PROTOTYPING FORM 2: FUSION 360

CSE 599 Prototyping Interactive Systems | Lecture 8 | April 25

Jon Froehlich • Jasper Tran O'Leary (TA)

DESIGN USE BUILD

MAKEABILITY LAB

PAUL G. ALLEN SCHOOL
OF COMPUTER SCIENCE & ENGINEERING

UNIVERSITY of WASHINGTON

LEARNING GOALS

FUSION 360

Sketching: How to **move** objects

Sketching: How to **resize** objects

Sketching: What are **construction** lines?

Sketching: How to use **constraints**

3D: How to **import** 3D objects

3D: How to **project** from 3D to 2D

3D: How to use **revolve** and **circular patterns**

BASIC INTERACTIONS

ZOOM, PAN, ORBIT

ZOOMING

Mac: two-finger pinch
Windows: mouse wheel

Note: zooms where mouse cursor is located

BASIC INTERACTIONS

ZOOM, PAN, ORBIT

ZOOMING

Mac: two-finger pinch
Windows: mouse wheel

Note: zooms where mouse cursor is located

PANNING

Mac: two-finger pan
Windows: drag middle mouse button

BASIC INTERACTIONS

ZOOM, PAN, ORBIT

ZOOMING

Mac: two-finger pinch
Windows: mouse wheel

Note: zooms where mouse cursor is located

PANNING

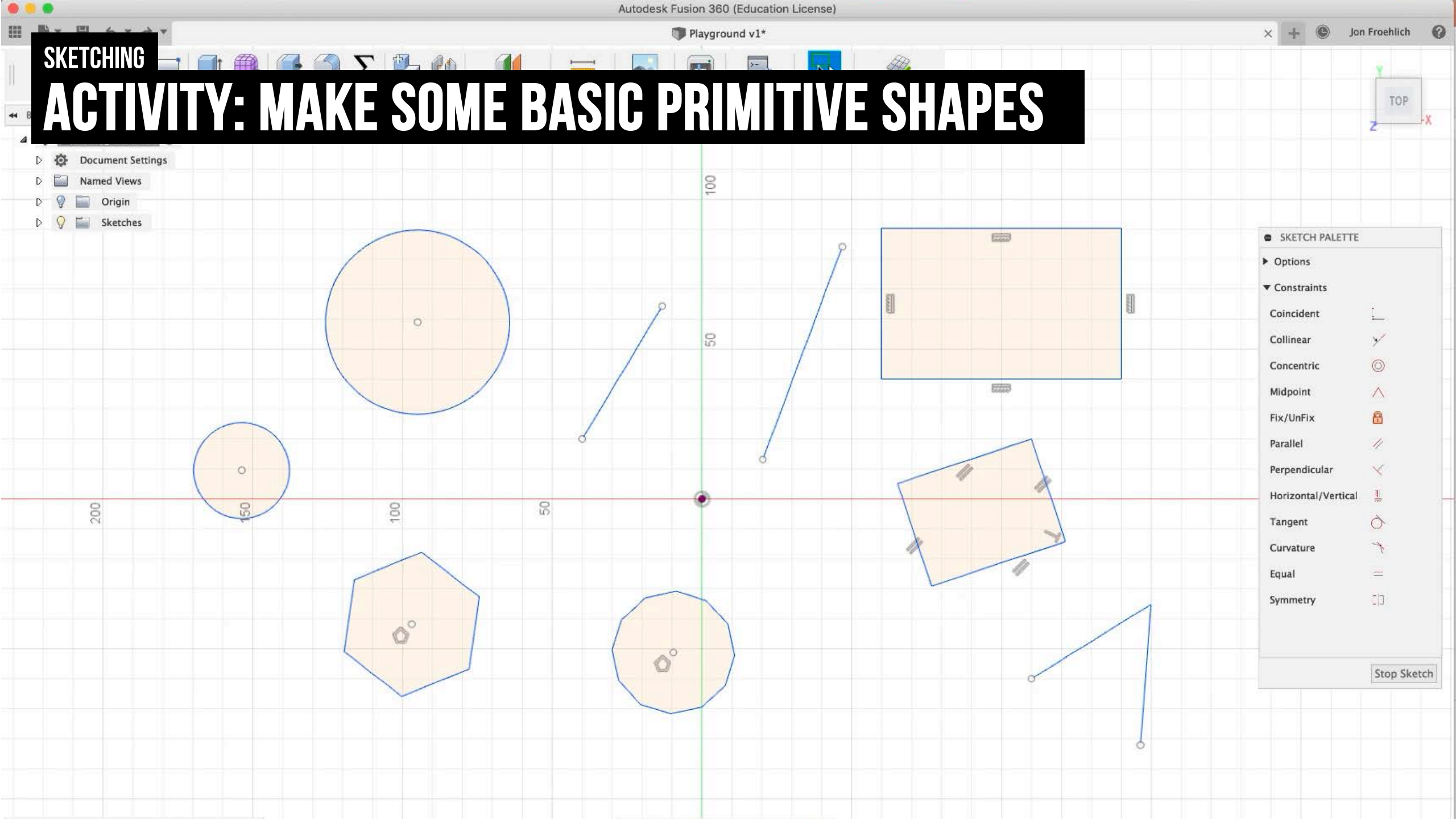
Mac: two-finger pan
Windows: drag middle mouse button

ORBIT

Mac: shift + two-finger pan
Windows: shift + drag middle mouse button

SKETCHING

ACTIVITY: MAKE SOME BASIC PRIMITIVE SHAPES

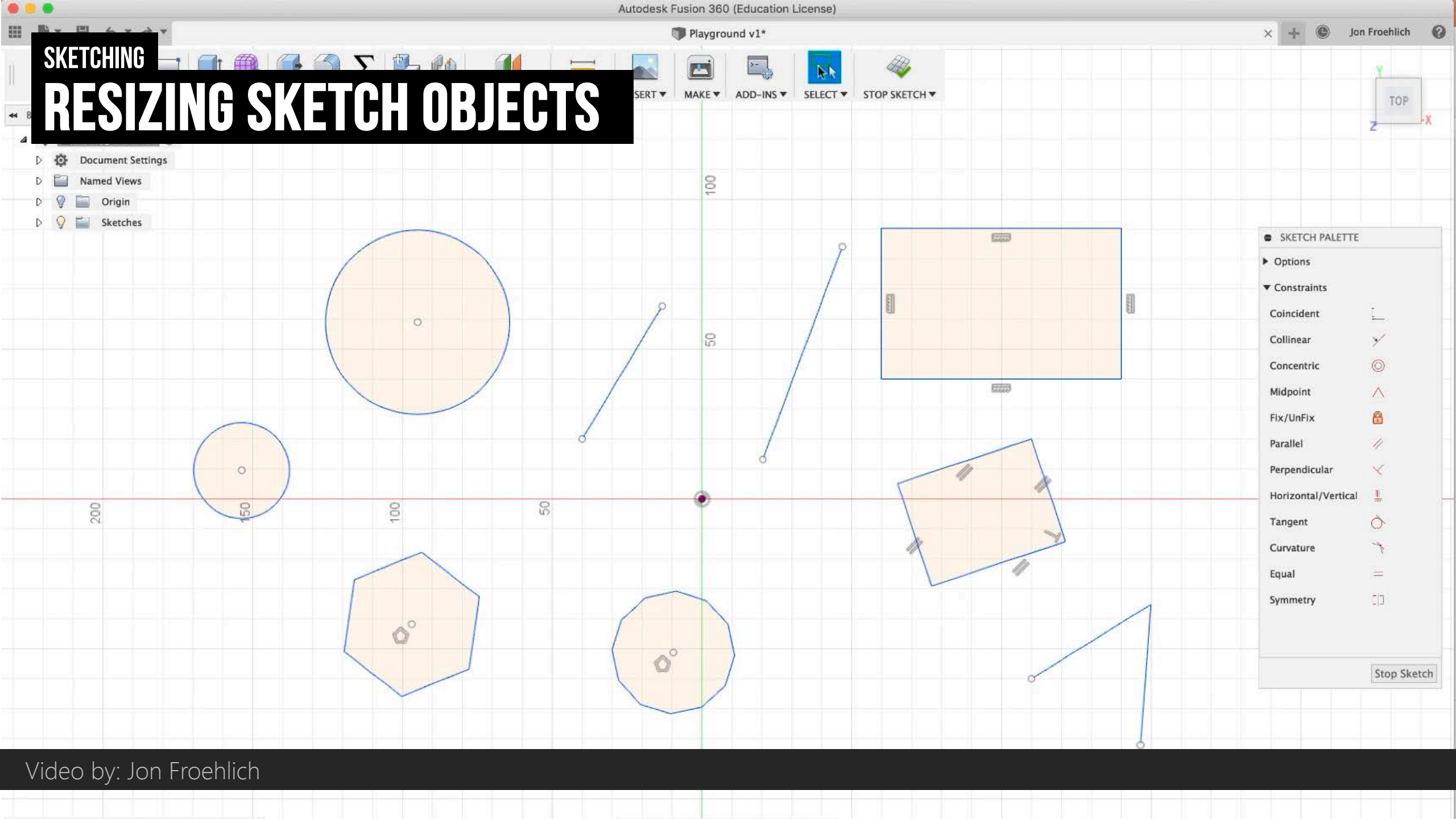


RESIZING SKETCH OBJECTS

Direct manipulation

Dimensions

Some constraints (*e.g.,* Equal)



