Introduction to Digital Photography: Composition

In his book **The BetterPhoto Guide to Digital Photography**, Jim Miotke defines composition as "the conscious placement of elements in a picture"—how you organize what's in the picture and where you choose to place things.

The Subject

In photography, the subject is any person, place, or thing that you are photographing. Whether it is a skyscraper or a flower, the subject is the character in your photograph. A photograph can have both major and minor subjects—and their emphasis depends on where they are placed in the picture.

Framing

Framing refers to what you place in the foreground of the image that provides the audience with a sense of where the viewer is standing.

Point-of-View

Point-of-view refers to where the photographer places the camera; for example, placing the camera above the subject creates a bird's eye view of the subject.

Balance

Balance refers to the placement of the main subject in the picture—and the main subject's position in relation to minor subjects and the background.

Contrast

In composition, contrast has two different meanings. You can use contrast to emphasize the importance of a main subject by contrasting it with another object. Contrast also refers to the tonal differences of light and dark parts of a photograph.

Rule of Thirds

The Rule of Thirds suggests that you position your subject in certain key spots. This placement helps the viewers' eyes travel around the rest of the image.

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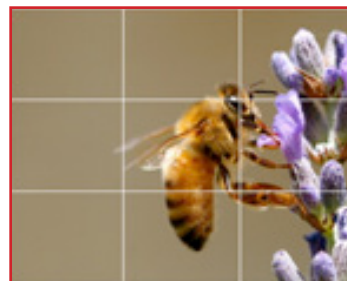
Digital Photography Composition Techniques[1]

Ricky Telg[2]

This EDIS publication, focusing on digital photography composition, is the second of a three-part series on taking good digital photos for your local Extension program. This series also includes publications on the basics of digital photography and photo editing.

Introduction

Composition is organizing the subject—the person or object of the photograph—through the viewfinder. Practice these composition techniques for better-looking photos. Start with holding the camera properly.

Holding the Camera

The quickest and surest way to get a sharp, clear picture is to hold the camera correctly.

Blurred pictures are caused most frequently by moving the camera as you press the shutter button. Stand comfortably, with your legs slightly apart, or lean against a tree or wall. Hold your elbows to your side to minimize shaking. Breathe at a slow, steady pace as you get ready to take the shot, and then hold your breath as you slowly press the shutter button.

Figure 1. This woman is holding a camera correctly. Holding a camera correctly is the best way to get a sharp, clear picture.

Focus and Flash

Most cameras' automatic modes do an excellent job of auto-focusing for you. Pressing the shutter button halfway allows the camera to calculate the focus, white balance, and amount of light. The focus

can also be manually set. Manual focus is used on digital cameras to emphasize one element in focus while deemphasizing another, which is out of focus.

Digital cameras also have several flash modes. Most allow you to select a flash, a red-eye reduction flash, or no flash. The flash setting that the camera chooses when the automatic flash is selected—by pressing the shutter button halfway—is not always correct. The automatic flash does not always select the best light for an image; rather, it selects light that is neither too dark nor too bright. If using the automatic flash doesn't produce satisfactory results, use one of the other flash settings. It is also recommended to stand no closer than 4 feet away from the subject and no farther than 10 feet away to get the best flash lighting. When taking pictures on sunny days, turn on the flash to help eliminate the harsh shadows produced by sunlight.

Angles

One of the best ways to create interest in photographs is to vary the angles while framing the shot well. An unusual angle or viewpoint can add a great deal of interest to an ordinary object. While it is appropriate to shoot at eye level with the object or person, varying the camera angle from time to time adds a little extra excitement to the photograph. For example, photographed from below, someone looks strong and dominating. From above, a person appears meek, even childlike.

Camera angles refer to the different angles you can hold a camera in reference to the object of interest.

- An *eye-level shot* looks the subject right in the eye. Some photographers call it the "bull's-eye effect" when the eye-level shot is coupled with placing the person directly in the middle of the picture, creating a "bull's-eye."

- A *low-angle shot* looks up at the object of interest. This angle creates a dramatic look, where everything appears magnified.

- Holding the camera high and shooting down is called a *high-angle shot*, where everything in the shot appears minimized or diminished.

Use your imagination to find different angles or perspectives for your photographs. You might try lying down or crouching in front of an object, climbing above it, or putting the camera on the ground.

Rule of Thirds

Perhaps the most well-known principle of photographic composition is the *rule of thirds*. The basic principle behind the rule of thirds is to imagine dividing an image into thirds horizontally and vertically so that you have nine parts. Position the main subject elements where the dividing lines intersect. This means not placing your subject right in the center of the frame. For example, frame the shot so that the subject's eyes are on the line dividing the upper third from the middle third. For landscapes, position the horizon along one of the horizontal lines instead of directly in the center of the picture. Photographs not taken with the rule of thirds in mind can be edited later to crop or reframe the image so that it fits the rule.
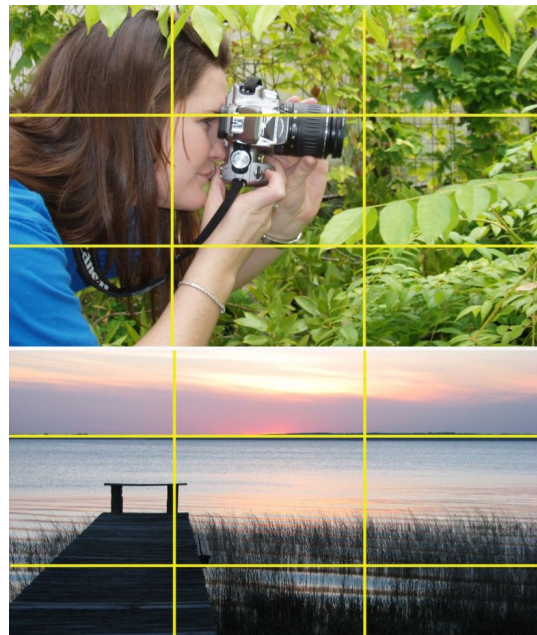
Figure 2. These photos show the rule of thirds in action. In each shot, the major impact or action takes place at intersections of the nine sections of the screen.

Lines

Using lines can be an effective way of drawing the viewer's eye into the focal point of an image. Lines can be the shape of a path, a line of trees, a

fence, or any feature in an image. When framing the shot, determine what lines are in front of you and how they might add interest to the shot.

- **Diagonal lines** are used to draw the viewer's eye through the photograph. Diagonal lines give images depth by suggesting perspective or depth, and they can also add a sense of action to an image.

- **Vertical lines** convey a variety of different moods in a photograph, ranging from power and strength, in such images as skyscrapers, to growth, such as in photographs of trees.

