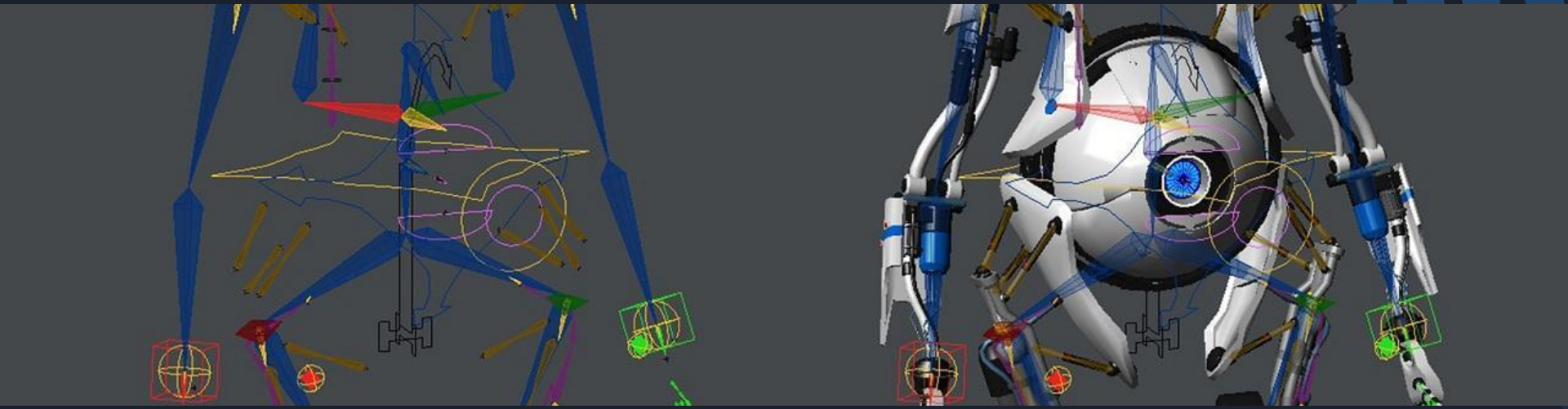
Rigging Intro

Introduction to the technical side of 3D art and rigging.



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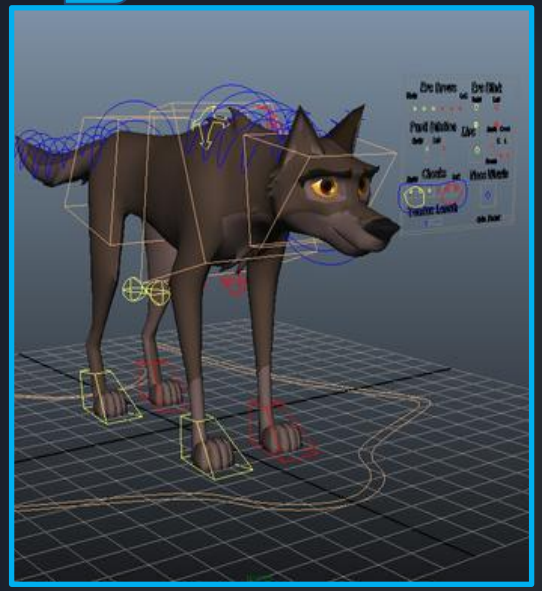
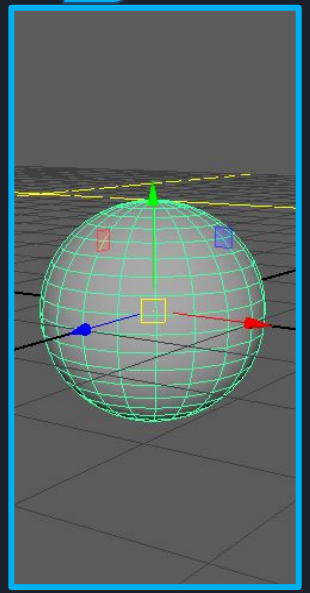
Rigging Intro|Contents





This lesson will cover the following:

1. What is Rigging
2. Pivot points
3. Naming conventions
4. Outliner
5. Parent/child
6. Groups
7. Constraints
8. Animation Controls

This lesson will be an introduction to the more technical aspects of 3D art and a pre cursor to the techniques used for rigging.

These techniques can also help with all aspects of your work, not just rigging.

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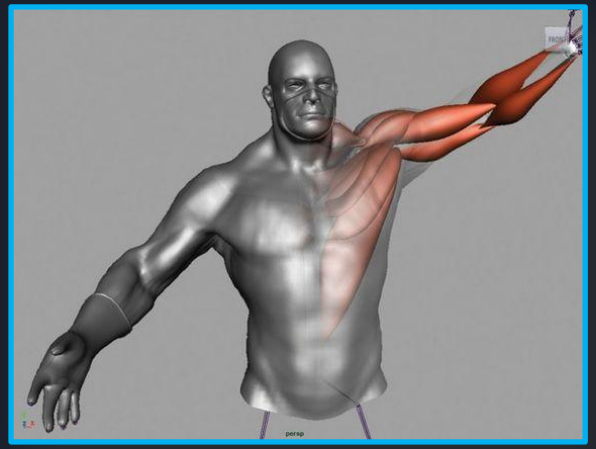
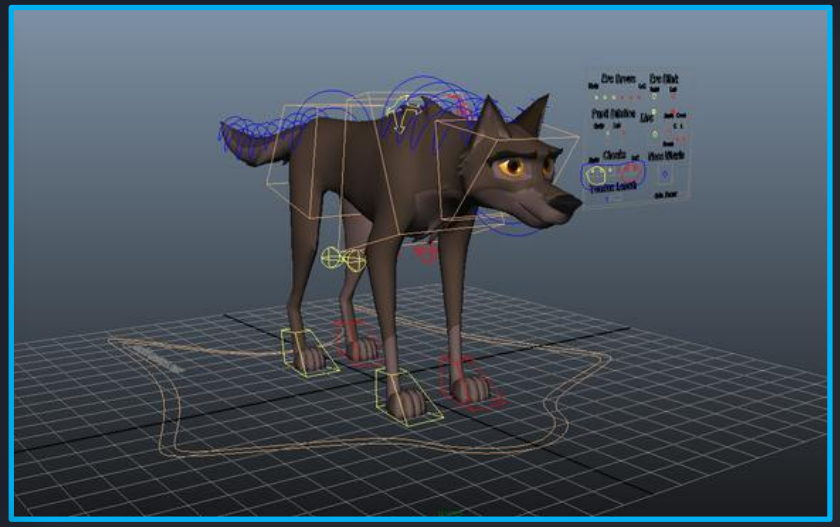
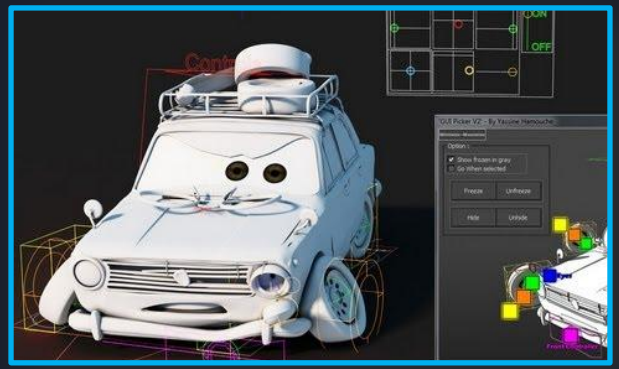
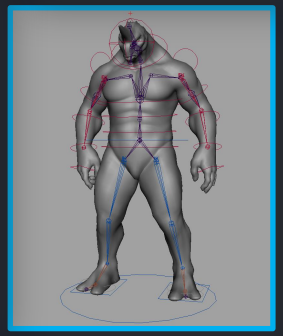
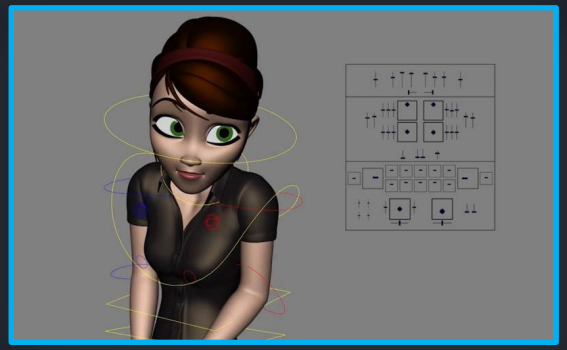
Rigging|What is rigging?











Rigging is preparing a model for animation.

Rigging is the stage between the model and the animator. It involves setting up any model for an animator to bring it to life - vehicles, animals, humans, etc.

Rigging is a highly technical area and is often a career path in itself.

It often involves setting up an internal skeleton which drives the model. This skeleton is prepared for animation by setting up easy to use controls that make sense to the animator.

Hiding away the often complex structure which is required to make the mesh move.

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Rigging|What is rigging?

Every character, prop, animal, face, vehicle in games or film have been through the process of rigging.

Whether it's to create a cartoon feel with lots of squash and stretch, it is all part of the same process.

As we progress through the subjects, you will learn more about rigging and the skills required to eventually set up characters.

For those that enjoy a very technical problem solving approach to work then rigging can be very enjoyable part of the workflow.

It can also be very unforgiving so you need to be thorough and accurate as you progress.

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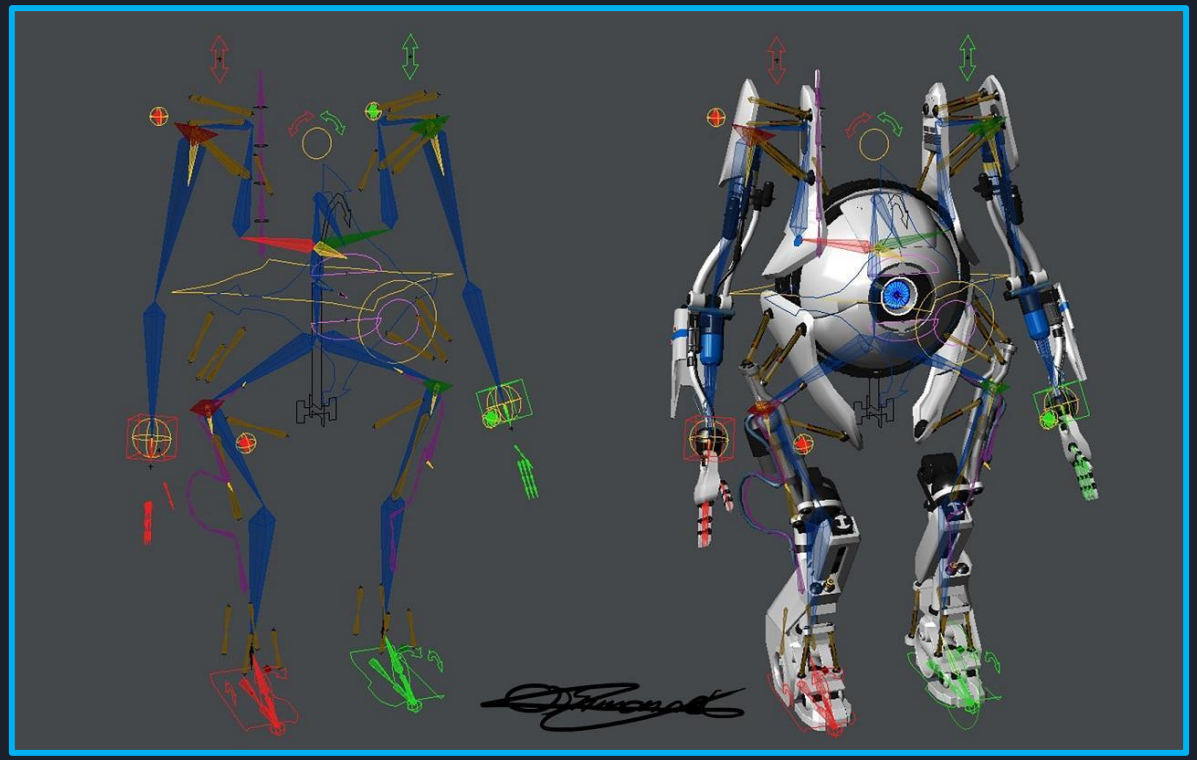
Rigging|The basics



There are some essentials you will need to develop that are used again and again.

This lesson will cover these essentials, as they are the foundations for more complex knowledge.

