

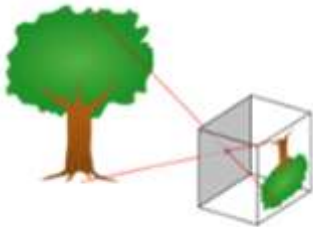
# DIGITAL PHOTOGRAPHY HONOUR



## Digital Photography Honour Requirement

1. Explain the following:
  - a. The principles of digital camera construction and how a digital camera works.
  - b. The effect of light on an image sensor.
  - c. How colour images are created from the BW image the sensor captures.
  - d. What the camera lens does; what focal length means.
2. How are lens aperture and depth of field related?
3. Describe pixels, image resolution, and image size.
4. What are the two types of image compression?
5. Name and describe three types of image formats.
6. Give the principle uses of photography.
7. Take pictures illustrating at least eight of the following techniques. Use comparison pictures for illustration:
  - a. Framing
  - b. Camera Steadiness
  - c. Direction of lighting - front, side, or backlighting
  - d. Quality of light - shade, sunlight, and time of day
  - e. Rule of thirds
  - f. Angle - eye level, high, and low level
  - g. Level horizon
  - h. Distance from subject - fill the frame
  - i. Use of leading lines
  - j. Correct exposure - underexposed, overexposed, and correctly exposed
  - k. Use of flash - proper distance and reflective objects
8. Learn how to place photos in PowerPoint. Create a PowerPoint presentation showing the pictures you took using the above techniques.
9. Using a photo editing program on a computer, show ability to crop, colour correct, sharpen, and adjust brightness/contrast to photos.
10. Complete at least three creative photographic projects in a photo editing program; such as a CD cover, a photo scrapbook page, a collage, etc.
11. Have a basic understanding of file organization techniques.

## HOW DOES A CAMERA WORK?

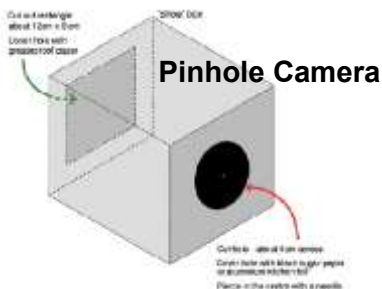


To make a pinhole camera

One box—paint black inside

One pinhole in heavy card or metal

One display screen—greaseproof paper



A pinhole camera is the simplest of cameras. In this type of camera. Light rays from an object pass through a small hole to form an image.

Cameras work with light from the visible spectrum. A camera generally consists of some kind of enclosed box, with an opening or aperture at one end for light to enter, and a recording or viewing surface for capturing the light at the other end.

Most cameras have a lens positioned in front of the camera's opening to gather the incoming light and to focus the image (or part of the image), on the recording surface.

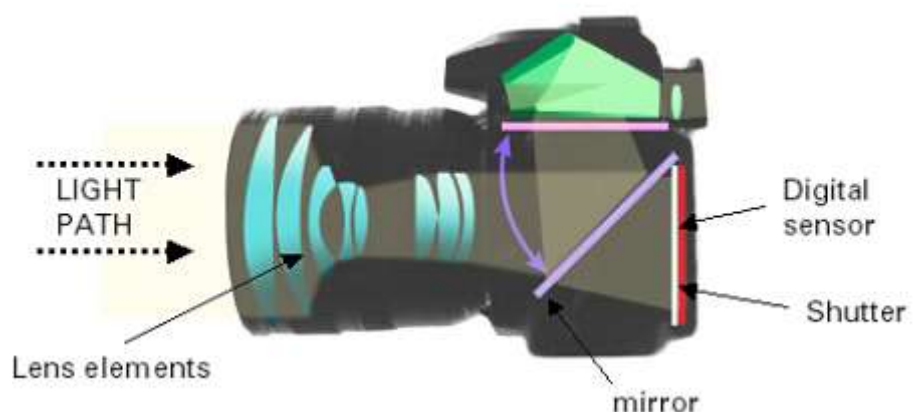
In your pinhole camera how does the image get recorded? \_\_\_\_\_

Can you store this image? \_\_\_\_\_

A Digital camera is simply a box with an opening (the lens) and a recording device—called a digital sensor. The digital sensor responds to light and creates electrical signals that can be stored in a computer chip.

You can read those computer chips on your computer.

Mobile camera phones have the same types of sensors in them.



