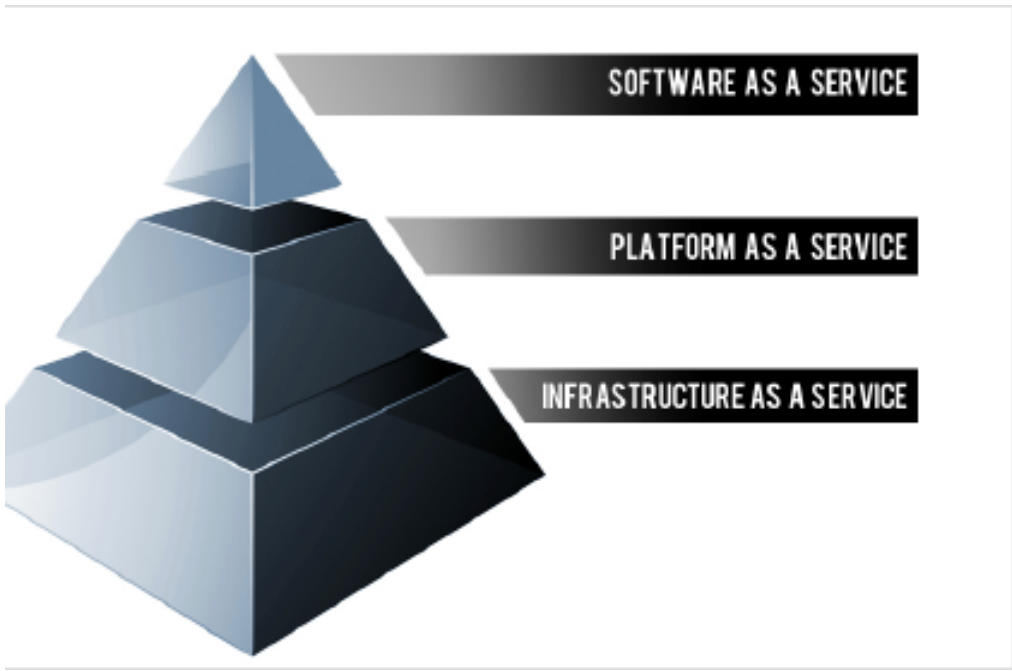
## What is the Cloud?

**Cloud Computing** is a broad term that describes a broad range of services. Many companies have seized the term "Cloud" and are using it for products. Cloud Computing is often described as a "stack" as a response to the broad range of services built on top of one another under the moniker "Cloud". Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

**What this means in plain terms is that you don't have to be Google to and build your own huge data centers or expensive processors to have the same access to server resources and computing resources located far away.**

## The different types of Cloud Computing services:

- **Software as a Service (SaaS):** designed for end-users' use, delivered over the web
- **Platform as a Service (PaaS):** the set of tools and services designed to make coding and deploying those applications quick and efficient
- **Infrastructure as a Service (IaaS):** the hardware and software that powers it all – servers, storage, networks, operating systems




By itself, infrastructure isn't useful - it just sits there waiting for someone to make it productive in solving a particular problem. Imagine the Interstate transportation system in the U.S. Even with all these roads built, they wouldn't be useful without cars and trucks to transport people and goods. In this analogy, the roads are the infrastructure and the cars and trucks are the platform that sits on top of the infrastructure and transports the people and goods. These goods and people might be considered the software and information in the technical realm.

# Web Browsers

## What is a Web Browser?

A software application for retrieving, presenting, and traversing information resources on the World Wide Web. An information resource is identified by a Uniform Resource Identifier (URI/URL) and may be a web page, image, video or other piece of content. Hyperlinks present in resources enable users easily to navigate their browsers to related resources.

