1 Snippets

1.1 Find all image textures path

```
for img in bpy.data.images:
    print(img.name, ":", img.filepath)
```

1.2 Manipulate selected objects

```
for obj in bpy.context.selected_objects:
    obj.rotation_euler.x += 1.5708  # Rotate 90 degrees (/2) on X-axis
```

2 Shortcuts

2.1 Selection & Navigation

Shortcut	Effect
Ctrl + '	Hide/Show gizmos
Tab	Toggle between Object Mode and Edit Mode
A	Select all
Alt + A	Deselect all
L	Select linked geometry (hover over a part and press L)
Ctrl + L	Select all linked geometry (based on selection)
B	Box select
C	Circle select
Shift + G	Select similar (choose criteria like area, shape, or material)
Alt + RMB	Loop select
Shift + RMB	Ring select

2.2 Transformations

Shortcut	Effect
Ctrl + '	Hide/Show gizmos
Tab	Toggle between Object Mode and Edit Mode
A	Select all
Alt + A	Deselect all
L	Select linked geometry (hover over a part and press L)
Ctrl + L	Select all linked geometry (based on selection)
B	Box select
C	Circle select
Shift + G	Select similar (choose criteria like area, shape, or material)
Alt + RMB	Loop select
Shift + RMB	Ring select
G	Grab (move)
R	Rotate
S	Scale
X / Y / Z	Constrain movement to an axis (e.g., G + X moves along the X-axis)
Shift + X / Y / Z	Move along the other two axes (exclude one axis)
Ctrl + A	Apply transformations (use in Object Mode)
Ctrl + Tab (or **1, 2, 3** in Blender 2.8+)	Switch between Vertex, Edge, and Face selection
Ctrl + E	Edge menu (Bevel, Mark Seam, etc.)
Ctrl + B	Bevel (works for edges and vertices)
Shift + Ctrl + B	Vertex bevel
F	Fill (creates a face between selected vertices/edges)
Alt + Left Click	Select edge loop
Shift + Alt + Left Click	Select multiple edge loops
Ctrl + R	Loop cut (scroll mouse wheel to increase cuts)

Shortcut	Effect
K	Knife tool (click to cut, Enter to confirm)
Shift + R	Repeat last action
Ctrl + Shift + B	Chamfer/Bevel vertices

2.3 Extrude, Inset & Merge

Shortcut	Effect
E	Extrude
I	Inset faces
M	Merge vertices (choose options like "At Center" or "At Last")
Alt + M	Older version of merge (pre-2.8)

2.4 Proportional Editing & Smoothing

Shortcut	Effect
O	Toggle Proportional Editing
Shift + O	Change proportional falloff type
Ctrl + Shift + B	Bevel vertices
Shift + S	Snap menu (snap selection to grid, cursor, etc.)
U	Unwrap UV (when in UV Editing)
Ctrl + T	Triangulate faces
Alt + J	Convert tris to quads

2.5 Miscellaneous

Shortcut	Effect
H	Hide selection
Alt + H	Unhide all
Shift + H	Hide everything except selection
P	Separate selection into a new object
Ctrl + J	Join selected objects

- Edit mode UV tools: press U
- Edge slide tool: in edit mode, with a vertex selected, press Grab (G) twice
- Triplanap projection: https://www.youtube.com/watch?v=KV_hgeQdCXk
- Baking: https://www.youtube.com/watch?v=sOvRr_D8ZpU

3 Pivot to Cursor

Press **Shift + Right Click** to place the 3D Cursor manually. Or use **Shift + S** → "Cursor to Selected" to place it at the selection.

Instead, to change the pivot point to cursor, do the following:
- In *Object Mode*, go to the top-center of the viewport (next to the selection mode dropdown) where the pivot point options are.
- Click on the Pivot Point dropdown (it's an icon that usually shows a circle with a dot in the center).
- Select 3D Cursor from the list of pivot options.

Alternatively:
- Period key (.) to open the pivot point menu and choose 3D Cursor.
- Perm
- Object - Set Origin

4 Animations: Docs Summary

These notes about animations in Blender are made by summarizing the Blender 4.3 Docs.

