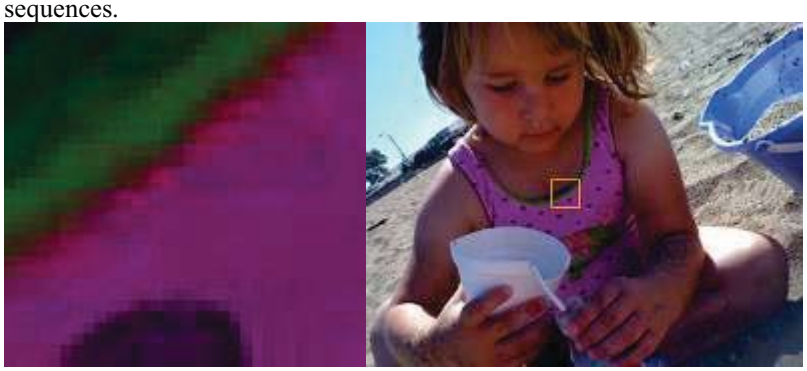
own station (they say its free!). http://www.shoutcast.com

Other popular online radio stations include: AOL Radio Network (http://music.aol.com/radioguide/bb), Yahoo! Music (http://new.music.yahoo.com/) and the UK's own AbsoluteRadio (http://www.absoluteradio.co.uk/)

What You Already Know
Although you may be new to editing video, there are a lot of things you already know about video on a computer. You know some things about text file formats, graphics, and audio on a computer. In this book we're discussing the fundamentals, and the commonalities between all these digital disciplines.

Video is a series of still images, displayed in rapid succession, that give the illusion of movement on screen. Video exploits two ways that your brain works to create this digital illusion - pixels and image sequences.



First, as you've seen with still images, each image is a combination of tiny dots (pixels) that, when put together, our brain interprets as an image. Zoom in and you'll see each pixel, zoom out and you'll see the image.

Then, add to this the dimension of time, and you've got video. Sequence one of these still images after another, and play them fast enough and you've see motion. Slow succession you see a slideshow, fast succession and you'll see motion pictures.

Televisions
We've already talked a little bit about computer monitors and how they display an image. A television is similar, but different. A picture is "drawn" on a television or computer display screen by sweeping an electrical signal horizontally across the display, one line at a time.

Starting at the top, all of the lines on the display are scanned in this way. One complete set of lines makes a picture. This is called a **frame**. This sequence is repeated quickly enough that the displayed images are perceived to have continuous motion. This is the same principle that low-tech "flip books" use; you rapidly flip through pages of still images to create a moving picture.

Each TV frame is produced by scanning the screen twice, arranged so that the lines of the second scan fill in the gaps left by the first. Each of these scans (or half an image) is a **field**. So a 30 frame per second TV picture is actually 60 fields per second.

Notice the horizontal lines in the image above? This makes "**interlacing**" visible, where you can see each of the fields that goes into making up one frame of video. Traditional television broadcasts are interlaced.

So to get one frame with maximum detail, you need to combine the information in both fields. Easy so far, but what happens when motion is introduced? Because the two fields are scanned sequentially in the camera, anything in the image that is moving is in a different place in the second field than it is in the first. This two-field frame helps create smoother motion in a TV picture, but it is also the reason why fields can cause trouble when it comes to editing.

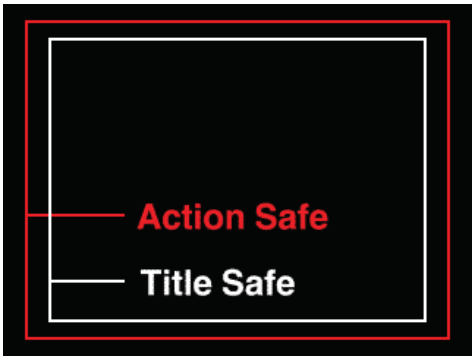
When a computer plays video on its monitor, it only displays a sequence of complete frames, it doesn't use the TV trick of interlacing fields.