- **Horizontal lines** convey a message of stability or rest, such as photographs of horizons, oceans, and even sleeping people. Landscape horizons are probably the most common horizontal lines in photographs. Generally, horizons should not be placed in the middle of the frame. A much more effective technique is to place the horizon in the upper or lower third of the frame, following the rule of thirds.

- **Converging lines** occur when two or more lines come from different parts of an image to a single point. Converging lines act as a sort of funnel for the viewer's eyes, directing the viewer's gaze to a point in the photograph. A good example of converging lines is a set of railroad tracks that converge on a horizon.

Figure 4. Example of vertical lines (Photo: Ricky Telg)

Figure 5. Example of horizontal lines (Photo: Katie Wimberly)

Figure 6. Example of converging lines (Photo: Hyunji Lee)

**Figure 3.** Example of diagonal lines (Photo: Erica Der)

Depth of Field

Depth of field refers to the portion of the scene in focus in the camera. Depth of field can be long or short. Depth of field that has a lot of the scene in focus has a long depth of field. When only a small zone is in focus, with much of the background out of focus, depth of field is short (also referred to as "narrow"). Depth of field is dependent on several factors, but one of the primary factors is the camera's aperture setting.

Aperture is the "iris" of the camera, like the iris of your eye. The aperture is the opening in the lens through which light passes to the camera sensor; it controls the amount of light that is allowed into the camera. Aperture settings are measured in f-stops (also called f-numbers). The easiest way to remember f-stop settings is this:

• The larger the f-stop, the smaller the aperture opening.

• The smaller the f-stop, the bigger the aperture opening.

For example, an f-stop of f-1.7 (small) means the aperture is open, where an f-stop of f-16 (large number) means the aperture is almost completely closed. An aperture with a small opening (large f-stop) produces a longer depth of field, while an aperture with a large opening (small f-stop) produces a short, or narrow, depth of field. Play with the depth of field to get an entire field of flowers in focus (long depth of field), or just a few flowers in focus while all of the rest of the flowers are blurred (short depth of field).
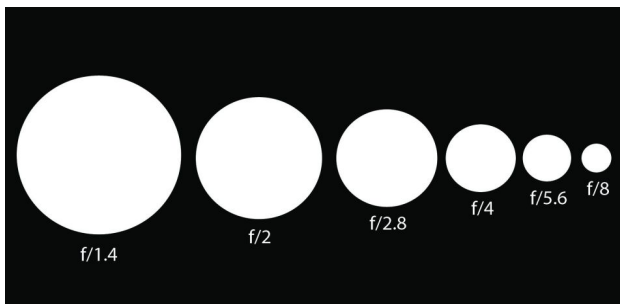
Figure 7. This graphic illustrates the f-stops in a camera: the larger the number, the smaller the aperture opening.

Figure 8. Long depth of field

Figure 9. Short (or narrow) depth of field

Figure 10. Short (or narrow) depth of field

Background Distractions

The best advice regarding backgrounds in photographs is to use a simple, plain background, unless the background is part of the story. Avoid extremely light or dark backgrounds. The more distractions that are removed from the background, the more attention is drawn to the subject.

Types of Photos

Try to shoot a photograph so that someone does not need to read a caption or an accompanying news story to understand what the photograph is about.

News and Feature Photos

To illustrate a news article, keep the news photograph simple and get as close as possible to the subject. Try to avoid "grip and grin" photographs—photos of people receiving awards and shaking hands with the person presenting the award, smiling as they receive the honor. If the story is about an award recipient, try taking a photograph of the recipient doing whatever the person did to earn the award instead of a "grip and grin." Arrange news photos to include a small number of people rather than large groups. People want to see closer shots of people's faces, not far-away shots of large groups.

A feature photograph is a photograph not tied to a news story. Many times, you will see a feature photograph with just a caption that details what the photo is about. A photo series is a group of three to five photographs on the same topic that tells an overall story. A photo series could be three to five photographs on how a team prepares for a competition.

A caption, also known as a cutline, provides written information underneath a photograph that is necessary for the reader to understand the photograph. Usually, a caption provides information about who is in the photograph, what is going on, where and when the action happened, and why the action is significant. A caption is one to two sentences in length. Include the full name of the person in the photograph and, when appropriate, the person's title.

People Photos

Most photographs have people in them. Following are suggestions on how to get the best "people pictures":

- **Avoid posed shots.** Do not force people to always pose staring at the camera. Get them doing something.

- **Take candid pictures.** Show people working, playing, or relaxing.

- **Keep people busy.** An interesting prop can give the person being photographed something to work with and can help create a natural feeling. For example, a rodeo cowboy could hold a lasso as his "prop."

- **Move in close.** Fill the camera's viewfinder with the subject to create pictures with greater impact. Standing too far away, even when taking group shots, produces images that are harder to see and less interesting.

- **Look your subject in the eye.** With children, for example, that means getting on their height level.

Animal Photos

Taking photographs of animals can be fun, but it can also be tiring because it's not possible to control how an animal will react or cooperate with you as you take pictures. For photographs of small animals, such as dogs and cats, use some of the suggestions in the "People Photos" section: move in close, get on the animal's eye level, keep the animal busy, avoid posed shots, and take candid pictures. For larger animals—cattle, pigs, horses, and other livestock—use these tips:

- **Groom the animal.** If it is a grand champion-type photograph, make sure the animal looks its best. An effective livestock photo should show a good side view of the animal so its markings, profile, and general condition are visible.

- **Show the animal just as it is.** Do not use photo editing software to "doctor" the picture.

- **Choose an appropriate background that does not clutter the picture or distract the viewer's attention from the animal.** For example, an open field as a backdrop is probably better than a dark barn.

- **Position and pose the animal properly.** Generally, use a full side view or a three-fourths view, when the animal's head faces more toward

the camera than the rest of the body. The animal's head should be high.

• **Use a flash, if possible.** A flash will enhance the animal's appearance by revealing shadow detail.

The previous tips are for animals that are not moving, but are posed in a controlled environment. Sometimes, though, it will be necessary to take photos of moving animals, such as those in a rodeo. To get close to the action, use a telephoto lens and a fast shutter speed to stop the action for the photograph. Try to anticipate where the animal will be and follow the animal and rider. Give the animal plenty of lead room in your viewfinder. If your camera allows you to take multiple rapid shots by holding down the shutter button, do so. You can choose the best photo later. Try to find varying angles to shoot from to get interesting photographs.

Additional Information

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INTRODUCTION

Any photographer can benefit from systematic exposure to the concepts and principles of good composition. Composition is knowable, and it is learnable.