## How does light affect a camera sensor?

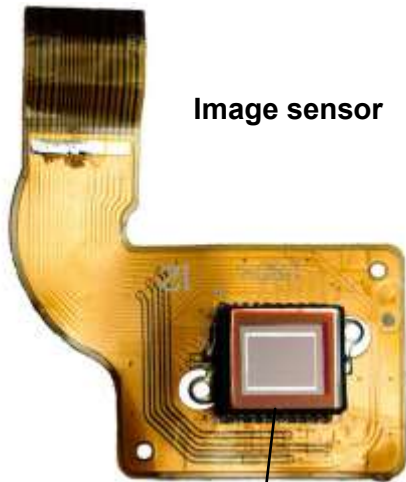


Image sensor

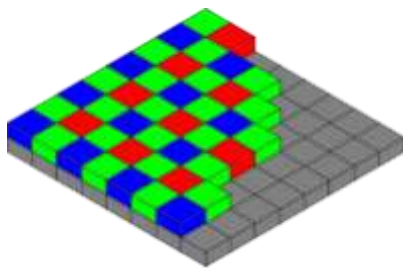
A camera image sensor is an analogue device. When light strikes the chip it is held as a small electrical charge in each photo sensor. The charges are converted to voltage one pixel at a time as they are read from the chip. Additional circuitry in the camera converts the voltage into digital information

Different parts of the sensor respond to different colours. Red, Green and Blue are the three colours the sensor picks up.

Each element on the sensor is called a pixel. Note that there are twice as many green pixels as red or blue sensors. Our eyes are better at seeing green light than red or blue light.

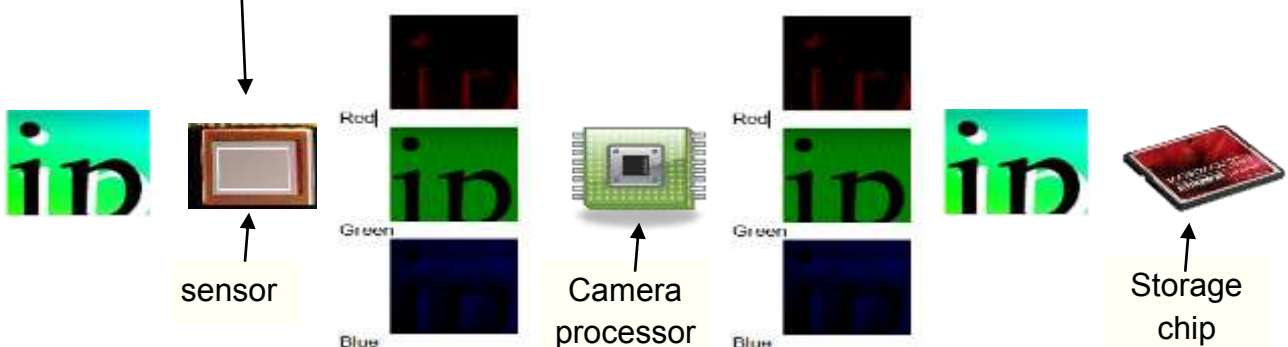
A small computer in the camera converts all the Red, Green and Blue information so that it can be stored on the chip.

Can you find the sensor in the sample camera?



Can you find the computer chip in the sample camera?

Can you take the memory chip out of the camera and put it back in?



## The camera lens



Camera lens

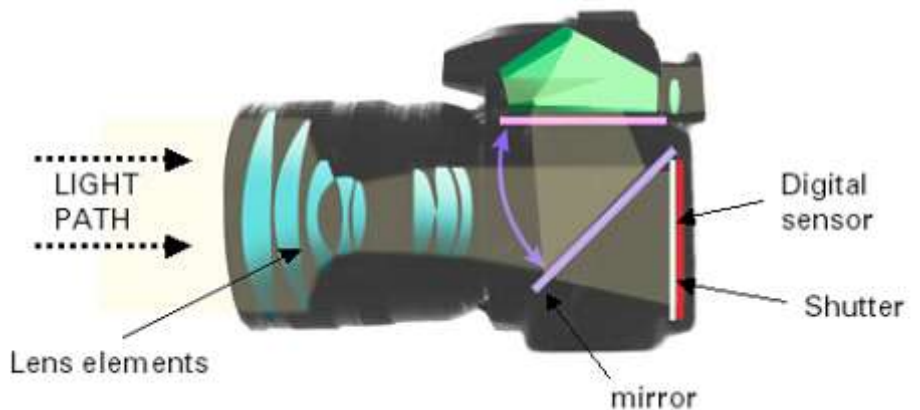
The camera lens body focusses the light from your picture onto the camera sensor through a series of lenses.