Title Safe/Action Safe

Every TV displays a slightly different image. Even with the same brand TV, two different units may show very different amounts of pictures, just because of the way that they are physically manufactured.

One will show more of the edges, while the other might cut some of the edges of the frame off. Some televisions, or professional field monitors used in video production, sometimes have an "**overscan**" option that let's you see the total image. Each TV will cut off a different amount of edges of the picture because each piece of glass the image is projected upon is slightly different. And, though you might think this wouldn't be the case with new LCD and Plasma screen televisions, it is. Though not to the same degree as the old tube televisions, you just can't ever know exactly where the edges will be for everyone's individual TV.

Below is an example of "title safe" area. Title Safe is the minimum that any commercially available television will display. Don't put titles or text that extend over these boundaries so that letters don't accidentally get chopped off. Action safe is a slightly larger area that you can assume that most everyone is seeing. I think that most LCD and plasma TVs fall within this Action Safe area. Many professional video editing applications will overlay a safety grid while you're editing - so you know where to place your text on screen.



Measuring Video Time
Video time is often referred to as "**timecode**" or worse "SMPTE" (pronounced "simp-tee"). The Society of Motion Picture and Television Engineers (SMPTE) standard is how each hour:minute:second:frame of video gets addressed - either by your computer, or by video editing equipment. SMPTE can lock (synchronize) video, audio, and other information.

The most common form of SMPTE timecode is an 80-bit (10 byte) frame that contains the following information:

- A time stamp in hh:mm:ss:ff (hours:minutes:seconds:frames) format
- Eight 4-bit binary groups commonly known as userbits
- Various flag bits
- Synchronization sequence
- Checksum

Don't worry, unless you're interested in being a video engineer, you probably won't have to know this level of detail in your daily work!

Timecode defines how frames are counted, and impacts the way you view and specify units of time throughout a project. You specify a timecode style, based on the media most relevant to your project. For example, you count frames differently when editing video for television than when editing for motion-picture film. By default, most digital video editing programs display time using SMPTE video timecode: hours, minutes, seconds, and frames.

At any point in your project, you can change to another display format for time, such as feet and frames for 16mm or 35mm film, or even measures, bars and beats. Timecode never changes the actual frame rate of a clip or project; it changes only how the frames are numbered. In other words, if you change timebases, your audio won't suddenly sound low and stretched out, or fast and chirpy. Timecode counts complete frames-not fields, even if your video is interlaced.

To Drop or Non-Drop a Frame
Just to make your life a little more complicated, there is 30 fps timecode (called non-drop frame timecode), and then there's 29.97 fps timecode (called drop-frame timecode). What's the deal with that?

You'll want to use **drop-frame** timecode whenever you're editing NTSC video that must match a **specific real-time duration**, such as a television commercial that must be precisely one minute long. When you work with a project using the NTSC-standard 29.97 fps timebase, the fractional difference between the 29.97 fps frame rate and 30 fps frame numbering causes a difference between the stated duration of the program, and its actual duration. While tiny at first, this difference gets larger as program duration increases, preventing you from accurately creating a program of a specific length. Drop-frame timecode is a SMPTE standard that maintains time accuracy by eliminating this error. No frames are lost, because drop-frame timecode doesn't actually drop frames, only frame numbers.

If the precise duration of a program isn't critical, or you're not working for a television station, you should specify 30 fps non-drop-frame timecode, which doesn't renumber any frames. The timecode running time will not exactly match normal time. This mismatch amounts to an 18 frame overrun every 10 minutes - tiny when you're not working for television. Non-drop frame timecode is easier on the brain to compute (for me, anyhow) and the difference is so slight, for my work, it mostly doesn't matter.

Aspect ratio

Video producers significantly change most movies from their original theatrical presentation, because standard television screens have a different shape than standard movies.

The standard (non-widescreen) television has a ratio of 4:3, the same as many computer monitors. Film and High-definition TV are in the 16:9 ratio (widescreen) that is becoming more popular in households every day. Many computer monitors, and laptops are also using the widescreen aspect ratio.