Tom Grill & Mark Scanlon

Why are some photographs more appealing and eye-catching than others? What is the secret behind an effective composition? This *Photographic Composition for Beginners* teaches you the basic principles and the design elements that are used to compose a photograph. These will act as guidelines to help make your composition more harmonious and pleasing to the eye.

WHAT IS PHOTOGRAPHIC COMPOSITION?

Composition is the arrangement of subjects or elements within the photographic frame. How the subjects are selected and arranged can make a big difference to your photograph. As a photographer, you control the arrangement and the look of the image. You decide what the focal point of interest is and where to place it within the frame so that the viewer will be drawn to the picture. Design elements such as line, shape, pattern and color have a dual function. Firstly, their presence helps to create a stronger image. Secondly, each element has intrinsic and symbolic attributes which can evoke certain emotions and feelings in the viewer. For example, curved lines give the feeling of gracefulness and calmness; diagonal lines can be dramatic and powerful; patterns can be repetitive and structured.

LESSON 1   PRINCIPLES OF DESIGN IN PHOTOGRAPHIC COMPOSITION

For a space divided into equal parts to be agreeable and aesthetic, between the smallest and largest parts there must be the same relationship as between this larger part and the whole space.

Vitruvius

1.   THE GOLDEN SECTION / MEAN

The ancient Greeks were the first to devise the *golden section.* Based on geometry and mathematical formula, they constructed the *golden section* or *mean*. They found that the proportions drawn were most beautiful and pleasing to the eye. The *golden section* is applied to art, architecture, design as well as photography. Examples are the Parthenon in Athens and Keops in Egypt.
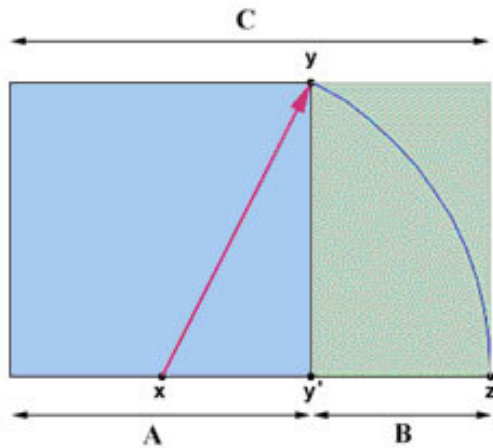

Figure 1   Golden Section

Figure 2   Parthenon, Athens

C

y

x   y'   z

A   B
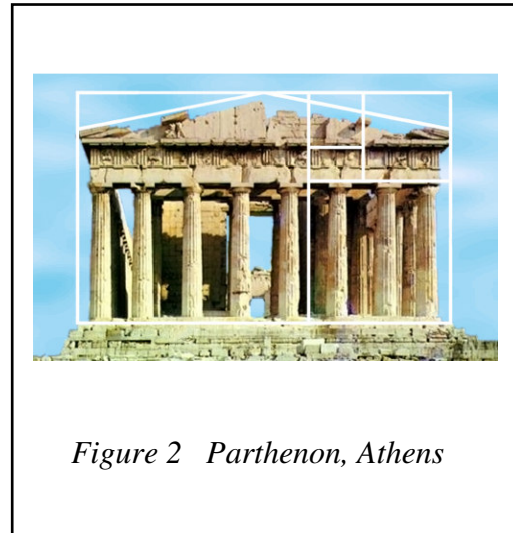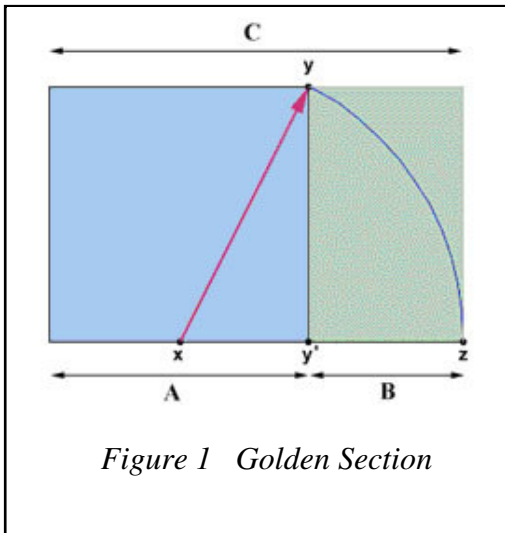
Figure 3
Constructing the Golden Section

1) Draw a perfect square (marked blue in diagram)
2) Divide the base of the square into two equal parts, shown as point x.
3) Take point x as the middle of a circle with a radius of the distance between point x and y.
4) Extend the base of the square till it hits the circle at point z.
5) The square can be transformed to a rectangle with a proportion ratio of 5:8. The ratio of A to C is the same as the one from B to A.

Refer to Figure 3. The g*olden section* is a rectangle of a shape such that the ratio of the length of the short side (B) to the long side (A) is the same as the ratio of the length of the long side (A) to the length of the long side (A) plus the length of the short side (B). It can be written as B : A = A : (A+B) or B : A = A : C. The ratio is approximately 5:8. The rectangle is also known as the *golden rectangle*.

The *golden rectangle* is important in photographic design because the 35mm frame approximates the proportion of the *golden rectangle*. See Figure 4.
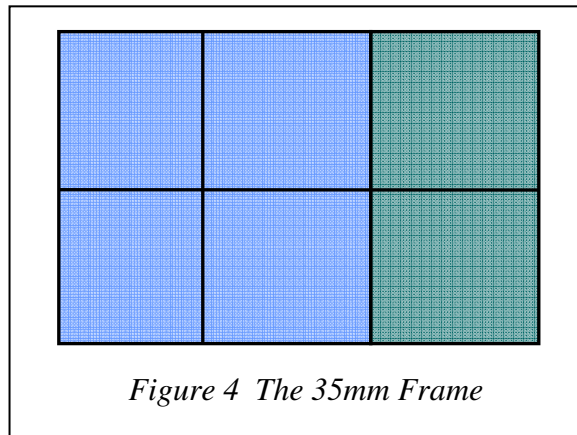

Figure 4 The 35mm Frame

2. RULE OF THIRDS

The *rule of thirds* is an extension of the *golden section*. Since the 35mm frame approximates the proportion of the *golden section*, we can use the *golden section* to help us compose our picture. If the subject or points of interest are placed on one of the intersection of the lines (black dots in Figure 5), it will give the image a more harmonious balance. The *rule of thirds* helps to break the symmetry and monotony of the rectangle.