4.1 Introduction

Animation = Transforming an object or changing its shape over time. More generally, any property about a blender object can be animated.
Animation is typically achieved by employing *Keyframes* (more on that later)

Any property in the *Properties Editor* has a *State Color*

Color	Meaning
Gray	Not animated
Yellow	Changed from the current frame
Green	Keyframed on a different frame
Orange	Changed from the keyframed value
Purple	Controlled by a *Driver*

4.1.1 Rigging

Rigging = adding controls handles to animate an object. Blender offers the following feature to rig a model

Rigging Method	Brief
Armatures	A Hierarchy of Joints associated with a mesh. Each joint has a *weight* [0.0, 1.0] for each vertex of the aforementioned mesh (can be painted). Transforming a joint will influence all vertices whose weight for that particular joint is greater than 0. This technique is called *Skeletal Animation* (more later).
Constraints	Control the kind of motion the rig is allowed to perform. They are found under *Properties Editor*, tab "Constraints" (more later).
Object Modifiers	Mesh deformation through modifiers. We are interested in Deformations and Physics (more later).
Shape Keys	Commonly called textitblendshape, meaning having different copies of a mesh (same topology, same UV, same *everything*). Example: different facial expressions that blend over time with *Keyframing* (more later).
Drivers	Mechanisms to control multiple properties at once and make some properties automatically update when others change (more later).

4.2 Keyframes

4.2.1 Relevant Shortcuts

With a property/object Selected:

Shortcut	Effect
I	Insert Keyframe (brings up keyframe menu)
Alt + I	Delete Keyframe
Shift + I	Insert Keyframe for all properties
Ctrl + I	Add keyframe to active keying set
Alt + S	Reset Scale (useful when animating transforms)
Alt + R	Reset Rotation
Alt + G	Reset Location

Inside *Graph Editor* or *Dope Sheet Editor*

Shortcut	Effect
G	Move keyframe(s)

Shortcut	Effect
S	Scale keyframe(s)
R	Rotate keyframe handle (in Graph Editor)
Shift + D	Duplicate keyframe(s)
X or **Delete**	Delete keyframe(s)
E	Extrapolate (Graph Editor)
T	Set Keyframe Interpolation (Linear, Bezier, Constant, etc.)
V	Set Keyframe Handle Type (Vector, Aligned, etc.)
Ctrl + C	Copy Keyframe
Ctrl + V	Paste Keyframe

Playback Shortcuts

Shortcut	Effect
Spacebar	Play/Pause animation
Shift + Left Arrow	Jump to **start frame**
Shift + Right Arrow	Jump to **end frame**
Left Arrow	Move **one frame backward**
Right Arrow	Move **one frame forward**
Up Arrow	Move to **next keyframe**
Down Arrow	Move to **previous keyframe**
Shift + Ctrl + Spacebar	Play animation in **reverse**
Home	Zoom to fit all keyframes in **Graph Editor/Dope Sheet**
Ctrl + Middle Mouse Scroll	Zoom in/out in Timeline/Graph Editor

When you set a keyframe on a simple static mesh, like a cube.
(in the Viewport, object mode, Ctrl + A -> Mesh -> Cube). If

- You press **I**, then all the transform properties are saved in the current frame as a keyframe (see in *Dope Sheet Editor*)
- If you want only a part of the default properties to be saved, then you can set them manually by clicking the *Animate Property* handle to the right of the property in the *Properties Editor*
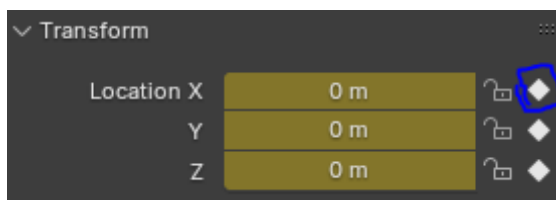
4.2.2 Introduction

A *Keyframe* is a marker of time which stores the value of the selected property.
The purpose of a keyframe is to save the value of a property in a given instance of "time" (on a rendered frame. Physical elapsed time depends on the FPS of the animation).

An overview of all the existing keyframe in your animation can be seen in the *Playback Editor*. To get the full information about existing keyframes (ie. to which object they refer to and which property they alter/set, use the *Dope Sheet Editor*).

Quick Experiment: Keyframe Visualization

File: `01_Keyframes_Intro-Moving_Cube.blend`

1. Create an empty Blender scene with a cube and check FPS

($Properties\ Editor \rightarrow$ Output $\rightarrow$ Frame Rate).

2. Select its position from the *Properties Editor* and set a keyframe (**I** to keyframe the transform).
3. Move to another keyframe inside *Dope Sheet Editor* or *Playback Editor.*
4. Freely transform your cube and then set a keyframe.
   Note: It's imperative that you first move to another place in the timeline and then manipulate your object, otherwise it won't work!
5. Go back to the start of the timeline (**Shift + Left Arrow**) and play the animation (**Spacebar**).

