Video #00 - Intro to Digital Imaging Concepts

When it comes to working in Photoshop, there's a few vital pieces of information that we need to know that will help us to fully understand the full extent of what we can do and what the tools in Photoshop can help us to do. The first of these is image size. Now every digital image is made up of pixels. The pixel is a point of information, which collectively make up a raster image for digital photographs or raster images. And some of you may have worked with vector images, which uses mathematical formulas to create shapes, like icons and things like that. So all digital photographs are raster images. And the important thing about raster images if you keep enlarging it, if you make it bigger, you lose quality of the image it breaks apart. individual pixels contain two pieces of information, its location, and its color value. Image Size is a description of how many pixels or individual points of information an image contains. Generally speaking, we measure pixels in how many pixels are running across an image, and how many pixels are running down an image. The amount of pixels in your image is directly related to the amount of megapixels in your camera sensor. In a camera. We measured in megapixels. But when it comes to Photoshop, we tend to normally talk about how many pixels run across versus how many pixels run down. In this image, we can see that there are 2000 pixels across. And 1333 pixels down. Image Size should not be confused with file size. So while image size is how many pixels are physically in your image, file size is how much space an image takes up on your hard drive. These two things are very closely related. Because if there are more pixels in an image, then the file size will be bigger. But they're not a one to one relationship, because the way their file saves can sometimes be compressed, which means that the file size is smaller. While the image size remains the same. One of the key problems with a pixel is that it is dimensionless. That means that an individual pixel has no scale, we can have a pixel that is the size of the smallest one on your phone, which you can't see with your naked eye. Or we could have pixels that are the size of your hand, if you can think about those massive screens that you have at stadiums if you go to see a concert. So this becomes a problem is that if we want to print something in the real world, we'll make the image real in some way and measurable, we need to assign pixels a dimension. And the way we do this is with something called resolution. Resolution is the density of pixels in the image. And it describes how many pixels fit into a given amount of space. Typically, we measure resolution in pixels per inch. So how many pixels there are an inch of space on your screen running edge. So if you have a single inch on your screen, how many pixels are fitting into that physical image. Luckily for us, we really just need to memorize two figures for resolution and the one is 300 pixels per inch. And this is if we're printing something, we need to make sure that we're printing with a density of 300 pixels per inch. And this is because of two factors. One is a printer prints generally speaking about 300 dots per inch. So that's the kind of technical limit of how much your printer can print how dense your printer can print. And secondly, at 300 pixels per inch, we're hard pressed with our naked eye to see the difference between one pixel and the next one. So it gives us a smooth, high quality image. When we're exporting something for a screen, we would export it at 72 pixels per inch. This is a little bit more complicated because screens have a variety of different resolutions. So for instance, the screen I'm currently looking at has a resolution of 72 pixels per inch. Whereas if you're looking at this on your phone, you could probably expect the resolution to be somewhere upwards of 200 pixels per inch. But generally speaking, we tend for the lowest common denominator. And if you're producing something for screen, then you will need to set your resolution to

72 pixels per inch. The next thing I want to talk about is digital color. Now if you've ever worked with paint, or anything along those lines, digital color is a bit mysterious works very differently from the kinds of ways that we're used to color working now every single pixel, if I were to take a magnifying glass and zoom into my phone screen on my computer screen and look at an individual pixel on the screen, you would actually see that it's not a single little light, it's normally made up of three micro pixels, one that's green, one that's blue, and one that is red. And by controlling the luminosity of these micro pixels, we can make almost any visible color. These little micro pixels are so small that the colors mix optically, you won't actually see the individual colors. This is called the RGB color model for red, green, blue. Any one of these micro pixels can be turned on or off. Let us just imagine that the green pixel has been turned off, we'd just be seeing the red and the blue pixels together as they would make the magenta color. If you mix green and blue, you'll get Cyan. And if you mix green and red, you get yellow. And if you mix all three, you get white. So that basically gives us our primary colors, which is red, green, and blue and are secondary colors, which are cyan, magenta, and yellow. Now each one of these pixels can be turned on or off. But so each pixel can have a varying amount of on or off. It can be turned on or off in steps. There are 256 steps, and I'll talk to you about that in a minute why there's that number. So we can kind of have a variety of shifting colors by turning some of these pixels partially on or partially off, and you can see that it changes the intensity of the color that's visible. So we can basically using these three factors We can then use that to represent any visible color. The problem with this particular mode of color is that it's a little bit confusing for us, right? It doesn't work intuitively, how would you make orange with the system would not be as logical and easy. So the most important thing for us to know about the RGB color system is it's the system that most monitors and most computers use. Anything that has to do with digital normally is working with an RGB color system, and that colors work in opposition or pairs. So often in Photoshop, we'll see this when we're making changes to color that the primary and its opposite secondary color work together in some manner. So the opposite of red cyan, the opposite of green is magenta, the opposite of blue is yellow. So for instance, we often find if we've got a bluish color cost, and our image will add yellow into the image, or if you've got a cyan color cost will add red or magenta color cost to add green. So these kinds of colors work in opposition to each other, they neutralize each other. Photoshop has a second color model to help us describe color. And this is called the HSL model. The HSL model breaks up our colour into three characteristics, hue, saturation, and luminosity hue in this system is where on the spectrum a color falls. So is it a red, is it a magenta, is it a blue? Is it a cyan, green, orange. Saturation is how rich our color is, when there's no saturation in the color, it's perfectly gray. And as we increase the saturation, the color gets richer and richer and richer until it's completely saturated. And the final characteristic is luminosity, which is how light or dark or color is. And with these three factors, we can create any color that we want. So we can create a light, highly saturated tone, a light desaturated tone, a dark saturated color, or a dark desaturated color, or anything in between, we can make any color that we can visibly see using this system. The next element that we're going to talk about is the bit depth of an image. The bit depth describes how much information is in an image when we spoke earlier about there being 256 shades of each micro pixel for red, green and blue. That number 256 is called our bit depth. But there's two reasons that it's 256, it's got to do with how computer architecture works, we often find that numbers work in powers of two, so we'll get two to the power of four, two to the power of eight. And that's just got to do with how your computer works. But the reason they've come up with two to the power of eight, which is eight bit color, so two times two times two times two times two times two times two times two gives you 256 is because if you were to lay 256 pixels next to each other, and started off with the first