Figure 5 Rule of Thirds
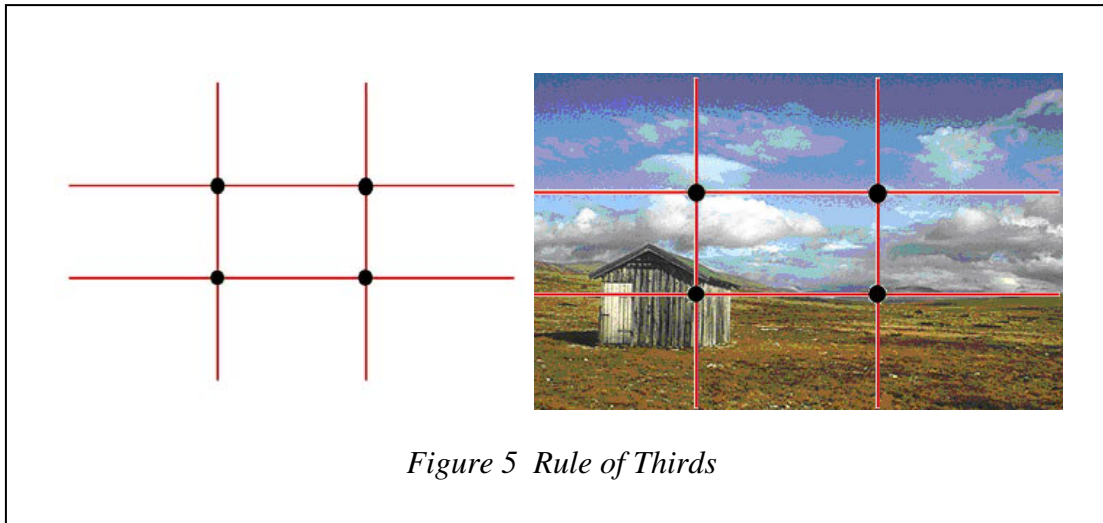
Beginners have a tendency to place subjects right in the center of the frame or divide the frame into two equal parts resulting in a weak and less dynamic composition. A centrally placed image does not the follow the *golden section*. Notice that if you place your subject in the center, the triangles formed within the rectangle are disproportionate to one another.

Figure 6 Centrally-placed subject
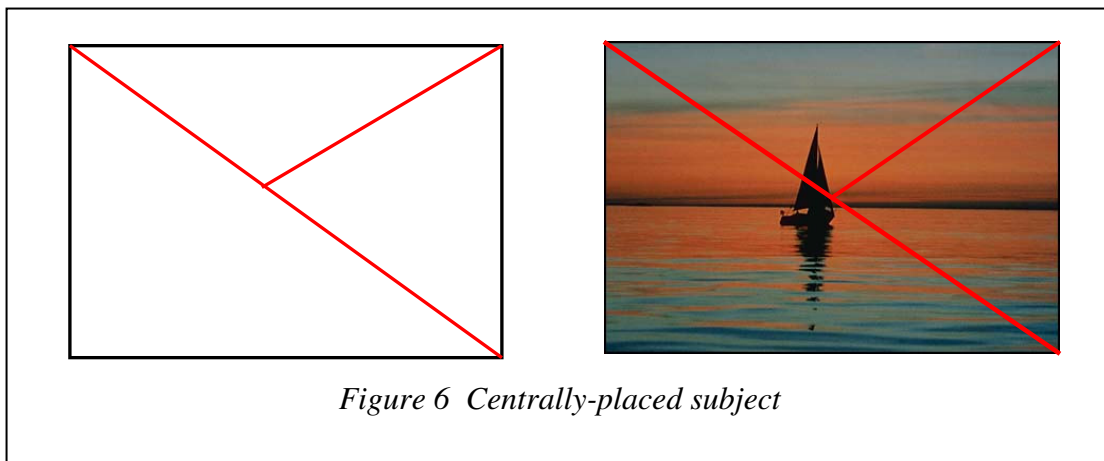
The horizon line of the photograph is also usually placed either about one third from the bottom or the top of the frame corresponding with the *rule of thirds* lines. The horizon line is never or rarely placed in the center of the frame as the image will have less impact. If the image is divided into equal parts, it tends to be weak and undefined (Figure 7a). Conversely, if the horizon line is placed at the lower or upper third of the frame, it will divide the image into unequal parts, creating a more dynamic composition (Figure 7b)
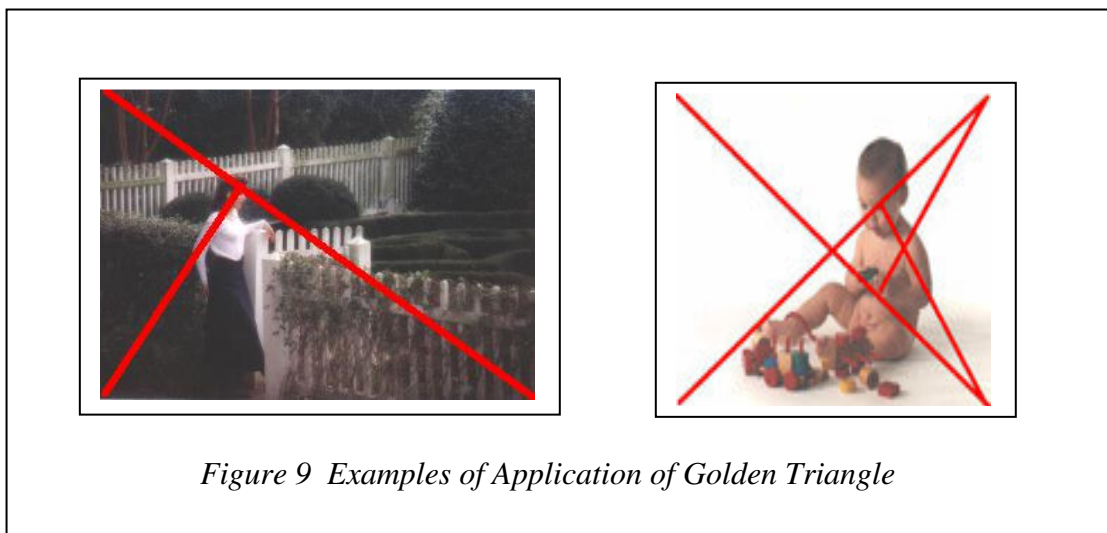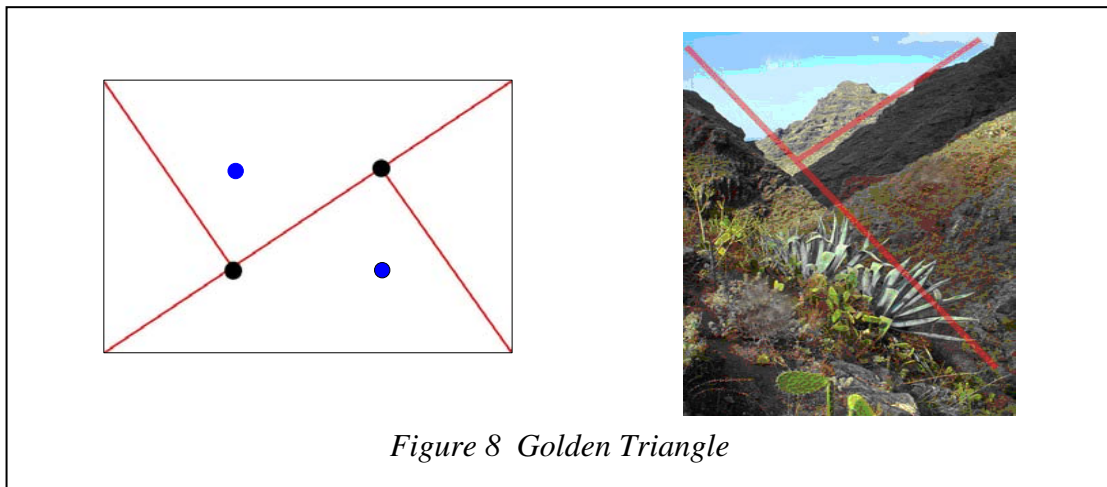

