G.C.E. O/L Grade 11 ICT

Lesson 4: Multimedia: Images, Animation, Audio and Video

- 4.1 Digital Images: Pixels, Resolution, Colour Depth, Raster and Vector Graphics
- 4.2 2D Animation: Frames, Key Frames, Frame Rate and Tweening
- 4.3 Audio and Video Editing: Recording, Trimming, Formats and Software
- 4.4 Integrating Multimedia: Storyboards, Design and a Sigiriya Video Project

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G.C.E. O/L Grade 11 ICT · Lesson 4

4.1 Digital Images: Pixels, Resolution, Colour Depth, Raster and Vector Graphics

Syllabus 13.1. Posters for Science Day, photos on the school website, a birthday card in Canva – all of these are **still graphics** (pictures that do not move). In this note you will learn what **multimedia** is, what a **pixel**, **resolution** and **colour depth** are, how to **calculate the file size** of an image, the difference between **lossy and lossless** formats and between **raster and vector** graphics, and how to edit a picture in **GIMP** with layers, selections, crop, resize and text. Finally you will learn to use **AI images** responsibly.

1. What is multimedia?

Multimedia means using **more than one kind of media together** to share an idea. The five media elements are **text, images (graphics), audio, video and animation**. When the user can click, choose or control what happens (like a quiz or a game), it is **interactive multimedia**.

Text
පෙළ

Images
රූප

Audio
ශ්‍රව්‍ය

Video
වීඩියෝ

Animation
සජීවීකරණය

2. Pixels – the dots that make a picture

A digital image is a grid of tiny coloured squares called **pixels** (picture elements). Zoom in on any photo and you will see them. The **size** of an image is written as **width × height in pixels**, for example **1024 × 768**. That picture has 786,432 pixels. A phone camera of 4000 × 3000 makes 12,000,000 pixels = **12 megapixels (MP)**.

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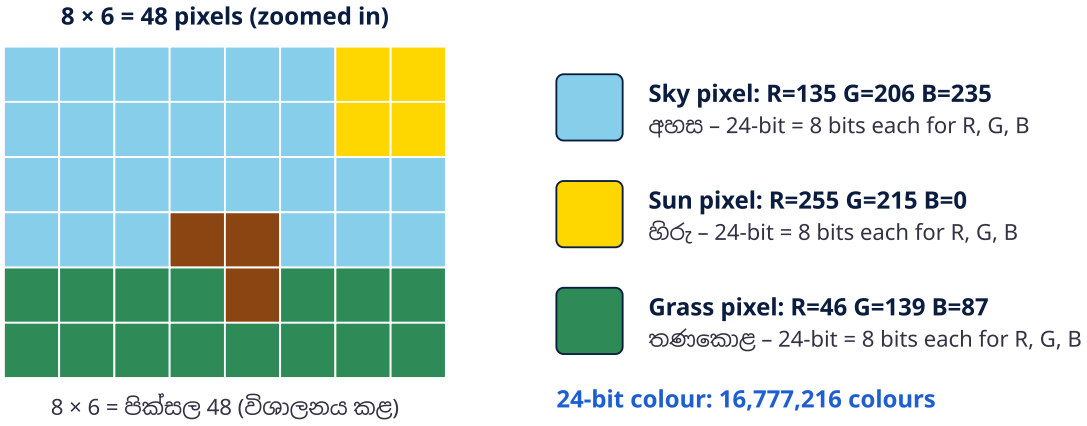


Figure 4.1 – A tiny picture zoomed in: each square is one pixel with its own RGB colour.

3. Resolution – PPI and DPI

Resolution tells how many pixels are packed into each inch. On a screen it is **PPI (pixels per inch)**; for a printer it is **DPI (dots per inch)**. More pixels per inch = sharper, more detailed picture. To find the printed size: **inches = pixels ÷ PPI**. A 1800 × 1200 photo printed at 300 PPI is 6 × 4 inches – a normal 6 × 4 photo.

4. Colour and colour depth

Screens make every colour by mixing **Red, Green and Blue (RGB)** light. Each pixel stores numbers for R, G and B (0–255 each). **Colour depth** (bit depth, **bpp** = bits per pixel) is the number of bits used for one pixel. With **n bits** a pixel can show **2^n colours**.

Colour depth	Number of colours (2^n)	Used for
1-bit	2	Black and white only
8-bit	256	GIF images, old screens
16-bit	65,536	“High colour”
24-bit	16,777,216	“True colour” – normal photos

💡 To find bits needed for a number of colours, find the smallest n with $2^n \geq$ colours. 64 colours → $2^6 = 64$ → **6 bits**.

5. Calculating image file size

For an **uncompressed** image (like BMP): **File size (bytes) = width × height × colour depth ÷ 8**. Divide by 1024 for KB and again by 1024 for MB. Worked example: 1024 × 768, 24-bit → 1024 × 768 × 24 = 18,874,368 bits ÷ 8 = 2,359,296 bytes ÷ 1024 = 2304 KB ÷ 1024 = **2.25 MB**.

Image	Size (pixels)	Colour depth	Bytes	File size

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School logo scan (black and white)	100 × 100	1-bit	1,250	1.22 KB
Old 256-colour web image	640 × 480	8-bit	307,200	300 KB
Class photo for the school website	1024 × 768	24-bit	2,359,296	2.25 MB
Full HD screenshot of e-thaksalawa	1920 × 1080	24-bit	6,220,800	5.93 MB

> 💡 Remember the order: **pixels → bits → bytes (÷ 8) → KB (÷ 1024) → MB (÷ 1024)**.

6. Compression – lossy and lossless

Compression makes files smaller so they load faster and take less space. **Lossy** compression (JPEG) throws away detail the eye hardly notices – very small files, but quality drops each time you save again. **Lossless** compression (PNG, GIF, TIFF) makes the file smaller **without losing any detail**. BMP is usually **uncompressed**. Example: a 2.25 MB BMP class photo might become about 230 KB as a JPEG – roughly 10 times smaller.

Format	Compression	Best for
JPEG (.jpg)	Lossy	Photos; small files; quality slider
PNG (.png)	Lossless	Logos, screenshots, transparency
GIF (.gif)	Lossless	Only 256 colours; simple animation
BMP (.bmp)	Uncompressed	Very large files
TIFF (.tif)	Lossless	Printing and scanning
SVG (.svg)	Vector	Shapes as maths; any size, always sharp

> NEW 2026 **2026: WebP** and **AVIF** are modern web formats that can be lossy or lossless and are often smaller than JPEG and PNG. Most browsers and Canva support them.

7. Raster and vector graphics

Raster (bitmap) images are made of pixels. When you enlarge them too much they become **blocky (pixelated)**. **Vector** images store **shapes as mathematics** – lines, curves and fills. You can enlarge a vector logo to the size of a school banner and it **stays sharp**, and the file is usually small.

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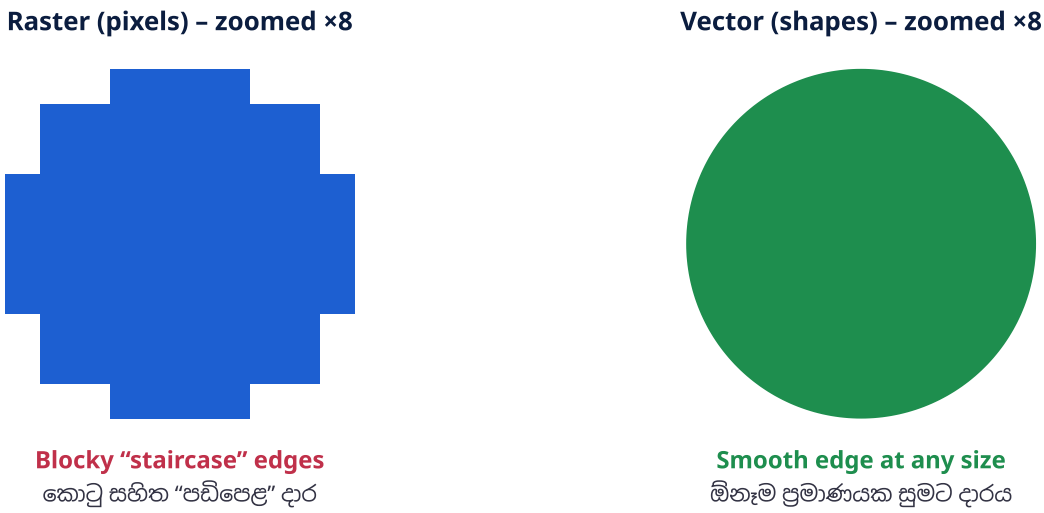


Figure 4.2 – Zoomed in, the raster circle shows pixel steps; the vector circle stays smooth.