Different Types of Web Browsers

### Internet Explorer

Internet Explorer was created in 1995. Most people started out using Internet Explorer the majority of the time when browsing the internet, checking emails, listening to music online, shopping online, and etc. This was the first web browser. In 2012, 26% of the users on the Internet were using Internet Explorer. Now, most people are using Google followed by Firefox.

| Pros | Cons |
|---|---|
| Free to download at no cost | More susceptible to bugs. |
| Offers help options | Huge target for hackers and cyber-thieves |
| Easy to use | No longer being updated |
| Mostly easily found through out the world | Lack of cross-platform experience (ie. used in Windows but not Mac) |

### Safari

Safari is web browser that was produced and developed by Apple Inc. which functions on a Mac OX, iOS, and Windows operating system. It was first put out in public on January 7, 2003 by Apple Inc. Safari is generally for Mac users who are operating Mac OS X 8.1 and onwards for later systems

| Pros | Cons |
|---|---|
| Ease of use | Lack of customization options many competitors offer |
| Page-load times impressive | Support system is missing some options for users |
| Provides all of security features | Trouble with Google built-in search engine |
| Great for Mac users and free to download | Difficulty deleting cookies on exit automatically |

# Web Browsers Continued

## Google Chrome

Google Chrome is a freeware browser developed by Google using the WebKit layout engine. It was first released on Microsoft Windows operating system on September 2, 2008 in 43 different languages. Currently, it is available in 52 languages.

| Pros | Cons |
|---|---|
| Fast browsing performance | Lack of parental controls |
| More control over your tabs | Minor site incompatibilities |
| More dynamic home page for common used search engines and bookmarks | |
| Has sync capabilities that allow you to access your customized browser from any computer | |
| Great developer tools and great security | |

## FireFox

Firefox is a free and open source web browser developed for Microsoft Windows, Mac OS X, and Linux coordinated by Mozilla Corporation and Mozilla Foundation. It was first version 1.0 released on November 9, 2004. It is now available in about 78 languages worldwide. It is popular with programmers for its features and secure downloads.

| Pros | Cons |
|---|---|
| Secure privacy mode and downloading | Resource heavy |
| More intuitive navigation | Uses a heavy portion of memory to run |
| Contains minimalist interface | |
| Offers lot of help and support on Firefox tutorial | |

Important Note: We will be using Google Chrome in this class. It is the easiest, best, and safest for developers!

# Safety and Cybersecurity

**Activity 1: Evaluate a Website**

**If you are trying to do research on the Internet, you should have a set of guidelines to help determine if you have come across a good or bad source. Practice evaluating websites by following the steps below.**

## FOLLOW THESE STEPS

1. Go to the following websites, find an article or story, and review the key areas listed below.

- Cnn.com [http://www.cnn.com]
- The Onion [http://www.theonion.com]
- National Geographic [http://www.nationalgeographic.com]
- Natural News [http://www.naturalnews.com]

2. Look for the page's author or source (Authority).
3. Find some facts or statistics that can be cross-checked (Accuracy).
4. Check to see if the site is up-to-date (Currency).
5. Determine if the content is overly biased (Objectivity).
6. Follow up on any links or resources provided on the page (Links).
7. Keep website domain types in mind when researching. For example, .com or .edu (Domain).

Notes:

# Safety and Cybersecurity

## Activity 2: Your Digital Footprint

**Each time we interact with computers on the Internet, we leave behind data. Sometimes this digital footprint is helpful. Our browser history allows us to easily find websites we have visited previously, and website cookies can help make our online experiences more personal. Knowing how to monitor and erase this footprint, however, is important to keeping your information safe online, especially if you interact with public computers and networks. Follow the steps below, to practice viewing and deleting your browser history and cookies.**

### FOLLOW THESE STEPS

1. Open the Internet browser you use most often.
2. Find your browsing history.
3. If you use your history to revisit websites just look through what information is recorded here. If you are using a public computer or would like to delete this information, try "clearing" this history.
4. Locate the option for deleting cookies in your browser and "clear" them.
5. Explore the other privacy options available on your browser, and remove data or update your preferences as you like..

