Exposure triangle worksheet

For many who start in photography, the relationship between aperture, shutter speed, and ISO can be confusing. To further muddy the water, the terms stop and f-stop are often used interchangeably, but refer to different things. In this article, I want to take some of the secrets out of these concepts by talking about the exposure triangle and why it's important for those who start to understand. Please note that the concepts in this article are too simplified to make it easy for beginners to understand, especially when it comes to ISO.1) The exposure triangle, shutter speed, and ISO form the three sides of the exposure triangle. You work together to create a photo that is properly exposed. If a variable changes, at least one of the other variables must change to maintain the correct exposure. For more information on this topic, you can review our detailed summary of exposure.2) Stop! Before going too far, let's start our discussion with a light stop. Understanding what a stop is is the key to understanding the exposure triangle. In photography, a stop refers to the doubling or halving of the amount of light that constitutes exposure. Every photo we take requires a certain amount of light to properly expose it. Adding a light stop by doubling the exposure brightens an underexposed image. Conversely, reducing an exposure by one stop (halving the amount of light) will obscure an overexposed image. So how do you add or take a light stop away? To do this, we need to change the aperture, shutter speed and/or ISO. Let's look at each of these individually.3) Shutter SpeedShutter speed is the length of time light is allowed to hit the sensor. It is measured in seconds. The shutter speed is probably the easiest of the exposure triangular pages to understand. To double the amount of light, we need to double the length of the exposure. For example, if you switch from a shutter speed of 1.60 s to 1.30 s, a light stop is added because the shutter remains open twice as long. If you switch from a shutter speed of 1s to 1/8s, the exposure decreases by three stops. Why? From 1s to 1/2 s is a stop. Then 1.2 s to 1/4 s is another stop. Finally, 1.4 s to 1/8 s is another halving of the time in which the shutter remains open or the third stop.4) The aperture refers to the size of the circular hole in the lens that lets light in. The larger the hole, the more light reaches the sensor. In fact, every time you double the area of this opening, double the amount of light or increase the exposure by one stop. On the other hand, if half the area of the opening, you hit half the amount of light on the sensor. And you guessed it; exposure is reduced by one stop. Now, without becoming too technical, an F-Stop is a ratio that refers to the size of this opening. Mathematically, it is equal to the focal length of the lens divided by the diameter of the lens. At first glance, the values are the aperture scale is confusing. The figures do not seem to make sense. Why do small values correspond to larger openings and vice versa? For a simple explanation, read on. To understand why large stop numbers point to small openings and small stop numbers to large openings requires a little math. Don't worry; I'm going to try to keep it simple. If you take the above-mentioned ratio:f-stop = focal length/diameter and rearrange it for the diameter, you get:diameter = focal length/f-stopWhat means that we can calculate the diameter of the aperture for each given focal length by dividing the focal length by the aperture value. But if you divide a certain focal length by a large F-Stop number, the result is a small diameter. Therefore, the area of the opening is small. Conversely, if you divide the same focal length by a small F-Stop number, you get a large diameter. And a large diameter means a larger area and more light that passes through the opening. In addition, it turns out that the rotation and place must be divided by the square root of two (1,414) to double the area of the opening. That's why the F-stops aren't nice round numbers. To reach half the area, the stop must be multiplied by the square root of two. If you're so inclined, prove it to yourself with a little geometry. Remember that the area of a circle:Area = (π/4) diameter2Try the calculation of the area of the aperture for a lens with a focal length of 50 mm using different aperture values. If you move the F-Stop scale up, you should see the ranges double.5) ISOThe last variable in the exposure triangle is ISO. You can imagine YOURSELF ISO as the sensitivity of the digital sensor (although it is much more complicated than that). Higher ISO values mean that the sensor does not need to collect as much light to make proper exposure. Low ISO values mean that the sensor must collect more light to make the exposure. Here is the ISO scale. Like the shutter speed, this scale is easy to understand. The doubling of the ISO corresponds to an increase in exposure by one stop. The halving of the ISO results in a reduction of exposure by one stop.6) The Analogy bucket for each photo has only a mathematically correct exposure. However, there are hundreds of combinations of aperture, shutter speed, and ISO that can be used to create this exposure. The combination we choose depends on what our artistic vision is for this image. First, let's look at how the three variables work together in the exposure triangle. In my next article, I will talk about how to use aperture, shutter speed and ISO artistically. If one of the three variables for each exposure, you must adjust one (or both) of the other variables in the opposite direction. For example, if you have decided to reduce your shutter speed by two stops, you must increase your aperture or ISO by two stops. You can also change both aperture and ISO to a stop with the same effect. Another example is that you have increased your ISO by four stops. Then there is the an equivalent decrease of four stops in aperture or shutter speed (or a combination of both) would be required. So leave everything together with an analogy. Instead of light, let's rain. Specially fill buckets with rainwater. Exposure is the total amount of water collected. Suppose our 'exposure' is a gallon. In this analogy, shutter speed is the time we leave the bucket outside in the rain to fill up. How much it rains is our 'opening'. A downpour would be a wide open aperture (large opening, small aperture number), while a slight dispersion would correspond to a tiny aperture (small opening, large aperture value). Finally, the width of the bucket represents ISO. Now all our buckets need to measure a gallon to collect the right 'exposure'. However, a very flat, wide bucket (think very sensitive, high ISO) will fill much faster than a large, thin bucket (low ISO). There are many scenarios that will collect our one-gallon exposure. To make things a little easier, we'll fix one variable and change the other two. Let's start with the fixation of ISO. If we have two buckets that have the same shape, we could expose one in a downpour for a short time to collect a gallon. Or we could expose the other for a long time during a slight scattering to collect the same gallon of water. However, if we laid out the bucket in a downpour for a long time, we would overexpose our image. Water would spill out onto the ground! Conversely, putting the bucket off would not fill the bucket for a short time. Our bucket would be underexposed. Here's another scenario. This time it can be assumed that there will be a continuous rain. If we have a wide bucket, we don't have to leave it outside for long to collect a gallon of rain. However, if we lay out a thin, high one-gallon bucket in the same rain, it will take much longer to fill the bucket. Finally, let's set the time we leave the buckets out. To collect a gallon of water, we were able to expose the wide, shallow bucket in light rain. Or we could expose the tall, thin bucket in a downpour for the same time to collect exactly one gallon of rainwater. As you can see, there are many combinations of 'shutter speed', 'aperture' and 'ISO' that result in a gallon of 'exposure'. Is one combination better than another? Well, it depends on how you want your photo to look. It is important to understand that if you increase or decrease a variable in the exposure triangle by a number of stops, you must compensate for this by reducing or increasing one of the other (or a combination of the others) by an equal number of stops.7) ConclusionA is the doubling or halving of the light that constitutes exposure. We can add or subtract stops by changing the aperture, shutter speed or ISO. So the next time someone tells you you need to increase your exposure by a few stops, hopefully you'll know what they mean and how you hope you found this article useful. If you have any questions, please contact the comments section below. Below.