Figure 7a
Horizon line placed in the middle of the frame where all
the elements are evenly placed.
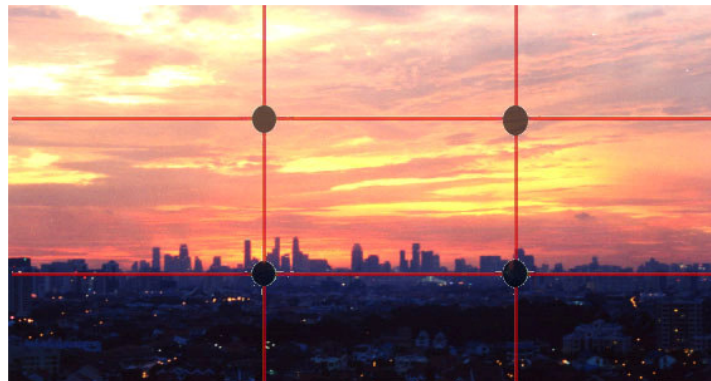
Figure 7b
Horizon placed at one third from the bottom of the
frame draws attention to the clouds resulting in a
stronger composition.

3. GOLDEN TRIANGLE

If your picture is characterized by diagonal lines, you may want to apply the *golden triangle* rule. Divide the rectangle of your frame into triangles as shown in Figure 8. If you place your main subject on either of the intersection points (shown as black dots), it will be more appealing to the eye. This is the *golden triangle* rule.
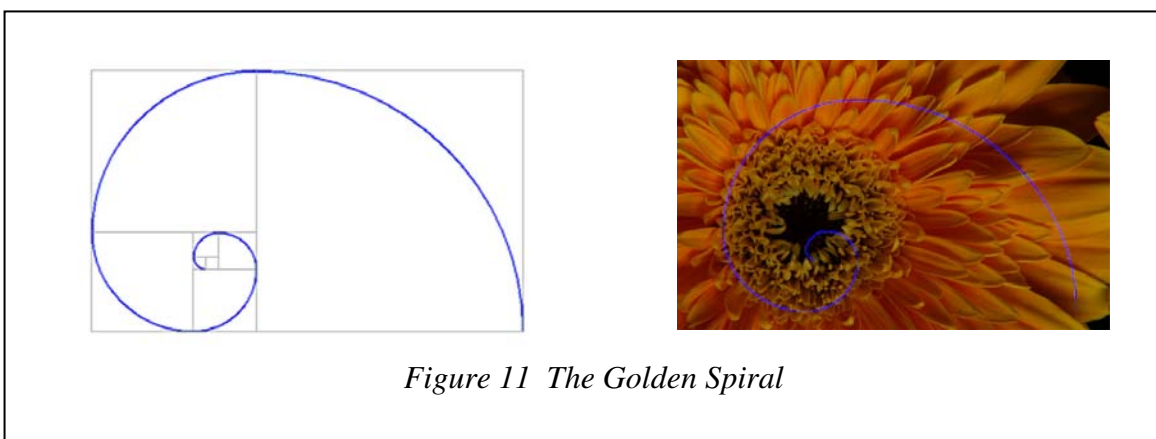

Figure 8 Golden Triangle

Figure 9 Examples of Application of Golden Triangle

4. GOLDEN SPIRAL

Take a close look at the nautilus shell or the head of a sunflower. Can you see the spiral design in their forms? See Figure 10.

Figure 10 Examples of Golden Spiral in Nature

Flowers such as daisies and sunflowers, the leaves of the agave plant, cactus and nautilus shell are some examples in nature which depict the form of the *golden spiral*. The *golden spiral* is another extension of the *golden section*. See Figure 11 below. The dimension and form of the *golden spiral* is constructed from several *golden sections*. If you frame your subject within the spiral, that will become the central focus of your composition. This principle is commonly used in photographing close ups of flowers, cacti blooms or any other circular forms.

Figure 11 The Golden Spiral

SUMMARY

In Lesson 1, you have learnt the four golden principles in composition: the golden section, rule of thirds, the golden triangle and the golden spiral. These principles will help you decide where to place the subject within the frame that will be appealing to the viewer. Do remember that these principles serve as useful guidelines. They are not rules to be followed blindly. There are always exceptions to the rules depending on the circumstances, the overall effect and the message you wish to convey in your photographs.

PHOTO TIP

Take an empty slide frame. Take four pieces of string and place it like a grid following the lines of the rule of thirds. When you are out on the field, look through the frame to guide you where to position your subject or point of interest. With enough practice, you will be able to do this instinctively.

ADDITIONAL RESOURCES

- History and the mathematical foundation of the golden section:
  http://en.wikipedia.org/wiki/Golden_mean

- Article on construction of the golden section and its variants:
  http://www.mcs.surrey.ac.uk/Personal/R.Knott/Fibonacci/phi2DGeomTrig.html

- Golden spiral and nature:
  http://www.mcs.surrey.ac.uk/Personal/R.KNott/Fibonacci/fibnat.html

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LESSON 2   ELEMENTS OF DESIGN IN PHOTOGRAPHIC COMPOSITION

Line, shape and pattern are some of the design elements that you can use to compose your photographs, whether they are landscape, close-ups, architectural or action images. Most photographs will contain at least one or a combination of these elements. Being aware of the design elements and being able to identify and isolate them in your images will help you improve your composition.

In addition, all the elements have a symbolic representation. They indirectly convey a message to your viewer. For example, vertical lines depict strength and height while horizontal lines give a calm and expansive feel to the picture.