Feature	Raster	Vector
Made of	Pixels (a grid of dots)	Shapes: lines, curves, fills (maths)
Enlarging	Becomes blocky (pixelated)	Stays sharp
Best for	Photos, paintings	Logos, icons, maps, diagrams
File types	JPEG, PNG, GIF, BMP, TIFF	SVG, AI, CDR, EPS
Software	GIMP, Photoshop	Inkscape, Illustrator, CorelDRAW

8. Graphics software

GIMP
GIMP

Adobe Photoshop
Adobe Photoshop

Inkscape
Inkscape

Canva
Canva

9. Editing a picture – basic operations

Example task: make a **Science Day 2026** poster for your school. You open a photo, crop it, add the school logo, write a title and export it. These are the operations you will use (menus shown for GIMP; Photoshop is very similar).

Operation	How (GIMP)
Open / Save / Export	File > Open; Save keeps layers (.xcf); Export makes JPEG or PNG
Import	File > Open as Layers adds a picture as a new layer
Resize (scale)	Image > Scale Image; keep the chain locked to keep the shape
Rotate / Flip	Image > Transform > Rotate 90° or Flip Horizontally

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Select	Rectangle, Ellipse, Free (lasso) or Fuzzy (magic wand) select
Cut / Copy / Paste	Edit > Cut (Ctrl+X), Copy (Ctrl+C), Paste (Ctrl+V)
Crop	Crop tool – keep only the part you need
Replace	Select an area, then paste another picture or fill a new colour
Layers	Windows > Layers; each object on its own layer
Text and effects	Text tool; then drop shadow, outline, gradient

Layers are like clear plastic sheets stacked on top of each other. Put the background, photo, logo and text on separate layers. Then you can move or change the text without damaging the photo. Save the working file as **.xcf** (GIMP) or **.psd** (Photoshop) to keep the layers; **export** a JPEG or PNG to share.

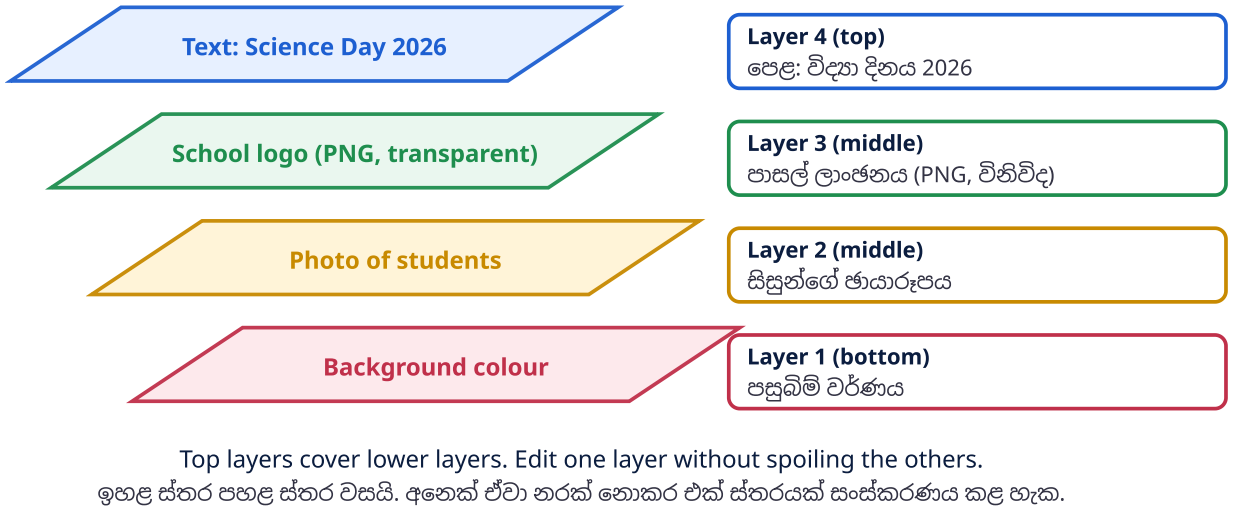


Figure 4.3 – The layers of a Science Day poster: text on top, background at the bottom.

> 💡 **Crop** removes the outside of a picture (the canvas gets smaller). **Resize/scale** keeps the whole picture but changes its pixel size. Do not mix them up!

10. AI images, copyright and credit

> NEW 2026 **2026:** Tools like Canva Magic Media, Adobe Firefly and Photoshop **Generative Fill** can create or change images from a text prompt. Use them responsibly: **say when an image is AI-made**, never make fake pictures of real people (**deepfakes**) to trick or bully, and do not copy another artist's work.

Photos you find on Google are usually **copyright** – the owner decides who may use them. Use your **own photos**, or images with a **Creative Commons** licence, and **give credit** (name of the creator and the source).

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Licence	Meaning
CC BY	Use it, but give credit
CC BY-SA	Give credit and share your new work the same way
CC BY-NC	Give credit; no commercial use
CC0	Public domain – free to use

Key Words

Multimedia – Using text, images, audio, video and animation together.

Interactive multimedia – Multimedia the user can control by clicking or choosing.

Pixel – The smallest coloured square in a digital image.

Resolution – Pixels per inch (PPI) or dots per inch (DPI).

Colour depth – Bits used for one pixel; n bits give 2^n colours.

RGB – Red, Green and Blue light mixed to make screen colours.

Lossy compression – Makes files smaller by removing some detail (JPEG).

Lossless compression – Makes files smaller with no loss of detail (PNG).

Raster graphic – An image made of pixels; blurs or blocks when enlarged.

Vector graphic – An image made of shapes; stays sharp at any size.

Layer – A separate sheet in an image that can be edited alone.

Crop – Cutting away the outer parts of a picture.

Sample Q&A

1. Name the five elements of multimedia.

> **Answer:** Text, images, audio, video and animation.

2. How many colours can a 24-bit image show?

> **Answer:** 2^{24} = 16,777,216 colours.

3. Find the size of a 640 × 480, 8-bit image.

> **Answer:** 640 × 480 × 8 ÷ 8 = 307,200 bytes = 300 KB.

4. Why is a school logo better saved as a vector?

> **Answer:** It stays sharp at any size, from a badge to a banner.

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5. What is the difference between lossy and lossless?

> **Answer:** Lossy removes some detail (JPEG); lossless keeps all detail (PNG).

6. Why use layers?

> **Answer:** So each part can be edited or moved without spoiling the others.

MCQ

1. Which is NOT one of the five multimedia elements?

A. Keyboard
B. Text
C. Animation
D. Audio

2. The smallest element of a digital image is a

A. vector
B. frame
C. pixel
D. layer

3. A phone camera takes 4000 × 3000 photos. How many megapixels?

A. 7 MP
B. 1.2 MP
C. 12 MP
D. 120 MP

4. How many colours can an 8-bit image show?

A. 256
B. 64
C. 8
D. 16

5. How many bits per pixel are needed for 64 colours?

A. 4
B. 6
C. 8
D. 64

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6. A black-and-white (1-bit) image can show

A. 1 colour
B. 256 colours
C. 8 colours
D. 2 colours

7. File size of an uncompressed 1024 × 768, 24-bit image is

A. 768 KB
B. 24 MB
C. 2.25 MB
D. 18 MB

8. A 1800 × 1200 photo printed at 300 PPI is

A. 18 × 12 inches
B. 6 × 4 inches
C. 60 × 40 inches
D. 3 × 2 inches

9. Which format uses lossy compression?

A. JPEG
B. PNG
C. BMP
D. TIFF

10. A logo with a transparent background should be saved as

A. JPEG
B. BMP
C. PNG
D. MP3

11. Which is a vector file format?

A. GIF
B. BMP
C. JPEG
D. SVG

12. When a raster image is enlarged too much it becomes

A. pixelated (blocky)
B. smaller in file size
C. sharper
D. a vector

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13. Which software is mainly a free vector editor?