one being off, giving you black, and the last one giving you a pure color, in this case red, we'd find a perfectly smooth gradient, we will not be able to see the difference between one pixel and the next. So that is why we've got that particular number, you will note that this way of working with this amount of information in an image if we start an edit an image, we'll start to see those smooth gradients start to break up. So you can see these lines that now appear. Photoshop allows us to work in different color mode, which is called 16 bit color. Now what this is, is your camera shoots in 16 bits. That means for each color and your camera, there are 16 bits of information. Basically, there's more than we can visibly see. And when working in 16 bit mode, your editing software can leverage this extra information in order to make sure that those gradients remain smooth. So if you're shooting with raw on your camera, your image will automatically be in this information rich mode. If you're shooting in JPEG, it won't JPEGs don't support 16 bit color. And that will give us that extra amount of information that when we make edits to our image, our gradients will remain smooth. The downside of this is that 16 bit images are a lot bigger in terms of file size, one of the things that we tend to do is work in an image in 16 bit mode and save it in eight bit mode. The last thing I want to talk about is file formats. And there's four file formats that we'll encounter regularly. The first one I'll talk to you about is one you're probably familiar with this raw files. So if you're shooting with your camera in raw mode, it'll produce a raw file. Now each camera maker has its own proprietary type of raw file, the raw file preserves all the camera data as its shot, it's recorded into the camera. And what this does is it allows the best image quality from the camera it records the full 16 bits. It records all sorts of extra information in our image. The downside of it is that you cannot print a raw file RAW files need to be processed and converted. Generally speaking, you can use something like Lightroom or bridge although Photoshop does have a built in raw editor as well, Raw generally quite a large file size as well. When we work in Photoshop, we will often save something as a PSD, a Photoshop document format, and this is photoshops native format. It's great for working files, so if you're busy still working with the file, it's a great format because it preserves all of the bits and pieces that Photoshop adds to an image like layers and masks are capable of working in 16 bits. So it's a great file format for working. The TIFF is very similar to a PSD. The only major difference for our purposes is that TIFF is open source. It's not owned by Adobe and then it means that it has bigger support, wider support and a PSD file. So generally speaking, I would use a TIFF as a printing file, it's also a large file format. But it can also support 16 bits and preserves the layers and masks. The final file type that we're going to encounter is a JPEG and a JPEG is a compressed file. So what this means is that it will compress the file size. So it does a whole lot of algorithmic kung fu to the image, it'll keep the image size the same, but it will downgrade the file size. I'm just going to quickly show you what a JPEG image looks like. If we start to zoom in, we can see what we call compression artifacts. And this is this kind of like scattering of little square around edges. And within gradients, the gradient is kind of reduced into those weird blocks and stripes. So those are called JPEG artifacts. So you can see it reduces the quality of the image, but it also radically changes the size of the file. The few things to note about a JPEG, it's great for anything to do with file size is more important than image quality. So if you're putting things on the internet, or you're sending things over to a client via email, whatever it may be, JPEGs are a great format for that because the file size is small. However, it's not great for printing, and it's not great for storing files either. It's not great for working files because it doesn't preserve things like layers and masks.