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INTRODUCTION TO DSLR PHOTOGRAPHY

ONLINE COURSE BY NICK CARVER

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WEEK 4 LESSON GUIDE

EXPOSURE TOOL #1: THE SHUTTER SPEED

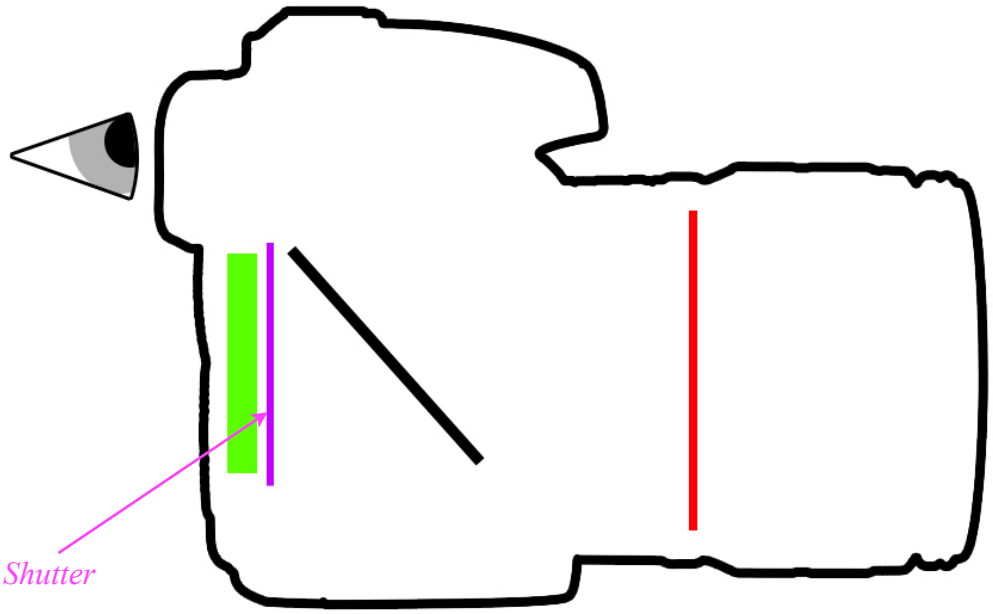
In Week 2 of this course, I touched on the shutter speed, aperture and ISO as your 3 exposure tools. This week I'm going to really break down the shutter speed into something you can use. Next week will be the aperture and the week after that will be the ISO.

WHAT IS THE SHUTTER?

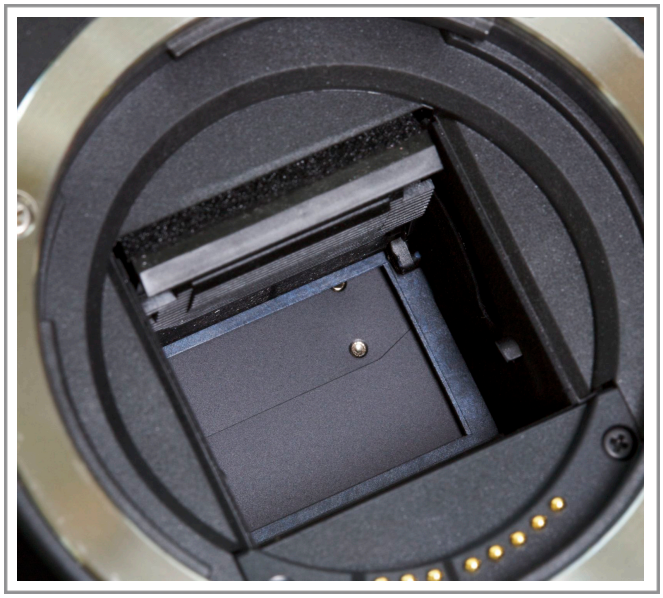
As far as *what* the shutter is, let me refresh your memory from Week 2.

The shutter is a curtain-like mechanism in front of your image sensor that blocks your sensor from the light until it's ready to take a picture. When you do take a picture, it snaps up like a window shade to let the sensor "see" the light coming through your lens and make an image. It's nothing more complicated than that — it's just a blind that snaps out of the way whenever you take a picture so that your camera's sensor can see the light coming through the lens and, thus, create an image.

Here's where the shutter is located:



Here is a picture of the shutter (it's those gray "blades" or curtain back there where the sensor was):



WHAT IS THE SHUTTER SPEED?

This curtain can stay open for various lengths of time depending on what your camera (or you) dictates. This length of time is called the "shutter speed." It can be open from a split-second to multiple seconds, minutes or even hours. You could literally start a stopwatch at the beginning of your picture and stop the stopwatch at the end of your picture and that will be your shutter speed. Luckily, your camera has a built-in timer that will leave the shutter open the correct length of time. No need to carry around a stopwatch.

Your camera can time the shutter speed from 30 seconds all the way to 1/4000 of a second (or 1/8000 for some cameras). Here are all of your shutter speeds (don't worry, no need to memorize them).