*And remember, always try be a good member of online communities!

Notes:

# Safety and Cybersecurity

## Activity 3: Learning to Identify Scam Emails

Directions: Find the parts of the email below that indicate that this is a scam email.

**To:** John Smith
**From:** Account Manager <manager165@hotmail.com>
**Subject:** URGENT ALERT!

---

ABC Bank

Dear Valued Customer

We have noticed unauthorized access to your acount fund and will need you to varify your infomration.

Please proceed to the following website to update your information:
http://www.sshhp_mybankwebsite.com/abcbank

It is urgent that you respond within 24 hours to avoid deactivation of your account!

Sincerely,
Bank Manager

Notes:

# Safety and Cybersecurity

## Activity 4: Shop Safely Online

**If there is something you can buy, there is probably an online retailer selling it. Practice evaluating the trustworthiness of online shopping sites by following the steps below.**

### FOLLOW THESE STEPS

1. Go to one or more of these popular online retailers (or go to a shopping website of your choosing) and look for the security features listed below.

   - Amazon.com [http://www.amazon.com/]
   - Overstock.com [http://www.overstock.com/]
   - Walmart.com [http://www.walmart.com/]
   - 1800Contacts.com [http://www.1800contacts.com/]

2. Look for a secure web address that begins with "https:". Remember, you may have to enter a secure part of the site before you see this.
3. Look for the padlock icon in the address bar.
4. Look for links to the privacy and return policies.
5. Verify the company's contact information.
6. Confirm that the site accepts payments by credit card.
7. Check to see that only relevant information is collected when creating an account.
8. Check to see if the retailer is accredited by an outside organization (for example, the Better Business Bureau).

Notes:

# Safety and Cybersecurity

## What is malware?

- Malware is basically any type of software that can cause harm. Malware can take the form of viruses that infect your computer and cause it to react in certain ways (clone itself to steal information, break down, etc).


## What does hacking mean?

- Hacking refers to using creative problem solving to get an answer to a problem. It can also refer to using something in a different way to solve a problem. We discussed examples of "real life hacks", such as using trash bags to cover your shoes when it is raining. Hacking in computer programming can refer to breaking into program or server to make sure it is more secure, and hacking can also refer to all the ways in which computer programs can steal information, such as people's identity. Hacking, at this point, has developed a bad reputation, but it can refer to changing something to create something new (and to help solve a problem in society).

## Why do we have a problem with security on the Internet?

- Everything on the Internet was built to be open. Therefore, we all have problems with keeping our data secure.

## What is DNS spoofing?

- This is when someone hacks into a DNS server and changes a website's IP Address to a fake address. This fake address directs the user to a website that can then be used to steal information such as passwords, emails, or credit card information.

# Cybersecurity Glossary

**Antivirus software**
Computer programs that can block, detect, and remove viruses and other malware.

**Backups/backing up files**
Extra copies of computer files that can be used to restore files that are lost or damaged.

**Botnet**
Multiple computers on a network that are infected with a program that can be controlled remotely. The infected computers are usually used to cause damage that couldn't be achieved with a single computer.

**DDoS**
A distributed denial of service attack attempts to make an online service, like a website, unavailable by overwhelming it with a flood of traffic from a team of computers.

**Encryption**
The process of using codes to make readable information unreadable. Encrypted information cannot be read until it is decrypted using a secret key.

**Firewall**
Software designed to block malware from entering protected networks.

**Hacktivist**
Someone who uses computers and computer networks to disrupt services or share secret information in an effort to draw attention to political or social issues.

**Keylogger malware**
A program that records every key struck on a keyboard and sends that information to an attacker.

**Phishing**
Attempting to trick people into revealing sensitive information, such as passwords and credit card numbers, often by using emails or fake websites that look like they are from trusted organizations.