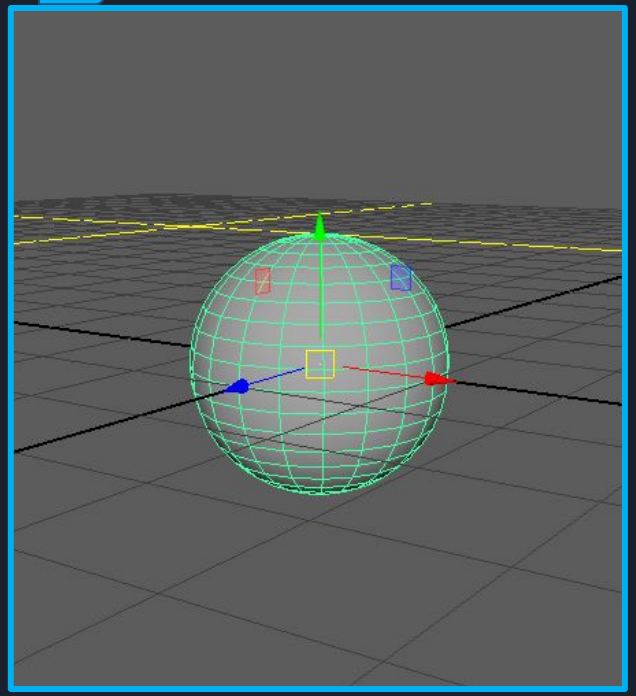
These will be invaluable when you approach more complex rigging and provide a well organised and error free setup ready for animation.

As you approach rigging and develop your own techniques, it is advisable to test first, before introducing the techniques into your rigs.

An error free rig, will make animation much more robust

Pivots|Adjusting pivot points

1



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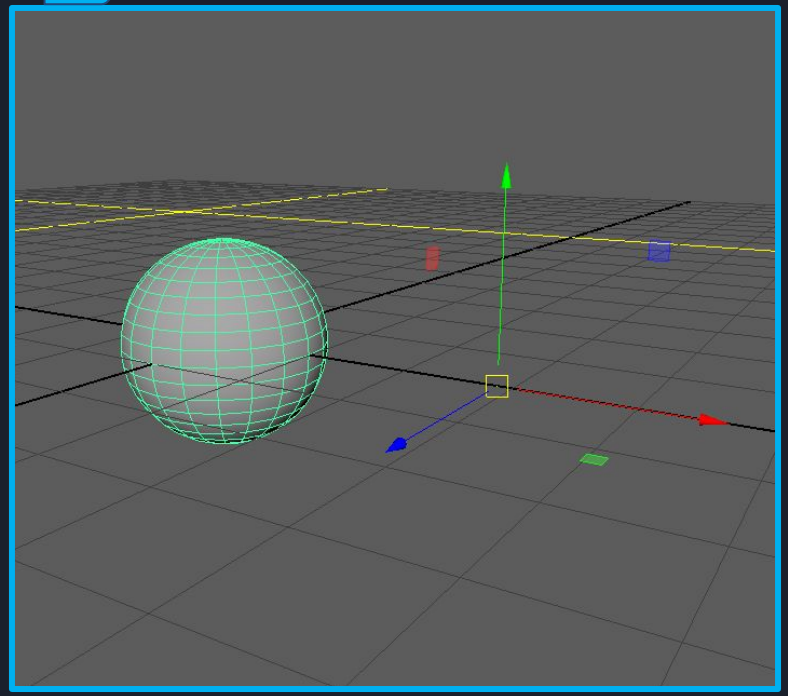


Defines the point around which an object can be moved, rotated or scaled.

1. Default is centre when object is created.
2. Pivot position can be moved for better object control.

Maya has many tools which allow you to manipulate object pivots.

Pivot Points|Repositioning

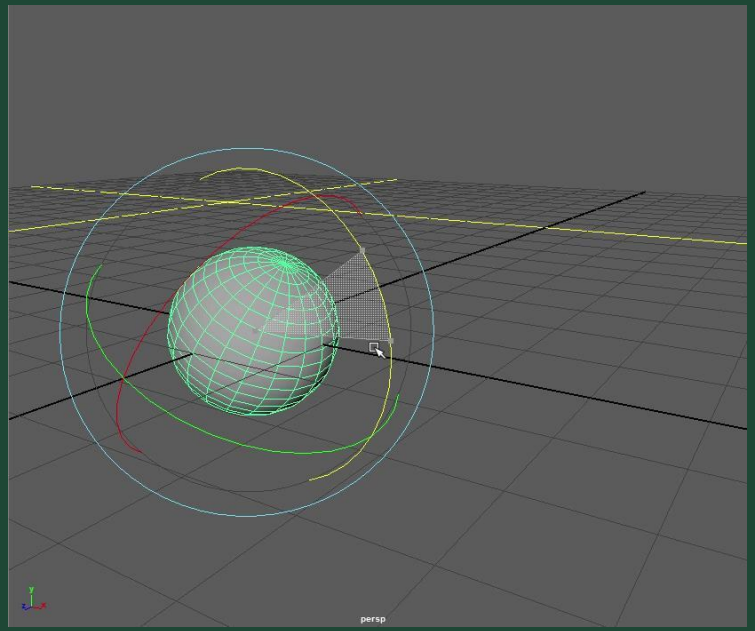
PIVOT MODE

Insert OR d

GIZMO SIZE

\+ LARGER

\- SMALLER



Adjusting pivot points is extremely useful for many aspects of 3D.

- Insert or D key to enable modify pivot point mode
- Use + and - keys to change the size of your pivot gizmo

Once modified, press Insert or D again to return to the normal manipulation mode.

Practice adjusting the pivot points of an object. Move, rotate and scale to test.

You can always reset the pivot to the centre of your object with:

Modify > Centre Pivot

Pivot Points|Snapping

USE SNAPPING

V Point Snap

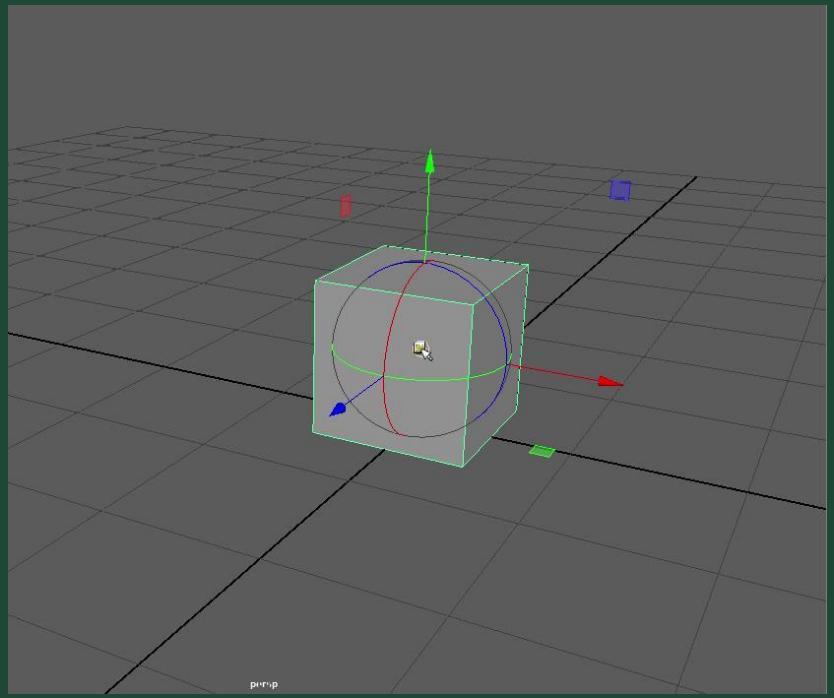
X Grid Snap

J Discrete Snap

USE ALIGN

Ctrl Orientation

Shft Position



Snapping and aligning is now a major part of managing pivot points.

- V - Snap to verts, locators, points, etc.
- X - Snap to grid
- J - Discrete rotation. (rotate in set increments)
- When in pivot change mode, you can align to faces, edges, vertices
- Ctrl - aligns orientation to face or edge
- Shift - aligns position to face or edge

Orientation restores when you deselect object.

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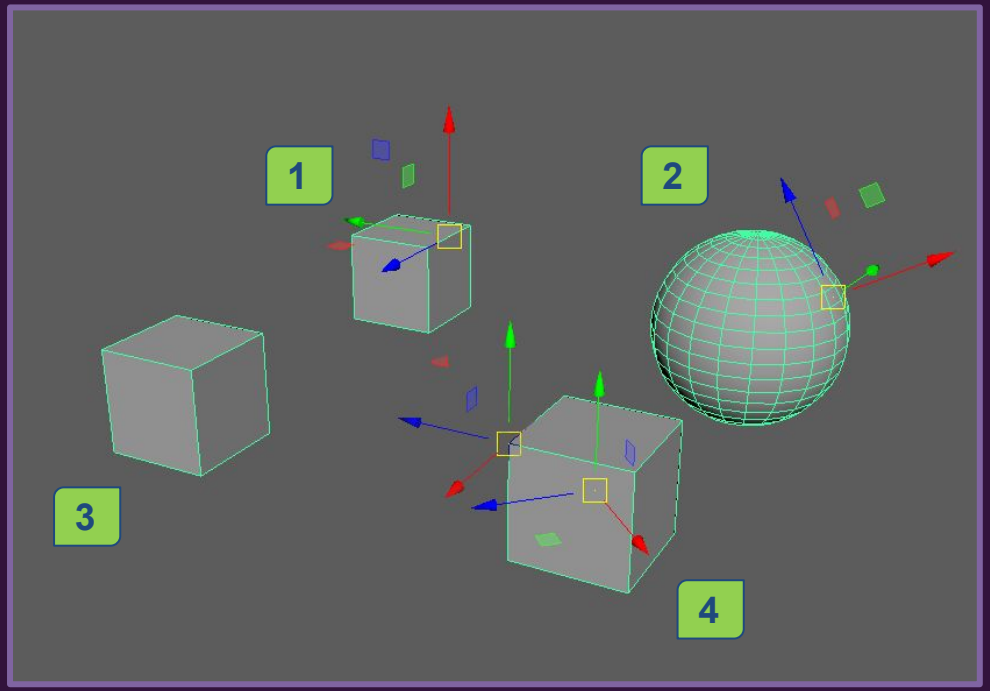
Exercise|Pivots

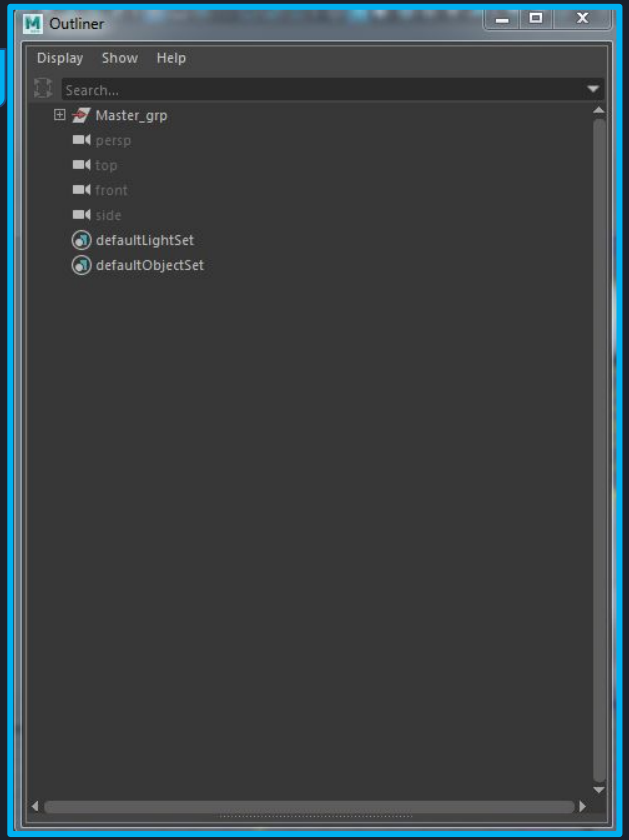


Create 3 Cubes and a sphere.