1. LINE

Lines are the strongest and most powerful visual element in design and photography. They draw the attention of your viewer into the photograph and direct the eye across the photographic space. They lead the viewers to the portions you want them to see. Lines also define and divide the areas within the frame and give a spatial relationship to the various elements in the photograph.

There are two types of lines: straight and curved lines. Straight lines can be horizontal, vertical or diagonal.

1.1. LINES AND THEIR MEANINGS

Another function of lines is that they can convey emotion and give meaning to your photographs. For example, thick lines give a sense of stability while thin lines are weak and have less impact. As a photographer, you can choose the type of lines (straight or curved) as well as the orientation of the lines (horizontal, diagonal, vertical, converging or diverging) to evoke different moods and feelings in your photographs.

Straight lines appear to be more stable, reliable and rigid while curved lines are softer and convey a relaxed feeling.

Here are examples of the different types of lines and the expressive qualities and meanings they add to the image.

1.2. STRAIGHT LINES

a) Horizontal Lines

Figure 12 Horizontal Lines

Horizontal lines express stability and calmness. Most landscape photographers use horizontal lines to convey a sense of space and to add breadth to the scene. Take a look at the top photo of Figure 12, does the scene with the bales of hay and the blue sky in a horizontal format give you a pastoral mood and a feeling of a lazy summer afternoon?

b) Vertical Lines

Figure 13 Vertical Lines

Vertical lines can evoke a feeling of strength, power and assertiveness. Verticals also accentuate height in the composition. Can you think of examples of vertical structures and forms? Look at buildings, flagpoles, towers, trees and waterfalls and see how their strong vertical lines can add power and height to your photographs.

c) Diagonal Lines

Figure 14 Diagonal Lines

Diagonals give the picture a sense of movement because the lines go up or down, away or towards the viewer. The presence of diagonals adds more energy to your composition than vertical or horizontal lines. Diagonals can be rather striking and dramatic as seen in the photo on the right in Figure 14.

1.3 CURVED LINES

In nature, lines are seldom perfectly straight. If you look at the meandering of rivers, undulating sand dunes and breaking waves, they are all examples of curved lines.

Figure 15 Curved Lines

Curving lines evoke a restful mood and add movement to the picture. Man-made structures like roads, highways and buildings can also depict a curved form which you can use in your composition.

2. SHAPE

Shape is the most fundamental element of design. If you look at a photograph and take away its pattern and color, you will be left with just the basic shape or outline of the objects in the scene. You can identify the object just by its shape alone.

Most photographers use frontlighting or backlighting to define and emphasize the shapes in their images. Backlighting creates a silhouette which eliminates the texture and pattern of the photograph leaving behind a stark outline and shape.

Figure 16 Shapes and Silhouettes

2.1. SHAPES AND THEIR MEANINGS

a) Circles

Figure 17 Circle

A circle represents wholeness. It's unbroken line and gives a sense of continuity, unity and completeness. Sometimes you may frame the circle partially.

b) Squares and Rectangles

Figure 18 Squares & Rectangles

Squares and rectangles give structure and stability to your composition. You find squares and rectangles mostly in man-made objects such as buildings, windows and cars.

Triangles
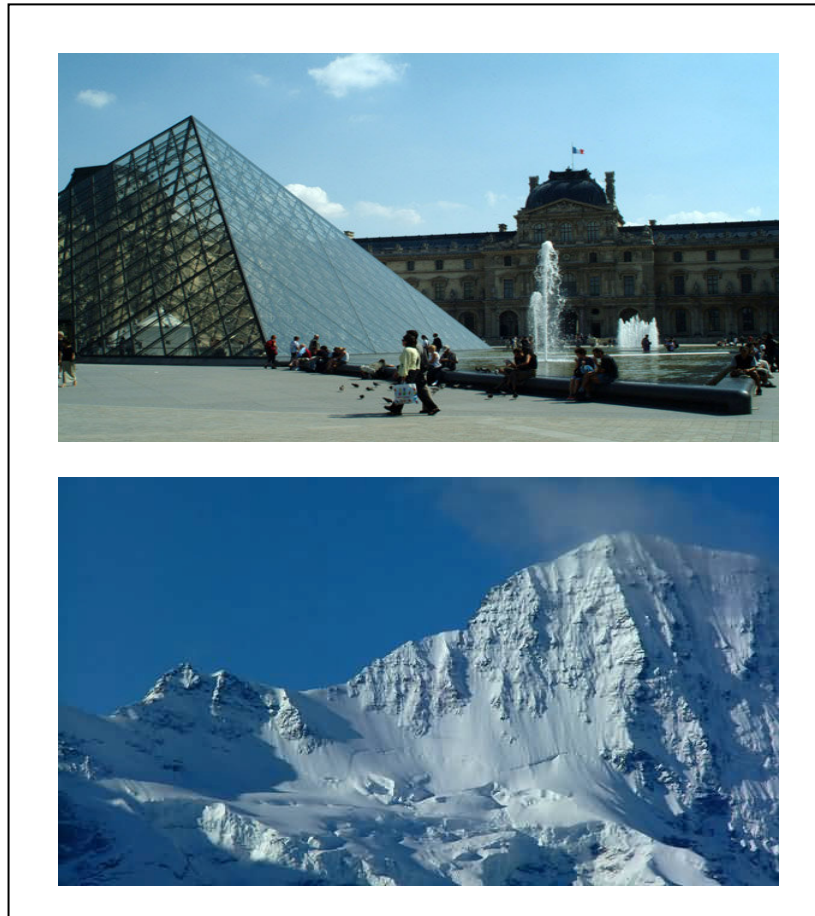
Figure 19 Triangles

Triangular forms such as mountain peaks, pyramids and buildings which point upwards into the sky represent stability, endurance and strength.