Frame size and resolution
Frame size is expressed by the horizontal and vertical dimensions, in pixels, of a frame. When we looked at digital images, we talked about "full size" images with a frame size of 640 x 480. In digital video editing, frame size and resolution are the same.

720 x 480 pixels is a standard DV NTSC frame. How do they jam more (720) pixels into the normal space of 640 pixels? Aha....Digital video camera don't use square pixels! They use rectangular pixels that are tall, and skinny. So their height is the same as a square pixel, but their width is slightly narrower. So it takes more of them (720) to fill the same area (640).

Higher resolution digital video cameras preserve more image detail, but produce larger files. If you change frame size, keep the dimensions proportional to the original video clip.

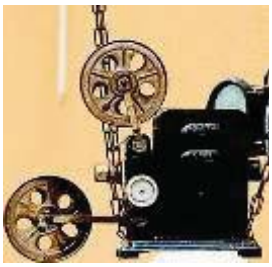
Bit depth
As you know, a bit is the most basic unit of information storage. The more bits used to describe something, the more detailed the description can be. Bit depth, just like in still images, indicates the number of bits set aside for describing the color of one pixel.

8-bit color can display 256 colors - this isn't used in video production anymore.

16-bit color can display "thousands" of colors. This is standard "component" YUV video.

24-bit color can display 16 million colors. This is the digital video, RGB standard.

Film vs. Video
The word "telecine" is derived from the words television and cinema. Telecining is the process by which film (shot at 24 progressive frames per second) is converted to digital video, which normally runs at 29.97 interlaced frames per second. Professional video editing applications, like Final Cut Pro for example, have some nice features that can make this process easier for filmmakers who want to take advantage of digital editing applications, or create films that are meant to be shown on a television, rather than through a projector.



A common "trick" (read: the cheap way) to digitizing film is to project the film onto a screen, and set up a digital video camera on a tripod and record from the screen. This is a fairly cheap way to get film digitized, and preserves a lot of the "filmic" qualities of your media.

Analog Video
Analog camcorders record video and audio signals as an analog track on magnetic videotape. As digital technology continues to improve in quality and drop in price, analog video is becoming less popular. I mention these formats here for historical purposes, and because many people have old tapes lying around that they'll want to ultimately transfer.

Each time you make a copy of an analog tape, it loses some image and audio quality. Analog formats lack a lot of the impressive features you'll find in digital camcorders, and, in fact, they are hard to buy nowadays. The main difference between the available analog formats is the kind of videotape the camcorder uses and the resolution. Analog formats include:

Standard VHS:
Standard VHS cameras use the same type of videotape as a regular VCR. Because of their widespread use, VHS tapes are a lot less expensive than the tapes used in other formats. Another advantage is that they give you a longer recording time than the tapes used in other formats. The chief disadvantage of standard VHS format is that the size of the tapes necessitates a larger, more cumbersome camcorder design. They have a resolution of about 230 to 250 horizontal lines, which is the low end of what's now available. These are pretty dated, but everyone has a collection of VHS tapes around the house - and now is a good time to think about converting them!

VHS-C:
VHS-C camcorders record on standard VHS tape that is housed in a more compact cassette. You can play VHS-C cassettes in a standard VCR, but you need an adaptor device that runs the tape through a full-size cassette. Basically, though, VHS-C format offers the same compatibility as standard VHS format. The reduced tape size also means VHS-C tapes have a shorter running time than standard VHS cameras. In high quality mode, the tapes can hold 30 to 45 minutes of video. They can hold 60 to 90 minutes of material if you record in extended play, but this sacrifices image and sound quality considerably. This format was pretty popular in the 1980s.

Super VHS:

Super VHS camcorders are about the same size as standard VHS cameras, because they use the same size tapes. The only difference between the two formats is that Super VHS (SVHS) tape records an image with 380 to 400 horizontal lines, a much higher resolution image than standard VHS tape. You cannot play Super VHS tapes on a standard VCR, but, as with all formats, the camcorder itself is a VCR and can be hooked up directly to your television or to your VCR to dub standard VHS copies These were popular among "prosumers" in the 1990s.