1. Align to edge, rotate so X is up
2. Align to a face
3. Align to a vertex of cube 4
4. Keep central, rotate so x points at a corner vert (45 degrees)

Organising|Naming conventions

1



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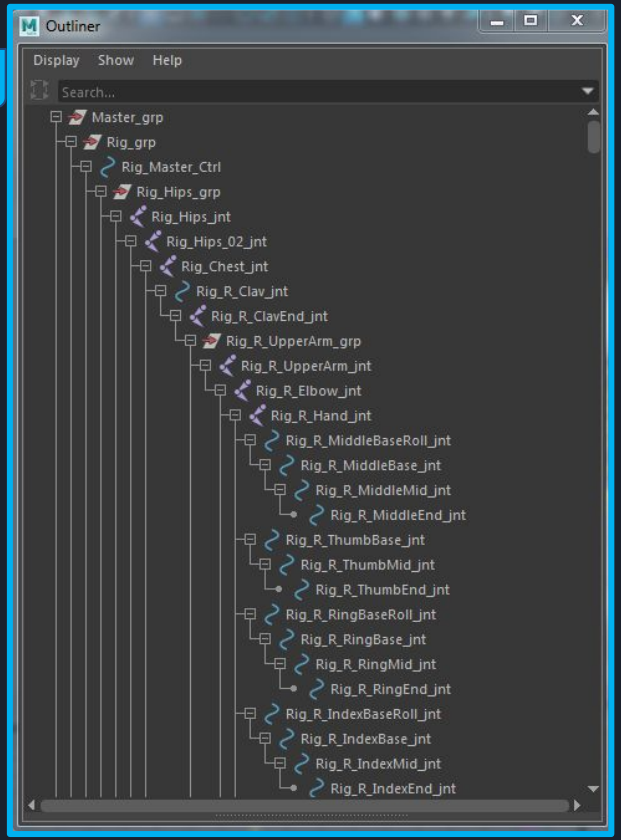

There is no standard way of naming in Maya. You will adapt your own conventions.

The key points are:

1. Make them meaningful
   polySurface30001
   is NOT good!!
2. Name as you go.
   Get into good habit
3. Be consistent.
   Define a system
   E.g.
   _grp, _jnt, _loc
4. Use groups to help organise (later)

The test is if you hand your scene to another artist, can they understand it?
DON'T BE LAZY!

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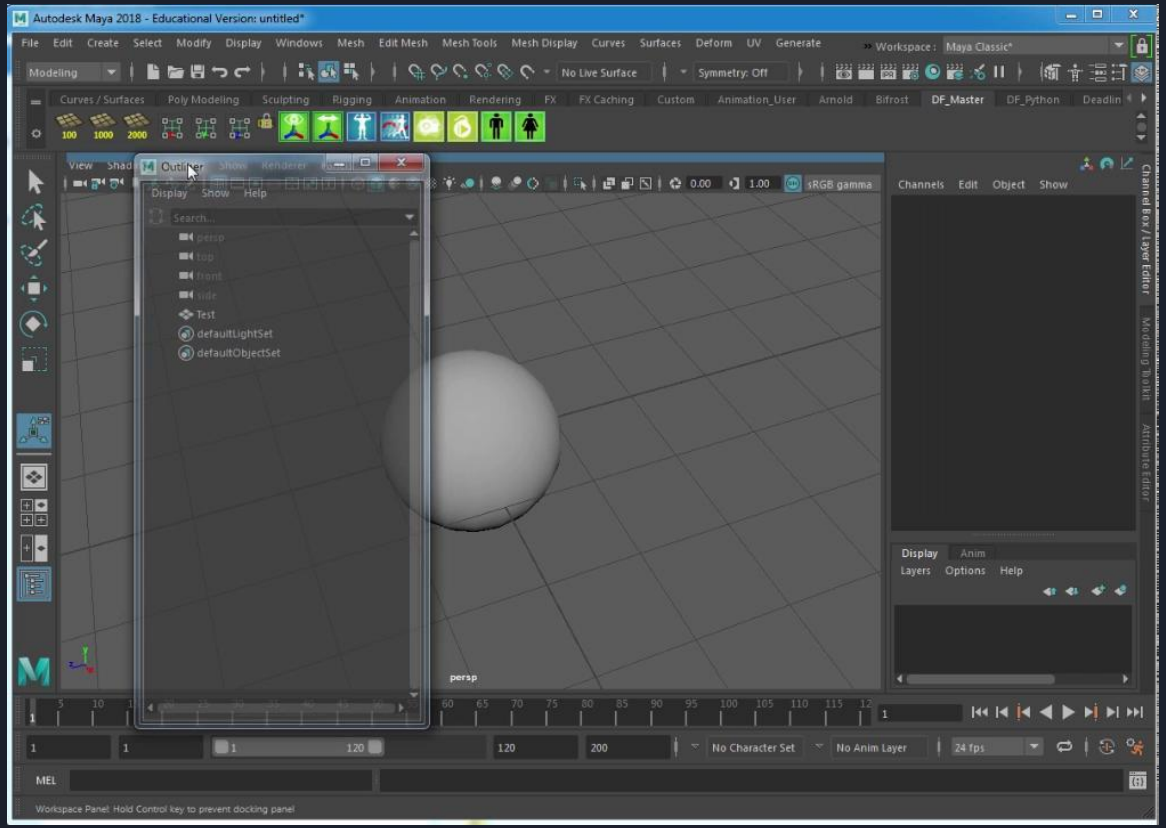
Organising|Using the outliner



Get into the habit of using the outliner as part of your scene management.

You can access it from the left side menu or from the Windows menu at the top.

You will have your own preference but you can hide or unhide the outliner from the side, or you can tear it off as a floating window.

Outliner is crucial for scene management, naming and organising everything as you go.

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Organising|Naming conventions

1

L_EyeBall_geo

Geo_grp
- Torso_geo
- Head_geo
- Hair_geo

Rig_L_Thigh_jnt
- Rig_L_Knee_jnt
  - Rig_L_Foot_jnt

2

pShere01

pSphere02
transform00004
transform3458

joint01
- joint 02
  - joint03

It is very important to keep your scenes clean and organised so other artists find them easy to understand.

It is good practice to name objects as you create them.

Make use of the following:

- Underscores (_)
- Prefix
- Suffix
- Left or Right (L or R)
- Consistency

Plan your naming convention thoughtfully and stick to it!

1. Nicely organised and named well
2. Badly organised with default names

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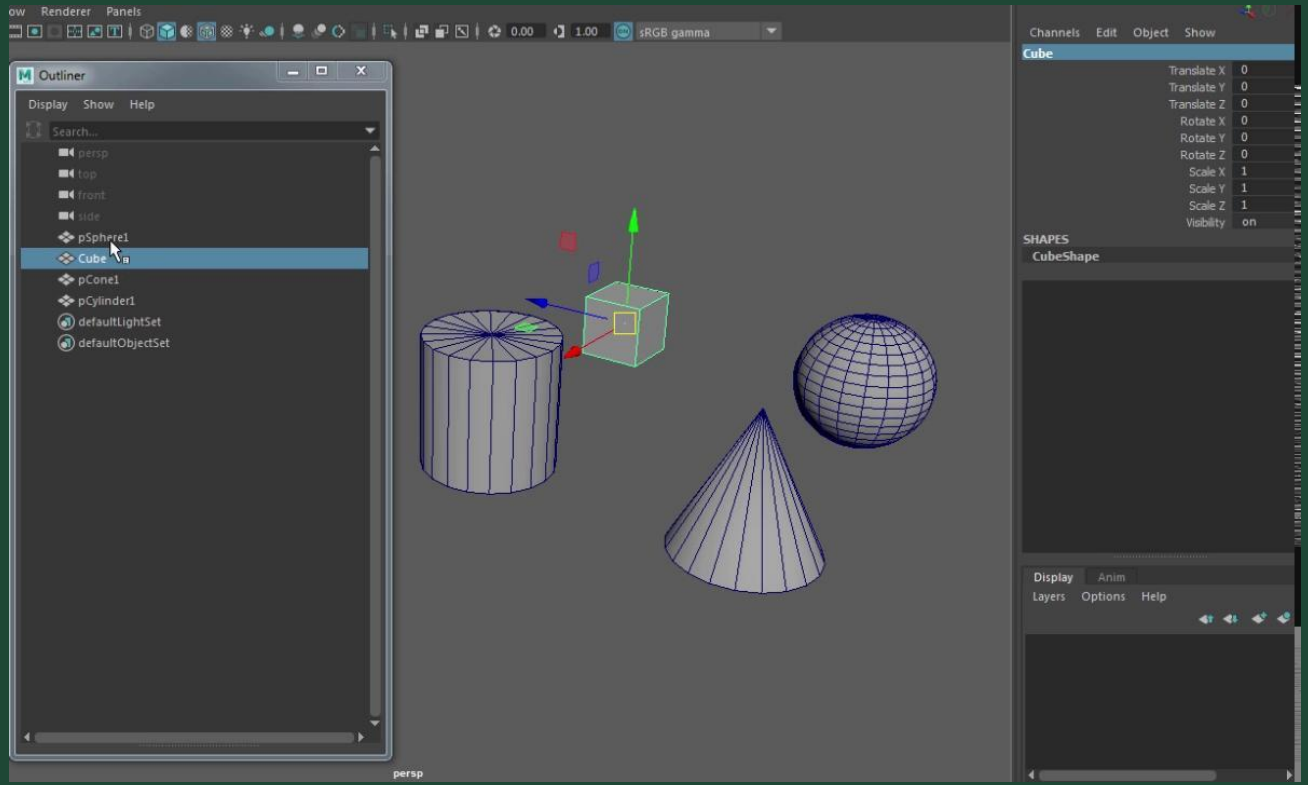
Organising|Using the Outliner



Outliner is critical for managing your scene files as they get more and more complex.

Initial way of naming objects is via the object in the channel box.

With the outliner you can:

- Select objects, multiple objects
- Rename
- Move the order of objects.
- hide/unhide objects
- organising hierarchies (to follow)

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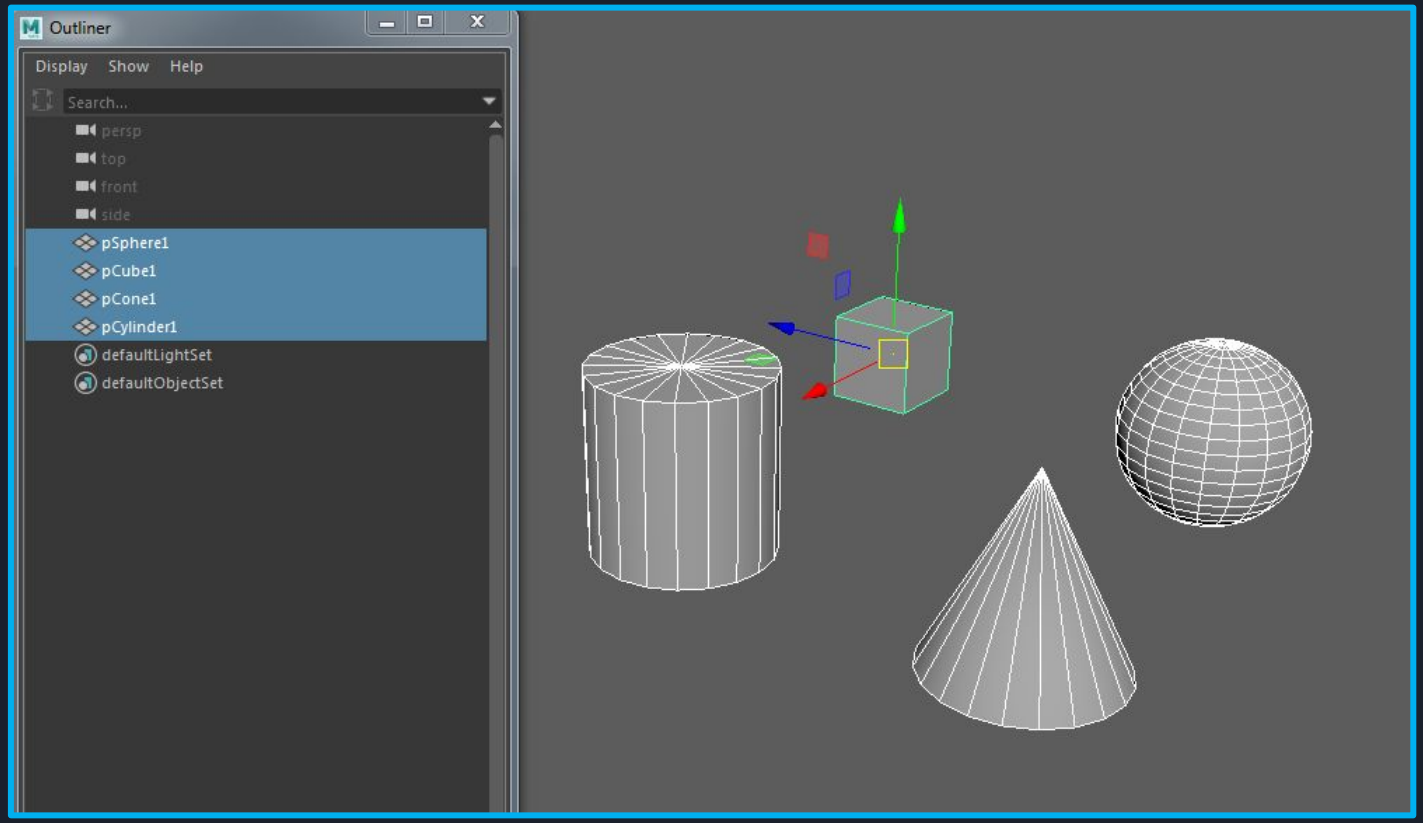
Hierarchies|child/parent objects



When you create an object, the default behaviour of Maya is to create the object at the origin (0,0,0) in world space.