30 25 20 **15** 13 10 **8** 6 5 **4** 3.2 2.5 **2** 1.6 1.3 **1** 0.8 0.6 **0.5** 0.4 0.3 **1/4** 1/5 1/6 **1/8**
1/10 1/13 **1/15** 1/20 1/25 **1/30** 1/40 1/50 **1/60** 1/80 1/100 **1/125** 1/160 1/200 **1/250**
1/320 1/400 **1/500** 1/640 1/800 **1/1000** 1/1250 1/1600 **1/2000** 1/2500 1/3200 **1/4000**

To get into multiple minutes or hours, there is an advanced function on your camera found in full Manual that will allow you to time the shutter speed yourself and go beyond 30 seconds. I'm not going to cover that in this class because **you will be dealing with fractions of a second the vast majority of the time in your photography.** You'll also occasionally get into multiple second shutter speeds, but not

often. Using shutter speeds of multiple *minutes* is rare and *hours* is virtually unheard of in digital photography.

WHY CAN IT BE OPEN FOR DIFFERENT LENGTHS OF TIME?

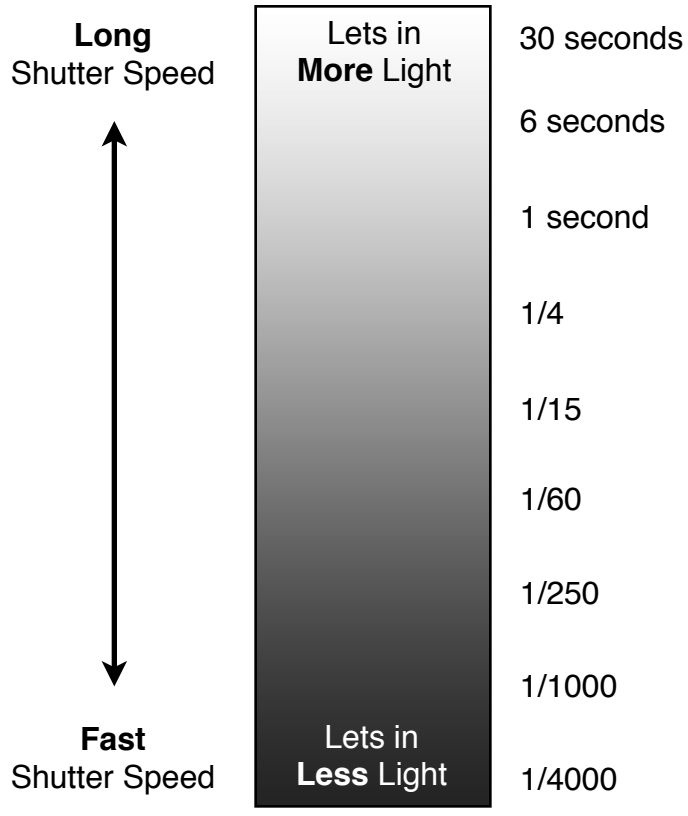
As we covered in Week 2, your camera's sensor works much like a sponge that absorbs light. So, if that sponge is exposed to the light for a long time, it will soak up more light than a shorter time would. The shutter speed will dictate how long this sponge is exposed to the light. And so, the longer the shutter speed, the more light it soaks up.

That's why the shutter can be open for different lengths of time, so it can control how much light the sensor will soak up.

So for example, a 1-second shutter speed is **longer** than a ½ second shutter speed. The 1-second shutter speed will let in **more** light than the ½ second shutter speed.

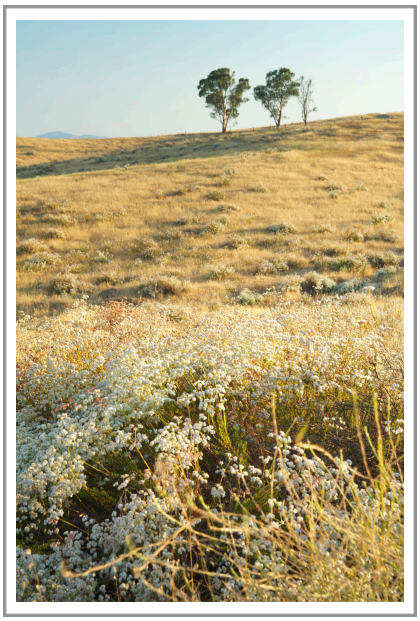
A shutter speed of 1/1000 is much **faster** than a shutter speed of 1/60. So the 1/1000 shutter speed will let in far **less** light than the shutter speed of 1/60.