   *Keep this example for the next section on Interpolation.*

4.2.3 Interpolation

When you set two keyframes on the same property, its value changes over the span of frames inbetween the two keyframes with *Interpolated Values*, ie values computed using a matematical formula. In particular, such formula is defined by an *F-Curve*, manipulated in the *Graph Editor*.
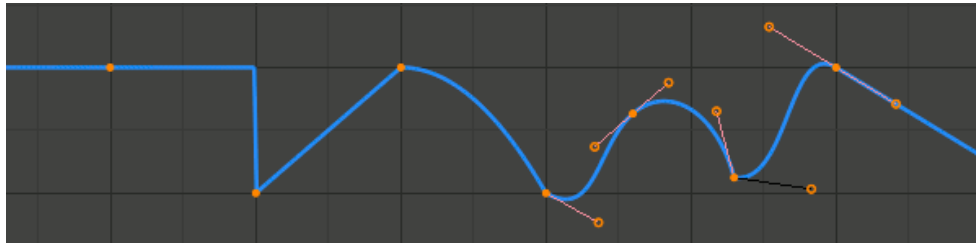
There is 1 curve for each animated property in the *Dope Sheet Editor*. The main setting is the *Interpolation* Type, which appears in the *Graph Editor* inside the *F-Curve* Tab. **Interpolation Modes:**[1]

- Bezier Curve
- Linear
- Constant
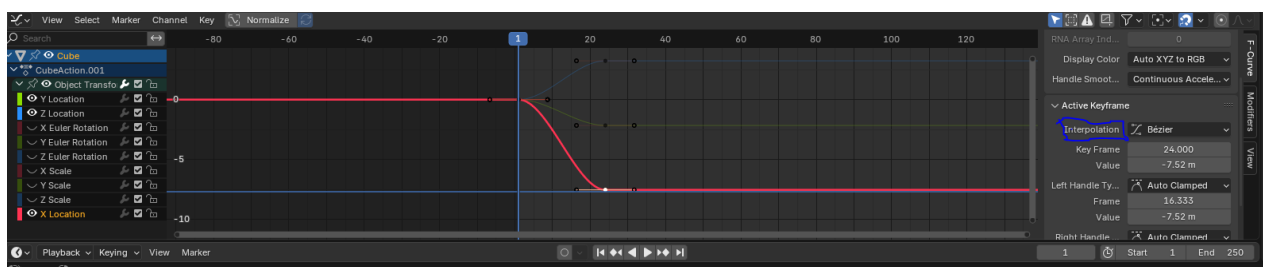
While what happens during the transition between a keyframe and the next one is defined by the *Interpolation* Mode, What happens outside the "Keyframed Range" (before the first keyframe and after the last keyframe) is defined by the *Extrapolation Mode.*

Extrapolation Mode is found under "*Graph Editor*/Channel/Extrapolation Mode" or with shortcut **Shift + E** (*Graph Editor* Selected) The following are the available **Extrapolation Modes:**[2]

- Constant: Continue in a straight horizontal line
- Linear: Continue in a straight line keeping the slope
- Make Cyclic: Repeat the curve
- Clear Cyclic: Removes Cycles Modifier

The settings to manipulate Curve Handles (placed on the F-Curve on the keyframe positions) depend on the Interpolation Type. A common setting among them all is the *Auto Handle Smoothing*, which can be either *None* or *Continuous Acceleration.*

When not *None*, edits to a handle are propagated in the near handles (similiar to proportional editing) to keep the F-Curve as smooth as possible.

Quick Experiment: Interpolation and Extrapolation: "Cyclic Overshoot"

File: `02_Keyframes_Interpolation-Moving_Cube_Custom_Interpolation.blend`

1. Open the cube example you produced from the previous experiment
2. Open the *Graph Editor* and select a "Location" Curve (the one with the bigger displacement in the Vertical axis)
3. Play around with the 2 Handles freely. Example: Use the last one as "Bezier" Interpolation and create an

---

[1]All the settings inside the *F-Curve* Tab affect the keyframes selected

[2]Extrapolation Mode affects all *F-Curves* selected

"overshoot"

4. Change the *Extrapolation mode* to Linear and then to Make Cyclic
5. Check in the "*Graph Editor*/Modifiers" (Tab) that The Cycles Modifier has been added to the *F-Curve*
6. Go back to the start of the timeline (**Shift+Left Arrow**) and play the animation (**Spacebar**)

Keep this example for the next section on Interpolation.

4.2.4 Keyframe Types

5 Animation: Used Editors

5.1 Properties Editor

5.2 Playback Editor

5.3 Dope Sheet Editor

5.4 Graph Editor

6 Animation Scenario: Camera Rig