When an object is created its transform values (position, rotation, and scale) are relative to the world coordinates.

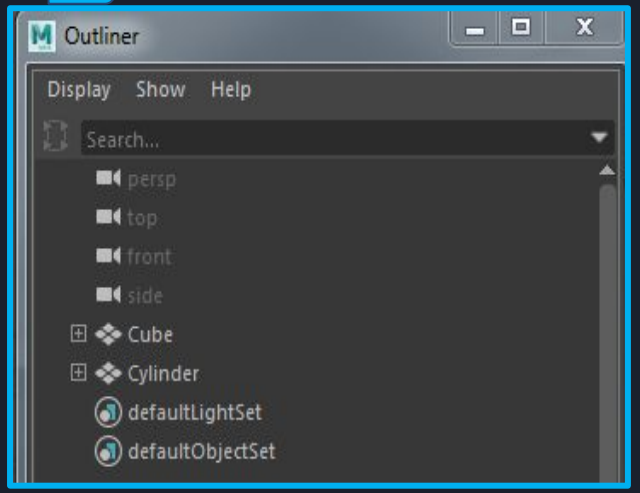
When you parent an object to another, the parent becomes the origin for the child. This means the transform values of the child are now relative to the parent object rather than the world.

This also means that when you transform the parent, the child object will also be transformed.

The child can still be transformed independently of the parent. Like moving your finger without moving your hand.

Hierarchies|Reading Outliner

1



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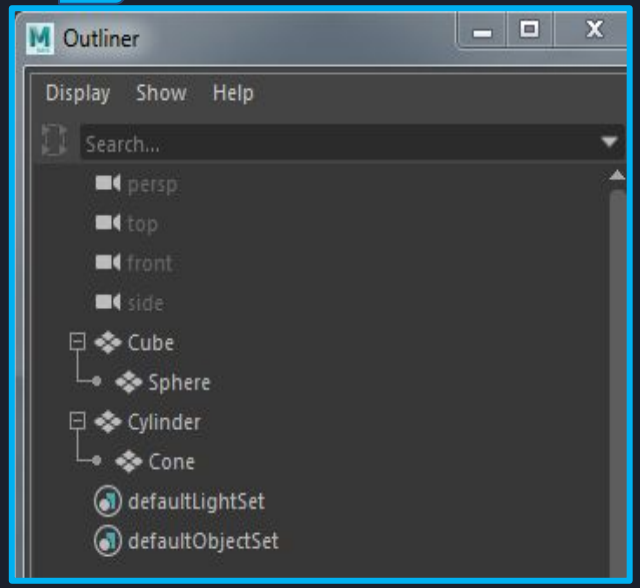

The outliner is a list of the objects in your scene. You can use it to view and modify the hierarchical structure of your scene.

1. Objects that have a + to their left, have child objects
2. Clicking on the + will expand the hierarchy to the next level to see the children

If the hierarchy is multi levels deep, holding shift while clicking on the + will fully expand the hierarchy.

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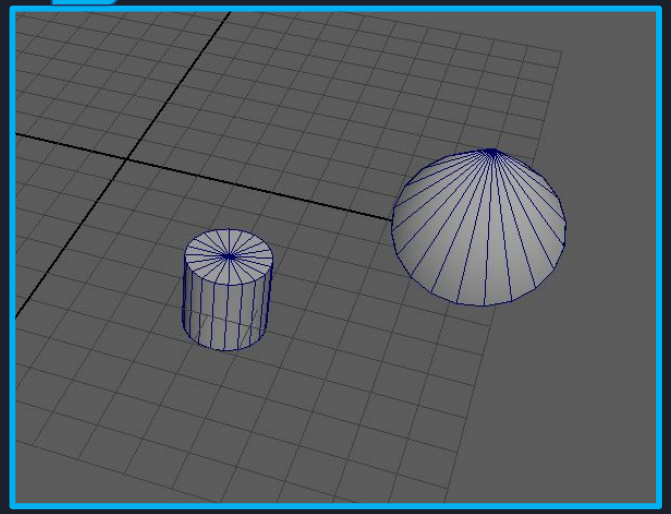
Hierarchies|Parenting/Child values

1



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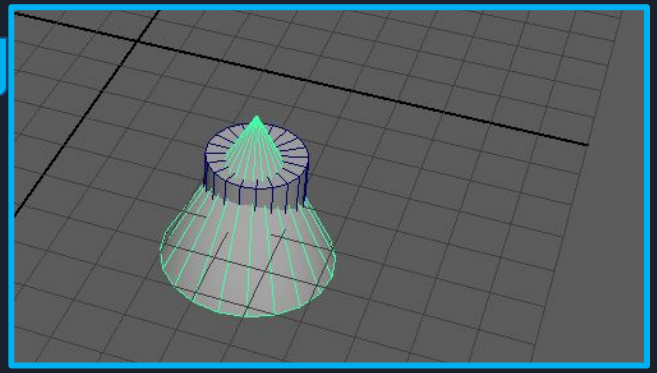

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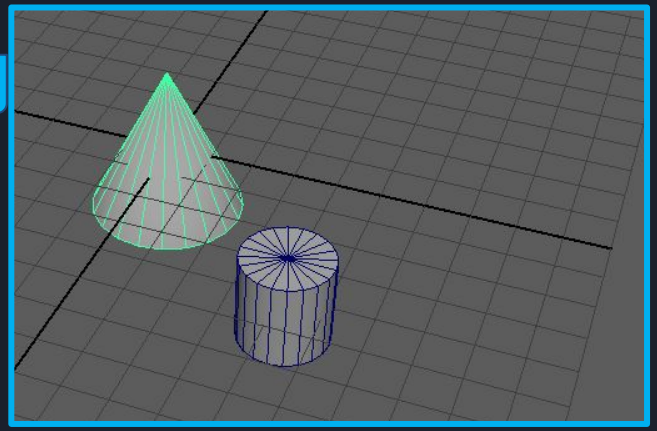

If an object is a child of another, then the parent becomes the world or the origin of that child.

1. Cone is the child of the cylinder
2. By resetting all values of the child to zero, the child is centred back to its parent
3. If an object has no parent, resetting its values to zero will restore it back to world origin

The parent-child relationship is important to understand

A parent is the world or origin of a child.

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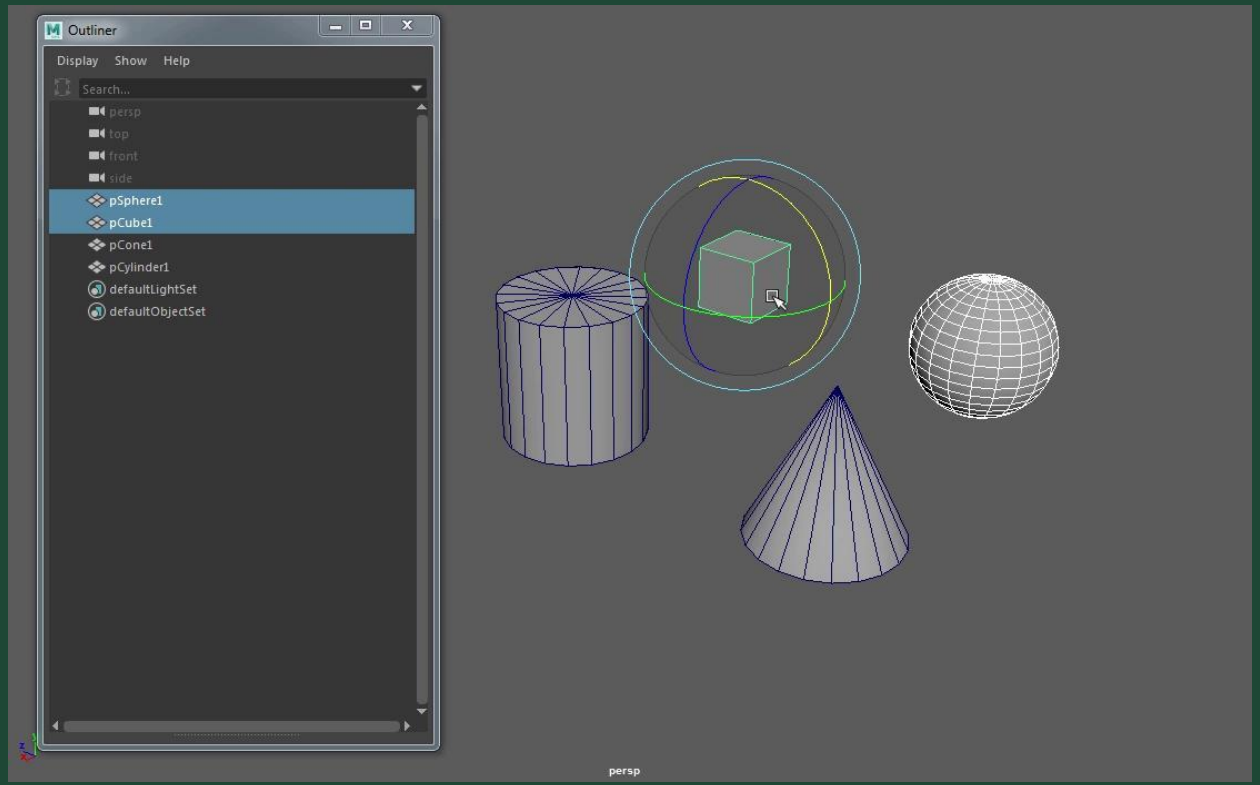
Organising|Parent



The main way to parent an object to another is by using the P key.

First select the prospective child. Next select the prospective parent. Lastly press the P key.

In this example, the hierarchy is as follows:
Cube
  Sphere
    Cone

- Cube will control all children. (Sphere and Cone)
- Sphere can be controlled independently and will control the cone.
- Cone can be moved independently.

Practice parenting while watching the relationship in outliner.

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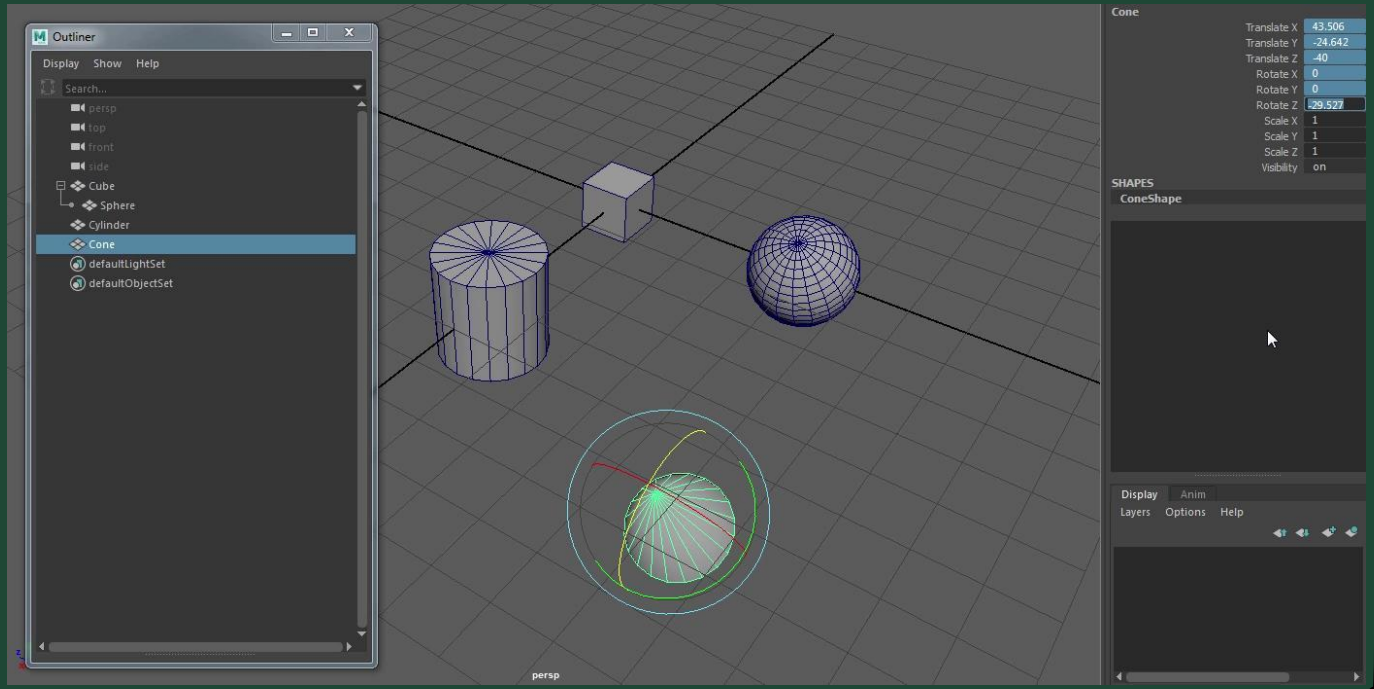
Organising|Parent using outliner



Another way of quickly setting up hierarchies is to simply use the outliner.