Super VHS-C:
Basically, super VHS-C is to super VHS as VHS-C is to standard VHS: It's just a more compact version that uses a smaller size cassette.

8 mm:


These camcorders use small 8-millimeter tapes (about the size of an audio cassette). The chief advantage of this format was that manufacturers could produce more compact camcorders, sometimes small enough to fit in a coat pocket. The format offers about the same resolution as standard VHS, with slightly better sound quality. Like standard VHS tapes, 8 mm tapes hold about two hours of footage, but they are more expensive. To watch 8 mm tapes on your television, you have to attach your camcorder and use it as a VCR. Somewhat popular in the 1980s.

Hi-8:
Hi-8 camcorders are very similar to 8 mm camcorders, but they have a much higher resolution (about 400 lines). Hi-8 tapes are more expensive than ordinary 8 mm tapes. This was a common format in the 1990s, but the tape was pretty fragile so it doesn't hold up well over time. But, it has a nice "bright" quality to the picture. It was used by "prosumers" and has similar quality to SVHS tape.

Digital Video
Digital camcorders differ from analog camcorders in a few very important ways. They record information digitally, as bytes, which means that you can record an image as good as your lens can "see", without losing any image or audio quality when you play the tape back. You can duplicate a digital tape as many times as you want, without loosing quality. Digital video can also be easily downloaded to a computer, where you can edit it, post it on the web, or even offer it as a video podcast. Digital video has a much higher resolution than analog video.

Web Cameras

Often built right in to your laptop computer, these webcams can be great if you're the star of your own vodcast show. They are quite simple to use, and if you have your laptop, you have everything you need to record! They are often not the best quality, but would be adequate for many vodcasts (remember, we're talking about shooting for the small screen, not the big screen). They record audio and video right to your hard drive, and they can also be used with real time video-conferencing systems (like iChat AV, Skype, etc).

Flash-based

Flip USB video camera. I think of these cameras as webcams that you can take with you without lugging around your laptop. They vary in quality and format, but they record to an SD or Flash Card, which can be removable or not. A common version of this (shown to the right) is the Flip camera that has become the easy-to-use camera of choice for YouTubers.

Don't expect to find any fancy features with these, but they are the kind of camera you can throw in your bag or backpack and just take it with you everywhere you go. I like this Flip camera, you don't even need to carry a cable around with you - the USB jack needed to connect to your computer is attached to the camera!

For me, I find these a little bit limiting because you can't remove the media from them - so if they have 1GB of storage, that's all you get - you can't just put in an 8GB card to expand them. So they can be a little limiting. When you read the specs for these cameras, be sure to note what quality provides which recording time - and stick with the highest quality recording (which will get you the least recording time).

Digital Still Cameras

Hey, don't forget that some digital photo cameras also shoot small amounts of video. The quality can really vary on these, as will the amount of recording that you can do, but they are yet another way to shoot video. Canon and Kodak have some great, very small still cameras that also shoot video which are worth looking into.

Your Cell Phone

Absolutely not the quality you'd normally choose, but a lot of cell phones can also shoot video - so if you're out there and something amazing happens - just use your cell phone video and see what you get!

DV Cameras (Digital Video format)

This format came into existence around 1998, and has been a great performer ever since. For what it's worth, this is the kind of camera I own. DV cameras transfer their data to your computer using IEEE Standard 1394 (Firewire) and some use USB 2.0. DV connections let you transfer digital data (both video and audio), directly from a DV camera to a digital editing system without any conversion loss. DV technology simplifies the process of bringing footage from your camera into your computer, and gives you high-quality video at low cost. Became widely used in the late 1990s and is still popular. They come in two basic quality choices - 1 or 3 chip (CCD). We'll start with the ones that record to mini-DV tapes.