3. PATTERN

Once is an instance, twice may be an accident but three or more makes a pattern.
Diane Ackerman
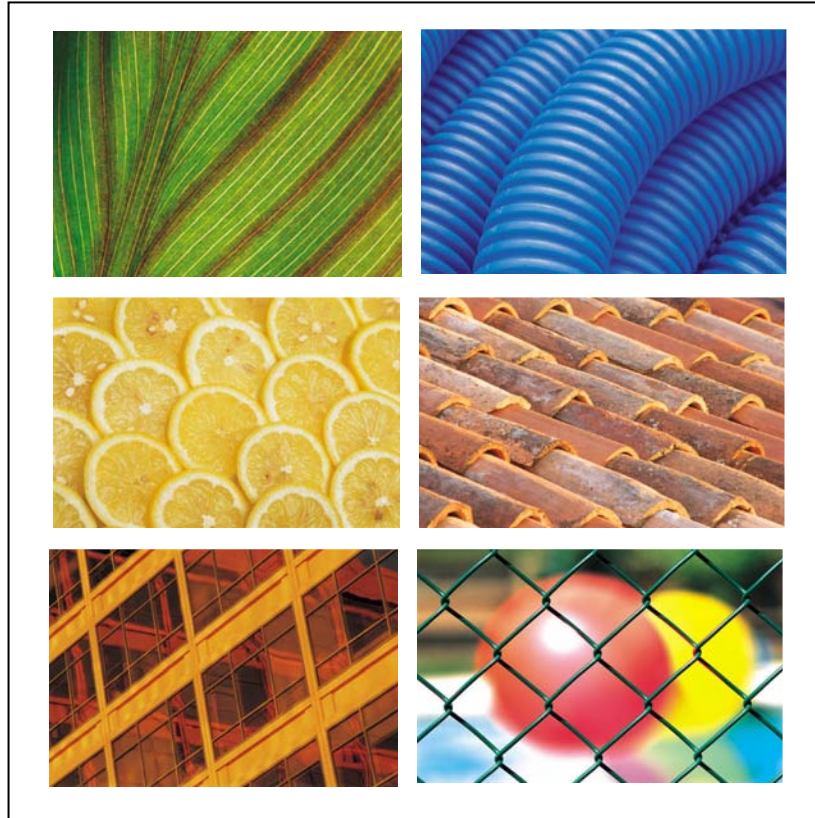
Figure 20 Patterns

We get patterns when the elements of shape, line and color repeat themselves in a scene. You can find patterns almost everywhere. Patterns are all around. Look at Figure 20. Can you identify the repeated design elements in the six photographs? The veins of a leaf, cables, cut oranges, roof tiles, glass windows and chain fences are some examples of ordinary everyday things that may be arranged to form patterns.

If you fill the whole frame with the same pattern, you get a very strong visual impact. Patterns give a sense of regularity, rhythm and predictability to your composition.

SUMMARY

In Lesson 2, we look at three design elements - line, shape and pattern. These design elements are important as they give order to your composition. We have looked at examples on how lines can bring the viewer into the picture and how they can give an impression of calmness or power depending on whether it is a curved or diagonal line. Patterns, on the other hand tend to be repetitive. Shapes like rectangles and triangles give a sense of stability while circles a sense of unity.

When used effectively, line, shape and pattern can create a visual as well as an emotional impact. They not only direct the viewer to focus immediately on your subject but also elicit an emotional interpretation of the photograph.

 PHOTO TIP

Train your eye to look for line, shape and pattern in the scene in front of you. Before you click the shutter, look at the scene and see if you can identify and isolate any interesting line, shape or pattern that you can fill the camera frame. You can do this by abstracting, that is looking at only the outline of the objects. Then, visualize how you can use one element or a combination of these design elements to create a stronger composition. Ask yourself if the elements elicit an emotional response. Finally, when you are satisfied with the composition, press the shutter.

LESSON 3   COLOR


Color is a language by itself.
Ernst Haas

We don't live in a black and white world. Our world is filled with colors – blue skies, green grass, white clouds, yellow sunsets, red roses and pink flamingoes. Colors can attract and draw attention. Have you noticed that images of red flowers among green ferns, or a field of orange-yellow sunflowers shot against the blue sky are more appealing? Why? In this lesson you will learn about colors and how they can be combined to create an effective composition. This lesson will focus on primary and secondary colors, complementary colors and color harmony.

1.   COLOR BASICS: Primary and Secondary Colors

Colors can be classified as primary and secondary colors. Primary colors are red, yellow and blue. See Figure 21. Primary colors cannot be created by mixing with other colors. Secondary colors are created by mixing two primary colors. Mixing red and yellow results in orange, mixing yellow and blue results in green, and mixing blue and red results in violet. See Figure 22.
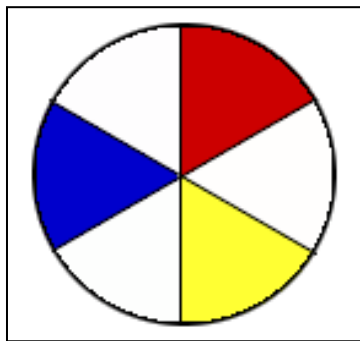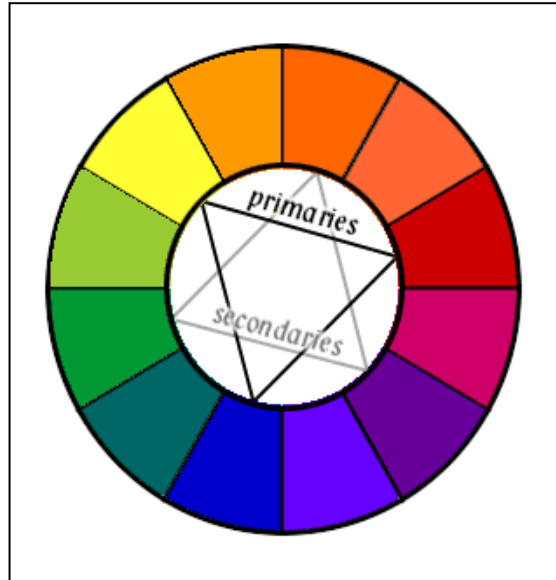

Figure 21
Primary Colors – Red, Yellow, Blue
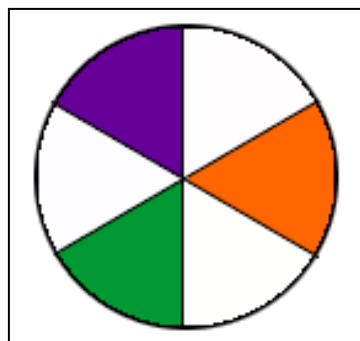
Figure 22
Secondary Colors – Orange, Green, Violet

A color wheel is an arrangement of twelve colors, both primary and secondary colors and their combinations. It shows the relationship of the colors to one another.

Figure 23 Color Wheel

2. COMPLEMENTARY COLORS

For each color there is an opposite color. This pair of colors is known as complementary colors. Take a close look at the color wheel in Figure 23. Violet is opposite to yellow. Thus, violet and yellow are complementary colors. Can you find other complementary pairs of colors?

Also, each primary color is opposite a secondary color. Red falls opposite green. Blue falls opposite orange. Finally, each secondary color falls between the two primary colors from which it is made. For example, green is between blue and yellow.