Video by: Jon Froehlich

SKETCHING

MOVING OBJECTS

Direct manipulation

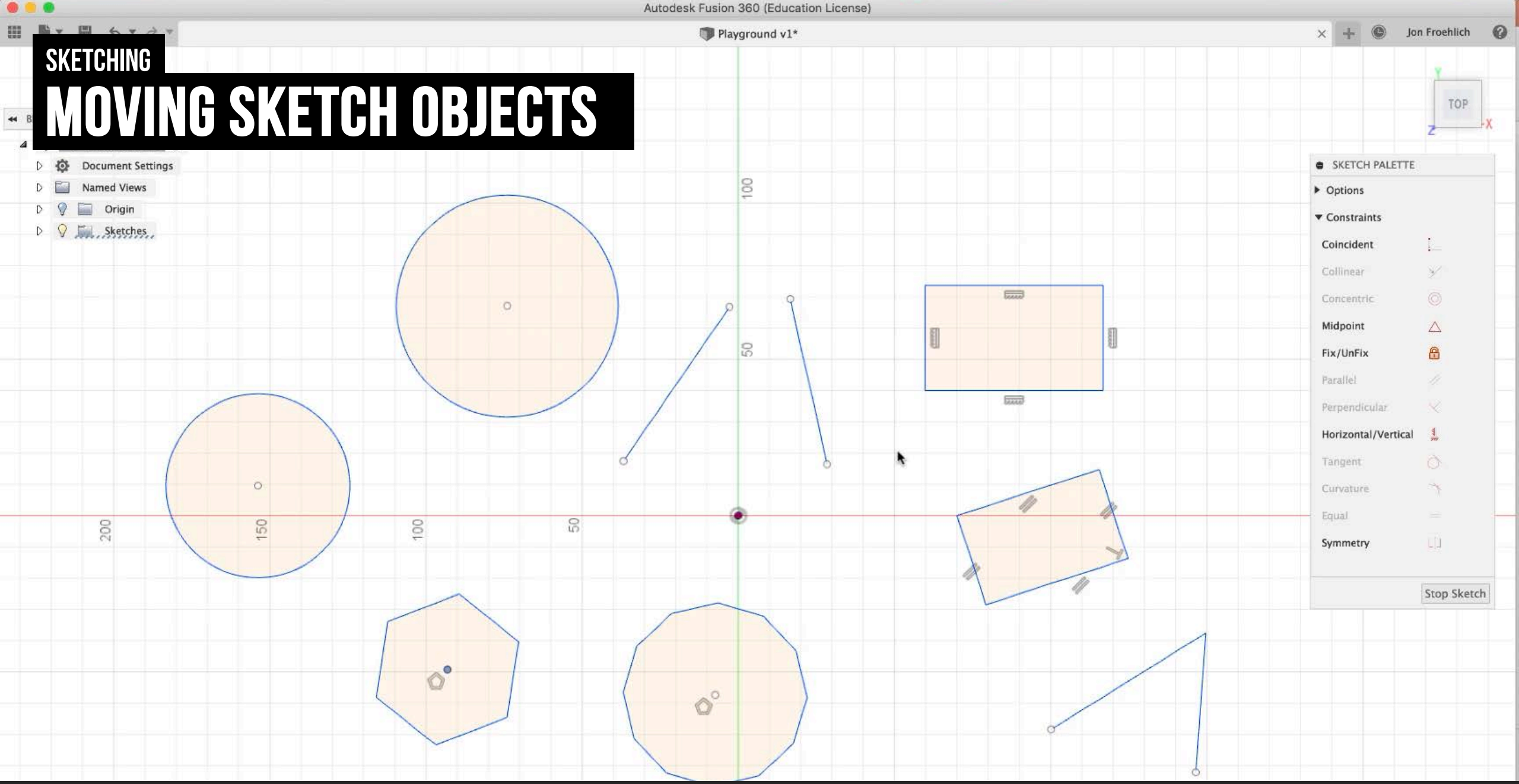
Pop-up menu

Many constraints (*e.g.,* midpoint, tangent, parallel)