A. Audacity
B. Inkscape
C. GIMP
D. Photoshop

14. Removing the unwanted outer edges of a photo is called

A. rotate
B. export
C. flip
D. crop

15. Before using a photo from the Internet in a school poster you should

A. remove the owner's name
B. check its licence and give credit
C. use it – everything online is free
D. change it with AI so it is yours

Structured Questions

1. (i) What is a pixel? (1 mark)
(ii) Calculate the uncompressed file size of a 640 × 480, 8-bit image in KB. Show working. (3 marks) *(4 marks)*

> (i) The smallest coloured square of a digital image (1). (ii) 640 × 480 × 8 = 2,457,600 bits (1); ÷ 8 = 307,200 bytes (1); ÷ 1024 = 300 KB (1).

2. (i) How many colours does 16-bit colour give? (1 mark)
(ii) What is the minimum colour depth for 1000 colours? (1 mark) *(2 marks)*

> (i) 2^{16} = 65,536 (1). (ii) 10 bits, because 2^{10} = 1,024 ≥ 1000 but 2^{9} = 512 is too few (1).

3. Give two differences between raster and vector graphics, with one file format of each. (4 marks) *(4 marks)*

> Raster is made of pixels, vector of shapes (1); raster pixelates when enlarged, vector stays sharp (1); raster e.g. JPEG/PNG (1); vector e.g. SVG/AI (1).

4. Kamala must send a class photo by WhatsApp and also print a logo on a large banner. Which format suits each? Explain. (4 marks) *(4 marks)*

> Photo: JPEG (1) – lossy, small file, quick to send (1). Logo: SVG / vector (1) – enlarges without becoming blocky (1).

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5. List four steps to make a Science Day poster in GIMP using layers. (4 marks) *(4 marks)*

> Open/import the photo and crop or resize it (1); add the logo as a new layer (1); add a text layer with the title and effects (1); save as .xcf and export as PNG/JPEG (1).

Summary

- Multimedia = text, images, audio, video, animation; interactive if the user controls it.
- Pixel = smallest square; size = width × height in pixels.
- Resolution = PPI (screen) or DPI (print); inches = pixels ÷ PPI.
- Colour depth n bits → 2^n colours; 24-bit = true colour (RGB).
- File size = w × h × bits ÷ 8 bytes; ÷ 1024 = KB; ÷ 1024 = MB.
- Lossy = JPEG; lossless = PNG, GIF, TIFF; BMP uncompressed.
- Raster = pixels (GIMP, Photoshop); vector = shapes (SVG, Inkscape).
- Use layers, crop, resize, text; credit images and label AI images.

MCQ answer key – 4.1

1. **A** – A keyboard is a device, not a media element.
2. **C** – A pixel is one coloured square.
3. **C** – 4000 × 3000 = 12,000,000 pixels.
4. **A** – $2^8 = 256$.
5. **B** – $2^6 = 64$.
6. **D** – $2^1 = 2$.
7. **C** – 1024 × 768 × 24 ÷ 8 = 2,359,296 bytes = 2.25 MB.
8. **B** – 1800 ÷ 300 = 6; 1200 ÷ 300 = 4.
9. **A** – JPEG removes some detail to make small files.
10. **C** – PNG is lossless and supports transparency.
11. **D** – SVG stores shapes, not pixels.
12. **A** – The pixels become visible squares.
13. **B** – Inkscape edits SVG vector graphics.
14. **D** – Crop keeps only the part you need.
15. **B** – Most images are copyright; use Creative Commons and credit.

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4.2 2D Animation: Frames, Key Frames, Frame Rate and Tweening

Syllabus 13.2. Cartoons on TV, a moving logo at the start of a YouTube video and a Scratch game are all **animations**. In this note you will learn how animation tricks the eye, what **frames**, **key frames** and **blank key frames** are, how the **frame rate (fps)** sets the speed, how to calculate the **duration**, the difference between **frame-by-frame** animation and **tweening**, and how to **publish** an animation as a GIF, video or HTML5 file using free tools like Synfig, Pencil2D and Scratch.

1. How animation works

An **animation** is a series of still pictures shown quickly one after another. Each picture is a **frame**. Each frame is a little different from the one before. Our eyes keep an image for a moment (**persistence of vision**), so the pictures seem to **move smoothly**. A **2D** animation is drawn on a flat surface (width and height only).

> 💡 Make a **flip book**: draw a ball in a slightly different place on the corner of each page of an exercise book, then flip the pages fast. That is animation!

2. Frame rate (fps) and duration

Frame rate is the number of frames shown each second – **frames per second (fps)**. Common rates are **12 fps** (simple cartoons, GIFs), **24 fps** (films) and **30 fps** (TV and phone video). More fps = smoother movement but more drawings. **Duration (seconds) = number of frames ÷ fps**, and **frames = seconds × fps**.

Frames	Frame rate	Duration
48	12 fps	48 ÷ 12 = 4 s
120	24 fps	120 ÷ 24 = 5 s
90	30 fps	90 ÷ 30 = 3 s
36	12 fps	36 ÷ 12 = 3 s
10 × 30 = 300	30 fps	10 s
5 × 24 = 120	24 fps	5 s

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3. Layers and the timeline

Animation software shows a **timeline**. Across the top are **frame numbers**; down the side are **layers**. Like layers in GIMP, each layer holds one object – a background, a character, a title – so each can move on its own. The red **playhead** shows which frame you are looking at.

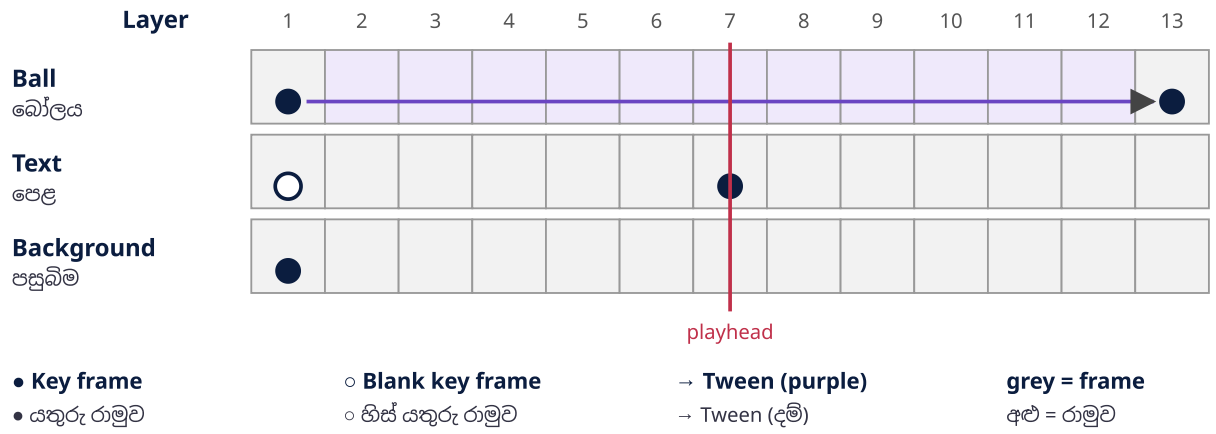


Figure 4.4 – A timeline with three layers: key frames (●), a blank key frame (○), frames (grey) and a motion tween (purple).

4. Types of frames

Frame type	Symbol	Meaning
Frame	grey cell	One picture in time; repeats the last key frame's picture
Key frame	filled circle ●	A frame where something new is drawn or changes
Initial frame	first ●	The key frame where a movement starts
Destination frame	last ●	The key frame where the movement ends
Blank key frame	empty circle ○	A key frame with nothing drawn yet

In Figure 4.4 the **Ball** layer has an **initial key frame** at frame 1 and a **destination key frame** at frame 13. The **Text** layer starts with a **blank key frame** (nothing yet) and the title appears at the key frame in frame 7. The **Background** has one key frame and then normal frames that just repeat it.