**Ransomware**
A type of malware that holds victims' computer files hostage by locking access to them or encrypting them. It then demands a ransom if the victim wants his or her files back.

**Software patch**
A piece of software designed to update a computer program in order to fix a software vulnerability or improve the program.

**Spam**
Unsolicited emails sent to many addresses. The purpose of most spam is to make money through advertising or identity theft.

# Software Lifecycle

## Introduction to Software Quality Assurance (QA) Testing

We test software - ALL THE TIME - by using it. Before software is released to the public for use, developers must test if it works properly. In our QA testing module, we will discuss this in much more detail. Briefly, tests looks for

- if the software does what it should
- if the software has bugs, or errors, especially where used on devices or in environments unlike the development environment
- if it's missing something
- if users understand what they are using and what it is doing adequately

A GREAT software test finds MANY things that aren't right and need to be fixed. Don't worry, the software doesn't have feelings!

Testing is only one piece of the **software development lifecycle.** Critical parts of this cycle: the creation of **requirements** for the software, designing and **developing** software, **testing,** and **iterating** to improve it.

# Software Lifecycle

**Software Development Life Cycle** (SDLC), in systems engineering and software engineering refers to the process of creating or altering systems, and the models and methodologies that people use to develop these systems. The concept generally refers to computer or information systems.

Each project will alter the framework for planning and controlling the creation of an information system the software development process.


## Software Development Phases

The SLDC adheres to important phases that are essential for developers, such as planning, analysis, design, and implementation, and are explained in the section below. There are several SDLC models in existence. The oldest model, that was originally regarded as "the Systems Development Life Cycle" is the waterfall model: a sequence of stages in which the output of each stage becomes the input for the next. These stages generally follow the same basic steps but many different **waterfall** methodologies give the steps different names and the number of steps seems to vary between 4 and 7. There is no definitively correct Systems Development Life Cycle model, but the steps are usually organized in a similar way: requirements, design/planning, development, testing, revising, and maintaining - and the cycle repeats.

# Software Lifecycle

## SDLC

**Initiation**

Begins when a sponsor identifies a need or an opportunity. Concept Proposal is created

**System Concept Development**

Defines the scope or boundary of the concepts. Includes Systems Boundary Document. Cost Benefit Analysis. Risk Management Plan and Feasibility Study.

**Planning**

Develops a Project Management Plan and other planning documents. Provides the basis for acquiring the resources needed to achieve a solution

**Requirements Analysis**

Analyses user needs and develops user requirements. Create a detailed Functional Requirements Document.

**Design**

Transforms detailed requirements into complete, detailed Systems Design Document Focuses on how to deliver the required functionality

**Development**

Converts a design into a complete information system Includes acquiring and installing systems environment; creating and testing databases preparing test case procedures; preparing test files, coding, compiling, refining programs; performing test readiness review and procurement activities.

**Integration and Test**

Demonstrates that developed system conforms to requirements as specified in the Functional Requirements Document. Conducted by Quality Assurance staff and users. Produces Test Analysis Reports.

**Implementation**

Includes implementation preparation, implementation of the system into a production environment, and resolution of problems identified in the Integration and Test Phases

**Operations & Maintenance**

Describes tasks to operate and maintain information systems in a production environment. Includes Post-Implementation and In-Process Reviews.

**Disposition**

Describes end-of-system activities, emphasis is given to proper preparation of data.

# Software Lifecycle

**Initiation/Planning**

To generate a high-level view of the intended project and determine the goals of the project. The feasibility study is sometimes used to present the project to upper management in an attempt to gain funding. Projects are typically evaluated in three areas of feasibility: economical, operational, and technical. Furthermore, it is also used as a reference to keep the project on track and to evaluate the progress of the team. This phase is also called the analysis phase.