The lens can also control the amount of light reaching the sensor. This is done with the iris diaphragm.

We can also control the light reaching the sensor using the shutter. The shutter is inside the camera.



Iris diaphragm inside the camera lens



I know how to change a lens on a camera

I can identify the iris diaphragm

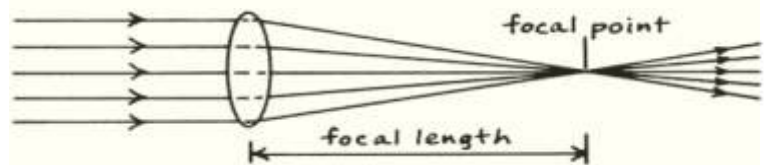
The iris diaphragm in the lens controls the amount of \_\_\_\_\_ reaching the image sensor

Now we will find out about long and short focal length lenses.

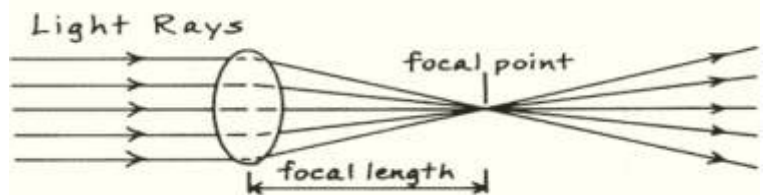
## Focal length

There are many lenses that you can fit on to a good camera to enable you to see a particular view in a certain way.

If I want to photograph a distant hill with a monument on it I will need to use a long focal length lens.



If I want to take a close up of that monument then I need to use a shorter focal length lens.



Another way to see this is using these four pictures



**28mm lens**

Short focal length



**50mm lens**



**70mm lens**



**210mm lens**

Long focal length

I can use a short-focal length lens for taking good pictures of \_\_\_\_\_

I would use a \_\_\_\_\_ focal length lens to take a picture of a \_\_\_\_\_ object in the country

## How are lens aperture and depth of field related?

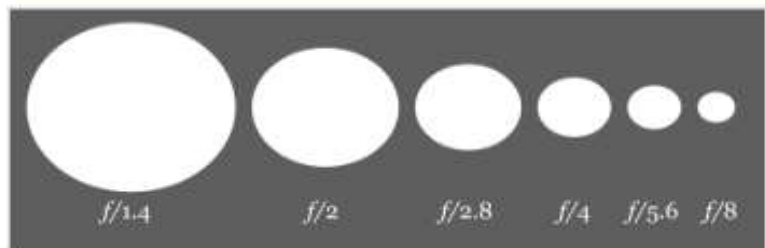


Iris diaphragm inside the camera lens

We have looked at the front of a lens and seen the iris diaphragm and found out how to change the size of the hole which allows light into the camera.

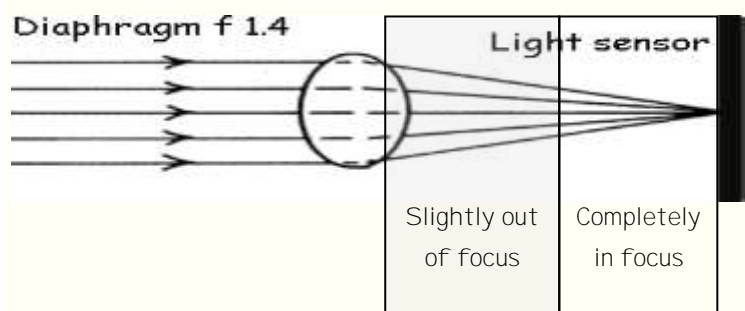
A large hole allows much light into the camera, a small hole only allows a small amount of light to reach the sensor at the back of the camera.

Camermen need a way to tell how big that hole is. They call the size the f stop. A small opening has a bigger f stop than a large opening in the iris diaphragm.



You can create special effects when the diaphragm is open to its widest. When this happens the focus is pin-point sharp—leaving the background and the foreground slightly out of focus. Look at the photos to the left to see what happens.

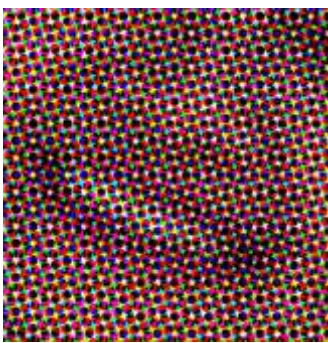
Deliberately altering the diaphragm like this is called altering the depth of field.