The following diagram helps illustrate this:

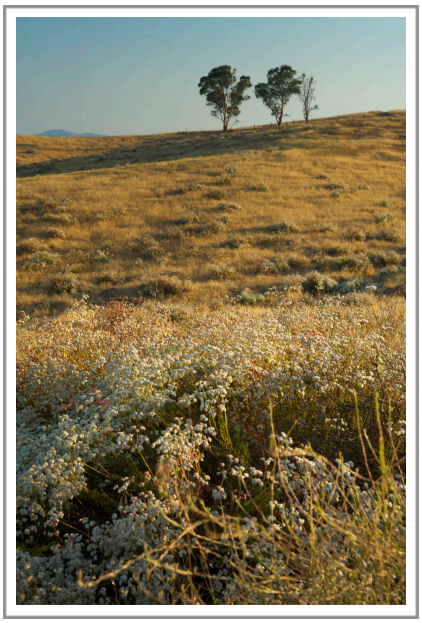


This is why in very low light situations with no flash, your camera will seem like it's taking forever to take a picture. Really what's happening is your camera is using a long shutter speed to give the sensor enough time to soak up the dim light.

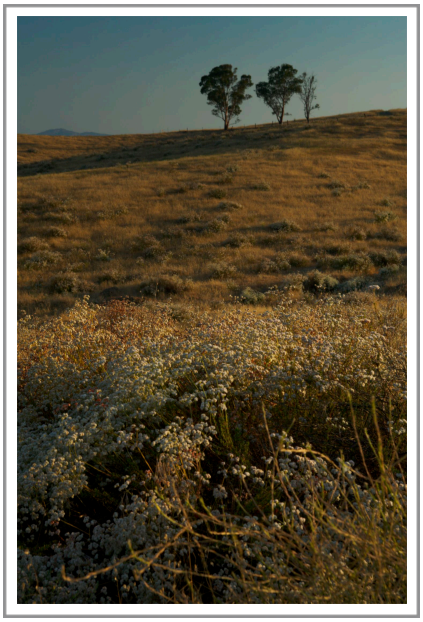
In the following examples, **the only thing that changed was the shutter speed.** I kept the other 2 exposure tools mentioned in Week 2 the same (the aperture and the ISO). These examples are only demonstrating that longer shutter speeds let in more light while shorter shutter speeds let in less light.



Shutter Speed:
1/6 *(of a second)*



Shutter Speed:
1/13 *(of a second)*



Shutter Speed:
1/25 *(of a second)*

Notice how the longest shutter speed created the brightest image and the fastest shutter speed created the darkest image. This is because the longer shutter speed gave the sensor more time to soak up the light and, thus, created a brighter image.

Simple enough, right? It's just there to let in more or less light. That's why we have the shutter speed.

Important Note: Keep in mind that if you put your camera on Shutter Priority Mode ("S" for Nikon shooters and "Tv" for Canon shooters) and make the shutter speed longer, your image will *not* get brighter. This is because your camera is automatically changing the aperture to negate this change. Meaning, you are making the shutter longer to let in more light, but your camera is changing the aperture to let in less light and cancel that out. The way to override this automatic function is to use the Exposure Compensation tool we talked about in Week 2 or to shoot in Manual.

HOW THE SHUTTER SPEED AFFECTS THE IMAGE

As mentioned in the "Important Note" above, an increase or decrease of light from the shutter speed can be negated with the aperture and/or the ISO (I'll explain that much more thoroughly in Week 6). This means that the same picture shot at 20 different shutter speeds could all be the same exposure (the same brightness). To change the brightness of the image, use the Exposure Compensation tool we talked about in Week 2. Changing the shutter speed won't do it unless you are in full Manual.

You might be wondering, "I'm not going to shoot in full manual yet, so why change the shutter speed at all if it won't change the exposure?"

Well, the shutter speed affects the image in another way, too. You could look at it as a "side-effect" of changing the shutter speed — this side-effect is not why the shutter speed exists, but it does affect the image.

This side-effect is *motion blur*. Basically, **changing the shutter speed will affect how motion shows up in the image.** It will determine whether or not motion is stopped or blurred in the resulting photo.

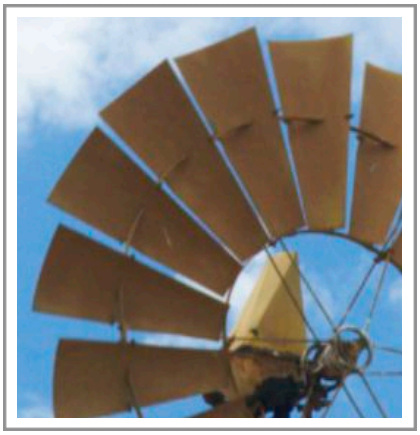
Can you see why? Since the shutter speed is a factor of time and that time can be changed, whatever *moves* during that time period will show up as motion blur in the final image.

For example, let's say you're photographing a person running and your shutter speed is **½ a second**. Well that runner **will move 10 feet** over the course of ½ of a second. So, in the resultant shot, you will see his motion over the course of 10 feet. That's quite a bit of movement, so he'll be really blurry.

Now let's say you're photographing that same runner but now you're using a shutter speed of **1/500 of a second** — much quicker than before. Well, in 1/500 of a second, your runner only **moves about a half an inch!** So, in the resultant shot, you will see his motion over the course of only half an inch. That's not much movement at all, so he won't be blurry — he'll be sharp and "frozen" in his run.

Get it? Faster shutter speeds will freeze motion while slower shutter speeds will blur it.

