

Animations with Blender

Year 9 3D Modelling & Animation • Building on Graphics (8.3) and Python (8.6)

9.1 • Knowledge Organiser

3D Modelling Basics & Object Manipulation

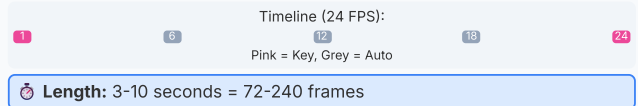
- **Primitive Objects:** Cube, sphere, cylinder, plane, torus, monkey (Suzanne)
- **3D Coordinate System:** X-axis (red), Y-axis (green), Z-axis (blue)
- **Basic Transformations:** Move (G), Scale (S), Rotate (R)
- **Object Naming:** Use descriptive names (Car_Body, Wheel_Front_Left)
- **Parenting:** Link objects together for coordinated movement
- **Duplicating:** Shift+D to create copies, Alt+D for linked duplicates

G Move	S Scale	R Rotate
X Delete	Tab Edit Mode	Shift+A Add Object

Navigation: Middle mouse to orbit, Scroll to zoom, Shift+Middle to pan

Animation & Keyframing

- **Keyframes:** Store object properties at specific times
- **Interpolation:** Computer calculates in-between frames
- **Timeline:** Shows current frame, keyframes, animation length
- **Frame Rates:** 24 FPS (film), 30 FPS (video)
- **Insert Keyframe:** I key to set keyframes
- **Advantages:** Perfect timing, easy editing vs stop motion



Advanced Modelling Tools

- **Edit Mode:** Tab to modify geometry (vertices, edges, faces)
- **Extrude:** E key to extend faces, create complex shapes
- **Loop Cut:** Ctrl+R to add edge loops for detail
- **Knife Tool:** K key for custom cutting lines
- **Proportional Editing:** O key for organic deformation
- **Subdivision:** Smooth modifier for organic shapes

Realism: Add imperfections - perfect symmetry looks artificial

Rendering & Cameras

- **Camera:** Position and angle for visual impact
- **Render Engines:** Eevee (fast), Cycles (realistic)
- **Output:** Resolution, frame range, file format
- **Ray Tracing:** Light simulation for realistic shadows
- **Formats:** PNG (images), MP4 (video)
- **Performance:** Quality vs render time balance

Tip: Test single frames before full animation render

Materials & Lighting

- **Materials:** Base colour, metallic, roughness, emission
- **Shader Editor:** Node-based material system
- **Light Types:** Sun (directional), Point, Spot (focused)
- **3-Point Setup:** Key light, fill light, back light
- **HDRI:** Environment images for realistic lighting
- **Colour Theory:** Warm/cool contrasts

Tips: Add roughness for realism, metallic for shine

Industry Applications & Impact

Film & TV Pixar, Marvel, Disney animations	Gaming Character models, environments
Architecture Building visualization, planning	Manufacturing Product design, 3D printing
Medical Surgical planning, prosthetics	Education Scientific models, simulations

Blender Success: Free software used by Netflix, NASA, Boeing - revolutionised 3D accessibility

Careers: 3D Artist, Animator, VFX Artist, Game Designer, Product Visualiser

Project Planning & Files

- **Structure:** Organised folders for models, textures, renders
- **Versions:** Save as project_v001, project_v002
- **Pipeline:** Concept → Model → Texture → Animate → Render
- **Backup:** Save regularly, keep multiple versions
- **Quality:** Test renders, check for errors first
- **Timing:** Plan realistic animation length

Folders: /Models/ /Textures/ /Renders/ main.blend

Computational Thinking Links

- **Decomposition:** Break complex scenes into simple objects
- **Patterns:** Identify repeated elements, reuse models
- **Abstraction:** Simplify complex shapes to essentials
- **Algorithms:** Step-by-step modelling processes
- **Maths:** 3D vectors, coordinates, transformations
- **Systems:** Building on Y8.1 computer knowledge

Links: Graphics (8.3), Python logic (8.6), files (7.1)