5. Geometric objects and shapes

Most 2D animations are built from simple **geometric shapes**: lines, rectangles, circles (ellipses), polygons and stars. You draw them with the shape tools, then change their **fill colour**, **stroke (outline)**, **size**, **position** and **rotation**. A sun can be a yellow circle; a house can be a square with a triangle roof.

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6. Frame-by-frame animation

In **frame-by-frame** animation you **draw every frame yourself**. It gives full control – for example a ball that **squashes** when it hits the ground – but it takes a long time. A 2-second clip at 12 fps needs 24 drawings. Pencil2D and OpenToonz are good for this.

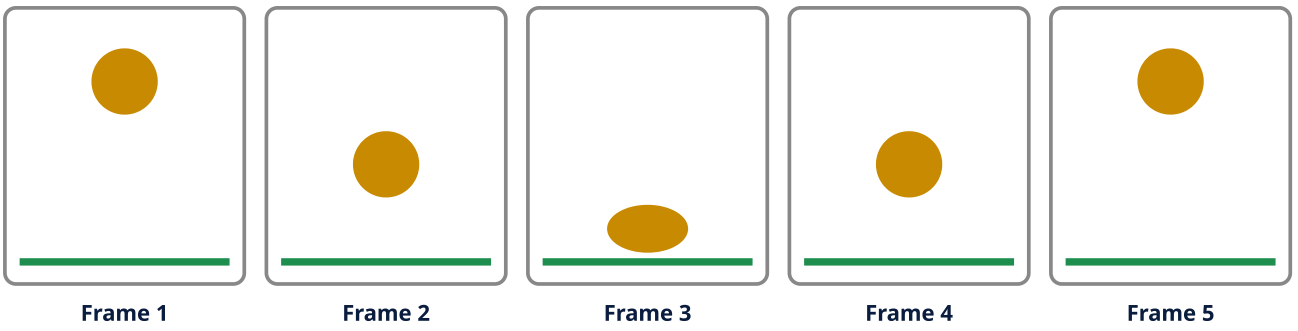


Figure 4.5 – Frame-by-frame: five hand-drawn frames of a bouncing ball.

7. Tweening – the computer draws the middle

Tweening (from “in-between”) is faster. You draw only the **initial** and **destination key frames**; the software **creates the in-between frames** automatically. With key frames at 1 and 13, the computer makes **11 in-between frames**. At 12 fps the movement lasts 13 ÷ 12 = 1.08 s.

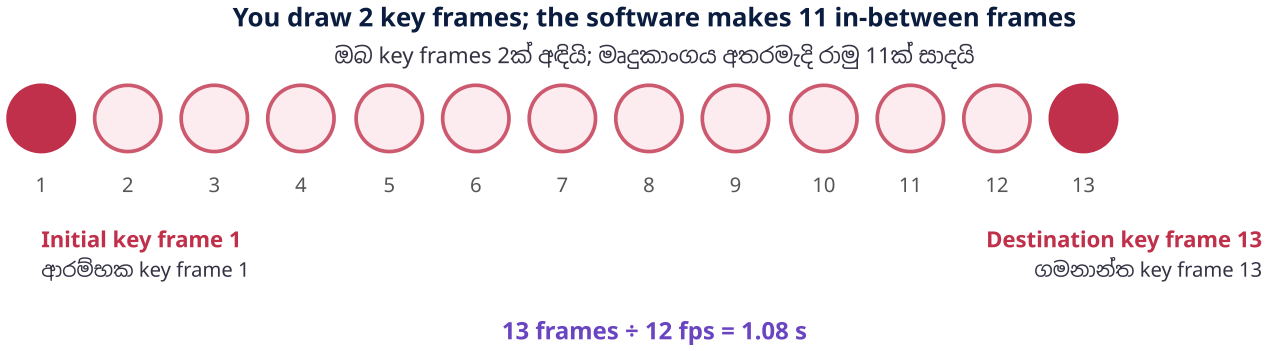


Figure 4.6 – Motion tween: the software fills in 11 frames between two key frames.

Motion tween Motion tween	**Shape tween** Shape tween

💡 Number of in-between frames = destination frame − initial frame − 1.

8. Publishing an animation

Output	Use
GIF	Short looping animation; no sound

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MP4 video	Plays everywhere: YouTube, phones; with sound
HTML5 (Canvas)	Runs in a web browser; can be interactive
SWF (Flash) – old	No longer supported by browsers since 2021

Older animations were often published as **SWF** files for Adobe Flash Player. Flash ended in **2021**, so today we publish **MP4**, **GIF** or **HTML5 Canvas**.

9. Animation software

Adobe Animate
Adobe Animate

Synfig Studio
Synfig Studio

Pencil2D
Pencil2D

OpenToonz
OpenToonz

Scratch
Scratch

NEW 2026 **2026:** Canva and CapCut can add ready-made animations to text in one click, and AI tools can turn a drawing into a short moving clip. They are quick, but learning key frames and tweens lets you control **exactly** how things move – and that is what the exam tests.

Key Words

Animation – Still pictures shown quickly so they seem to move.

Frame – One single picture in an animation.

Key frame – A frame where a new drawing or change is set.

Blank key frame – A key frame with nothing drawn on it yet.

Initial frame – The key frame where a movement begins.

Destination frame – The key frame where a movement ends.

Frame rate (fps) – Number of frames shown per second.

Timeline – Shows frames across and layers down.

Frame-by-frame – Animation where every frame is drawn by hand.

Tweening – Software creates the in-between frames.

Motion tween – Tween that moves, rotates or resizes an object.

Shape tween – Tween that changes one shape into another.

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Sample Q&A

1. What is a frame?

> **Answer:** One still picture in an animation.

2. What does 24 fps mean?

> **Answer:** 24 frames are shown every second.

3. How long is 120 frames at 24 fps?

> **Answer:** 120 ÷ 24 = 5 seconds.

4. What is a blank key frame?

> **Answer:** A key frame with nothing drawn yet.

5. Why is tweening faster than frame-by-frame?

> **Answer:** You draw only two key frames; the software makes the rest.

6. Name two free 2D animation programs.

> **Answer:** Synfig Studio, Pencil2D (also OpenToonz, Scratch).

MCQ

1. Animation seems to move because of

A. vector shapes
B. persistence of vision
C. high resolution
D. lossy compression

2. fps stands for

A. files per second
B. fills per shape
C. frames per scene
D. frames per second

3. How long does 48 frames at 12 fps play?

A. 4 seconds
B. 48 seconds
C. 576 seconds
D. 12 seconds

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4. How many frames are needed for a 10-second animation at 30 fps?

A. 40
B. 300
C. 3
D. 30

5. Which frame rate is the usual standard for films?

A. 24 fps
B. 1000 fps
C. 2 fps
D. 6 fps

6. A frame where something new is drawn or changes is a

A. blank frame
B. pixel
C. key frame
D. layer

7. On a timeline a hollow circle ○ usually shows a

A. blank key frame
B. sound file
C. tween
D. key frame with a drawing

8. The key frame where a movement ends is the

A. blank frame
B. initial frame
C. first layer
D. destination frame

9. Key frames are at frame 1 and 13. How many in-between frames does the software create?

A. 13
B. 11
C. 2
D. 12

10. Drawing every frame by hand is called

A. frame-by-frame animation
B. rendering
C. motion tweening
D. shape tweening

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11. A circle slowly changing into a star is a

A. layer mask
B. motion tween
C. shape tween
D. blank key frame

12. A bus moving from left to right across the screen is best made with a

A. blank key frame only
B. shape tween
C. motion tween
D. JPEG

13. Which format gives a short looping animation with no sound?

A. SVG
B. GIF
C. MP3
D. WAV

14. Which is a free 2D animation program?

A. Audacity
B. Inkscape
C. Microsoft Excel
D. Pencil2D

15. Old SWF animations needed

A. Audacity
B. a 3D printer
C. Adobe Flash Player
D. a scanner

Structured Questions

1. (i) What is frame rate? (1 mark)
(ii) An animation has 120 frames at 24 fps. Find its duration. (2 marks) *(3 marks)*

> (i) Number of frames shown per second (1). (ii) 120 ÷ 24 (1) = 5 seconds (1).