1 chip (1CCD)
These are great "consumer" level cameras. They are pretty affordable and will give you years of great use. The tapes run anywhere from $5-$10 depending on where you buy them. The 1CCD (which you might see written on the side of the camera) stands for 1 Charged Coupled Device. This is basically the image sensor that the camera uses to pick up the light and color information through the lens and write it to the DV tape. To create any image, three colors are required: red, green, and blue. With a single CCD system, one sensor sees all three colors and interprets them.

3 chip
3CCD cameras capture image data by assigning one color to each chip, resulting in more accurate color information. With a 3CCD system, one sensor is dedicated to see and interpret each color (red, green, blue), resulting in three times as much color information. You'll get better detail and more accurate colors with a 3CCD camera. And, you'll have better looking "low-light" images because you basically have three times the "seeing" power. They are more expensive than single chip cameras, but probably worth the investment.

Hard Disk Drive Recorders (HDD)
Like the DV cameras listed above, these will also come in 1CCD and 3CCD varieties. What makes these different is that rather than recording to mini-DV tape, they record to an internal hard drive. The drives are not removable, so you get what you get, and can't upgrade these. They'll record in some format other than DV (a standard and editable in iMovie and Movie Maker). Sony is big on this kind of camera, and their HDD recorders record in MPEG2 format - which is nearly impossible to edit on a Macintosh.

You'll find 30GB on up hard drive sizes - giving you hours of record time on the drive. Just sync the camera with our computer to clear off the hard drive and shoot some more.

HDV
I have known many people who have purchased a brand new HDV camera and come up to me so excited to have their new "hi-def" video camera. Well, don't let this happen to you. HDV does not stand for hi-definition video. HDV is an "enhancement" to the DV format - but it still records to mini-DV tapes. Both iMovie and Movie Maker support this format. The quality is dependent more on whether you get a 1CCD or 3CCD camera. These are good cameras, and the quality can be great, just know what you're buying and make sure it works with your computer.

DVD recorders
Rather than tapes, some video cameras record right to DVDs. Nowadays, there's even cameras that record right to Blue-ray (hi-def) discs. I haven't used these, and the media can sometimes get expensive. Most of the discs are the smaller size "mini-DVDs" and my slot-loading DVD player on my laptop doesn't accept

these. If yours does, this might be a good option.

Video Camera Basics

There are three basic levels of camera you can use to take great video footage. You should choose based on what you need, what you have access to, or cash to buy!

Consumer cameras are great for the home user, and they are the cheapest video cameras you can buy. In most cases, this will be a great entry-level camera you can get, and not worry so much about special features or complicated manuals. These are typically 1-chip cameras.

Prosumer cameras are the high-end of "consumer" cameras, or the low-end of "professional" cameras. These cameras are typically 3-chip cameras, but still small, light, and something you can take with you on vacation without feeling like a news videographer! These work great for home businesses, wedding videos, public access stations, and uses like that.

Professional cameras are what you see professional videographers using. They are "broadcast" quality. They are large and bulky, but take pristine quality video footage. They are typically too expensive for the common consumer or small business. You'll find these cameras in television studios and with reporters in the field.

Understanding Image Sensors

There are two main types of image sensors, CCD and CMOS. Neither one is inherently better than the other. CMOS sensors have, in the past, been used in low power, low-resolution situations, where CCDs have been used in cameras that focus on high-quality images with lots of pixels and excellent light sensitivity. CMOS quality is improving rapidly, and there's little difference between the two technologies.

CCDs

Like a film camera, a camcorder "sees" the world through lenses. In a film camera, the lenses serve to focus the light from a scene onto film treated with chemicals that have a controlled reaction to light. In this way, camera film records the scene in front of it: it picks up greater amounts of light from brighter parts of the scene, and lower amounts of light from darker parts of the scene. The lens in a camcorder also serves to focus light, but instead of focusing it onto film, it shines the light onto a small semiconductor image sensor. This image sensor, a charge-coupled device (CCD), measures light with a half-inch panel of 300,000 to 500,000 tiny light-sensitive diodes called photosites.