I know the difference between f1.4 and f8.0 \_\_\_\_\_

I can adjust the diaphragm in a lens \_\_\_\_\_

## Pixels, image resolution, and image size



640 x 480  
307200 pixels

1280 x 720  
921600 pixels



Every digital image consists of many fundamental small-scale units called pixels. Look at the picture to the left. The picture looks nice and smooth. Take a close look at the ladies mouth. Look at the hundreds of dots.

Each dot contains information our eyes use to make up the full picture. Millions of pixels combine to create a detailed and seemingly continuous image.

Each pixel contains a series of numbers which describe its colour or intensity. The more pixels your image contains, the more detail it has the ability to describe. The more pixels the higher the resolution. This creates a more detailed picture.

The camera sensor converts the light into number that a computer can turn into a picture on a screen.

The image size you can create is important. An older computer screen will have a size of 640 x 480. This will be 640 pixels wide by 480 pixels in height. A modern widescreen TV screen will be 1280 x 720. Not only is the size of the rectangle different, there are more pixels. More pixels means higher resolution because there is more information in each picture.

This matters most when it comes to printing a picture on paper. Look what happens when we print a picture with too little information in it. There are too pixels in the picture.

When it is printed as a small picture it looks good. When we print the picture larger the poor quality is obvious.

I have learned that I should take pictures at \_\_\_\_\_ resolution

## What are the two types of image compression?



What is the best way to carry a cup of soup from one town to another? The simplest way is to carry the soup in a dried form. The water is removed and the soup is easy to carry.

The easiest way to transport a photograph in an electronic form is in a compressed form.

The image sensor in a camera can provide lots of information in the form of pixels. This information is stored in the form of a computer file.

Many times we need to make the files smaller so that we can move them easily from the camera to a computer.

There are two sorts of compression that we use. The two forms are 'lossy' and 'lossless'.

Lossless compression means that the image file does not lose its quality. When we need to keep an important file we use lossless compression. We don't want to lose quality if we send an x-ray picture from hospital to hospital.

Lossy compression means that the file loses some of its quality. We don't mind some loss of quality if we are wanting to send a mobile phone picture to another friend.

What kind of compression would you use to keep an important picture on your computer hard drive?

I would prefer to use \_\_\_\_\_ compression



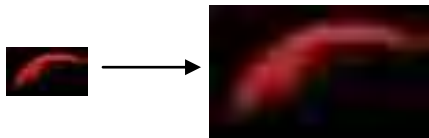


## Name and describe three types of image formats

There are two main types of image format that you will meet. The first sort is a raster image. The second sort is a vector image.



Vector graphics are very clever as they use mathematic principles to describe what the picture looks like. These images can be expanded very easily without losing quality. The most frequent vector graphic file you will meet is a PDF file.



The other main type of image format is a raster image. Raster images are copies of the original picture—but they are not expressed in mathematic principles. If you increase their size the quality decreases.



A lossless raster image file format is PNG, this stands for 'Portable Network Graphics'. This format is clever as you can send the file with a transparent background.

A lossy image file format is jpg (JPEG Joint Photographic Experts Group). This format can produce a smaller file than PNG for photographic (and photo-like) images. You cannot have a transparent background with this file type.

Look at the different between the two balloon pictures to see what happens when you have a transparent background.

When I want to send a friend a file that I want them to enlarge a lot I will use a \_\_\_\_\_ file

If a friend wants me to send a small file I would prefer to use a \_\_\_\_\_ compressed file.

If I want to send a file with a transparent background I will use a \_\_\_\_\_ compressed file

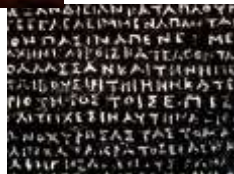
## Give the principal uses of photography



Recording events. We record events for many reasons. Sometimes we want to let our family know what we have been doing. We may want to amuse our friends with a post on Facebook. We might have been asked to write an article for a newspaper who want us to include a picture of the event.

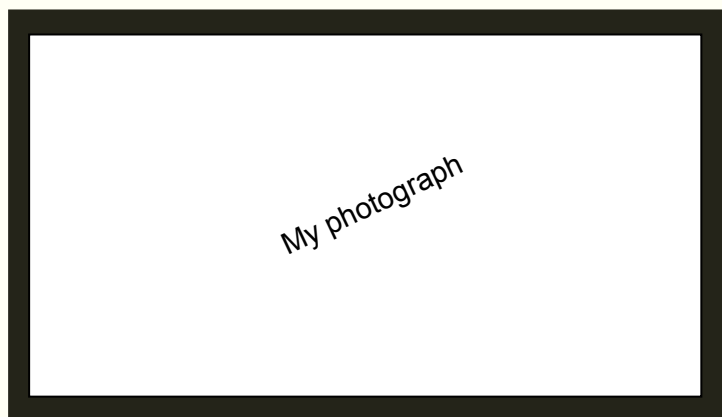


Art appreciation. Many people like to look at beautiful scenes. Photography is ideal to record beautiful scenes. We can print the picture we take or put it on a website to share the picture. People get pleasure from looking at these photographs.