Here is a sequence of shots demonstrating this change in how motion is rendered depending on the shutter speed. The windmill is moving at a constant speed in each picture. I changed the shutter speed in each shot in order to demonstrate how it affects the motion of the windmill. Notice that the pictures with longer shutter speeds *are not brighter.* This is because my camera negated the increase of light from the shutter with a decrease in light from the other 2 exposure variables (the aperture and ISO). So brightness won't change, only how motion is rendered. In these shots, my camera is perfectly still on a tripod, so my own motion isn't a factor. Notice how the windmill blurs more at slower shutter speeds.

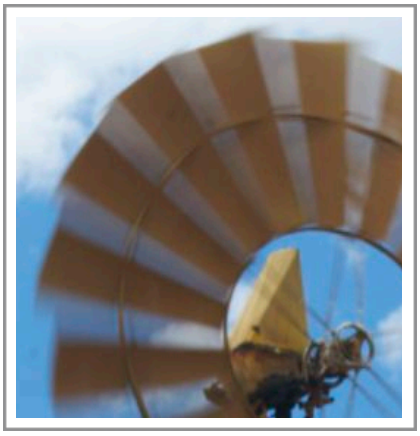


1/200

1/100

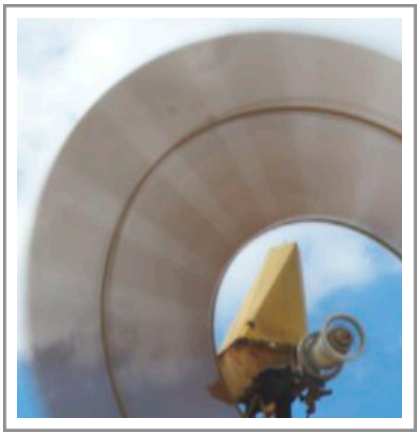
1/50

1/25



1/13

0.3

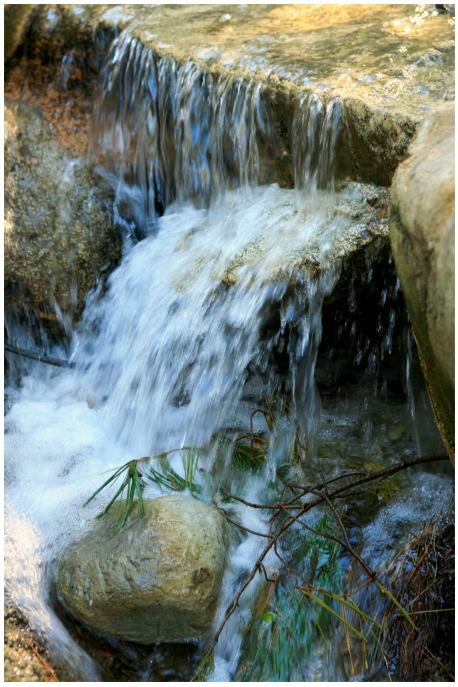


0.6

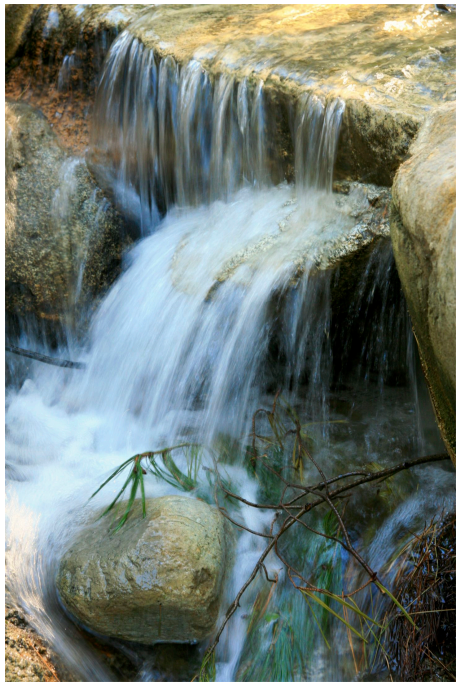
2.5 seconds

5 seconds

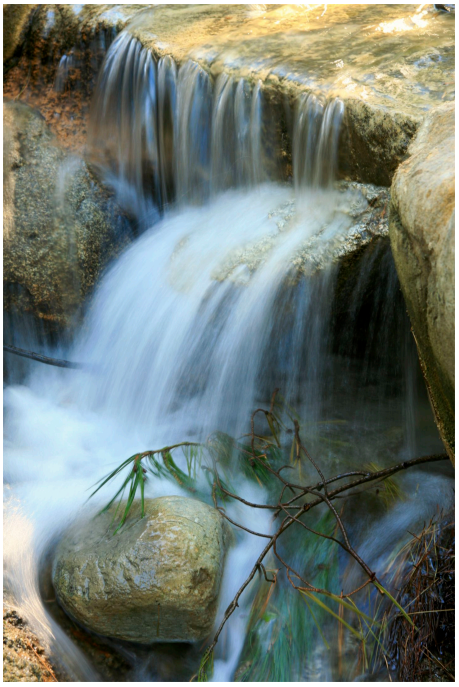
Here is another sequence showing how shutter speed affects the motion of water. Again, my camera is perfectly still on a tripod, so my own motion isn't a factor, and the only thing moving in these pictures is the water, so that is where the motion blur will change.