Simply middle mouse drag an object onto another in the outliner.

You can do this to create many levels of parent and child hierarchy.

If you want to unparent, then middle drag the object onto anywhere in the outliner to take it back to world space.

You can parent more than one object at a time.

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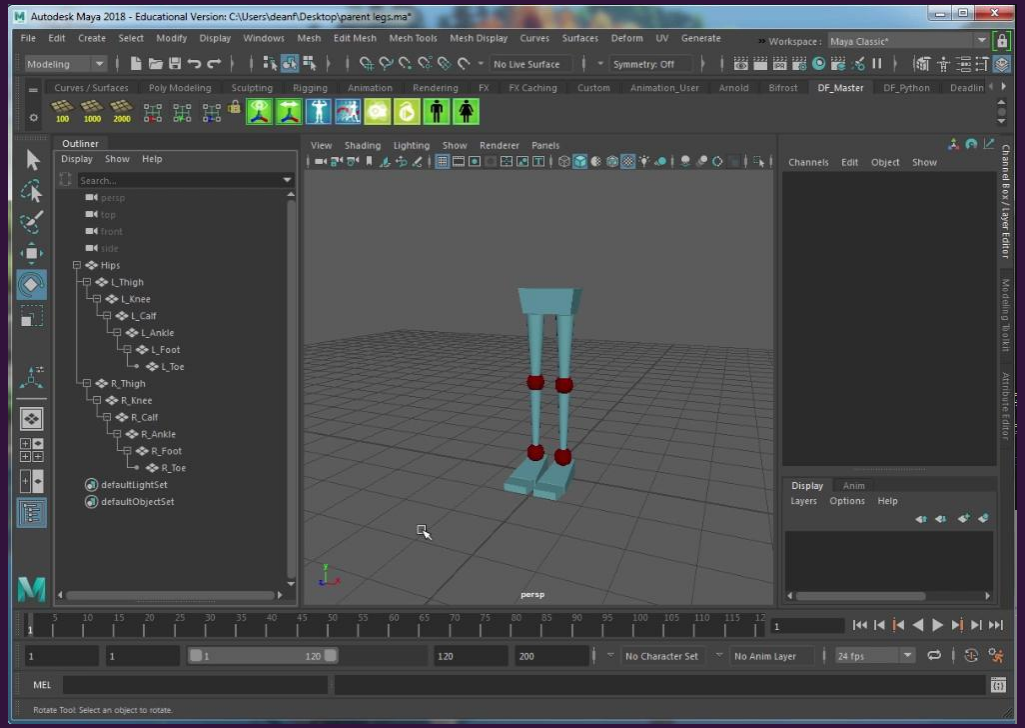
Exercise|Parenting and pivots



Create a lower torso using poly objects.

- Set up correct pivots
- Name correctly
- Parent correctly

Limbs should rotate from correct position.

Create correct hierarchy of limbs

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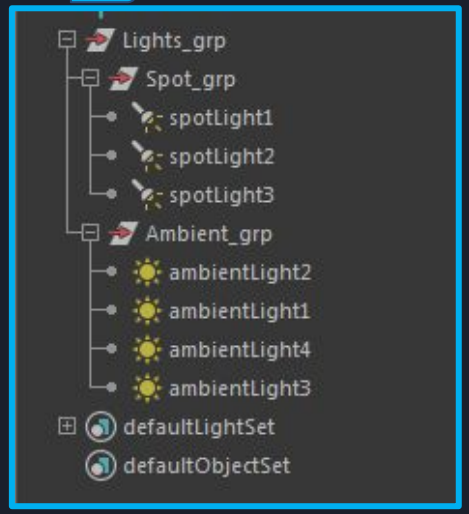
Groups|What are they?

1



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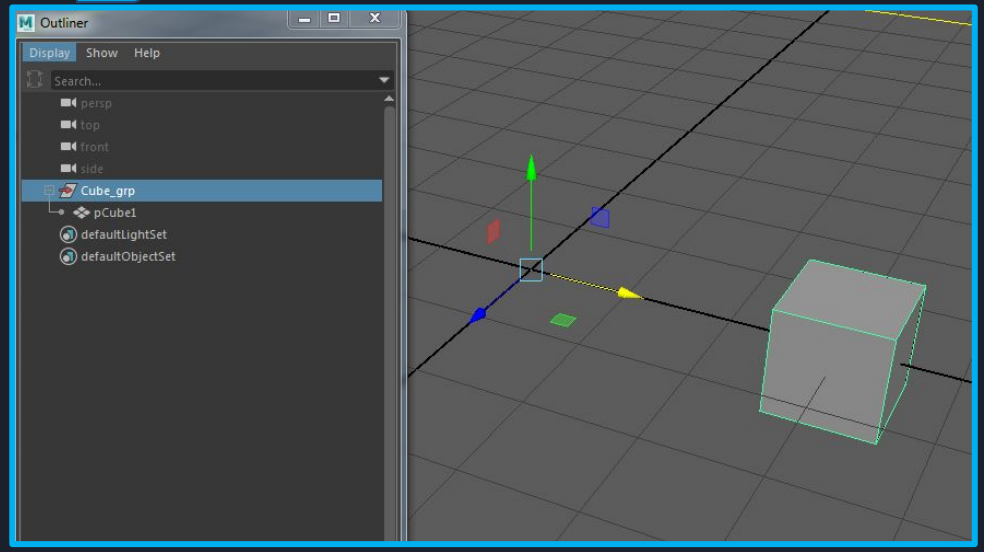


Groups can 'group' objects together without combining them.

They behave just like objects and can adjust pivot points, parenting, translate, rotate and scale etc.

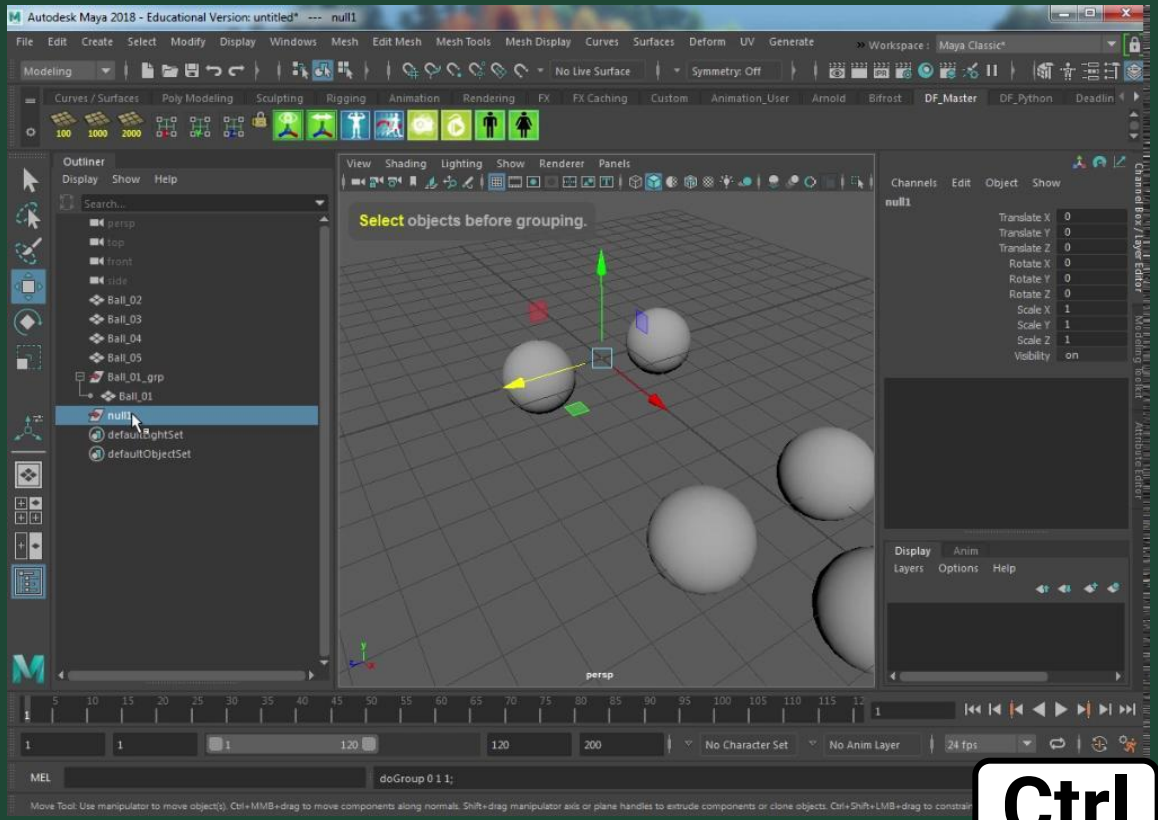
Perform basic selection and transformations on a collection of objects as if they were one.

Another use for groups is to simply group objects together as a way of organising in the outliner.

1. Groups have been used to organise spot lights, ambient lights and have a parent Lights group

2. Group is used here as a pivot for an object

Groups|Create and organise



Ctrl + G

Shortcut for creating a group is Ctrl+G.

- Creating a group while an object is selected will place your object as a child of the new group.
- You can create an empty group by having nothing selected.
  You can parent objects to the new group after group creation.
- You can group multiple objects too.

Groups are transform objects so you can move, rotate, scale and change their pivot.

Experiment changing their pivots.

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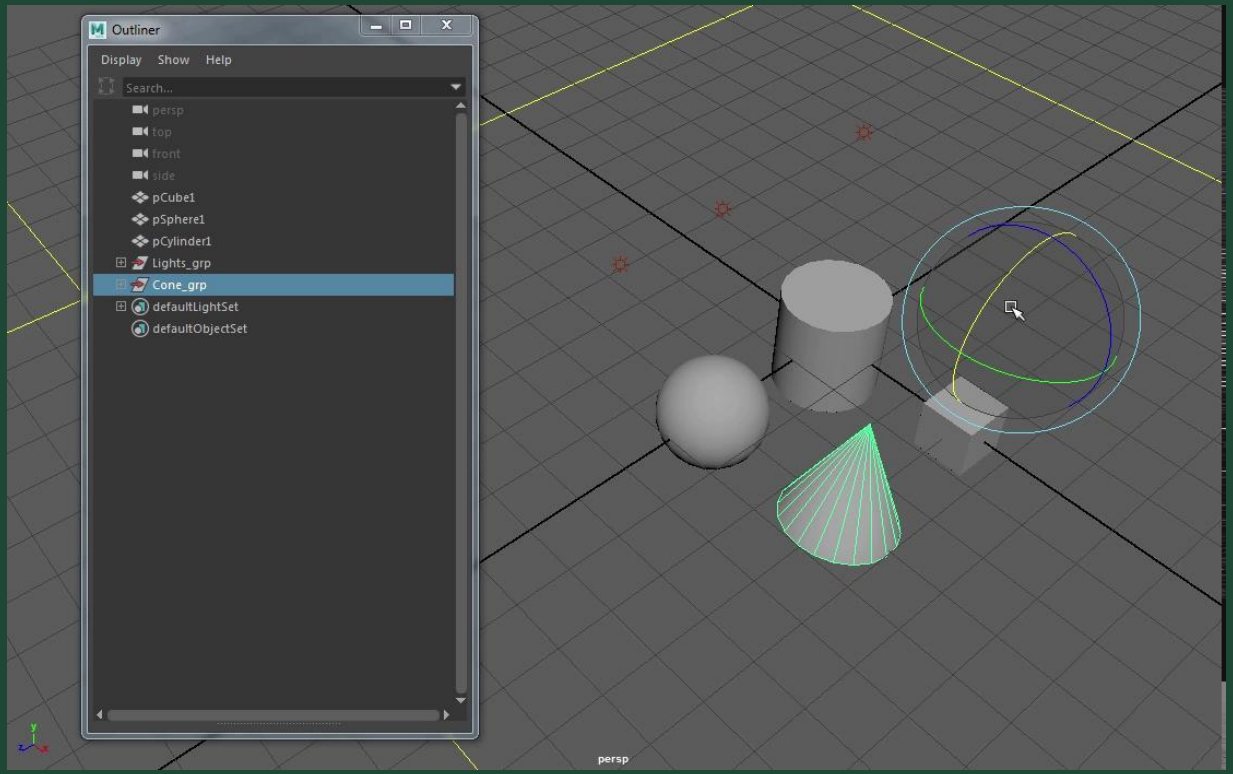
Groups|Create and organise



Let's have a look at grouping more objects and organizing your scene.