2. Explain key frame, blank key frame and frame. (3 marks) *(3 marks)*

> Key frame – a frame where a drawing is set or changes (1); blank key frame – a key frame with nothing drawn yet (1); frame – repeats the last key frame’s content (1).

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3. Compare frame-by-frame animation and tweening. Give one advantage of each. (4 marks) *(4 marks)*

> Frame-by-frame: every frame drawn by hand (1); full control of detail, e.g. squash (1). Tweening: only key frames drawn, software makes in-betweens (1); much faster, smooth movement (1).

4. A Grade 11 student makes a ball roll across the screen with a motion tween from frame 1 to frame 13 at 12 fps.
(i) How many in-between frames are made? (1 mark)
(ii) How long does the movement last? (1 mark) *(2 marks)*

> (i) 13 − 1 − 1 = 11 (1). (ii) 13 ÷ 12 = 1.08 s (1).

5. Name two formats to publish an animation and say where each is used. (4 marks) *(4 marks)*

> MP4 (1) – YouTube, phones, with sound (1); GIF (1) – short looping clip on a website or chat (1). (HTML5 Canvas – runs in a browser – also accepted.)

Summary

- Animation = still frames shown fast; persistence of vision.
- fps: 12 cartoons/GIF, 24 films, 30 TV/phone.
- Duration = frames ÷ fps; frames = seconds × fps.
- Timeline: frames across, layers down, playhead shows current frame.
- Key frame ●, blank key frame ○, initial and destination frames.
- Frame-by-frame = draw every frame; tweening = software makes in-betweens.
- Motion tween moves; shape tween changes shape; in-betweens = last − first − 1.
- Publish as MP4, GIF or HTML5 (SWF/Flash ended 2021).

MCQ answer key – 4.2

1. **B** – The eye holds each picture for a moment.
2. **D** – Frames shown each second.
3. **A** – 48 ÷ 12 = 4.
4. **B** – 10 × 30 = 300.
5. **A** – Cinema uses 24 fps.
6. **C** – Key frames mark changes.
7. **A** – Empty circle = nothing drawn yet.
8. **D** – Destination = where it arrives.
9. **B** – 13 − 1 − 1 = 11.
10. **A** – Each frame is your own drawing.
11. **C** – Shape tween changes the shape.
12. **C** – Motion tween changes position.
13. **B** – Animated GIFs loop and have no sound.
14. **D** – Pencil2D is for frame-by-frame animation.

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15. **C** – Flash ended in 2021; use MP4 or HTML5 now.

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G.C.E. O/L Grade 11 ICT · Lesson 4

4.3 Audio and Video Editing: Recording, Trimming, Formats and Software

Syllabus 13.3. You record the principal's speech at the prize-giving, a song for the school concert or a short video about the school garden. In this note you will learn how sound is **recorded** (sample rate and bit depth), how to **edit audio** in **Audacity** – trim, cut, split, fade, volume and noise reduction – the common **audio formats**, video **resolution** and **formats**, and how to **edit a video** on a **timeline** with transitions and titles, then **export** it.

1. Recording sound

A **microphone** changes sound waves into an electrical signal. The computer **measures (samples)** this signal thousands of times each second and stores each measurement as a number. **Sample rate** = samples per second (CD quality = **44,100 Hz = 44.1 kHz**). **Bit depth** = bits for each sample (CD = **16-bit**). Higher values = better quality but bigger files.

Worked example (uncompressed WAV, stereo = 2 channels): 44,100 × 16 × 2 × 60 s ÷ 8 = **10,584,000 bytes ≈ 10.09 MB** for one minute. That is why we usually save as **MP3**.

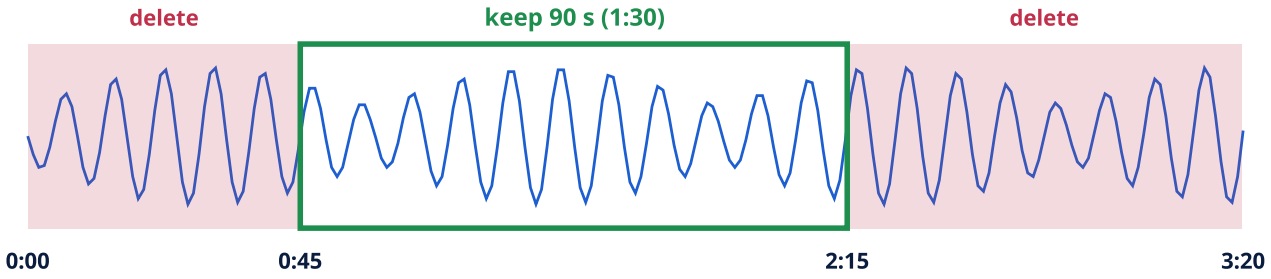
> 💡 Record in a quiet room, keep the mic about a hand-width from your mouth, and do a short test first.

2. Editing audio in Audacity

Edit	What it does
Trim	Remove unwanted parts at the start and end
Cut / Split	Cut a part out, or split one clip into two
Fade in / Fade out	Sound grows from silence / dies away smoothly
Amplify / Volume	Make the sound louder or softer
Noise reduction	Remove fan or traffic hiss

Example: the recording of the principal's speech is 3:20 long. You only need the prize-giving part from **0:45 to 2:15**. Select it and use **Trim** (Ctrl+T) – everything else is deleted. Kept = 135 − 45 = **90 s (1:30)**; removed = 110 s. Then add a **2 s fade-in** and a **3 s fade-out** so it does not start or stop suddenly.

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Trim: keep 0:45 → 2:15 of a 3:20 speech recording in Audacity
කප්පාදුව: 3:20 කථන පටිගත කිරීමෙන් 0:45 → 2:15 තබා ගැනීම

Figure 4.7 – Trimming a speech in Audacity: keep 0:45 → 2:15 (90 s), delete the rest.

> 💡 Time in m:ss → seconds: minutes × 60 + seconds. 2:15 = 2 × 60 + 15 = 135 s.

3. Audio file formats

Format	Compression	Notes
MP3	Lossy	Small; music and podcasts
WAV	Uncompressed	Best quality; very large
AAC / M4A	Lossy	Better than MP3 at the same size; phones, YouTube
OGG (Vorbis)	Lossy	Free and open format

4. Video basics – resolution and frame rate

A **video** is many frames (pictures) per second **plus a sound track**. Like images, video has a **resolution** in pixels. Phones usually record at **30 fps** (or 60 fps for smooth sport).

Name	Pixels (w × h)	Total pixels
720p (HD)	1280 × 720	921,600
1080p (Full HD)	1920 × 1080	2,073,600
4K (UHD)	3840 × 2160	8,294,400

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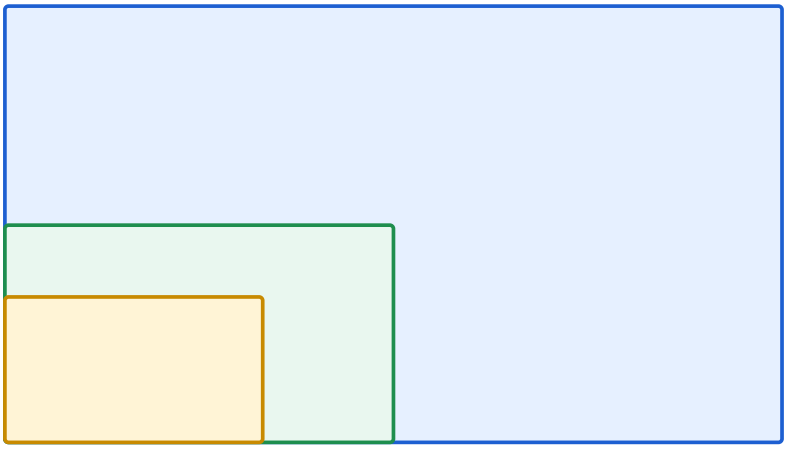


Figure 4.8 – 720p, 1080p and 4K drawn to scale. 4K has four times the pixels of Full HD.