Transmitting information. A policeman may attend a car crash and want to take photographs of the scene so that other people can decide what happened. Scientists may take pictures of experiments to allow other scientists to see what happened. Archaeologists may take pictures of items they have found to illustrate a book to help explain history.

Your first task. Take a photograph of a friend that you would like to send them. Try to make the photograph amusing. The photograph should tell a story about what you have been doing. The photograph can be printed later and stuck here



## Define photography

Photography is the process of recording pictures by means of capturing light on a light-sensitive medium, such as a film or sensor.



Light reflected from objects can affect a sensitive material so that an image of the real object can be recorded.

In the past photographic film was used. Chemicals in the film change colour when light hit the chemicals.

Now we have electronic devices that react to light. These devices convert the light into electrical patterns that we can record on some form of computer memory.



Most people take photographs viewing their subject through a photographic lens attached to a camera. The camera stores the resulting information chemically or electronically.

The word, photograph, comes from the Greek words  $\phi\omega\varsigma$  *phos* ("light"), and  $\gamma\rho\alpha\phi\acute{\iota}\varsigma$  *graphis*. ("drawing lines"). Together these give us the word meaning "drawing with light."

Traditionally, the product of photography has been called a *photograph*, commonly shortened to *photo*.



A

B

C

Which of these pictures is a photograph? A, B or C. Be careful about your answer

**Take pictures illustrating at least eight of the following techniques. Use comparison pictures for illustration:**

**Framing**



A



B

Our eyes work well with our brain to help us see the world in 3D. We see depth in objects because our eyes are set slightly apart. Our brains can use the two sets of information to help us see in stereo.

Ordinary cameras are different. They have only one eye, the lens. We set out to take pictures that add depth by adding a frame of some kind to our pictures to give depth.

We use some object as a frame in the photograph to give us a foreground or background to highlight our subject.

Which picture has a frame — A or B? \_\_\_\_\_

I took a framed photo \_\_\_\_\_

I took an un-framed photo \_\_\_\_\_

I prefer the \_\_\_\_\_ photo

**Camera Steadiness**

If you have taken a photograph that looks blurred this is usually caused by one of three things. Your subject may be moving, you are not holding your camera steadily or your camera is set for too slow a shutter speed.



A



B

When this happens this is called 'camera blur. You can easily avoid camera blur if you think before taking your picture.

Hold your camera properly. Use both hands to hold the camera steady. Stand comfortably so that you don't move as you take the picture.

## Camera Steadiness (continued)



A



B

Your subject may be moving. Look at the conductor in picture A. The simplest solution is to only take photographs of people who are not moving but this is not usually possible. We all move at some time.

There is another solution and that is to make sure that the shutter speed is fast enough to capture the action. Your camera ought to be set to take photographs with a shutter speed faster than  $1/125$  of a second.

If you can set the shutter speed yourself then you may be able to take photographs of people who are moving—so long as there is enough light available.

How was this photograph taken? Can you think what had to be done to blur the background but keep the child in focus?



I took a blurred photograph \_\_\_\_\_

I took a very steady photograph \_\_\_\_\_

## Direction of lighting - front, side, or backlighting

In order to take some artistic shots you need to be able to understand that you can take photographs with the light from behind the subject, to the side of the subject or in front of the subject.

You can spot where the light is coming from by looking at the shadows in the photographs

**Front lighting** is best when you want to see the details of your picture. You might want this if you're taking a close-up of someone's face.

Be careful with this type of lighting as your subject might be squinting because of the glare from the light source. This mostly happens when people face the sun as they are being photographed. You might also need to take care that the subject might be over-exposed, the picture might be too light.





**Side lighting** brings out the shadows of the scene and so adds depth and realism. This is good for landscape pictures. In a face this might add a glint of light to the eyes. This adds life to the face of the person being photographed.

It is easy to arrange for side-lighting. Position your subject near to a window. The girl in this photograph has the light on her left side as she reads her Bible.