You can group any number of objects including lights, models, more groups, etc.

You can group multiple objects at once.

Groups are essentially empty objects that you can transform along with its child objects.

Once a group has been created, you can use the outliner or the parent command 'P' to add more objects and 'Shift-P' to unparent an object from a group.

Practice until you are confident with groups

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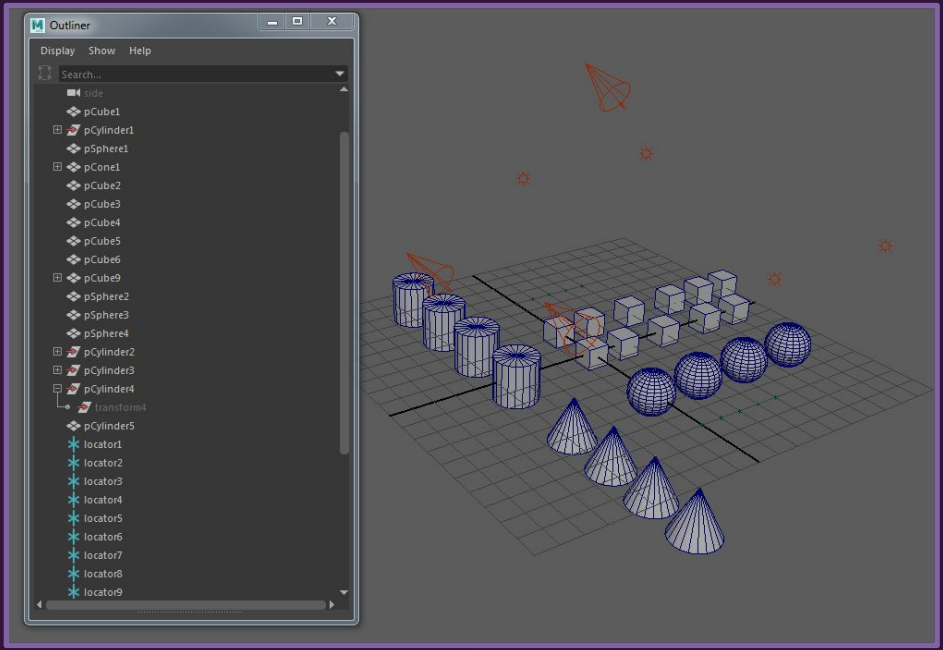
Exercise|Cleaning up



Open the file mess.ma

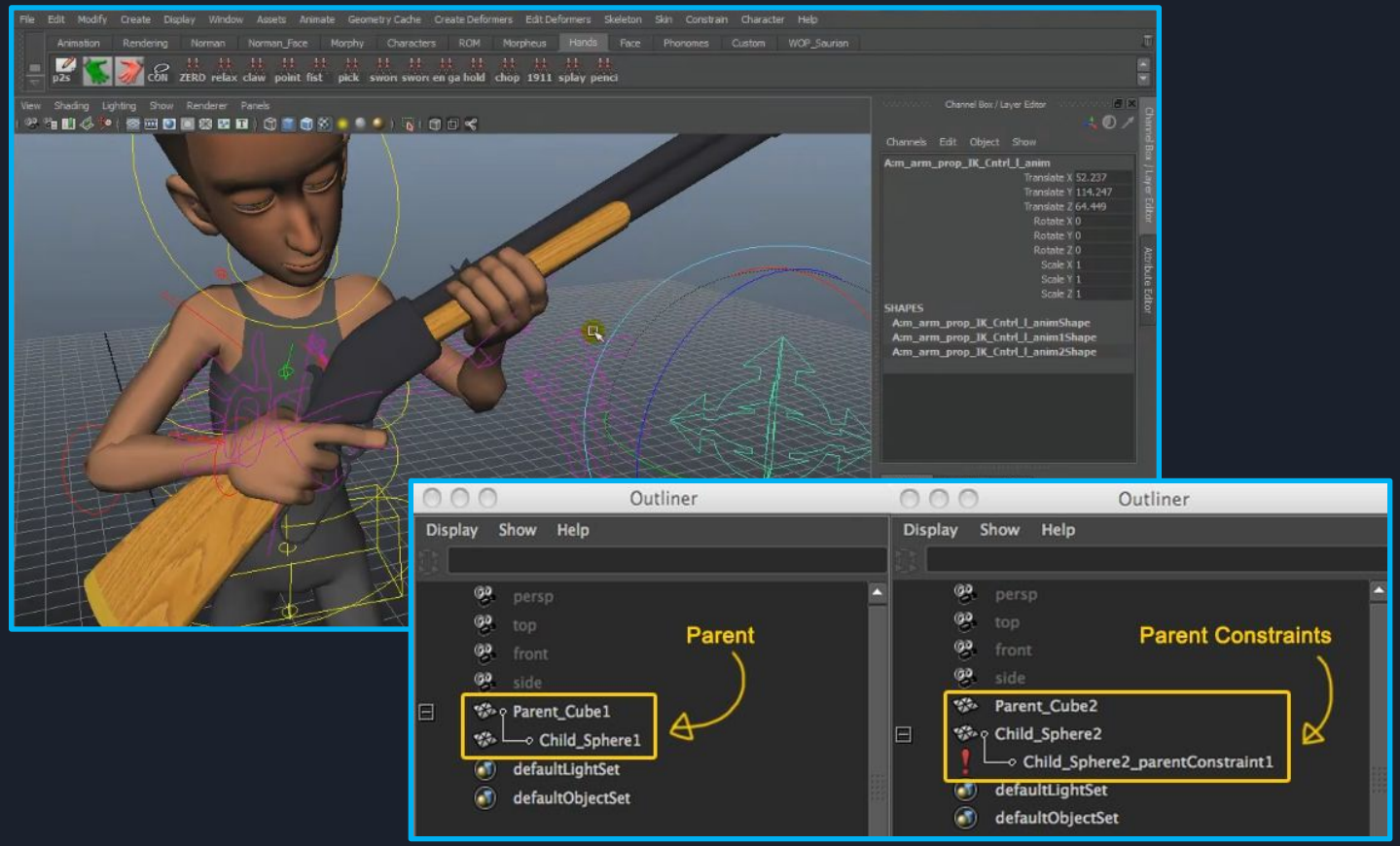
Reorganise the messy scene in a considered way.

Use groups, hierarchies and naming.

Would the scene structure be clear and easy to understand if another artist were to open it without having it explained to them?

Compare ideas in class.

Constraints|What are they?



Constraints can be described as animation controllers.

With constraints you can control the position, rotation and scale of an object with other objects.

We will start simply and build on your knowledge of constraints as you progress.

Having a good understanding of the technical side of 3D will improve your skills as an artist.

Constraints are used extensively when setting up characters and props for animation.

They are an important technical aspect to understand.

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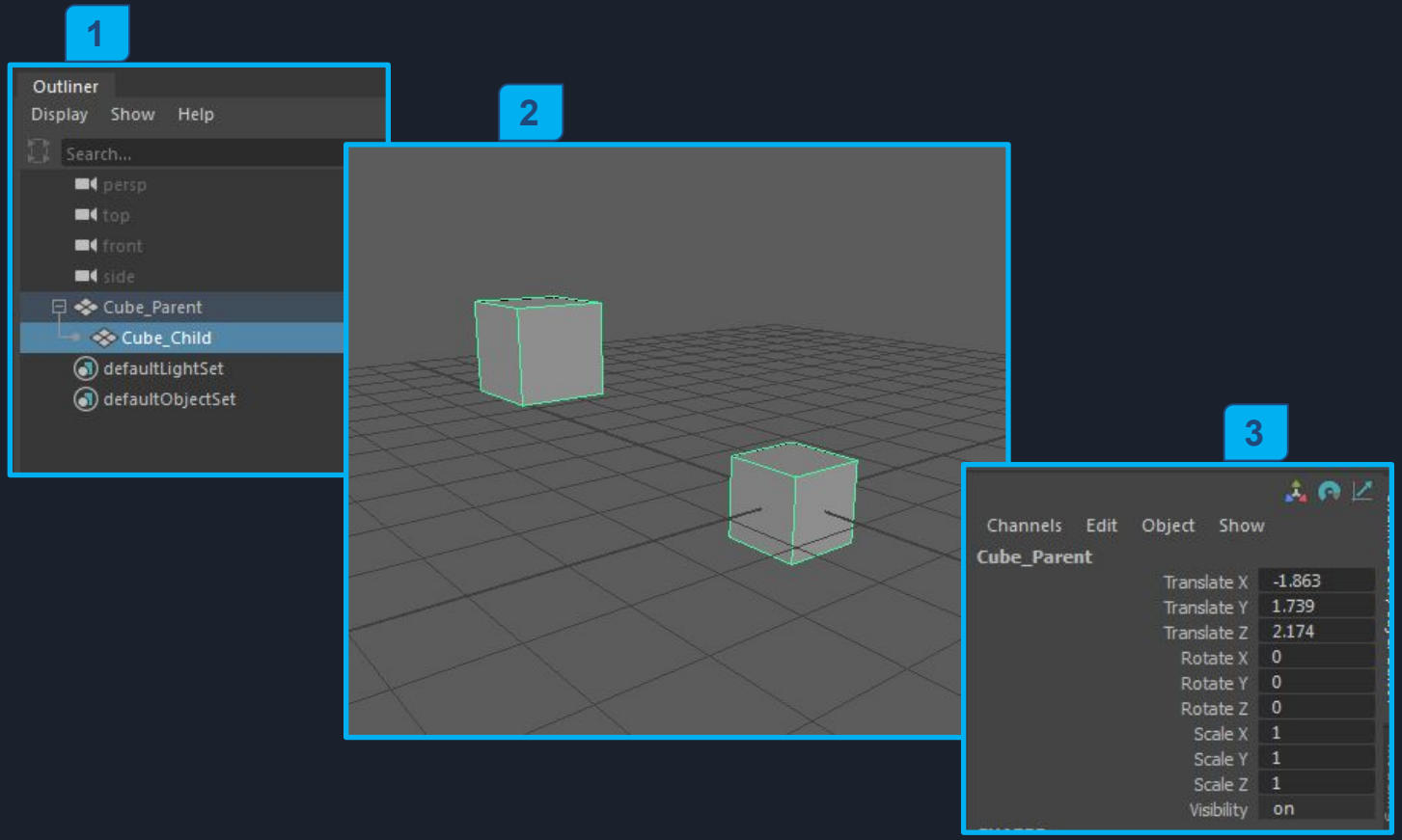
Constraints/Parents|parenting



When an object is created it exists in World Space.

When a child is parented to an object, the child is now in Parent Space. This means its transform values (position, rotation and scale) are now relative to the parent.

A child can still be transformed independently in a child/parent relationship.