Video format	Notes
MP4	Most common; phones, YouTube, WhatsApp
AVI	Old Windows format; large files
MOV	Apple QuickTime; iPhone videos
MKV	Holds many audio and subtitle tracks

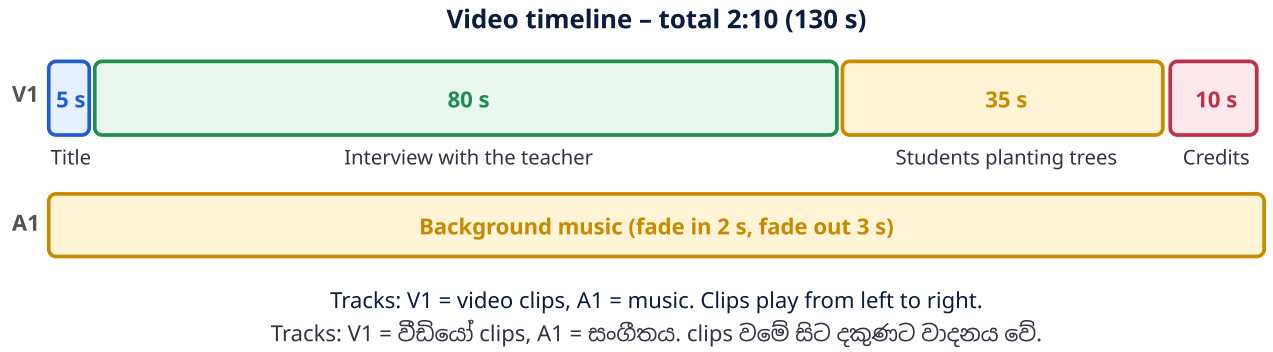
5. Editing a video on a timeline

Step	What you do
Import	Bring clips, photos and music into the project
Timeline	Put clips in order on video and audio tracks
Trim / Split	Keep only the useful part of each clip
Transitions	Fade or dissolve between two clips
Titles and captions	Add text on the video
Export / Render	Save the finished video as MP4

Example: a video called **“Our School Garden”**. Each clip is trimmed so only the useful part is kept: Title 5 s, Interview with the teacher 80 s, Students planting trees 35 s, Credits 10 s. The finished video is 5 + 80 + 35 + 10 = **130 s (2:10)**.

Clip	Original length	Keep (start → end)	Kept
Title: Our School Garden	0:05	0:00 → 0:05	5 s
Interview with the teacher	2:30	0:20 → 1:40	80 s
Students planting trees	1:00	0:10 → 0:45	35 s
Credits	0:10	0:00 → 0:10	10 s

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Tracks: V1 = video clips, A1 = music. Clips play from left to right.
Tracks: V1 = වීඩියෝ clips, A1 = සංගීතය. clips වමේ සිට දකුණට වාදනය වේ.

Figure 4.9 – Video timeline: four trimmed clips on track V1 and music on track A1 (total 2:10).

💡 **Save** keeps the project file (you can still edit). **Export/Render** makes the final MP4 that others can watch. Always keep the project file too!

6. Audio and video software

Audacity Audacity	**OpenShot** OpenShot
Shotcut Shotcut	**DaVinci Resolve** DaVinci Resolve
CapCut CapCut	**Microsoft Clipchamp** Microsoft Clipchamp

NEW 2026 **2026:** Editors like CapCut, Clipchamp and DaVinci Resolve now have **AI tools**: automatic captions, background-noise removal and “remove silence”. Always check auto-captions – they often get Sinhala and Tamil names wrong.

Key Words

Microphone – Changes sound into an electrical signal.	**Sample rate** – Number of sound measurements per second (Hz).
Bit depth (audio) – Bits used to store each sample.	**Trim** – Keep the selected part and delete the rest.
Split – Cut one clip into two at the playhead.	**Fade in / out** – Sound or picture slowly starts or ends.
Noise reduction – Removing background hiss or hum.	**Video resolution** – Pixel size of video frames, e.g. 1080p.
Timeline (video) – Tracks where clips are arranged in time order.	**Transition** – An effect between two clips, e.g. fade.

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Export / Render – Making the final video file, e.g. MP4.

Codec / format – How audio or video is stored, e.g. MP3, MP4.

Sample Q&A

1. What is sample rate?

> **Answer:** The number of sound samples taken each second, e.g. 44.1 kHz.

2. Which audio format is uncompressed?

> **Answer:** WAV.

3. A 3:20 recording is trimmed to 0:45–2:15. How long is it now?

> **Answer:** 90 s (1:30).

4. What does fade-out do?

> **Answer:** Makes the sound get softer until silence at the end.

5. What is the pixel size of 1080p?

> **Answer:** 1920 × 1080.

6. Name a free audio editor and a free video editor.

> **Answer:** Audacity; OpenShot (or Shotcut).

MCQ

1. A device that changes sound into an electrical signal is a

A. microphone
B. scanner
C. webcam light
D. speaker

2. CD-quality sample rate is

A. 1080 Hz
B. 24 kHz exactly
C. 44.1 kHz
D. 8 Hz

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3. Size of 1 minute of uncompressed stereo audio at 44.1 kHz, 16-bit is about

A. 10.09 MB
B. 1 MB
C. 100 MB
D. 16 KB

4. A 3:20 speech is trimmed to keep 0:45–2:15. The kept part is

A. 200 seconds
B. 90 seconds
C. 135 seconds
D. 110 seconds

5. Keeping only the selected part and deleting the rest is

A. Fade in
B. Split
C. Trim
D. Amplify

6. Making music slowly get quieter at the end is

A. Fade in
B. Split
C. Noise reduction
D. Fade out

7. Removing the hum of a ceiling fan from a recording uses

A. Fade in
B. Crop
C. Noise reduction
D. Export

8. Which audio format is uncompressed?

A. MP3
B. OGG
C. AAC
D. WAV

9. Which is a free and open audio format?

A. AVI
B. OGG
C. MOV
D. BMP

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10. 1080p (Full HD) video is

A. 1920 × 1080
B. 1280 × 720
C. 3840 × 2160
D. 1080 × 1080

11. 4K video has how many times the pixels of 1080p?

A. 3
B. 4
C. 8
D. 2

12. The most common video format for phones and YouTube is

A. TIFF
B. WAV
C. MP4
D. GIF

13. Clips of 5 s, 80 s, 35 s, 10 s are joined. Total length?

A. 2:10
B. 1:30
C. 2:30
D. 1:10

14. A smooth fade or dissolve between two clips is a

A. caption
B. render
C. codec
D. transition

15. Which is a free audio editor?

A. Synfig
B. Audacity
C. Excel
D. Inkscape

Structured Questions

1. (i) What is sample rate? (1 mark)
(ii) Why is WAV much larger than MP3? (2 marks) *(3 marks)*

> (i) Number of samples taken per second (1). (ii) WAV is uncompressed (1); MP3 is lossy and removes sounds we hardly hear (1).

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2. Nimal recorded a 3:20 speech. He keeps 0:45 to 2:15.
(i) How long is the kept part in seconds? (2 marks)
(ii) Name the Audacity tools to remove the rest and to make the start smooth. (2 marks) *(4 marks)*

> (i) 135 − 45 (1) = 90 s (1). (ii) Trim (1); Fade in (1).

3. Give the pixel size of 720p and 4K, and one advantage and one disadvantage of 4K. (4 marks) *(4 marks)*

> 720p = 1280 × 720 (1); 4K = 3840 × 2160 (1); advantage: much sharper picture (1); disadvantage: very large files / needs more storage and a strong computer (1).

4. List the steps to make a 2-minute school garden video in OpenShot. (5 marks) *(5 marks)*

> Import clips and music (1); place them on the timeline in order (1); trim/split clips to the useful parts (1); add transitions and titles (1); export as MP4 (1).

5. What is the difference between saving a project and exporting a video? (2 marks) *(2 marks)*

> Save keeps an editable project file (1); export makes the final video file (e.g. MP4) to share (1).

Summary

- Microphone records; sample rate (44.1 kHz) and bit depth (16-bit) set quality.
- Audio size = rate × bits × channels × seconds ÷ 8 bytes.
- Edit: trim, cut/split, fade in/out, volume, noise reduction (Audacity).
- Kept length = end − start (convert m:ss to seconds first).
- Audio formats: MP3, AAC/M4A, OGG lossy; WAV uncompressed.
- Video: 720p 1280×720, 1080p 1920×1080, 4K 3840×2160; 30 fps typical.
- Video formats MP4, AVI, MOV, MKV; edit: import, timeline, trim, transitions, titles, export.
- Software: Audacity, OpenShot, Shotcut, DaVinci Resolve, CapCut, Clipchamp.