**Back lighting** is lighting from behind the subject. A silhouette is often all that is seen with little or no detail.

You can often take photographs like this when you have your subject with the sun behind the back. There is not much light on the face of this subject, everything behind the person is very well lit by the sun.

It is important to take care if you are taking photographs into the sun like this. The direct light from the sun can damage your eyes.

I was able to take a photograph that was front lit

\_\_\_\_\_

My photograph that was lit from the side was of

My backlit photograph was of \_\_\_\_\_

I found that the photograph with \_\_\_\_\_ lighting was the hardest to create

The photograph I enjoyed taking was the one where I had to use the \_\_\_\_\_ lighting

## Quality of light - shade, sunlight, and time of day



Many photographers will be up taking photographs just after sunset—or just before sunset. These are the golden hours to take photographs.

The light at this time is not so bright, colours are warmer and shadows are longer. The light from the sun also has more red, pink and orange in it.



However if we take photographs in the middle of the day pictures do not have many shadows and look 'flatter'. This does suit pictures of buildings.



It is possible to take pictures when there is no sunshine. At these times it is good to take close-up pictures of flowers. You might also want to take pictures on a foggy day.

I took one photograph in the middle of the day when the sun was bright. I took the same subject as the sun was going down.

Which photograph did you prefer? Why did you prefer it?

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## Rule of thirds

This is important to understand. Our brains seem to be attuned to looking at pictures composed using this rule.

A



B



Take a look at the two photographs. The most natural photograph is marked with an A. The other photograph has been altered to make it look 'wrong' to our eyes. Take note where the eyes are in the picture. They are about 2/3rds of the way up the picture. They look 'right' to us.



The same principle applies with landscape photographs. This picture of Whitby was taken just as the sun was going down. The photograph at the top looks more natural than the photograph below it which has left the town half-way up the picture.

It is easy to use the rule of thirds. As you look through the viewfinder of the camera divide up the image that you see into three equal parts. If you are taking a picture of a person try to place those eyes on the imaginary line  $\frac{2}{3}$  of the way up the screen.

$\frac{2}{3}$

$\frac{1}{3}$



I was able to understand the rule of thirds \_\_\_\_\_

I took three photographs of a friend's face. One had the eyes  $\frac{1}{3}$  of the way up the picture, one had the eyes half way up the picture and the other had the eyes  $\frac{2}{3}$  of the way up the picture.

Which picture did you prefer—and why did you prefer that picture?

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## Angle - eye level, high, and low level



The angle you take your photographs from mean that your photographs will look different.

In this section you will need to take three different photographs.

**High angle means** - looking down on your subject

**Mid-angle means** - looking at your subject straight on

**Low-angle means** - looking up at your subject



You might try this. Find some tall straight trees, and take a picture looking straight at them, then another one by laying on the ground looking up through the trees. Does the angle make a difference?



Now you try taking pictures of some children.

Photograph them by standing safely on a chair and looking down on them to take a photograph. Now have the children stand on a chair and you take the photograph looking up at them. Now take a third photograph with your eyes at the same level as your eyes.

I was able to take pictures of my friends viewing them from the three different angles.

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## Horizons

It is good to keep your photographs level, unless you are taking some artistic shots when you really want to tilt the picture for some special reason.

You can check how level a picture is by looking at the horizon.

The picture of the bike looks odd but the train looks as though it is speeding along.

It is ok to break the rules of photography occasionally.

I took photographs and tried to make the horizons level

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### Distance from subject - fill the frame

If you take a picture of your friend you really don't want to have people to say, "who's that" because your friend is so far away from the camera.

It is good to fill the frame of the photograph with your subject. The subject of the photograph is the person or the object that you are photographing.

In order to fill the frame you will need to stand closer to the person you are taking the photograph of. When you do this you can have really good images.



Try taking a photograph of a group of people from a distance. Now come a lot closer so that you can see the expressions on people's faces.

I took a photograph of a group of people from a distance, then I took the same group from close up when they were all together.

Which photograph do you prefer? \_\_\_\_\_

### Use of Leading lines

We saw earlier that we can frame a picture using objects in the foreground or in the distance to add depth to a picture.

We can do the same and highlight the subject using lines in the photograph that lead towards the subject.

Fence poles, trees, roads or paths can direct the eye to the subject of a photograph.

I took a photograph that used leading lines. The lines led to the subject of the photograph \_\_\_\_\_



## Correct exposure - underexposed, overexposed, and correctly exposed



It is important to learn how to take a photograph and make sure that you have made sure that the right amount of light has reached the sensor to record your picture.