1. Outliner shows hierarchy
2. Selecting the parent will highlight the child
3. Values are relative to parent

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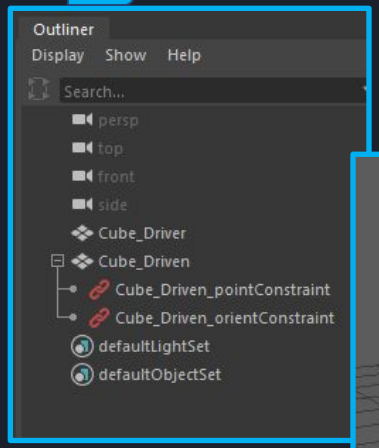
Constraints/Parents|constraints

1



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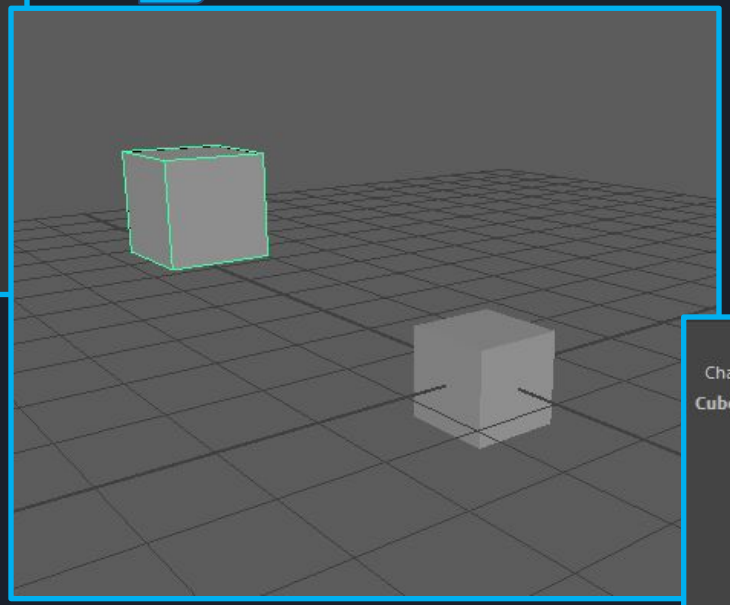

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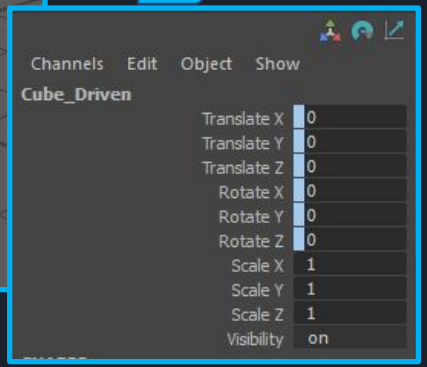

Constraints attach objects to other objects but offer more flexibility than parenting alone.

Constraints can be focused to certain channels e.g. translate, rotation and scale.

Constraints can be turned off or set as a percentage of influence through a weight value.

Constraints override hierarchies

Constraints can have more than one driver whereas parenting cannot.

1. Outliner shows constrain nodes
2. Selecting driver will not highlight child (driven)
3. Constrained values are blue in channel box

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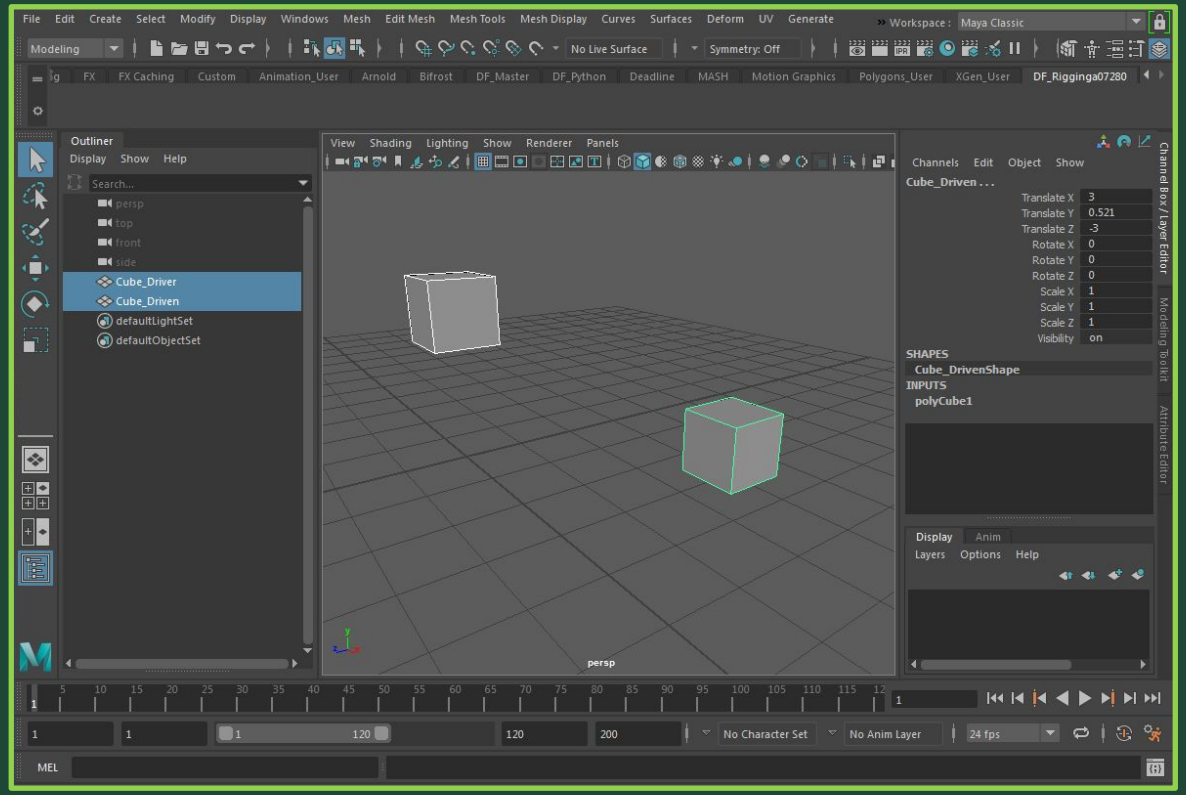
Constraints|Setting up



Next we will be going through the simple steps to assign a basic Point Constraint.

The end result will be one cube (Driver) driving the translation of another (Driven).

Create 2 cubes and position them similar to image with:
Driver on the left
Driven on the right.

Name them the following:

- Cube_Driver
- Cube_Driven.

When setting up constraints, the Driver is ALWAYS selected first.

Select Cube_Driver then shift and select Cube_Driven

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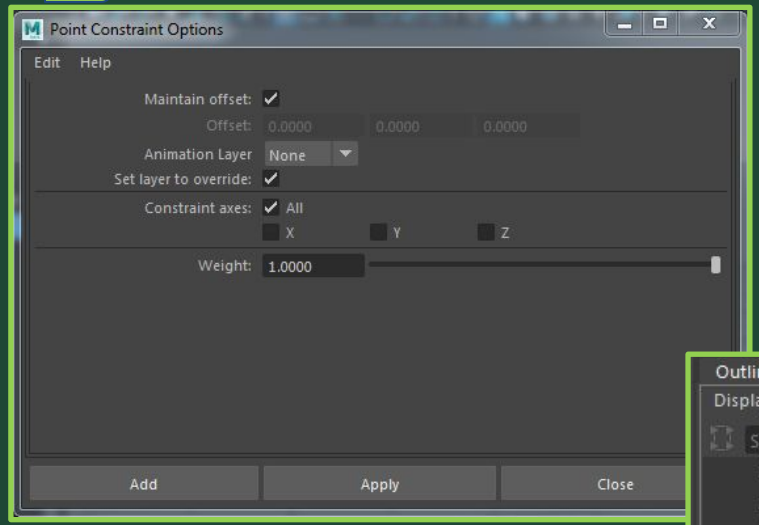
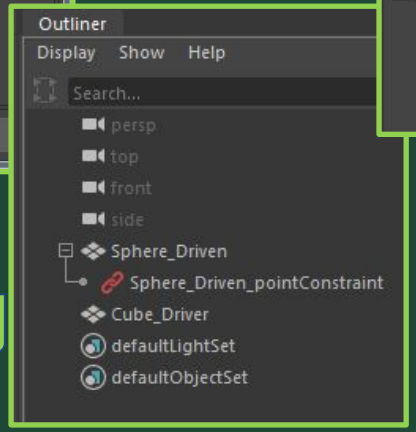
Constraints|Setting up

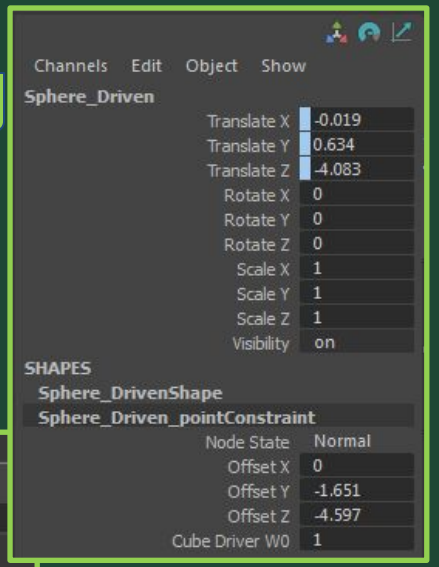
1



2



3



With both selected, from the top menu find: Constrain > Point

To open the Point options dialog, click the square next to Point

1. This dialog box is similar for point, orient, scale and parent constraints

Maintain offset: Do you want the driven object to maintain where it is now?
Constraint axes: all or specify which ones
Set layer to override: leave as default.

2. The new constraint appears as a node in outliner and can be renamed or deleted.

3. Constrained channels show blue in channel box.

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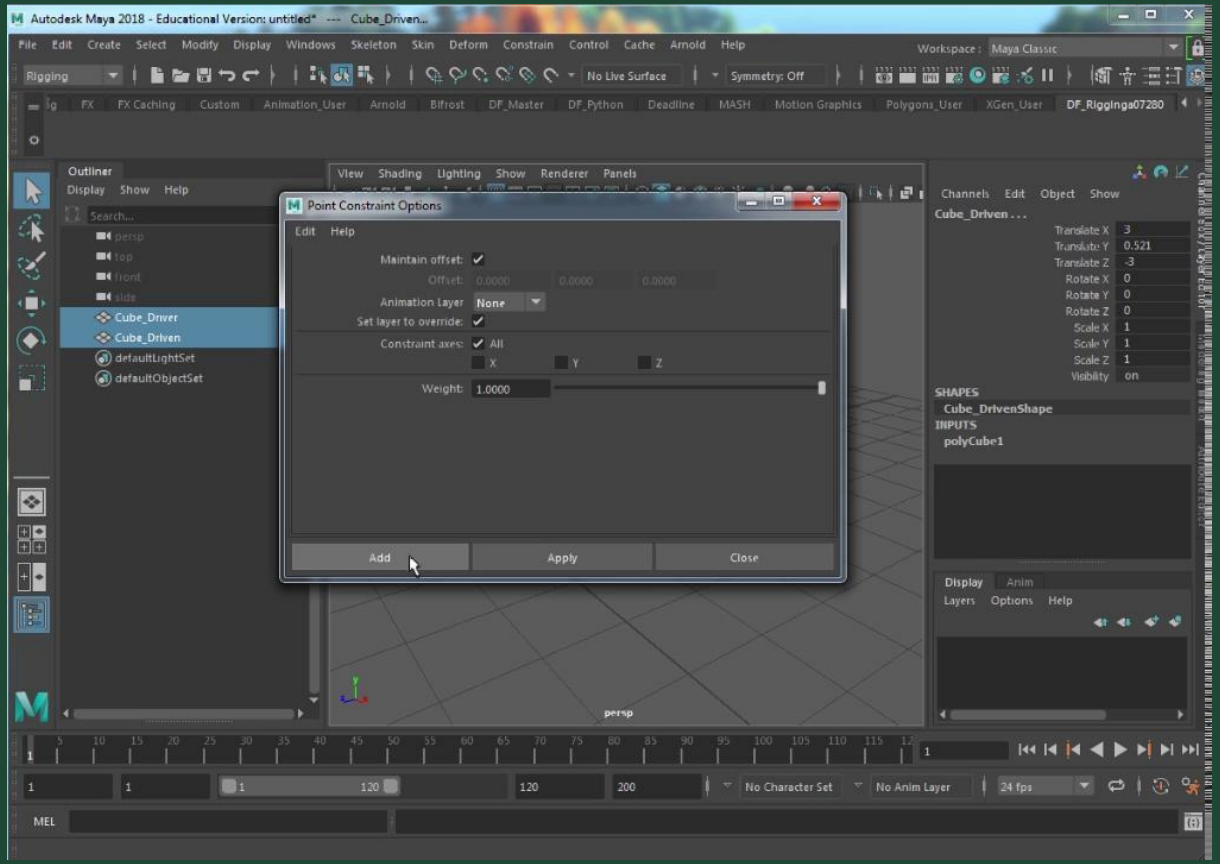
Constraints|Setting up



Once a constraint is set up, the relevant channels of the driven object are locked. (Point constraint will lock the position channels)