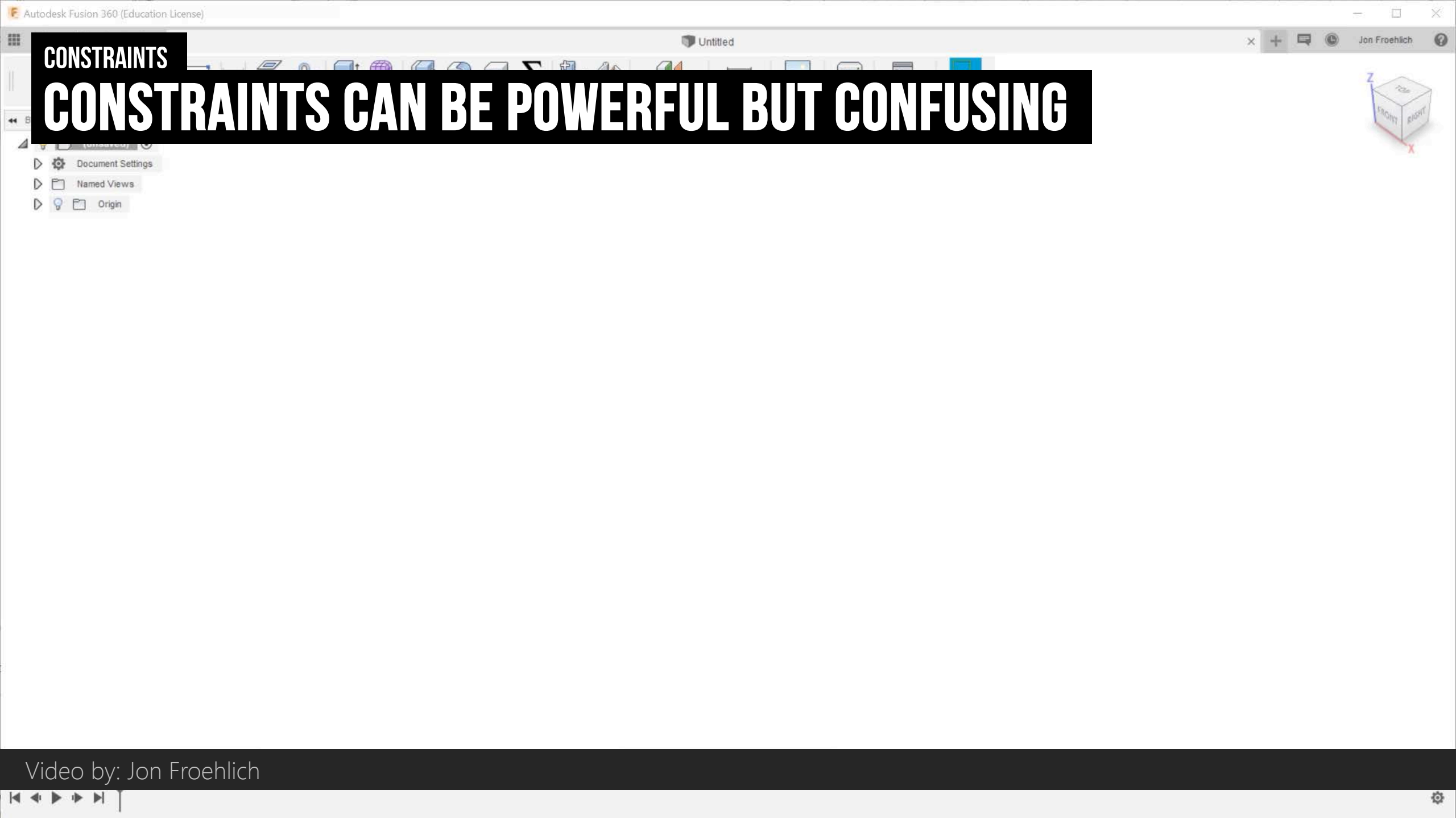
Using dimensions

SKETCHING

MOVING SKETCH OBJECTS



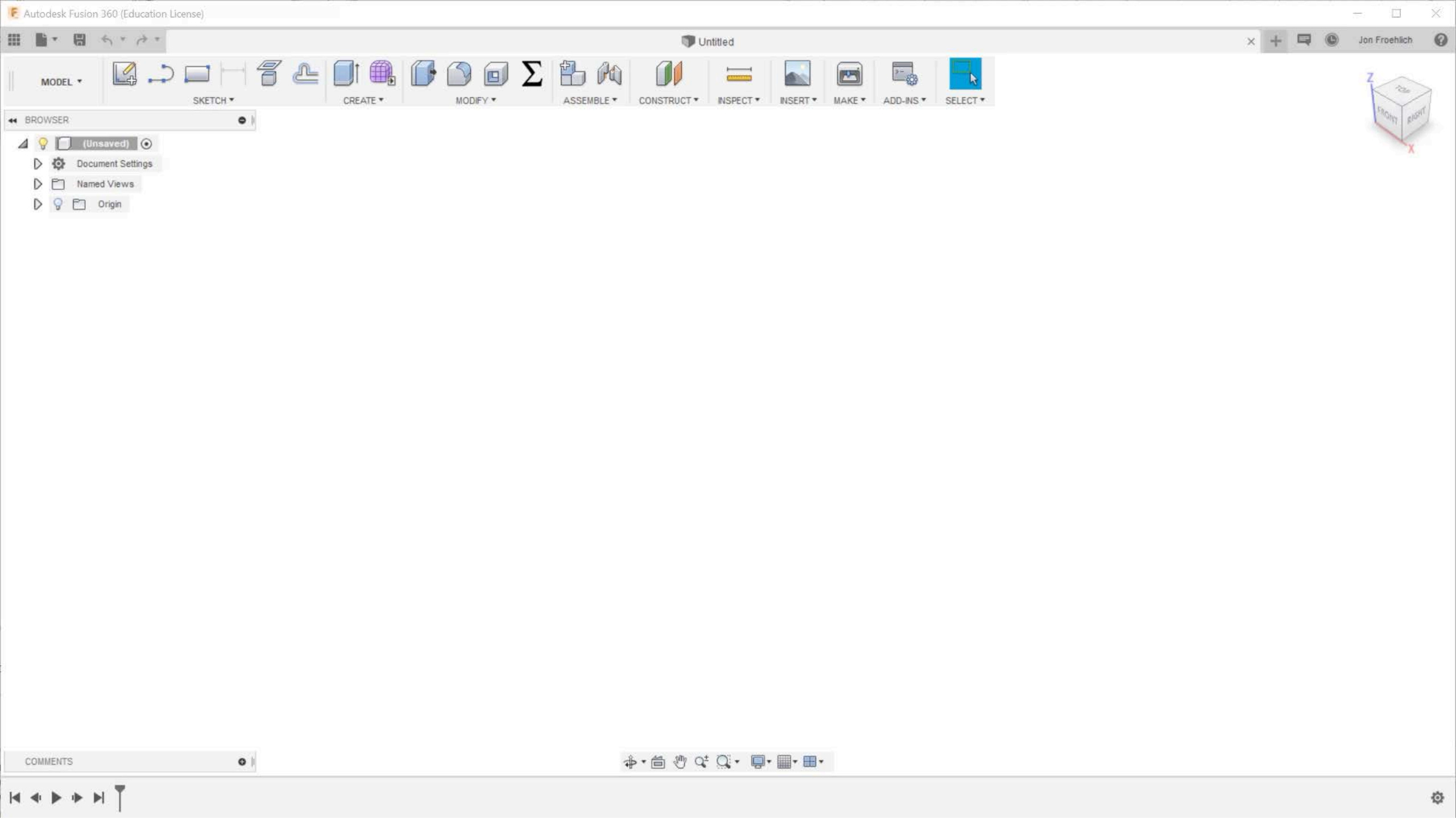
Video by: Jon Froehlich



CONSTRAINTS

CONSTRAINTS CAN BE POWERFUL BUT CONFUSING

Video by: Jon Froehlich


Autodesk Fusion 360 (Education License)
Untitled
Jon Froehlich
MODEL
SKETCH
CREATE
MODIFY
ASSEMBLE
CONSTRUCT
INSPECT
INSERT
MAKE
ADD-INS
SELECT
BROWSER
(Unsaved)
Document Settings
Named Views
Origin
COMMENTS
FRONT
RIGHT
Z
X

SKETCHING

MOVING OBJECTS

Direct manipulation

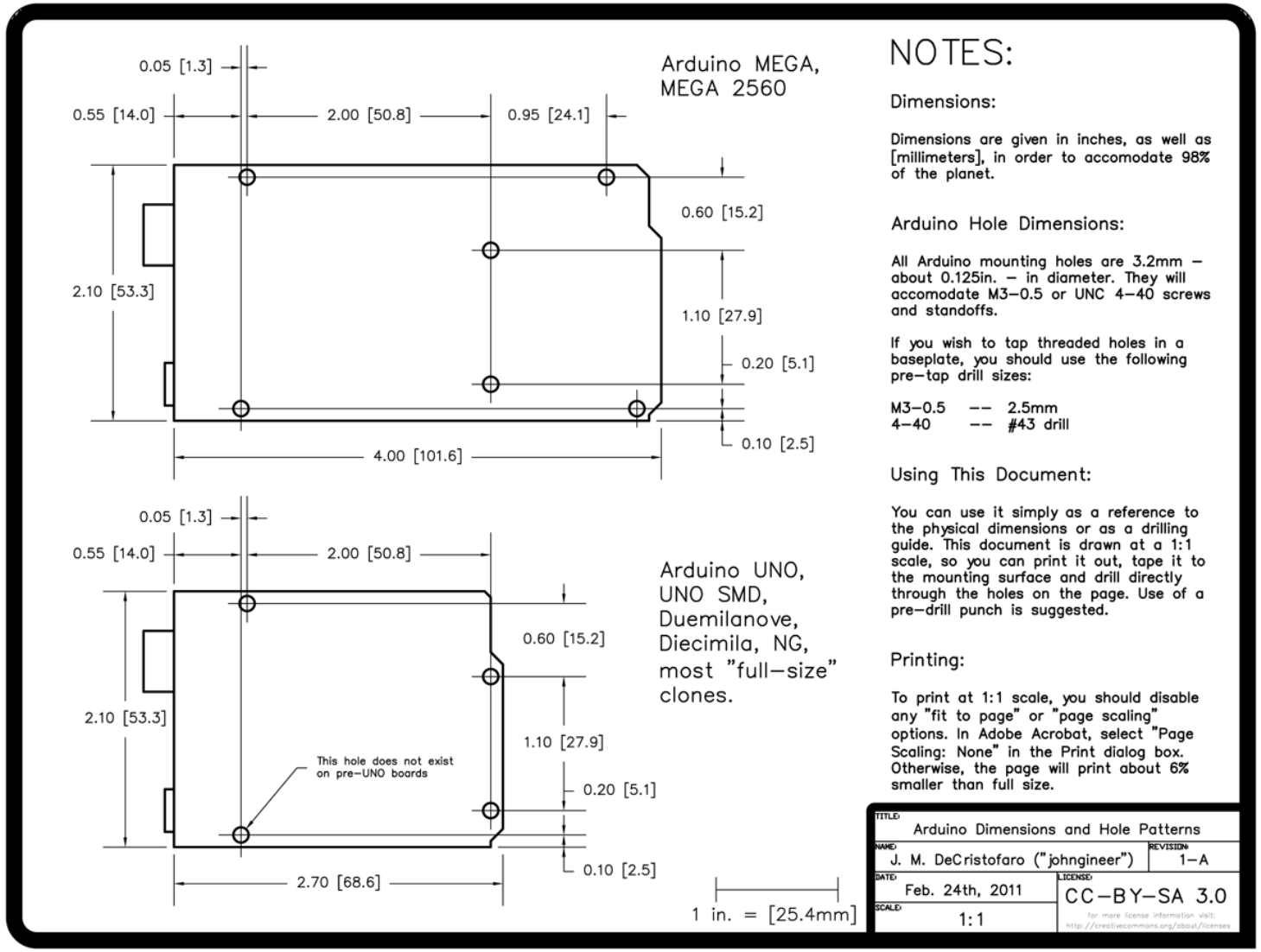
Pop-up menu

Many constraints (*e.g.,* midpoint, tangent, parallel)

Using dimensions

SKETCHING

REFER TO DATASHEETS FOR DIMENSIONS



Source: https://imgur.com/Qu65kad

ARDUINO UNO DIMENSIONS

NOTES:

Dimensions:

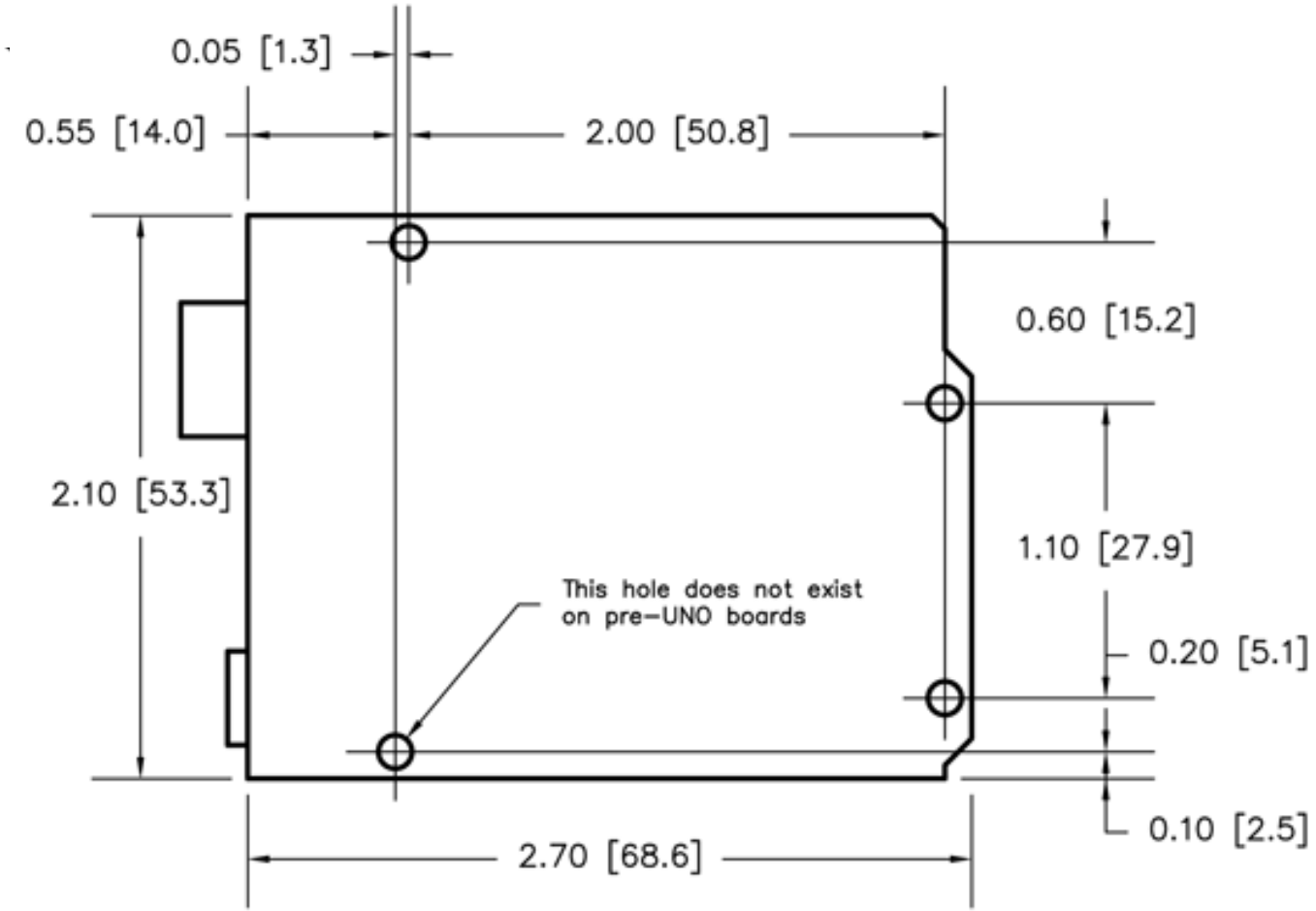
Dimensions are given in inches, as well as [millimeters], in order to accomodate 98% of the planet.

Arduino Hole Dimensions:

All Arduino mounting holes are 3.2mm – about 0.125in. – in diameter. They will accomodate M3–0.5 or UNC 4–40 screws and standoffs.

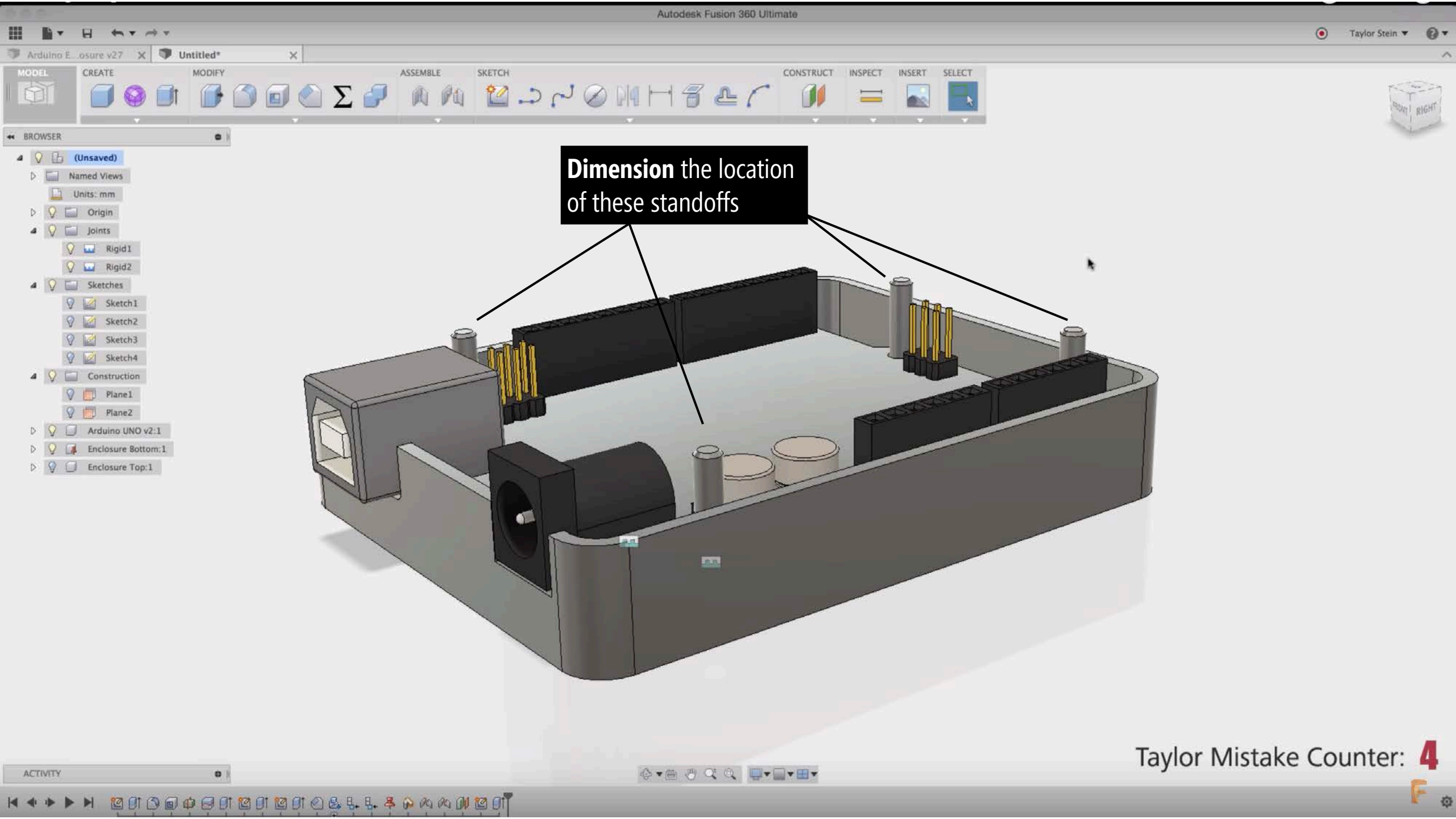
If you wish to tap threaded holes in a baseplate, you should use the following pre–tap drill sizes:

M3–0.5 –– 2.5mm
4–40 –– #43 drill



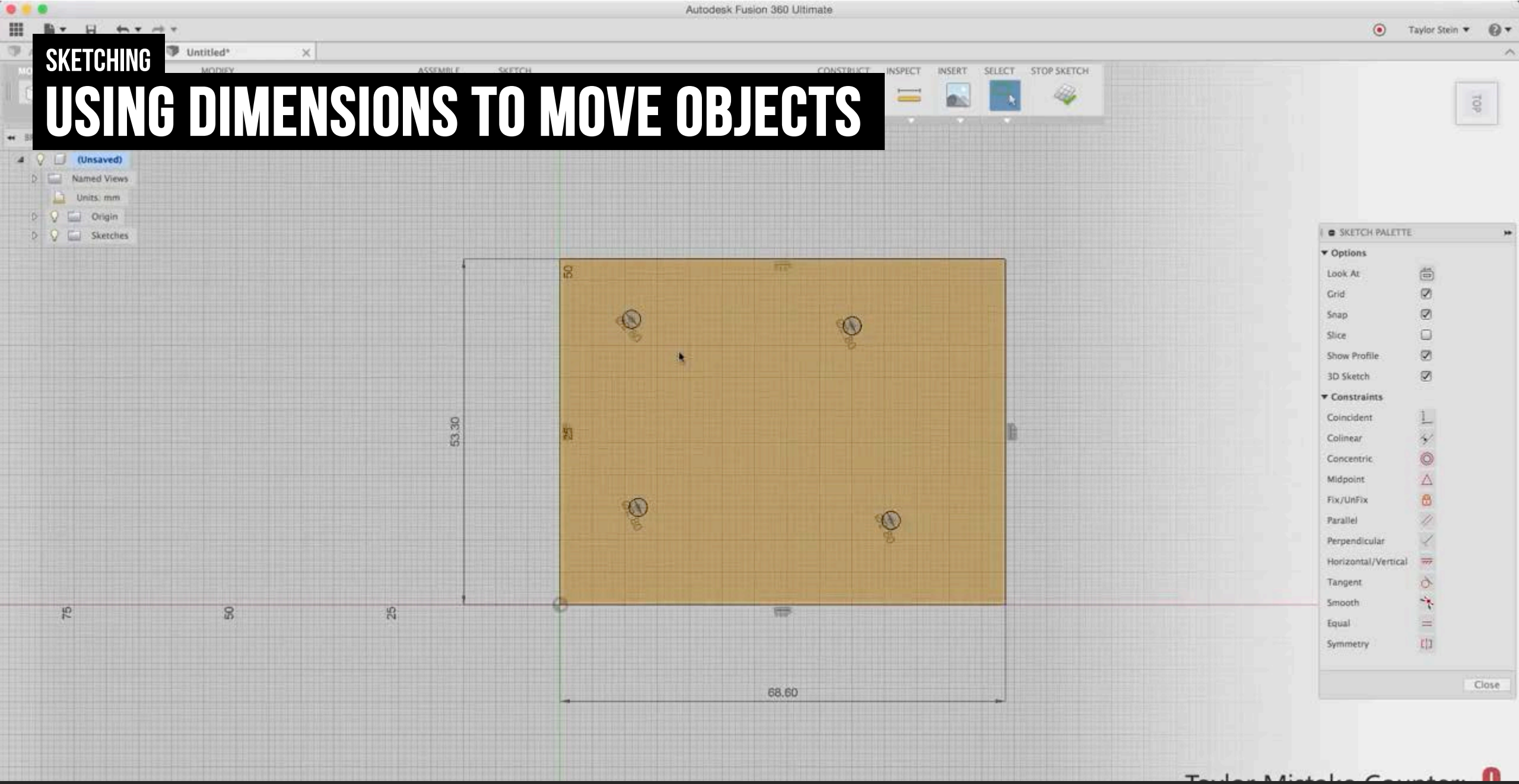
Arduino UNO, UNO SMD, Duemilanove, Diecimila, NG, most "full–size" clones.

1 in. = [25.4mm]


Autodesk Fusion 360 Ultimate
Taylor Stein
Untitled*
MODEL
CREATE
MODIFY
ASSEMBLE
SKETCH
CONSTRUCT
INSPECT
INSERT
SELECT
BROWSER
(Unsaved)
Named Views
Units: mm
Origin
Joints
Rigid1
Rigid2
Sketches
Sketch1
Sketch2
Sketch3
Sketch4
Construction
Plane1
Plane2
Arduino UNO v2:1
Enclosure Bottom:1
Enclosure Top:1
Dimension the location of these standoffs
ACTIVITY
Taylor Mistake Counter: 4

SKETCHING

USING DIMENSIONS TO MOVE OBJECTS



Source: Autodesk Fusion 360 Tutorial Series, https://youtu.be/E0bhdr84FNU

Autodesk Fusion 360 Ultimate

Taylor Stein

Arduino E...osure v27 | Untitled*

MODEL | CREATE | MODIFY | ASSEMBLE | SKETCH | CONSTRUCT | INSPECT | INSERT | SELECT | STOP SKETCH

BROWSER

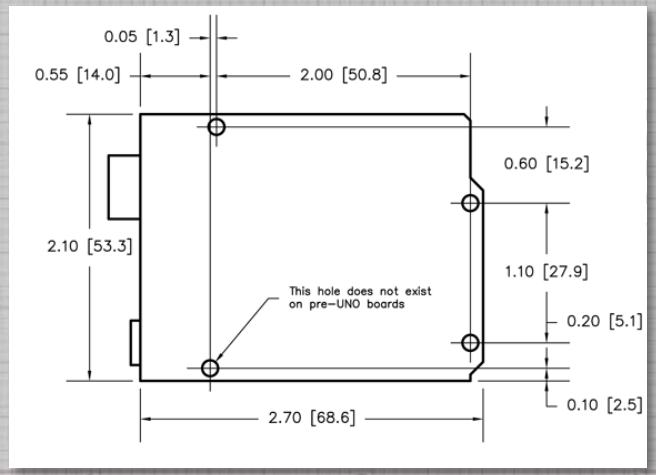
(Unsaved)