The more CCDs (or chips) your camera has, the better the image quality will be. Currently, consumer cameras have 1-chip, and professional cameras have 3 chips.

Understanding CMOS

CMOS (complementary metal oxide semiconductor) image sensors use a different technology from CCDs for capturing images digitally. In a CMOS sensor, each pixel has its own charge-to-voltage conversion (rather than 1 or 3 chip CCD cameras), and the sensor can includes amplifiers, noise-correction, and digitization circuits, so that the chip outputs digital bits. This seems like it should be great, but with each pixel doing its own conversion, sometimes adjacent pixels which "should" look similar don't.

And now there's High Definition
Yes, now, even regular consumers can get digital video cameras that record in high definition, or HD. These cameras are becoming more popular, but they are still pretty expensive. And, think of the hard drive space that is required to edit the footage! Sometimes you'll see this listed as HDV (high-definition video). Beware, some cameras have an HD stamp on them, but HD in this case refers to the fact that they record footage to a hard drive right in the camera.

You'll need to use a video editing application that supports the HD format - but any version of iMovie since 2006 does, as does Movie Maker since Vista (2007). (Read this as your XP versin of iMovie won't edit HD footage.)

Zoom Lenses
Just like with a digital still camera, a digital video camera usually has both an optical, and digital zoom. **Optical zoom** occurs within the optics (the properties of the actual glass) of the lens. It is beautiful quality.

Digital zoom doesn't involve the camera lens at all; it simply uses the camera's processor to expand an image beyond optical zoom. Digital zoom focuses in on part of the total picture captured by the CCD, and magnifies the pixels. Digital zooms stabilize magnified pictures a little better than optical zooms, but you sacrifice resolution quality because you end up using only a portion of the available photosites on the CCD. The loss of resolution can make the image appear fuzzy (shown below).

When you're using your video camera to shoot footage, be careful to not overuse the zoom lens. Continuously zooming in and out can really distract from your story. Use your zoom to frame shots, then use it sparingly while you're shooting.

Here's a tip. If you zoom in all the way, you can really focus on your images. If you zoom back out, everything in the camera's view will remain in focus.

Using a Tripod

A great feature to look for if you're in the market for a new video camera is called image stabilization, which helps steady a shaky hand. It works great to give you smoother, non-jerky video footage. Often, I find that a slightly heavier camera also helps me keep the camera steady (hence I own a prosumer camera that is larger than the tiny consumer cameras out there).

The best way to stabilize your video footage is to use a tripod. Although you can try your video camera on a standard still camera tripod, you may find it doesn't let you smoothly pan the camera around or change the tilt. A fluid-head tripod will be best, but they can be expensive.

Microphones

Every digital video camera comes with a built-in microphone that lets you record audio along with your video. These mics are typically directional, picking up audio directly in front of the microphone. Some cameras even have features that "zoom" the audio in as you use the zoom feature on the lens. The mics are pretty good for most consumer, or even semi-professional uses. Be careful when you're using your camera outside, these mics don't handle wind very well.

If you need better audio to go with your video, you can use the mic in jack to plug in an external microphone. Even if all you have is a mini-jack mic input on your camera, you can still attach an adapter that will convert the input to "XLR", a professional microphone connection. Check when you're buying a camera to see if you have this option - it can make your consumer quality camera into a prosumer quality camera with a simple adapter.

Most Sony cameras have "shoe" adapters on the top of the camera. You can use the shoe to attach wired or wireless microphones to improve your audio quality.

Analog Video Converters
Digital video can be processed in many ways that analog video cannot. Digital video can also be played over and over without any degradation, when analog video loses quality over time in poor storage conditions.

So, there is huge benefit to digitizing your old analog video footage. It can preserve the footage, and you can integrate the old footage and the new footage together in interesting ways.

Analog sources must be converted into a digital format by a digitizer. A digitizer, or converter box, is a device designed for a certain type of analog source material, such as a negative film scanner, flatbed scanner, or a video capture board system.