3. COLOR HARMONY

How can color help you improve the design of your photograph? Color harmony is achieved when you are able to successfully look for and combine pairs of complementary colors in your composition. In Figure 24, the red color of the poppies is complementary to the green background.
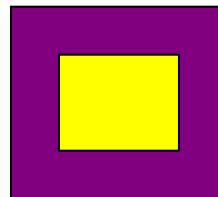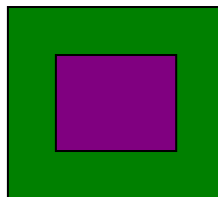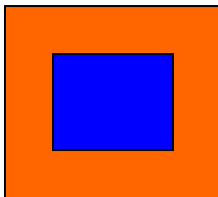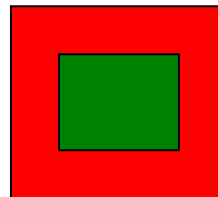

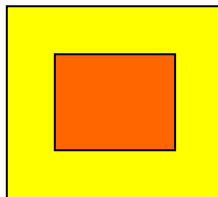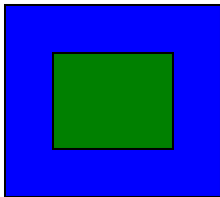*Figure 24 Color Harmony – Red and Green*

Figure 25
Color Harmony - Orange and blue

In Figure 25, the orange-yellow color of building complements the blue of the sky.

EXERCISE 4

1) Check the diagrams below which show complementary colors.

2) Mark the photographs that use complementary colors in its composition.

SUMMARY

In this lesson on color, you learn about primary and secondary colors and how they relate to one another. You find that the combination of some colors work better than others. If you are able to identify the various pairs of complementary colors, for example, red and green, blue and orange, yellow and violet, and use them in your photograph, you will achieve a sense of harmony in your composition.

 PHOTO TIP

When you are out on photography field trips, try to look for complementary colors. If you find a red object, survey the surroundings and look for a green color and see if you can combine both colors within the frame. With practice and experience, you will learn how to make the colors work in your images. Remember as a photographer you are in control and can select what you want to shoot.

Introduction to Digital Photography: Part II

Exposure

In film photography, exposure refers to the amount of time that light falls on the film. In digital photography, exposure refers to the amount of time the light falls on the sensor. Understanding aperture, shutter speed, and ISO is necessary for understanding exposure.

Aperture

Aperture, or f-stop, is the size of the opening of a lens. The aperture determines how much light will enter through the lens. Aperture change is similar to the way that the pupil dilates to control how much light enters the human eye.

As the f-stop number get bigger, the aperture gets smaller.
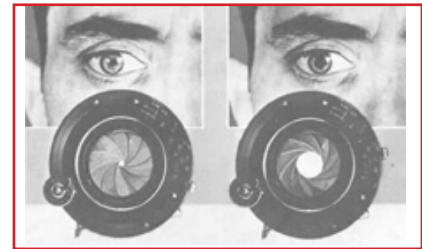
f16   **f6**

ISO

ISO is the measurement of the digital camera's image sensor's sensitivity to light. (In film photography, ISO is the measurement of the film's sensitivity to light.) A lower ISO number means that more light is required—either with a longer shutter speed, a larger aperture opening, or both—to get the same effect that a higher ISO number would get with less light.
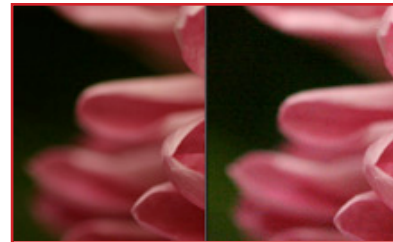
Shutter Speed

Shutter speed refers to the amount of time that the aperture can remain open. The longer the shutter speed, the more light enters the camera and reaches the sensor.


Focus

In photography, focus refers to the point where rays of light that originate from a point on an object (or "object point") converge. If the rays of light converge well in the image, then the image is in focus. An out-of-focus image will appear fuzzy or blurry.

Depth of Field

Depth of field is the distance in front of and behind the subject that appears to be in focus. If you look at the nearest and farthest subject in a photograph, the depth of field of that image will refer to the people or objects that are most sharply in focus.

When photographers focus their lens on a subject, anything at that same distance from the lens will be in focus. The objects that are out of focus will appear fuzzy.
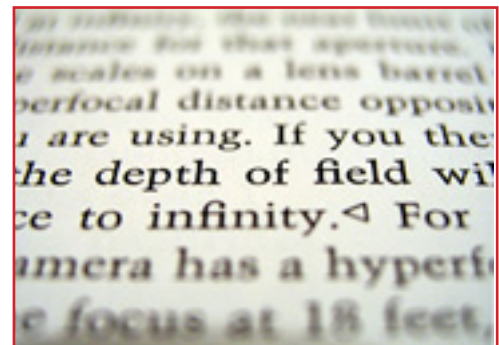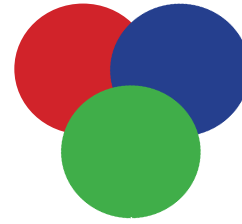
Color

A digital camera sees colors in a way that is similar to the human eye. A digital camera reads the brightness of light and translates that information into the colors that one sees. Like the human eye, a digital camera analyzes the brightness value of the light and records the brightness value for each color in separate parts of an image file (or, for a person, an image-storing part of the brain). The camera then combines those colors to create a full-color image.

Light

Although we can't usually notice it, all visible light has color. We only perceive light to be colorless because our eyes naturally compensate for the various colors in light and then balance those colors accordingly.

However, digital cameras' image sensors often have difficulty automatically adjusting those color levels.

White Balance

When you adjust white balance on your digital camera, you are removing unrealistic colors levels from the image and adjusting those color levels for the camera. White balance refers to the adjustment of relative amounts of red, green, and blue so that the neutral colors are correctly reproduced.

incorrect white balance   **correct white balance**

Pixels

Digital images are composed entirely of pixels. If you magnify a digital image on your computer screen, you can see the individual pixels, which appear as little dots. These pixels are the smallest components of every digital image.

Image Size

Image size, or "pixel dimensions," refers to the number of pixels that comprise an image (and is measured by the number of pixels wide by the number of pixels high). In digital photography, the quality of pictures often depends on the image size of the picture. The more pixels a digital camera can record, the more detail and clarity it can capture.

Resolution

Resolution also determines the quality of an image and is measured in pixels per inch (ppi). A higher ppi (i.e., more pixels per inch) means that the image will be crisper and of a higher quality. Image resolution is measured in pixels per linear inch, not pixels per square inch. Therefore, a resolution of 50 ppi means that there are 50 pixels horizontally and 50 pixels vertically—or 2,500 pixels per square inch.

| 1 x 1 | 2 x 2 | 5 x 5 | 10 x 10 | 20 x 20 | 50 x 50 | 100 x 100 |