1/80

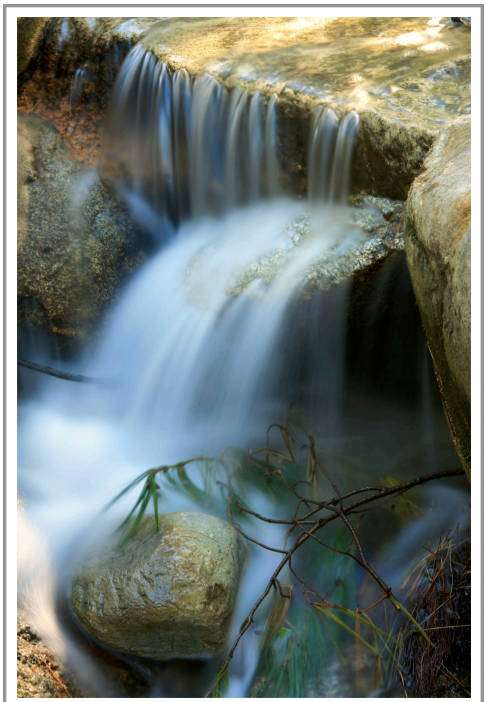


1/20



1/5

0.8 second



3.2 seconds

See how with the longer shutter speeds, the motion of the water is blurrier? Blurred water takes on this "cotton" look that is generally pleasing in most landscapes or close-ups involving water. So, if you want that soft cottony look to moving water, use longer shutter speeds. You just need to make sure your camera stays perfectly still throughout the picture.

WHAT SHUTTER SPEEDS YOU CAN USE

The shutter speeds you'll be *able* to use depends mostly on how much available light there is.

If there is a ton of light available (like outdoors on a sunny day), you'll be able to use fast shutter speeds like 1/500 and above with ease. The light is so powerful that your camera can soak up the proper amount of light without needing to soak it up for a long time.

In a dim environment, however, (like indoors in the evening) it will be much more difficult or impossible to use fast shutter speeds. The fastest you can get might only be 1/10 of a second before your image starts to get too dark! This is because the light is so dim that your camera has to give itself a lot of time to soak up the proper amount of light. It would be like trying to saturate a sponge under a faucet that's barely trickling out water — it's going to have to sit under there for a long time.

Same thing on the opposite end of the spectrum. If you are shooting under a ton of light (like outdoors on a sunny day), you won't be able to use *long* shutter speeds. The longest you can get might only be 1/60 of a second before the image starts to come out too bright. The light is so powerful that if you expose the sensor to it for too long, your image will come out too bright.

Whereas if you're back in that dim environment, you'll be able to use long shutter speeds with no problem. You could probably use a shutter speed all the way down to 30 seconds! The light is so dim that you can leave your sensor exposed for a really long time before it starts to soak up too much light.

Flash is mostly there to add a ton of light to the image and, thus, allow you to use a faster shutter speed.

So don't get frustrated if you can't get the shutter speed you want, either fast or slow. Some environments just won't let you use the shutter speed you need.

WHAT SHUTTER SPEEDS YOU SHOULD USE

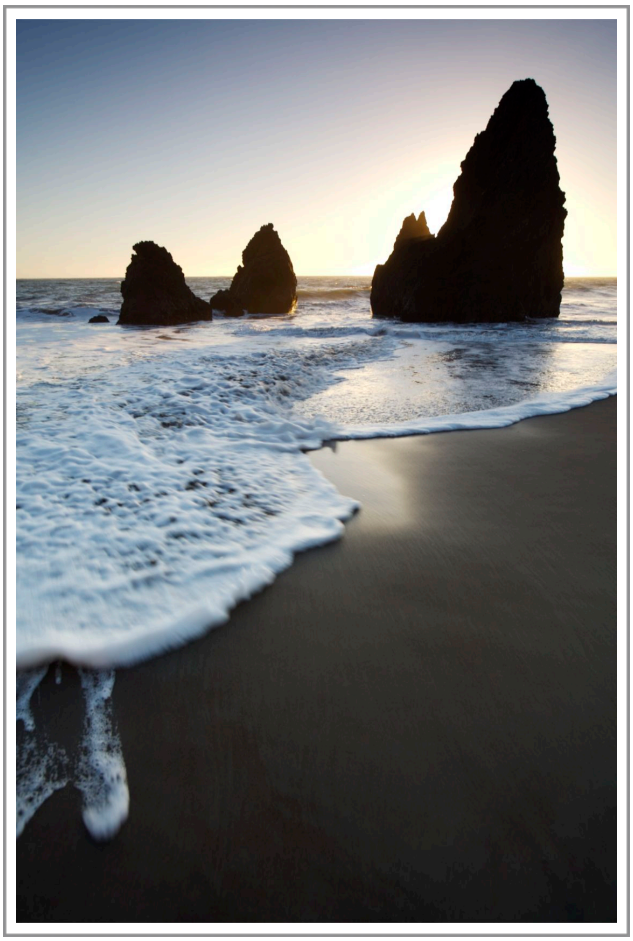
The shutter speed you need in order to freeze the motion of your subject depends on a lot of factors like how fast the subject is moving, how blurry you want it to be and how far away it is. So, unfortunately, I can't just give you a list of common subjects and tell you what shutter speed to use (books or other classes that do that are trying to dumb it down too much).