**Requirements Gatherings and Analysis**

The goal of systems analysis is to determine where the problem is in attempt to fix the system. This step involves breaking down the system in different pieces and drawing diagrams to analyze the situation. Analysts project goals, breaking down functions that need to be created, and attempt to engage users so that definite requirements can be defined.

**Design**

In systems design functions and operations are described in detail, including screen layouts, business rules, process diagrams and other documentation. The output of this stage will describe the new system as a collection of modules or subsystems.

**Build or Coding**

Modular and subsystem programming code will be accomplished during this stage. Unit testing and module testing are done in this stage by the developers. This stage is intermingled with the next in that individual modules will need testing before integration to the main project. Planning in software life cycle involves setting goals, defining targets, establishing schedules, and estimating budgets for an entire software project

**Testing**

The code is tested at various levels in software testing. Unit, system and user acceptance testing are often performed. This is a grey area as many different opinions exist as to what the stages of testing are and how much if any iteration occurs. Iteration is not generally part of the waterfall model, but usually some occurs at this stage.

Types of testing:

- Data set testing, Unit testing, System testing, Integration testing, Black box testing, White box testing, Module testing, Regression testing, Automation testing, User acceptance testing

**Operations and Maintenance**

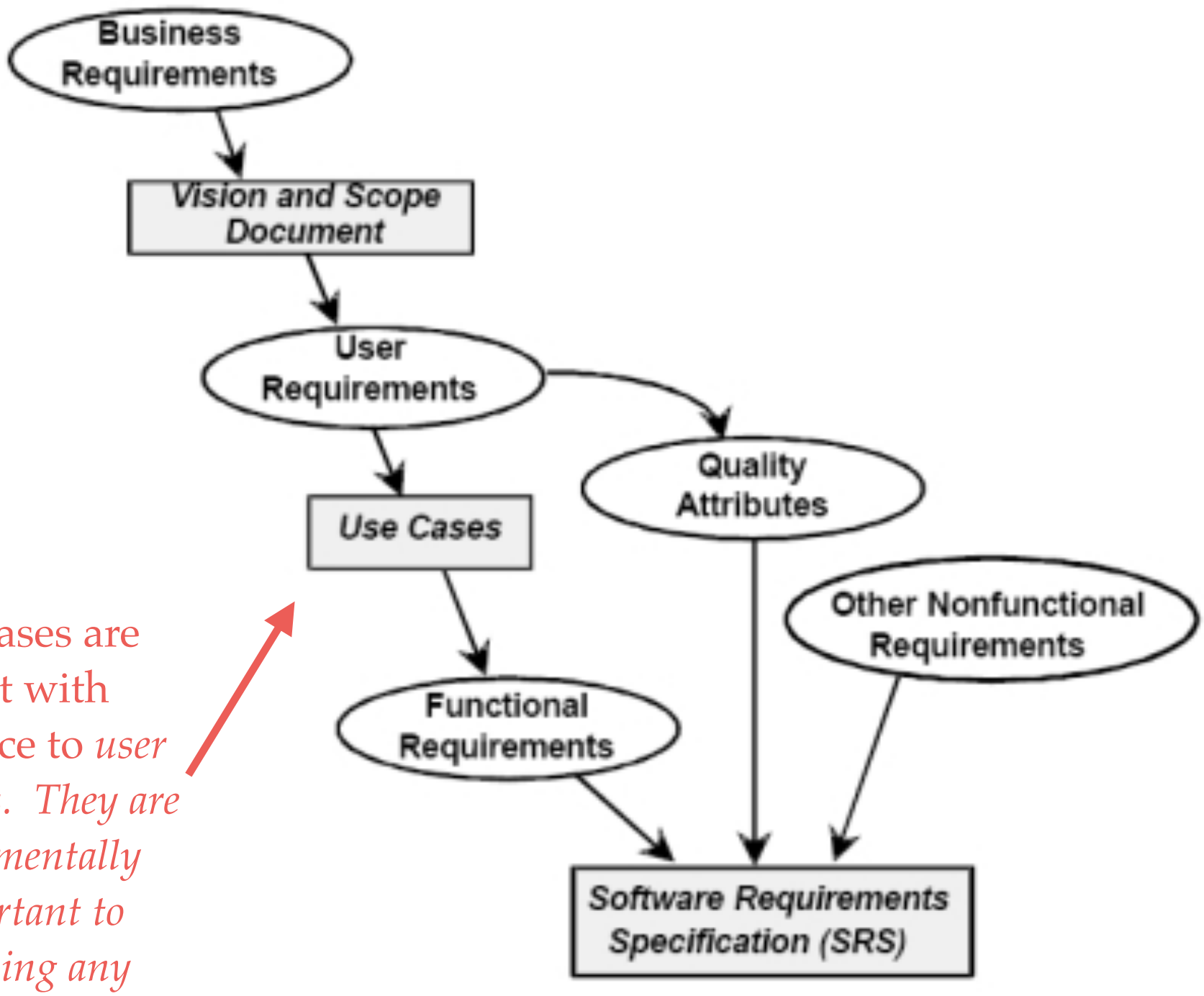
The deployment of the system includes changes and enhancements before the decommissioning or sunset of the system. Maintaining the system is an important aspect of SDLC. As key personnel change positions in the organization, new changes will be implemented, which will require system updates.