You can check the amount of light reaching the sensor using a meter inside your camera.

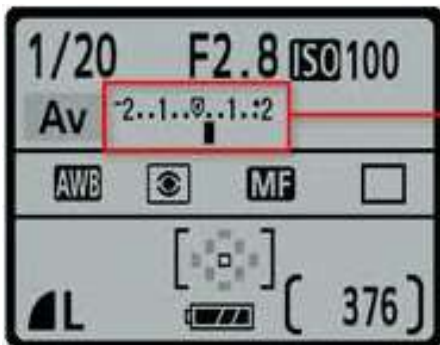
If too much light enters the camera the picture would be over-exposed and so too light. If too little light reaches the sensor then the picture would be under-exposed and would be too dark.

A correctly exposed picture looks just right with the features of your subject being clearly seen.

A digital camera has a screen to give a quick check on your photograph. It is a good idea to check your photographs as you go along.



Many digital cameras have a screen like the one below and to the left.



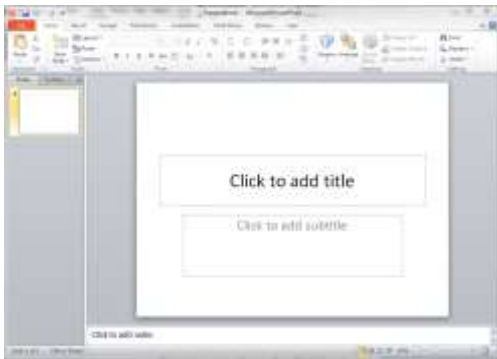
The little box on the left in red surrounds a scale that is similar to the one seen on most digital cameras. The black square is almost in the centre of the screen. This shows that the picture being taken will be very slightly over-exposed.

When you take a photograph with this kind of meter aim to place the square in the centre of the scale.

I was able to use and understand the light meter inside the camera viewfinder \_\_\_\_\_

I took three pictures of the same subject and made sure that one photograph was properly exposed. One of the photographs was under-exposed. That picture was too \_\_\_\_\_ I also took a photograph that was far too light. That photograph was \_\_\_\_\_ exposed

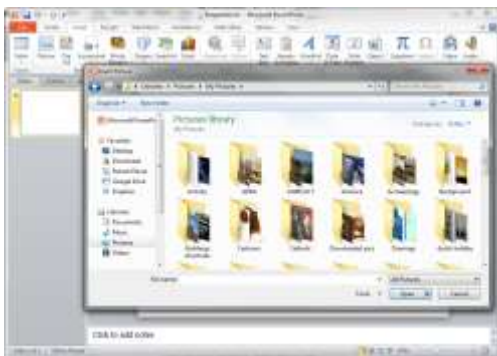
**Place photos in PowerPoint. Create a PowerPoint presentation showing the pictures you took using the above techniques**



If you want a number of people to see your beautiful photographs in one room it is a good idea to use presentation software and project your pictures using a video projector.

One type of presentation program is Microsoft PowerPoint. Other programs are available for other computers. This booklet uses PowerPoint to illustrate what you need to understand and do.

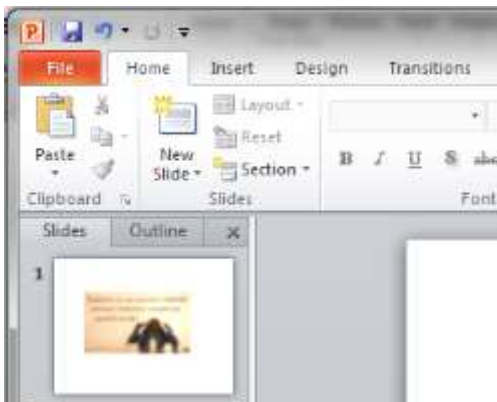
We assume that you have saved your photos into one folder on the hard drive of your computer and have given them good file names.



Open PowerPoint and immediately think of a file name for your show. Save that file in your folder on the computer you are working on.

Using 'insert > picture' select a picture file from your folder using the box that opens then insert that file into the program.

The file may not be the size you want it to be. Click and drag the picture to the place and size you need it on the screen.

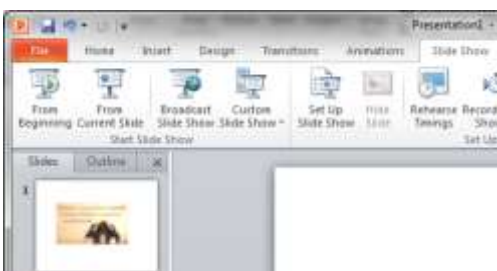


You might want to add some effects to the picture. This can be done in a number of ways. Try a right click and then select 'format picture'. Select the correction you wish to apply.