You'll have to take lots of pictures of different subjects to learn for yourself what shutter speeds freeze what kind of motion. But I'll give you just a few starting points here:

- To get that cottony look to water, you'll probably need at least 1 second or longer
- To freeze a person walking, you'll probably need at least 1/100 or faster
- To freeze an average person running, you'll probably need at least 1/500 or faster
- To freeze hummingbird wings, you'll probably need 1/4000

So if you want to freeze motion, you need faster shutter speeds whereas if you want to blur motion, you need slower shutter speeds. Just how fast or slow of a shutter speed you need depends on how quickly the subject is moving.

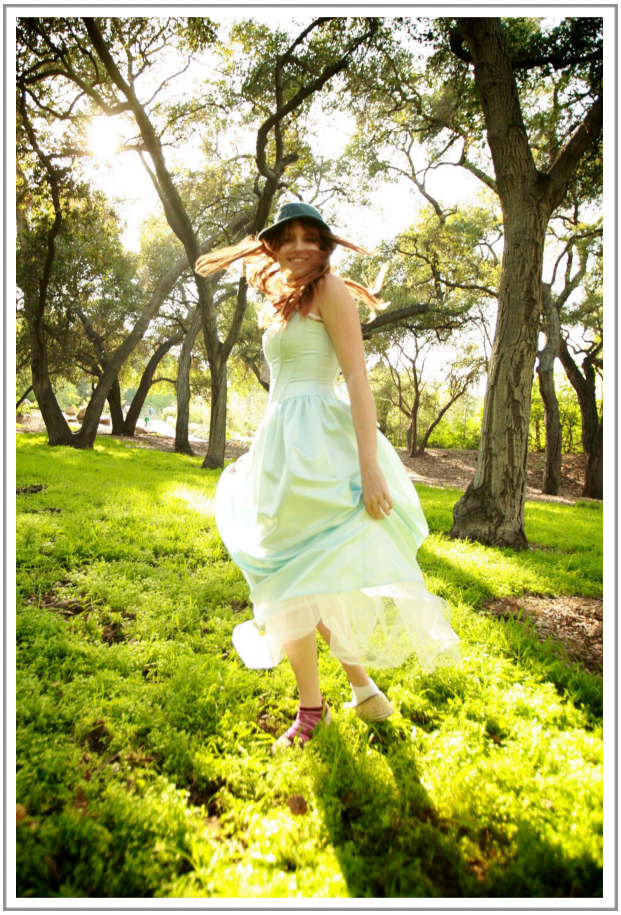
Here are several real-life example pictures and the various shutter speeds I used:



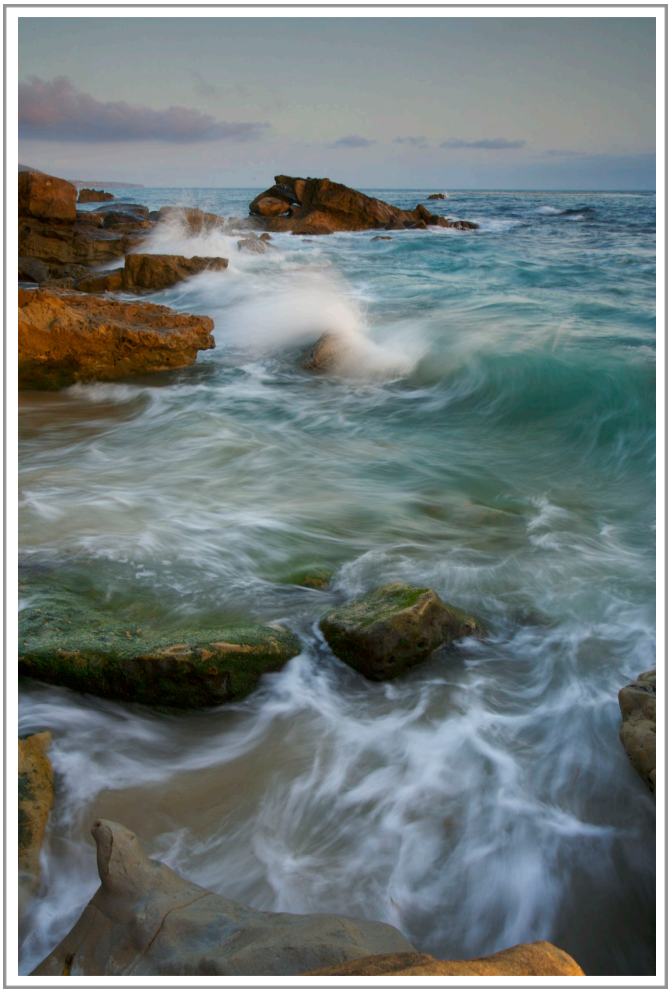
1/60

1/6400

1/8000



1/500



0.3 seconds

8 seconds

One thing you can keep in mind is that although the human eye has no shutter speed (since we have no shutter), we obviously can't see things like hummingbird wings frozen in mid-flight and we don't see water with a cottony look. This means we must have something *like* a shutter speed, right? Well, if you were to "assign" a shutter speed to the human eye, it would be somewhere around 1/30 to 1/60 of a second. **But this does not mean it's safe to shoot a subject at 1/60 and it doesn't mean your subject will come out sharp at 1/60!** It just means that's about comparable to what we see.

Pro Tip: Don't be afraid to experiment with shutter speeds. You don't have to freeze the motion of a moving subject for it to be a great picture. Using a little bit slower shutter speed on a person or animal running will show some blur that will really make the subject look like it's moving. In such an instance, try using a little bit slower shutter speed (like ½ to 1/15 of a second) and pan your camera to follow the motion of the person, animal or car. It takes some practice, but if you pan your camera at just the right speed, the background will blur into streaks and your subject will look relatively sharp. It makes it seem like the subject is going really fast!

HANDHOLDING AND SHUTTER SPEED

Now, if shutter speed is going to affect motion blur, then you need to consider the fact that you are moving (ever so slightly) when handholding your camera. Even with perfect handholding technique and stance, you aren't all that stable. Breathing, your pulse, trying to hold the weight of the camera — all these things contribute to instability. And you need a fast enough shutter speed when handholding your camera to freeze all of this motion.

It seems to be floating around the photography community that 1/60 of a second is fast enough to freeze your motion. *This is false!* If anyone teaches you this or you read it somewhere in another resource, *ignore it because it is wrong.*

The correct rule of thumb for an acceptable shutter speed to handhold your camera is (and I will explain it fully in a minute):

$$\frac{1}{\text{Your Lens Focal Length}}$$

First off, let me explain "You Lens Focal Length" in a nutshell. The focal length of your lens is that little number indicated on the lens barrel like "28" or "70". Here are some lenses with the focal length indicated on each:

*This is a focal length of **100mm***

*This is a focal length of **70mm***

*This is a focal length of **35mm***

*This is a focal length of about **45mm***

This number is actually indicating millimeters, but the millimeters have *nothing to do with how far away your subject is, should be or needs to be.* This number is basically indicating magnification with the higher numbers (e.g. 300mm, 500mm, 600mm) being much higher magnification and the lower numbers (e.g. 25mm, 50mm, 75mm) being lower magnification. This focal length number can range from 10mm to 800mm depending on the lens. I'm not going to cover lens focal length any more in-depth than that in this class. For now, just know that higher focal length numbers (in "mm") have higher magnification.

So with this rule of thumb, again, the *slowest* shutter speed you can get away with when handholding is

1

Your Lens Focal Length

Which will look something like this:

If your lens focal length is set to	Then your shutter speed needs to be at *least*
25mm	1/25
50mm	1/50
100mm	1/100
250mm	1/250
400mm	1/400

You can always go *faster* than this, but if you go any slower, you risk blurring the image from your own motion. And **this rule of thumb only affects your own motion blur, not the subject**. So if you're shooting at 100mm, but your subject is a hummingbird, 1/100 of a second will freeze *your* motion, but it will not freeze the *hummingbird's* motion.

The reason this rule works is when you zoom in with your lens (meaning you move to the higher focal length numbers), everything gets magnified — including your own motion — so you need a faster shutter speed to freeze your motion when you zoom in.

Here are some images demonstrating this rule of thumb...

The image to the right is a 100% view of an image that was taken handheld with a focal length of **200mm** and a shutter speed of **1/40**. The shutter speed I chose *broke this handholding rule (i.e. was too slow)* and, thus, resulted in a blurry image from my own camera shake.

The image to the right is a 100% view of the same image that was taken handheld at the same focal length of **200mm** but now with a shutter speed of **1/400**. The shutter speed I chose *followed this handholding rule* and, thus, resulted in a sharp image.

See how much blurrier the image that broke the rule is?

Keep in mind, though, that this is just a rule of thumb. You might find you need to shoot with faster shutter speeds to freeze your motion, or maybe you'll find you can shoot with slower shutter speeds and still get a sharp image.

The most common reason for blurry photos is TOO SLOW of a shutter speed when handholding! So really understand this rule and start using it. Utilizing this handholding rule of thumb will prevent blurry photos the vast majority of the time.

CHANGING THE SHUTTER SPEED AND WHERE TO FIND IT

Back in Week 2 of this course, we talked about the different shooting modes on your camera. One of those modes was called "Shutter Priority." This mode is indicated by an "S" on Nikon cameras and "Tv" on Canon cameras. When you put your camera on this mode, the shutter speed will be in your control (as well as the ISO if you wish) while the camera takes care of the aperture value for you.