# Software Lifecycle

## Requirements

What are Requirements and why are they so important?

- Requirements are the detailed plans for the software that you are building. There are three types of requirements:
  - **Marketing requirements**: Who is this product for? And what do you want to sell?
  - **Product requirements**: What are you building? What operations does your product need to complete?
  - **System requirements:** What external resources does the product need in order to run properly?
- Requirements are the critical first step to ensure that the development runs smoothly and that the product is made correctly and efficiently. Bad requirements can cause confusion between teams and can create chaos at the workplace. As a tester, you need to be able to read requirements and find requirements that don't meet the standard of being: Necessary, Concise, Unambiguous, Verifiable, Complete, or Feasible.



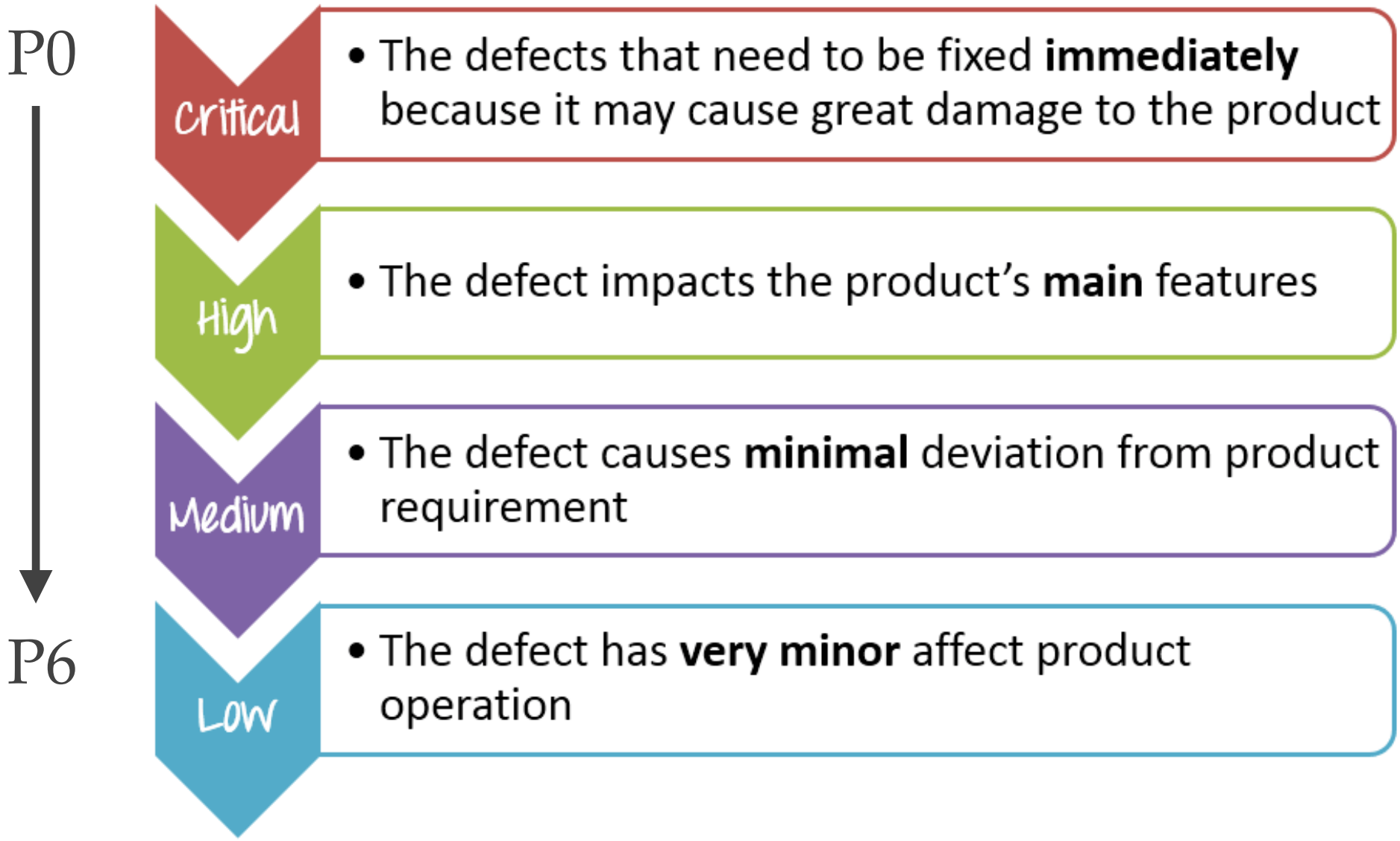

Use cases are built with reference to *user personas. They are fundamentally important to planning any software.*

# Software Lifecycle

- There are five different types of **testing** that you can work on:

  - **Unit Testing** (an individual piece of software),
  - Integration Testing (testing the interactions between different pieces of the software),
  - **Systems Testing** (making sure the entire product runs properly and on as many different devices as possible), and
  - **User Acceptance Testing** (testing how the user likes and interacts with the product).
  - **Hardware Testing** (testing that a physical product functions safely and as it should)

- You will be working on test cases (also called use cases) for each type of product that you are testing. This refers to the specific User Type, Usage, and Result of a piece of the product.
  - In class, we will work on logging test cases appropriately in Google Sheets as well as in a company specific bug report.
  - When you are testing, you will keep track of the test cases as well as the bug report. With bug report, you will document where the bug was found, how you found it, and the severity of the bug - use screenshots wherever possible.
    - **The scale ranges from a huge problem or a defect that renders the product useless (P0) to a minor problem in the product (P6).**