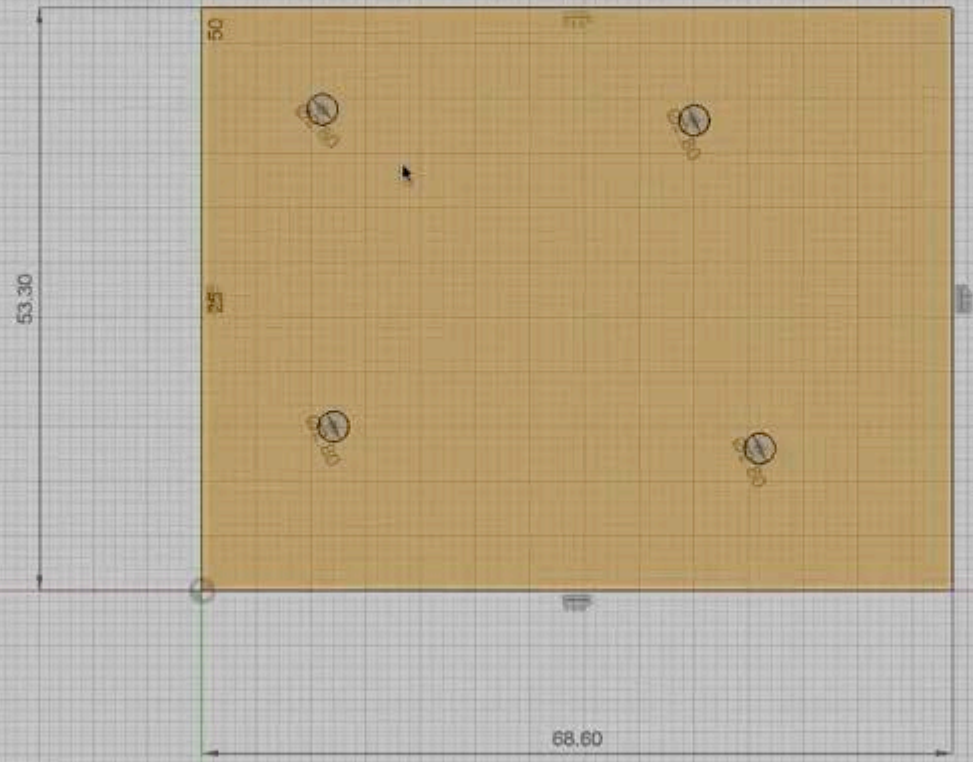
Named Views

Units: mm

Origin

Sketches





SKETCH PALETTE

Options

Look At

Grid

Snap

Slice

Show Profile

3D Sketch

Constraints

Coincident

Colinear

Concentric

Midpoint

Fix/UnFix

Parallel

Perpendicular

Horizontal/Vertical

Tangent

Smooth

Equal

Symmetry

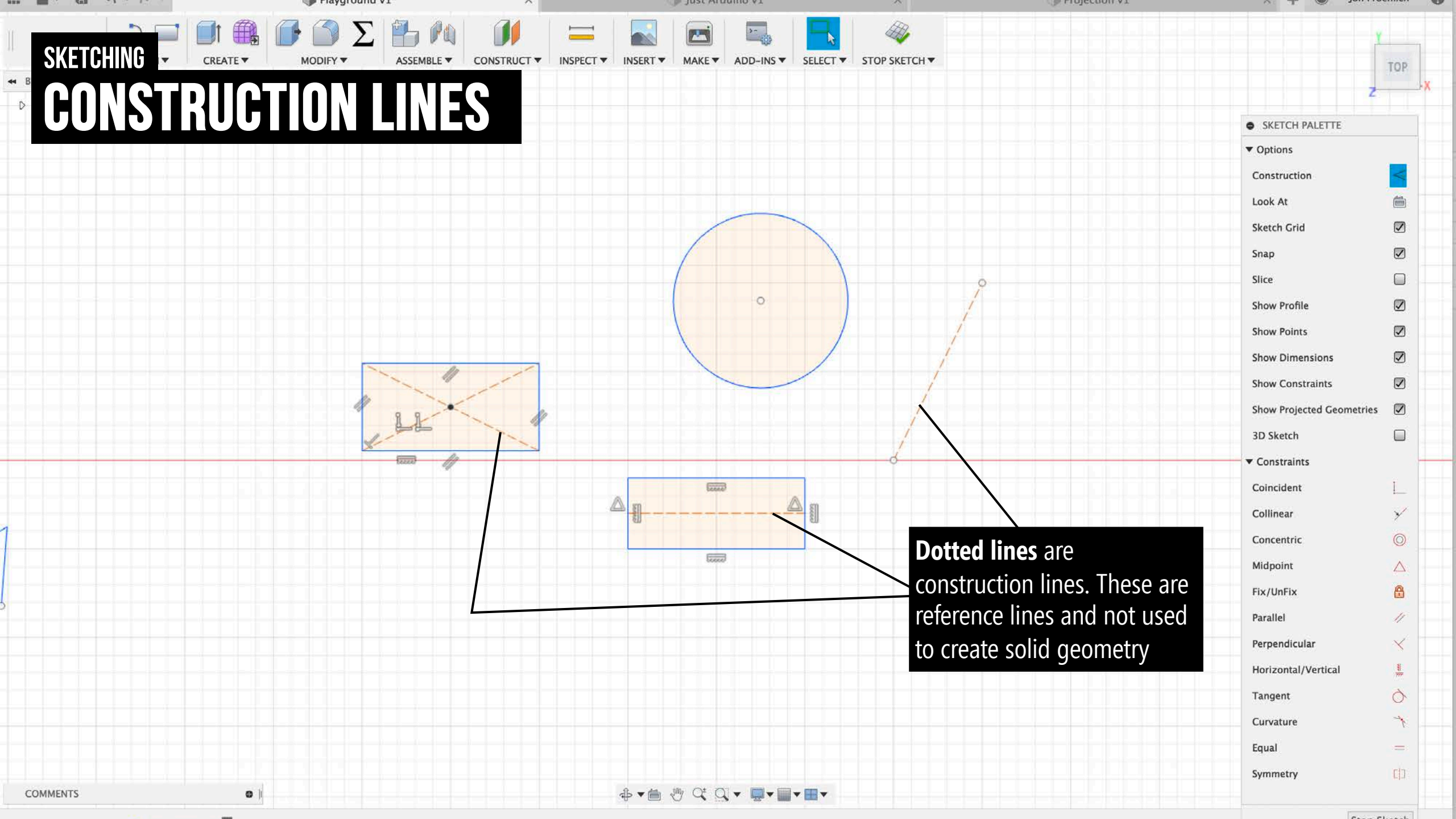
Close

ACTIVITY

Taylor Mistake Counter: 0

SKETCHING

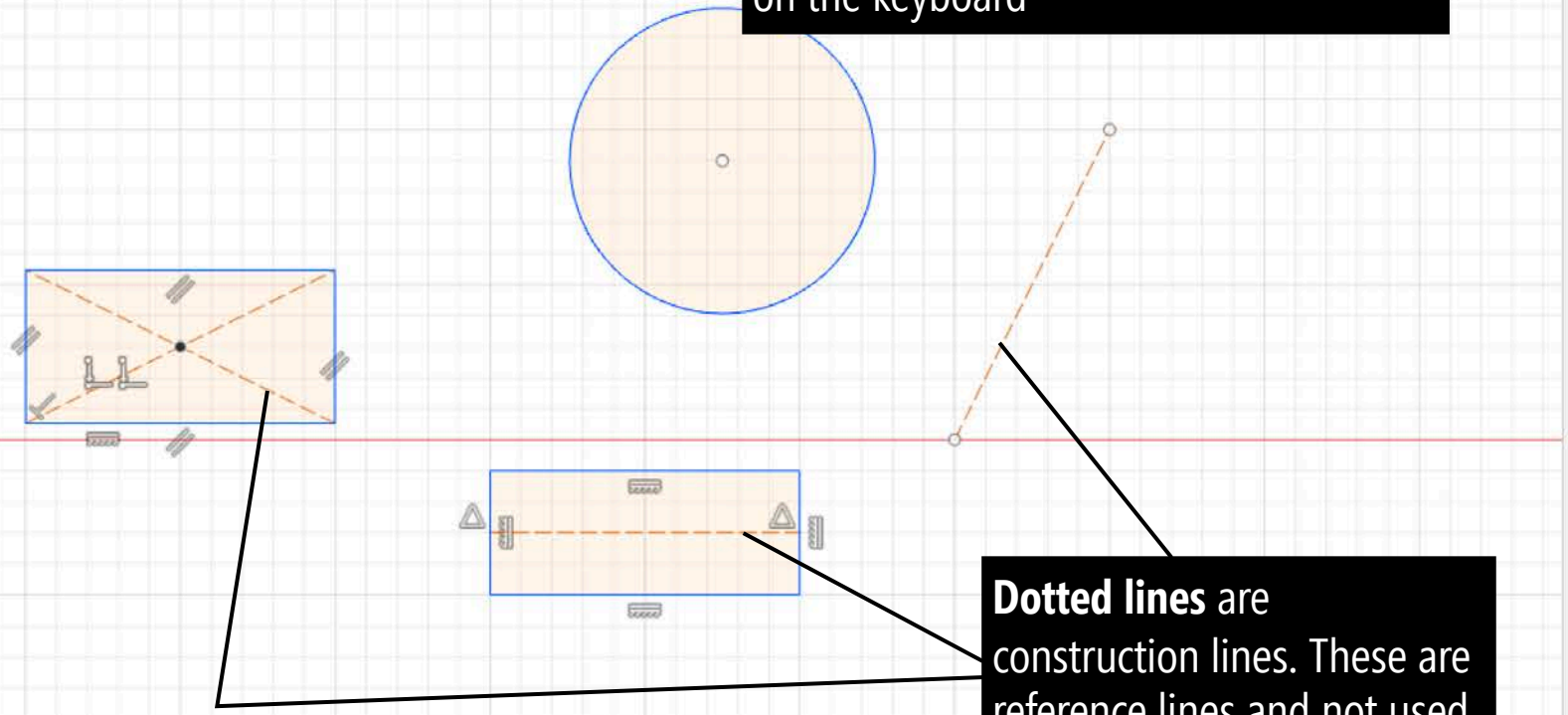
CONSTRUCTION LINES



SKETCHING

CONSTRUCTION LINES

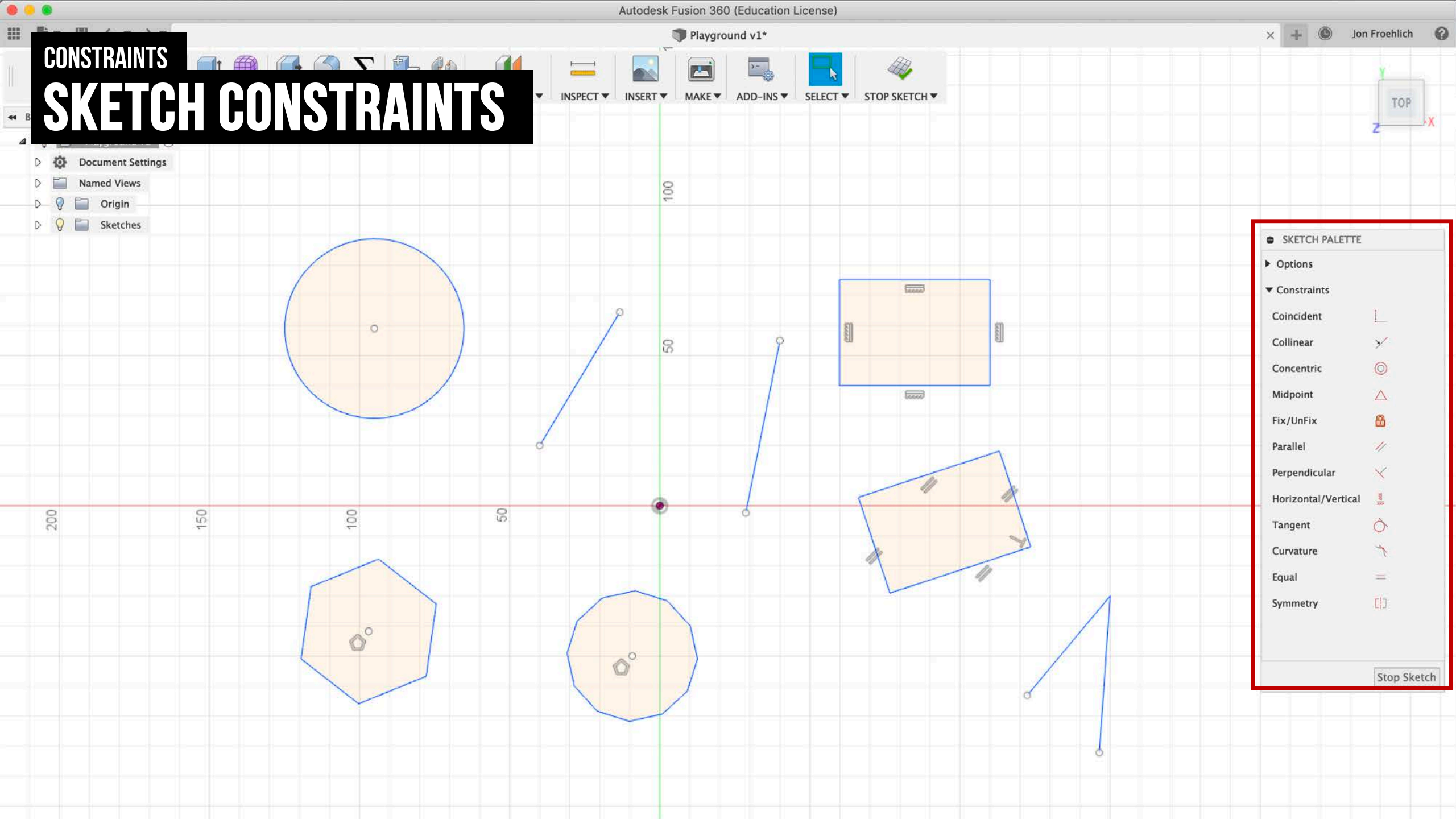
To convert a geometry to a construction reference, select the line and then this 'Construction' icon. You can also hit 'x' on the keyboard