MCQ answer key – 4.3

1. **A** – Mic = input for sound.
2. **C** – 44,100 samples per second.
3. **A** – 44,100 × 16 × 2 × 60 ÷ 8 = 10,584,000 bytes.
4. **B** – 135 − 45 = 90.
5. **C** – Trim keeps the selection.
6. **D** – Fade out = slowly to silence.
7. **C** – Noise reduction removes steady background noise.
8. **D** – WAV stores raw samples.
9. **B** – OGG Vorbis is open.
10. **A** – Full HD = 1920 × 1080.

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11. **B** – 3840 × 2160 = 4 × (1920 × 1080).
12. **C** – MP4 plays almost everywhere.
13. **A** – 5 + 80 + 35 + 10 = 130 s = 2:10.
14. **D** – Transitions join clips smoothly.
15. **B** – Audacity edits sound.

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G.C.E. O/L Grade 11 ICT · Lesson 4

4.4 Integrating Multimedia: Storyboards, Design and a Sigiriya Video Project

Syllabus 13.4. Now you can make images, animations, audio and video. In this note you will put them **together** in one product. You will learn to **plan** for the **purpose** and **audience**, draw a **storyboard**, put an **animation over a background image**, add **audio and video**, think about **file size** and **copyright**, and follow a full project – a one-minute video about **Sigiriya** – from plan to **YouTube** with **captions**.

1. What does integrating multimedia mean?

Integrating means combining several media elements – **text, images, animation, audio and video** – into **one** product, such as a video, a presentation or a web page. Each element does a job: the image sets the scene, the animation catches the eye, the narration explains and the music sets the mood.

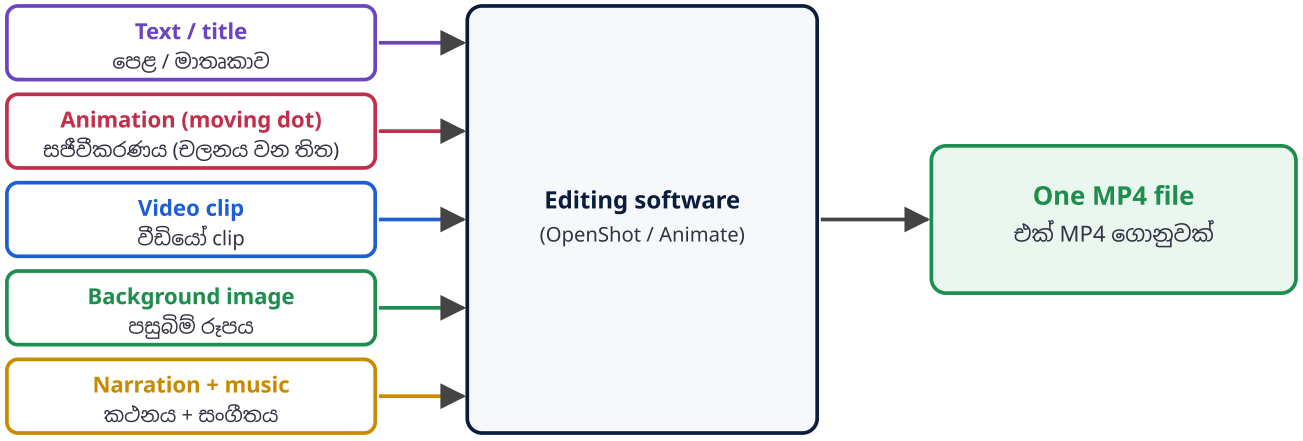


Figure 4.10 – Text, animation, video, a background image and audio are combined in editing software into one MP4.

2. Animation on a background image

Put the **background image** on the **bottom layer** and lock it. Put each moving object (a bird, a title, a dot on a map) on its **own layer above**. Then add a **motion tween** to each moving object. Because the background is on a separate layer, it stays still while the objects move. Use a PNG with **transparency** for objects so the background shows around them.

3. Adding audio and video

- **Narration** – record your voice in Audacity, remove noise, export as MP3, then import.
- **Background music** – keep it **soft** under speech and **fade it out** at the end.

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- **Video clips** – trim them first, then place them on the video track in story order.
- **Sync** – line up the narration with the matching picture on the timeline.

4. Designing for the requirement

Before you open any software, answer these questions. A video for **Grade 6 students** needs simple words and bright colours; a video for **tourists** may need English captions.

Requirement	Ask yourself
Purpose	What should the viewer learn or feel?
Audience	Who will watch it – Grade 6 students, parents, tourists?
Storyboard	Sketch each scene, its text, sound and time
File size and format	Small enough to share (MP4, 1080p)
Copyright	Use your own media or Creative Commons and give credit

5. The storyboard

A **storyboard** is a plan drawn as a row of boxes, like a comic strip. Each box is one **scene**: a quick sketch, the text on screen, the sound and the **time**. It helps the group agree on the story before spending hours editing, and it shows the total length.

6. Worked project – “Sigiriya: Our Heritage”

Task: A Grade 11 group makes a **1-minute video** for the school’s Heritage Day to teach Grade 6 students about Sigiriya, a UNESCO World Heritage Site in the Matale District. **Purpose:** to inform and make students proud of their heritage. **Audience:** Grade 6 students. **Output:** MP4, 1080p, 30 fps.

Scene	What we see	Media used	Seconds
1	Title on a Sigiriya photo	Background image + animated title	6
2	Map: a dot moves to Matale	Motion tween on a map	8
3	King Kashyapa and the 5th century	Narration audio + still image	12
4	Video: the Lion’s Paw steps	Trimmed video clip	14
5	Frescoes and the Mirror Wall	Photos with zoom effect	12
6	Protect our heritage – credits	Text + music fade out	8

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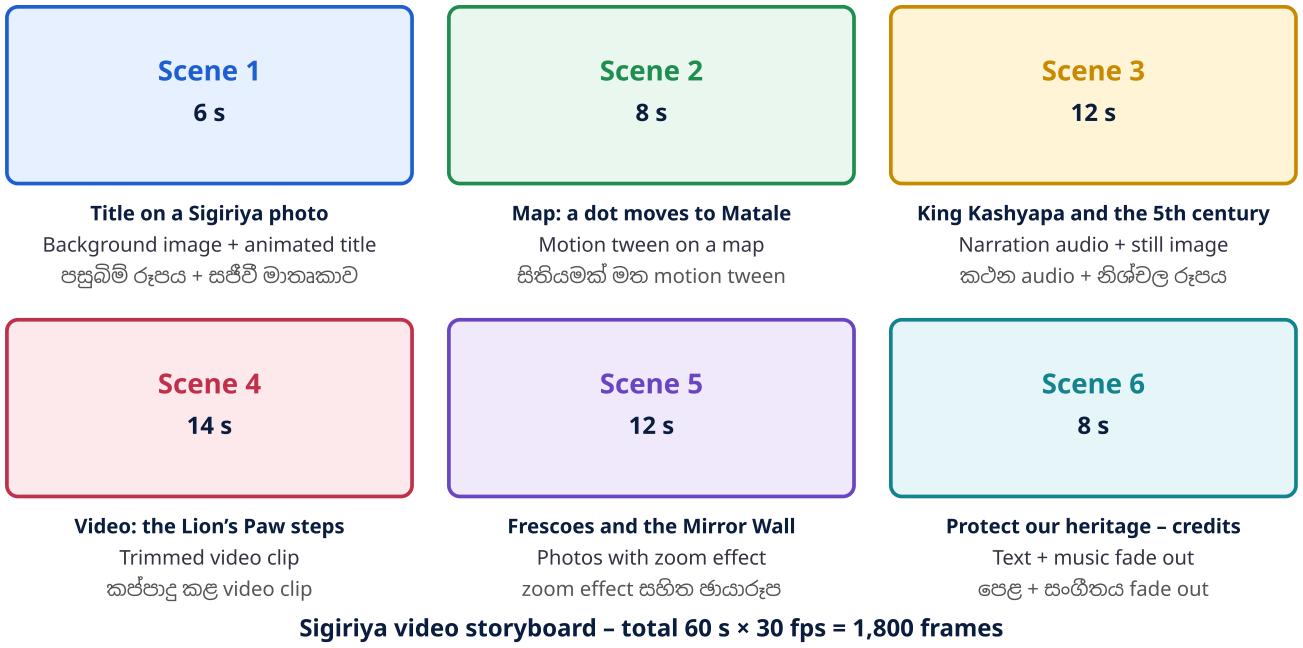


Figure 4.11 – Storyboard for the Sigiriya video: 6 scenes, total 60 s = 1,800 frames at 30 fps.