# Software Lifecycle

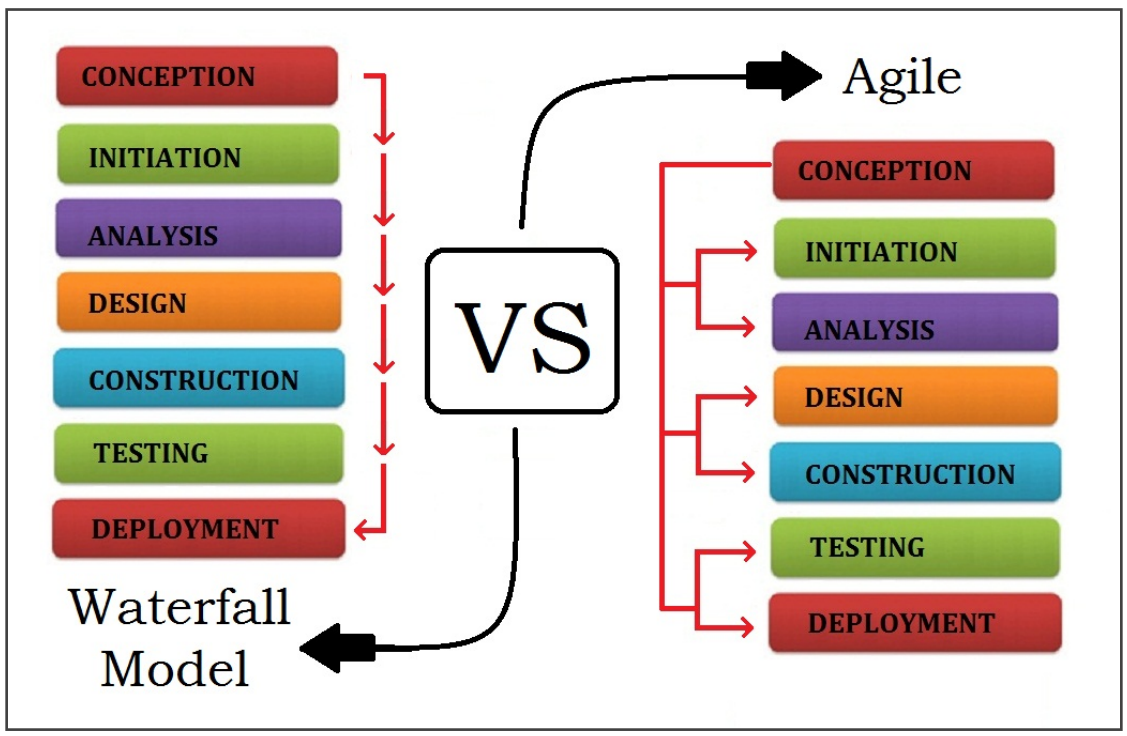
## SDLC Methods

Companies use different methods to create and test their software products. Because of this, these are different SDLC methods.

- 1) **Agile**: This method promotes a project management process that encourages frequent inspection and adaptation. The system works on a series of sprints (aka 2-3 week periods) in which a piece of the product is planned, developed, and tested. Then, the entire process is reviewed and analyzed before continuing on with building the product.
  - Our example was to use the analogy of a house. In Agile, the foundation of the house would be planned, built, tested, and evaluated by the customer before the first wall is built. That whole process would be considered the first sprint. Once the foundation is finished and accepted, the team would move on to the next piece of the house.

- 2) **Waterfall**: This method is called a "plan driven" method, and it has the team plan out the entire product, build the whole thing, and then test at the end.
  - In our example, we would plan very detail of our house, build the entire thing, then have the testers come in and run inspections.

- 3) **Spiral**: This method is a version of the two previous methods. In this case, the team plans and build a full prototype of the final product and has testers work on the prototype. Once this is approved, more prototypes are made and this cycle is repeated until the operational prototype or final product is made.




In our example, this would be like making a miniature house for testers to analyze and customers to give their feedback on. The team would take those suggests and go back to make an improved prototype. This process would repeat until they are ready to build the entire house based on the most recent prototype.

# Software Lifecycle

## Quality Assurance Matching

1. The process of finding and removing the causes of software failures

Debugging

2. Testing one particular module, functionality heavily.

Use Case

3. Testing conducted to enable a user/customer to determine whether to accept a software product

Unit Testing

4. A document describing the scope, approach, resources, and schedule of intended testing activities. It identifies test items, the features to be tested, the testing tasks, who will do each task, and any risks requiring contingency planning.

Test Plan

5. Testing of individual software components.

Integration Testing

6. Testing of combined parts of an application to determine if they function together correctly.

Acceptance Testing