In these modes, the shutter will be controlled by your camera's primary control dial. For all Canon cameras this will be the front dial near your righthand index finger. On Nikon cameras it will typically be the rear control dial by your thumb. Rotating this dial back and forth will lengthen or shorten your shutter speed.

On your camera's display screen, the shutter speed value will be located on the left. Here are some common camera display layouts and where the shutter speed is indicated. **All demonstrate a shutter speed of 1/250 of a second**.

*Display from a **Canon** camera*

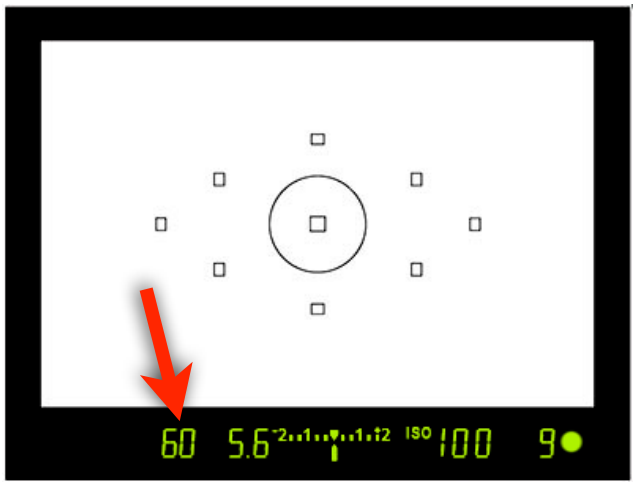
*Display from a **Canon** camera*

*Display from a **Nikon** camera*

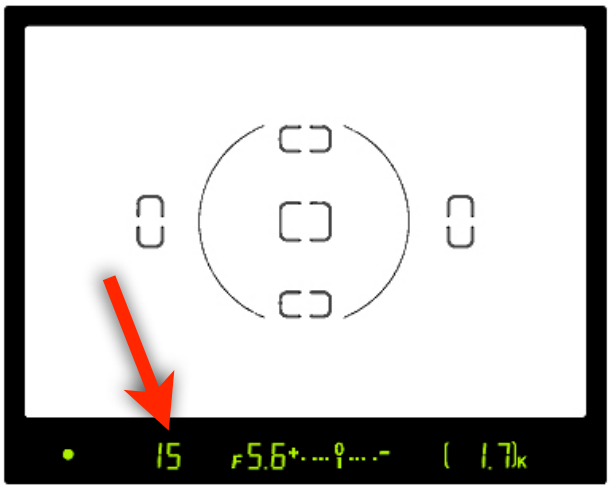
*Display from a **Nikon** camera*

As you can see, some cameras put the entire fraction (1/250) while others only put the denominator (the bottom number of the fraction - in this case, 250).

When you look through your viewfinder, you'll see these values at the bottom, too (usually in a yellow-green digital display). This allows you to change the shutter speed without taking your eye away from the viewfinder. Again, the shutter speed is on the left side and it will only show you the denominator, not the whole fraction. Like this:



*This is a typical **Canon** viewfinder display with a shutter speed of **1/60**.*



*This is a typical **Nikon** viewfinder display with a shutter speed of **1/15**.*

Full seconds always have quotes after them. For instance 30 seconds will be indicated by 30”. Similarly, 2 ½ seconds with be indicated by 2”5.

So **⅛ of a second** will look like this:

Whereas **8 seconds** will look like this:

Quick Assignment: Put your camera on Shutter Priority Mode ("S" or "Tv"). Locate the shutter speed value on the display screen and in the viewfinder. If nothing shows up, press the shutter release button halfway down to wake your camera up. Now, rotate your primary control dial to change the shutter speed. Change your shutter speed to 30 seconds. Now bring it all the way up to 1/30 of a second, then all the way up to 1/4000 of a second. No need to take any pictures, just find the numbers on your display and cycle through them to get a feel for the controls and layout.

VIDEO PRESENTATION

Go to the Curriculum Homepage where you got this lesson guide and watch the Video Presentation entitled "Shutter Speed"

ASSIGNMENT

Using the Shutter Priority mode on your camera, take several photos of moving subjects at different shutter speeds. Try to freeze the motion with a fast shutter speed and blur the motion to varying degrees with a slow shutter speed (you MUST stabilize your camera on a tripod or other solid object when using slow shutter speeds so as to avoid camera shake blur). Email 3 images to me at info@nickcarverphotography.com showing the use of different shutter speeds to create different motion blur.

IMPORTANT NOTES ABOUT SHUTTER SPEED:

- You can't use *any* shutter speed you want *whenever* you want. If the light is very dim, you will be limited mostly to longer shutter speeds. If the light is very bright, you will be limited mostly to faster shutter speeds.
- If you can't get a shutter speed fast enough to handhold (according to the handholding rule of thumb explained above), you need to steady your camera on a tripod or other solid object. Not doing so will result in a blurry image.

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