Save your PowerPoint file.

Repeat the process by going to 'home > new slide' and then inserting another picture into your file.

When you have finished creating your presentation you will want to show your finished product to an audience. Go to 'slide show > from beginning' and watch your creation on screen.



You do not need to use PowerPoint for this operation.

I was able to create a slide show using all of the pictures I took to illustrate good photographic technique \_\_\_\_\_

**Use a photo editing program on a computer, show your ability to crop, colour correct, sharpen, and adjust brightness/contrast in your photos**

Many photographs need adjusting after you have taken the photograph. You can use a photo editing program to make these adjustments. There are expensive professional products that you can use to do these tasks but there are also simpler editing programs that allow you to perform the same tasks.

What could you do to this photograph to improve it? Look for the subject of the photograph. How can you make this more obvious?

I would \_\_\_\_\_ this photograph. You could draw how you would do this.

Look at another photograph. The bowl is full of pasta with black olives on top of the pasta. What colour should the pasta be? A photo editing program would be able to correct the problem with this photograph.

I would re- \_\_\_\_\_ this photograph.

Now look at another photograph. You could use a picture like this in a newsletter designed for children. However you might like to change the look of the crossword puzzle to make it stand out a little more. This is very easy to do in a photo editing program.

I would alter the \_\_\_\_\_ on this photograph to make the black stand out more.

Sometimes you want to sharpen a picture. Many photo editors have a 'Sharpen tool'. This focuses soft edges in a photo to increase clarity or focus.

Look at the picture of the lizard sun-bathing. If you sharpened this picture what would you think would happen to the look of the scales on the back of the lizard?

I think that the scales would \_\_\_\_\_



**Use a photo editing program on a computer, show your ability to crop, colour correct, sharpen, and adjust brightness/contrast in your photos (continued)**

Most modern photo editing software allows you to accomplish these tasks simply and quickly. Adobe's Photoshop is probably the best known photo editing package, but you may use other editing programs.

**Complete at least three creative photographic projects in a photo editing program; such as a CD cover, a photo scrapbook page, a collage, etc.**



Use the photographs that you have taken in the earlier exercise. As in the earlier task the program that many people use is Adobe Photoshop or Photoshop Elements.

Other programs will enable you to complete this project.

As this project requires you to use your own programme your task here is to complete the project with you Pathfinder leader and have him, or her, show that you have completed the project.

Pastor Jeynes will need to be notified when this task has been completed. Details of how to contact Pastor Jeynes are at the back of this booklet.

**Have a basic understanding of file organization techniques.**

A mother said to her son, "How do you find things in your bedroom?" The son said, "I know where everything is."

A computer user needs to know where everything is stored on a computer. To make this easy a computer stores information in files, and the files are stored in folders. To make all of this possible the files can be given titles using names and numbers. The same can be done for folders.

All of these can be easily found on the hard drive of the computer.

This photograph was taken by Peter Jeynes in October 2012 at a place called Portland. It shows a part of Chesil Beach. I took 6 other pictures of the same scene.



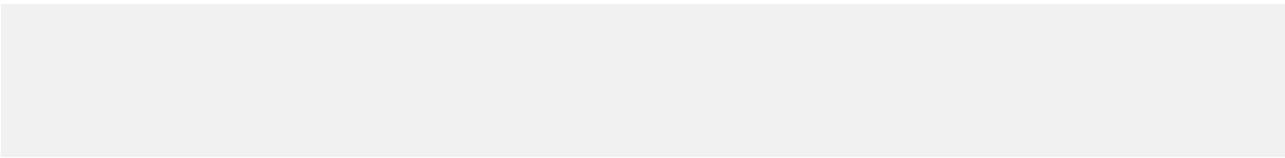
What would you call the file? \_\_\_\_\_

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You want to store the file in a folder. I took the photograph when I was on holiday in Dorset with my wife Ludy. What would you call the folder?

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I can store a file in a computer and I can re-name files and folders \_\_\_\_\_



This booklet was created by Pastor Peter Jeynes  
pjeynes@necadventist.org.uk

North England Conference of Seventh-day Adventists  
22 Zulla Road, Mapperley Park, Nottingham NG3 5DB  
Telephone: 0115 960 6312 Fax:: 0115 969 1476  
[www.necadventist.org.uk](http://www.necadventist.org.uk)

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