Check the plan: 6 + 8 + 12 + 14 + 12 + 8 = **60 s** = exactly 1 minute. At 30 fps that is 60 × 30 = **1,800 frames**.

- **Images:** the group's own photos from a school trip (no copyright problem).
- **Animation:** a dot moves across a map of Sri Lanka to Matale with a motion tween.
- **Audio:** narration recorded in Audacity; Creative Commons music with credit at the end.
- **Video:** a trimmed 14-second clip of the Lion's Paw steps.
- **Edit and export:** put everything on the OpenShot timeline, add a title and fade, export MP4.

> 💡 Keep text on screen long enough to read aloud twice. A Grade 6 student reads slowly!

7. File size and copyright

A long 4K video can be several gigabytes – too big for WhatsApp or a school pen drive. For most school projects **1080p MP4** is a good balance. Compress large photos (JPEG) before putting them in. For **copyright**, use your own media, or Creative Commons media, and **list credits** at the end.

8. Sharing online – YouTube, captions and vertical video

Platform	Aspect ratio	Pixels
YouTube / TV	16:9	1920 × 1080
Shorts, Reels, TikTok	9:16	1080 × 1920
Instagram square	1:1	1080 × 1080

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Figure 4.12 – Aspect ratios: 16:9 for YouTube, 9:16 for Shorts and Reels, 1:1 square.

NEW 2026 **2026:** When you upload to **YouTube**, write a clear title and description, choose **"Made for kids"** if it is for children, and add **captions/subtitles** (Sinhala, Tamil, English) so deaf viewers and people without sound can follow. For **Shorts, Reels and TikTok**, make a **vertical 9:16** version. Mark AI-made content if the platform asks.

Key Words

Integrating multimedia – Combining text, images, animation, audio and video in one product.

Storyboard – A scene-by-scene plan with sketches, text, sound and time.

Scene – One part of the story shown in one storyboard box.

Purpose – What the product should achieve.

Target audience – The people the product is made for.

Background image – A still picture on the bottom layer behind moving objects.

Narration – Recorded voice that explains the pictures.

Sync – Lining up sound with the matching picture.

Copyright – The creator's legal right to decide who uses their work.

Creative Commons – Licences that let others use work under simple rules.

Captions / subtitles – Text on screen showing what is said.

Aspect ratio – Width to height shape, e.g. 16:9 or 9:16.

Sample Q&A

1. What is a storyboard?

Answer: A scene-by-scene plan with sketches, text, sound and time.

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2. Why put the background image on its own bottom layer?

> **Answer:** So it stays still while objects on upper layers move.

3. Name two things to decide before making a multimedia product.

> **Answer:** Purpose and target audience (also file size, copyright).

4. Scenes of 6, 8, 12, 14, 12, 8 s are planned. How long is the video?

> **Answer:** 60 s = 1 minute.

5. Why add captions?

> **Answer:** So deaf viewers and people watching without sound can understand.

6. Which aspect ratio suits YouTube Shorts?

> **Answer:** 9:16 (vertical), 1080 × 1920.

MCQ

1. Combining text, images, audio and video in one product is

A. integrating multimedia
B. cropping
C. compression
D. tweening

2. A scene-by-scene plan drawn as boxes is a

A. codec
B. storyboard
C. layer
D. timeline

3. Who the product is made for is the

A. purpose
B. resolution
C. target audience
D. format

4. To keep a background still while a bird flies over it, put the background

A. on the same layer as the bird
B. in a shape tween
C. on its own bottom layer
D. in the audio track

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5. Scenes of 6, 8, 12, 14, 12, 8 seconds give a total of

A. 6 seconds
B. 50 seconds
C. 72 seconds
D. 60 seconds

6. A 60-second video at 30 fps has how many frames?

A. 600
B. 2
C. 1,800
D. 90

7. Which image is safest to use in a school video?

A. a film poster
B. any Google image
C. a TV channel’s logo
D. your own photo

8. CC BY means you may use the work if you

A. give credit to the creator
B. remove the creator’s name
C. never share it
D. pay a fee every time

9. Text at the bottom of a video showing what is said is called

A. key frames
B. captions/subtitles
C. credits
D. thumbnails

10. YouTube Shorts and Instagram Reels use the aspect ratio

A. 9:16
B. 16:9
C. 4:3
D. 1:1

11. A normal YouTube video is usually

A. 9:16 (1080 × 1920)
B. 2:1 (100 × 50)
C. 1:1 (1080 × 1080)
D. 16:9 (1920 × 1080)

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12. Lining up narration with the matching picture is called

A. compress
B. crop
C. sync
D. rotate

13. Which output is best for most school video projects?

A. 1080p MP4
B. BMP
C. WAV
D. 4K uncompressed AVI

14. Background music under narration should be

A. any copyright song
B. soft, and faded out at the end
C. louder than the voice
D. stopped suddenly

15. A video for Grade 6 students should use

A. very small text
B. simple words and clear pictures
C. no sound or pictures
D. long technical paragraphs

Structured Questions

1. (i) What is a storyboard? (1 mark)
(ii) Give two reasons for making one before editing. (2 marks) *(3 marks)*

> (i) A scene-by-scene plan with sketches, text, sound and time (1). (ii) The group agrees on the story (1); shows the total time and media needed, saving editing time (1).

2. A Sigiriya video has scenes of 6, 8, 12, 14, 12, 8 seconds and is exported at 30 fps.
(i) Find the total length. (1 mark)
(ii) Find the number of frames. (1 mark) *(2 marks)*

> (i) 60 s (1). (ii) 60 × 30 = 1,800 (1).

3. Explain how to show an animated bird flying over a still photo of a paddy field. (3 marks) *(3 marks)*

> Import the photo onto the bottom layer (1); put the bird (transparent PNG) on a new layer above (1); add a motion tween from an initial to a destination key frame (1).

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4. List four things to consider when designing a multimedia product for a requirement. (4 marks) *(4 marks)*

> Purpose (1); target audience (1); file size and format (1); copyright / credit (1). (Storyboard also accepted.)

5. The group will upload the video to YouTube and also share a version on Reels. Give three good practices. (3 marks) *(3 marks)*

> Add captions/subtitles (1); make a vertical 9:16 version for Reels (1); clear title/description, “Made for kids”, credits for music (1).

Summary

- Integrating = text + images + animation + audio + video in one product.
- Plan purpose and audience first.
- Storyboard = boxes per scene with sketch, text, sound and time.
- Background on the bottom layer; moving objects tweened on layers above.
- Narration soft music, sync, fade out; trim video clips.
- Total time = sum of scenes; frames = seconds × fps.
- 1080p MP4 for school; own or Creative Commons media with credits.
- YouTube 16:9, Shorts/Reels 9:16; add captions.

MCQ answer key – 4.4

1. **A** – Integrating = putting media together.
2. **B** – Storyboards are planned before editing.
3. **C** – Audience = the viewers.
4. **C** – Separate layers move separately.
5. **D** – 6+8+12+14+12+8 = 60.
6. **C** – 60 × 30 = 1,800.
7. **D** – You own the copyright of your own photo.
8. **A** – BY = attribution.
9. **B** – Captions help deaf viewers.
10. **A** – Vertical video = 9:16.
11. **D** – Landscape 16:9.
12. **C** – Sync = in time together.
13. **A** – Good quality, reasonable size.
14. **B** – Speech must be clear.
15. **B** – Design for the audience.

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