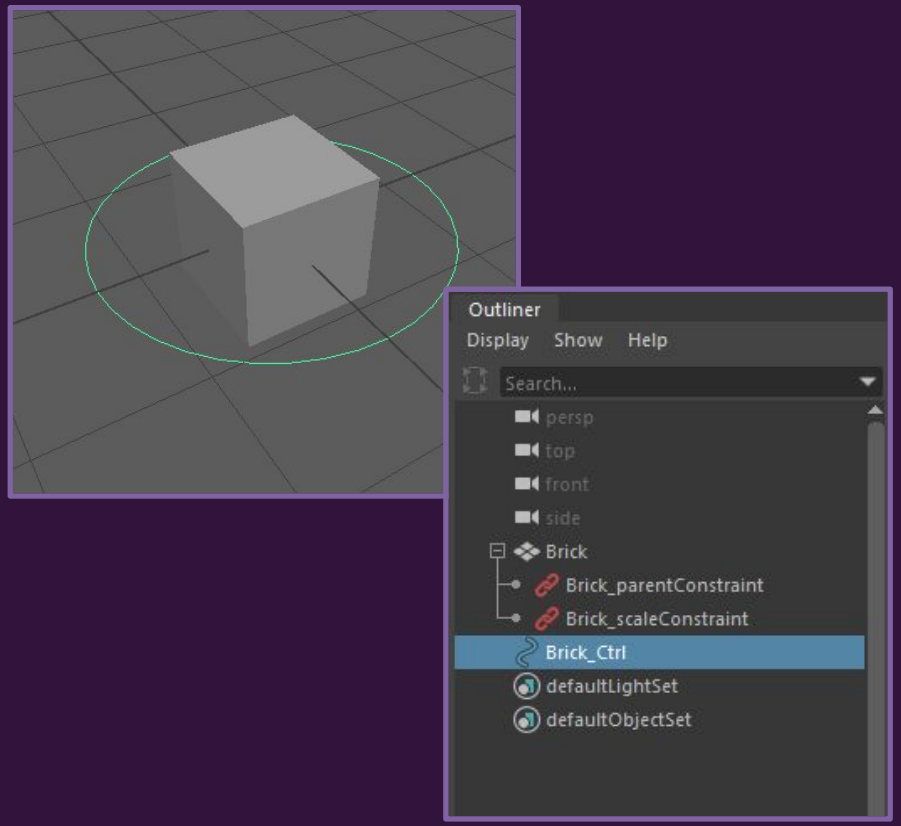
If you move the Driven it will snap back to its original position once you move the Driver.

You can remove the constraint by selecting the constraint node in the outline and deleting it.

When you do this, the Driven is no longer constrained by the Driver.

Practice this with other objects. Investigate using point, orient, scale and parent constraints.

Exercise|Animation Control



Create a simple animation control for an object.

- Create an object
- Create a nurbs circle as the Control object
- Zero the Position of both objects
- Freeze transforms, delete history
- Name them meaningfully
- Parent constrain object to control
- Scale constrain object to control

You have created your first animation control

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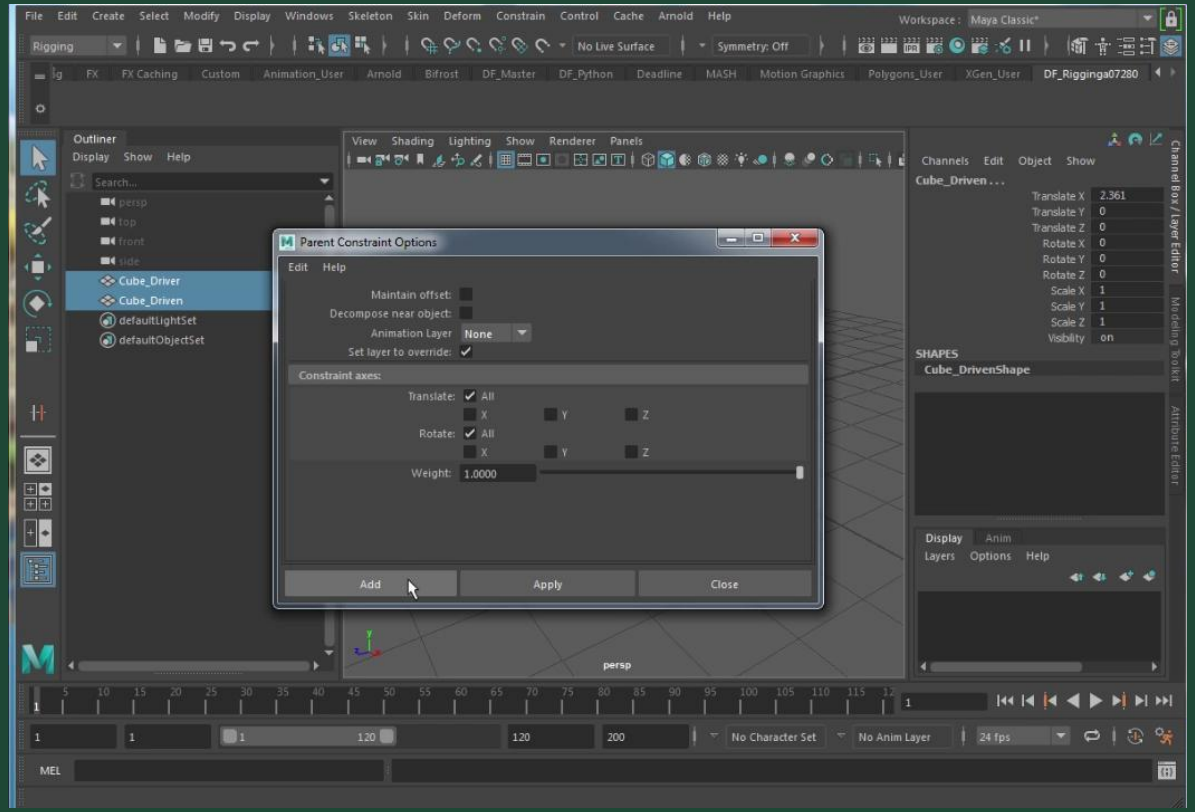
Constraints Extra|Aligning



You can take advantage of the constraints and use them to align one object to another.

- Create 2 cubes similar to the scene.
- Set up a parent constraint but make sure you untick maintain offset.

This will make the Driven snap to the same place as the Driver.

- In the Outliner, delete the constraint node so the Driven object is free again.

Point constraint will align position
Orient will align rotation
Parent will align both

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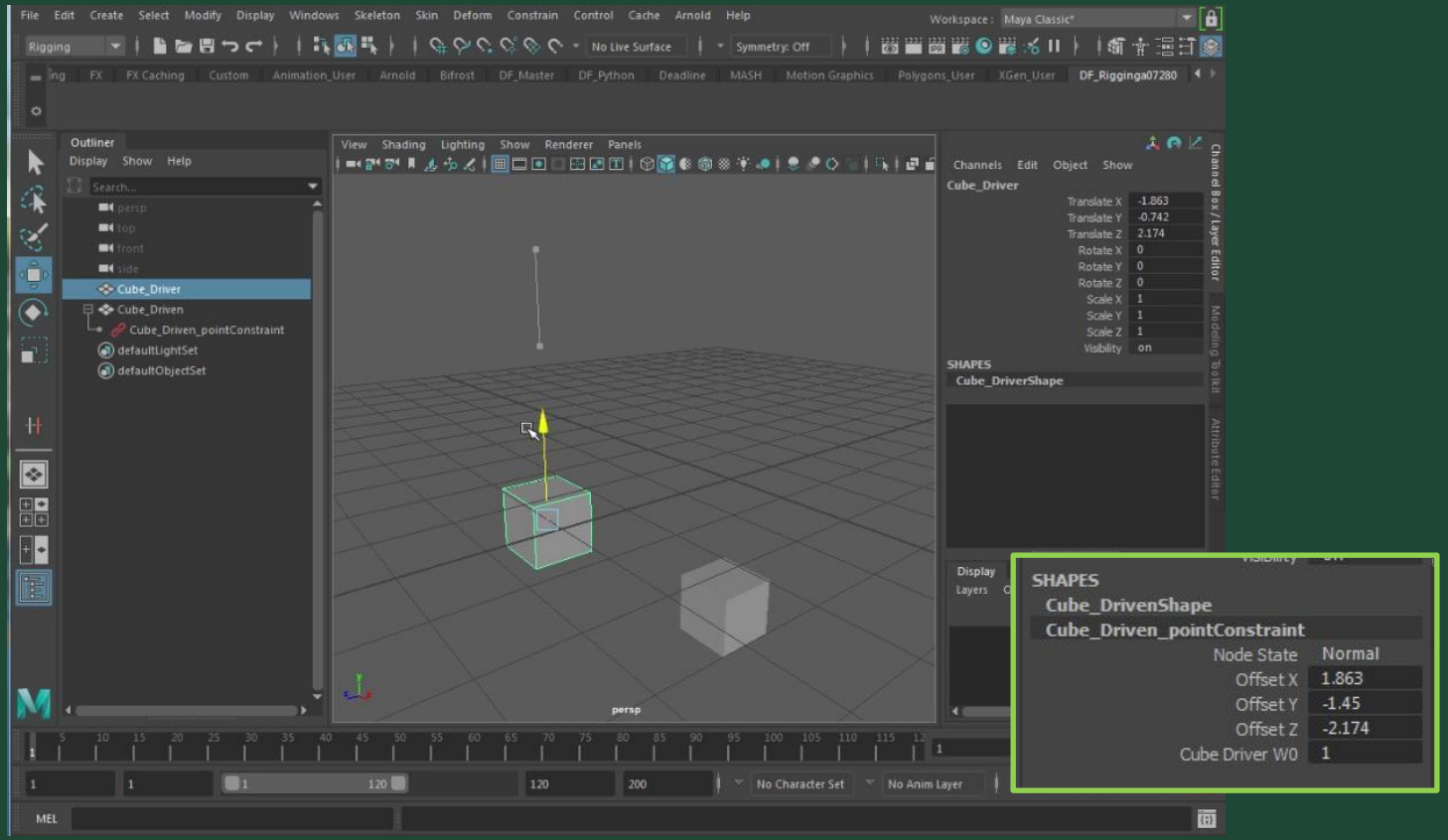
Constraints Extra|Turning on/off



Once a constraint has been set up you can see this in a number of ways.

Driven object will have a constraint node in outliner.

Driven object will have blue channels which are constrained.

You will also see the constraint in the channel box under the SHAPES menu.

Under the Constraint setup (see image), you will see the Driven object name with W0

In this case Cube Driver W0

1 is fully on
0 is fully off
0.5 is half on

Change the value and see the constraint turn on and off

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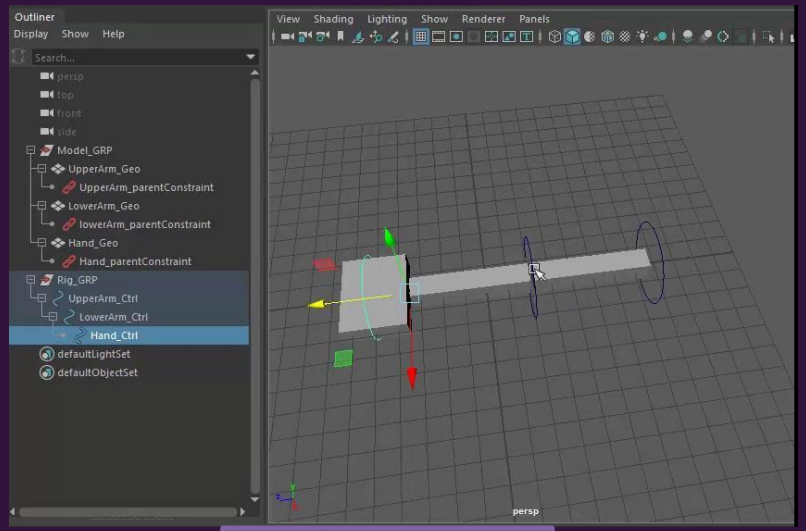
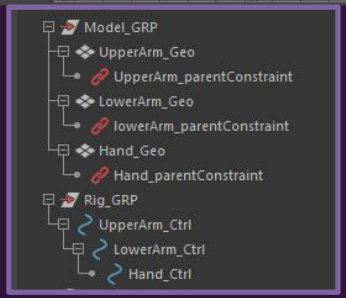
Exercise|Rigging a robot arm





Create an arm from poly primitives and create animation controls to drive it.

- Create 3 geometry objects: UpperArm, LowerArm, Hand
- Create 3 nurbs circle controls
- Positon the controls
- Set up pivots for controls
- Freeze transforms, delete history
- Name them (see image)
- Create hierarchy for geo and controls
- Parent constrain objects to control

You have a simple arm rig!

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