Some computer-based editing software, in conjunction with a capture card, can digitize analog videotape and save it to disk as clips that can then be add to a project. Capture boards usually come with capture software and are sometimes bundled with editing software. There are digitizer systems for consumer use,

professional corporate level use, multimedia professionals and broadcast quality.

It is up to the quality of the digitizer card to have the quality standards to be able to digitize the original video source into a quality digital source for use in production projects.

A short interlude
Technology is obviously changing every day. What was new yesterday, becomes obsolete in a matter of just a few years. So, you've got lots of old VHS tapes sitting around, degrading year after year on your bookshelf. Now is the time to digitize them into your computer to preserve them.

I once had a job taking old reel-to-reel audio tapes and converting them to DAT tape - the medium of choice in the early 1990s. They were trying to preserve these old tapes by converting them to digital. So I'd load up the reels onto the machine, and play the tape. Invariably, the tape would break during the copy, so I'd have to splice it back together and start again - hoping it wouldn't break again. Yes, media gets this fragile after as few as 10 years.

Anyhow, I converted it all to DAT, and now they are in the process of burning it all to DVD or some other medium.

The moral of the story, you need to kind of "keep up" with your media archives. Even word processing documents you created a few years ago may not be able to be opened in new versions of software - so, every so often, its a good idea to go back and check your archives, to make sure they are still in usable condition.

Another good reason to keep uncompressed, pristine-quality files around. Hold on to your .WAVs or AIFFs. Keep your .PSDs. And keep your uncompressed, unedited video footage.

File Sizes for video
How much digital video can I fit on a CD-ROM? How big a server do I need to hold my streaming files? How big a drive do I need to store my digital video and audio files? Video takes up a lot of room on your computer! Let's do the math.

The three variables to consider are:

- Disc space available (measured in KiloBytes)
- Data rate for every second of the movie (measured in KiloBytes)
- Duration of the movie (measured in seconds)

Given two of the variables, the third can be calculated using this formula:

Disc Space (KBytes) = Duration (secs) X Data per second (KBytes)

uncompressed video footage =
720 pixels x 480 pixels = 345,600 pixels per frame
at 24-bit color depth for each pixel = 8,294,400 bits
8,294,400 bits divided by 8 (to get bytes) = 1,036,800 bytes or about 1MB per frame.
So uncompressed video footage takes about 30MBs per second - running at 29.97 fps

30MBs x 60 seconds = almost 2GB per minute for uncompressed video (no one really ever uses uncompressed video)

DV is compressed video (although it's considered "mild" compression, and its super-high-quality, and it compresses at a ratio close to 10:1).

For DV you get about 5 mins of footage = 1GB

(ps. this doesn't include the audio!)

Working in HD - 1 min = 1GB (this is about half the file size as uncompressed video and 5 times the file size of DV)

Getting A Hard Drive for Video

First, if 5 mins of DV footage takes up about 1GB of hard disk space, you'll need a large hard drive to hold even your short videos!

Most video editing software would prefer that you have a dedicated hard drive used only to store digital video footage - separate from your applications, documents and all the other stuff you've got stored on your computer. This way, you can reformat the video hard drive after every project, to keep it defragmented and working great for video.

Hard disk speed is key. Because your camcorder transfers footage very quickly, your hard disk and its disk controller must be fast enough to accept it. How fast is fast enough? Since each second of DV video consumes about 3.6 megabytes of disk space, your hard drive must be able to receive and store ("write") data at a minimum sustained transfer rate of 3.6 megabytes per second. For most modern hard drives, that's not a challenge, but that's not always the case. Laptop computers, for example, often use slower hard drives that require less power when operating on batteries and, in some cases, they aren't fast enough to work with digital video. Best to check before you buy.

Digital Video Editing - How did we get here?

If this is to be your first experience editing video, consider yourself fortunate! You'll be editing video at your home, on your own computer. It wasn't too many years ago that you had to use a really expensive editing studio, paying high hourly fees, just to edit video. And, it was probably editing "tape" or analog