Dotted lines are construction lines. These are reference lines and not used to create solid geometry

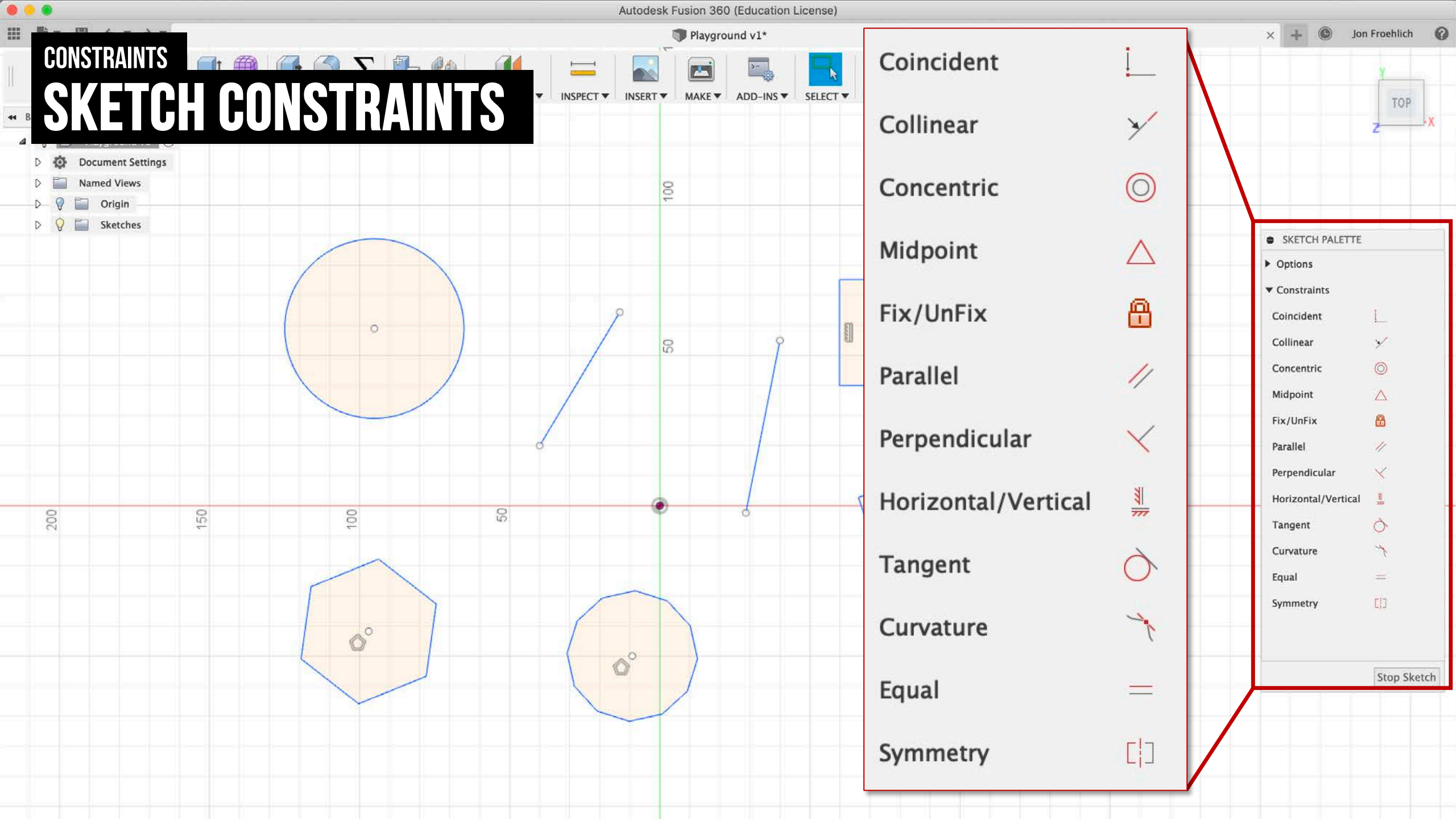
CONSTRAINTS

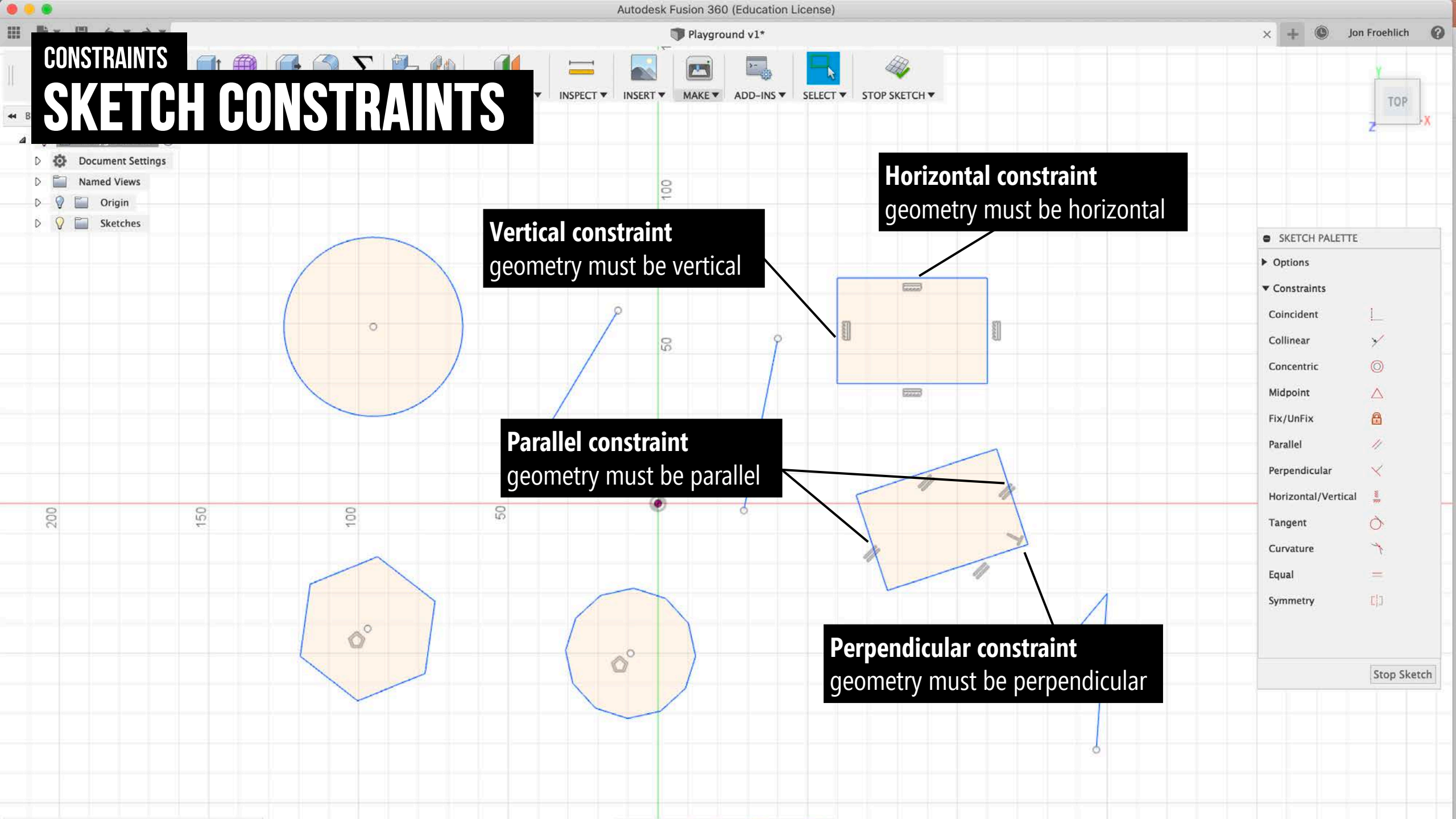
SKETCH CONSTRAINTS

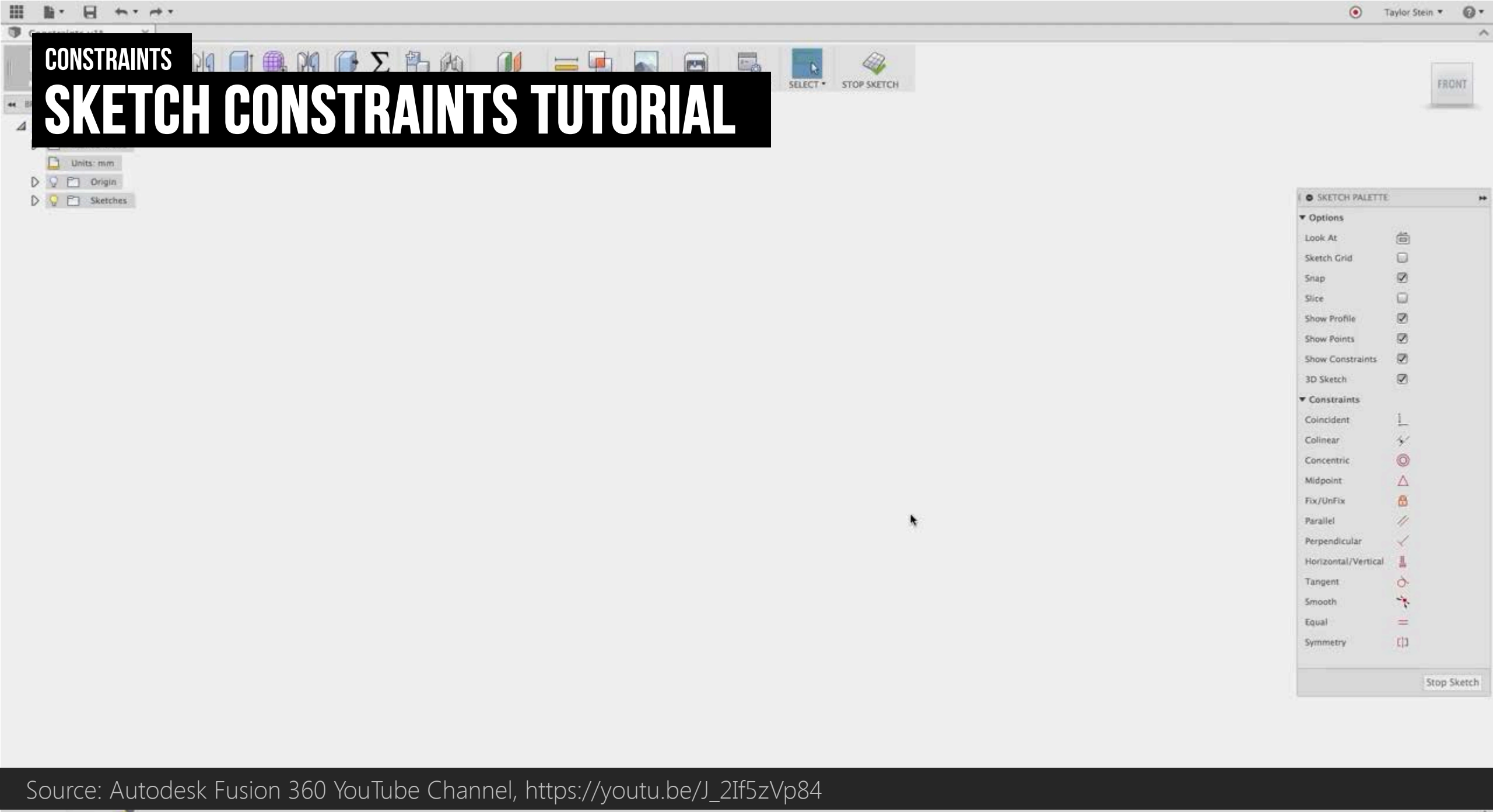


CONSTRAINTS

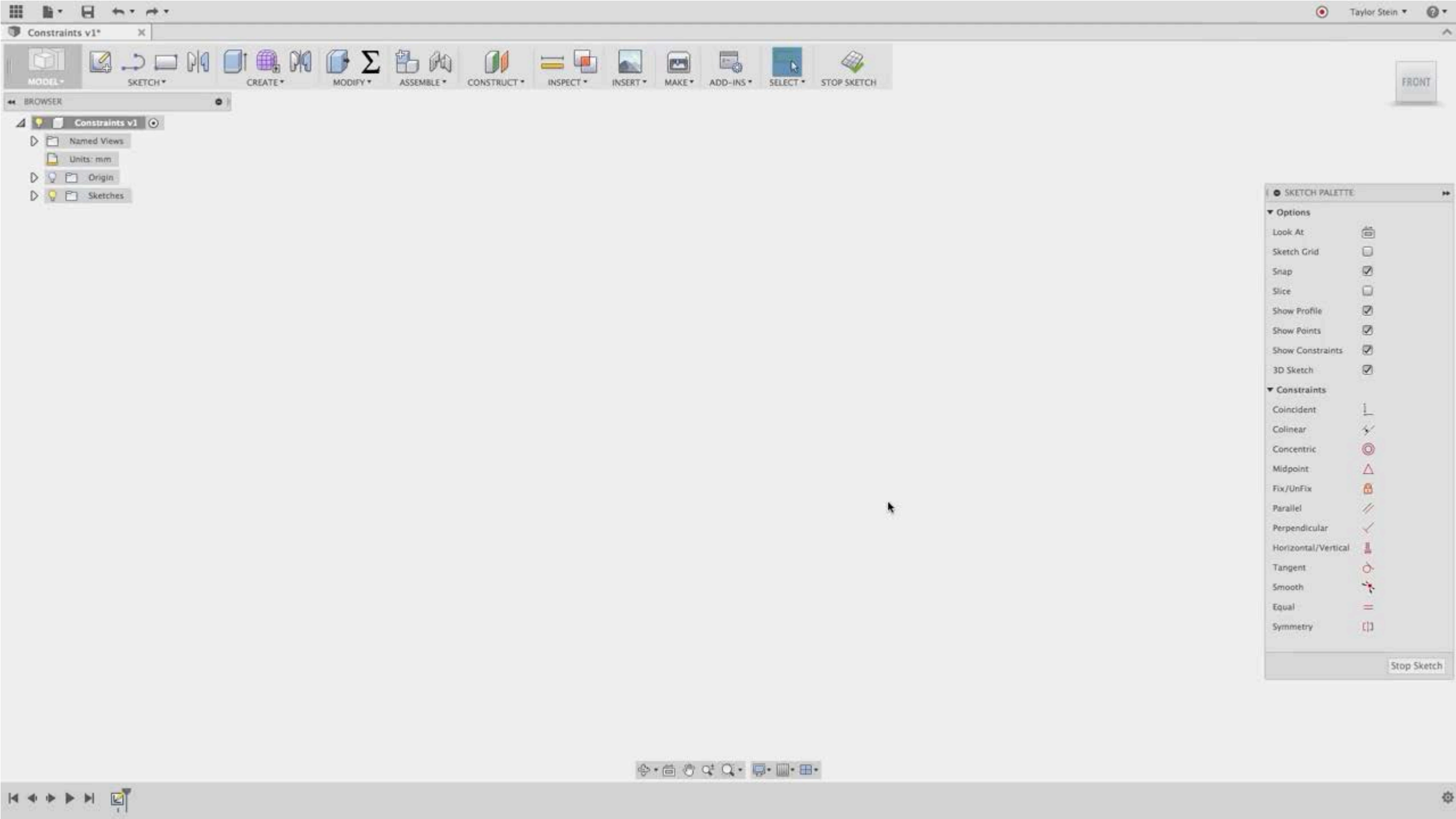
SKETCH CONSTRAINTS




Autodesk Fusion 360 (Education License)
Playground v1*
Jon Froehlich
CONSTRAINTS
SKETCH CONSTRAINTS
INSPECT
INSERT
MAKE
ADD-INS
SELECT
STOP SKETCH
Document Settings
Named Views
Origin
Sketches
TOP
Horizontal constraint
geometry must be horizontal
Vertical constraint
geometry must be vertical
Parallel constraint
geometry must be parallel
Perpendicular constraint
geometry must be perpendicular
SKETCH PALETTE
Options
Constraints
Coincident
Collinear
Concentric
Midpoint
Fix/UnFix
Parallel
Perpendicular
Horizontal/Vertical
Tangent
Curvature
Equal
Symmetry
Stop Sketch

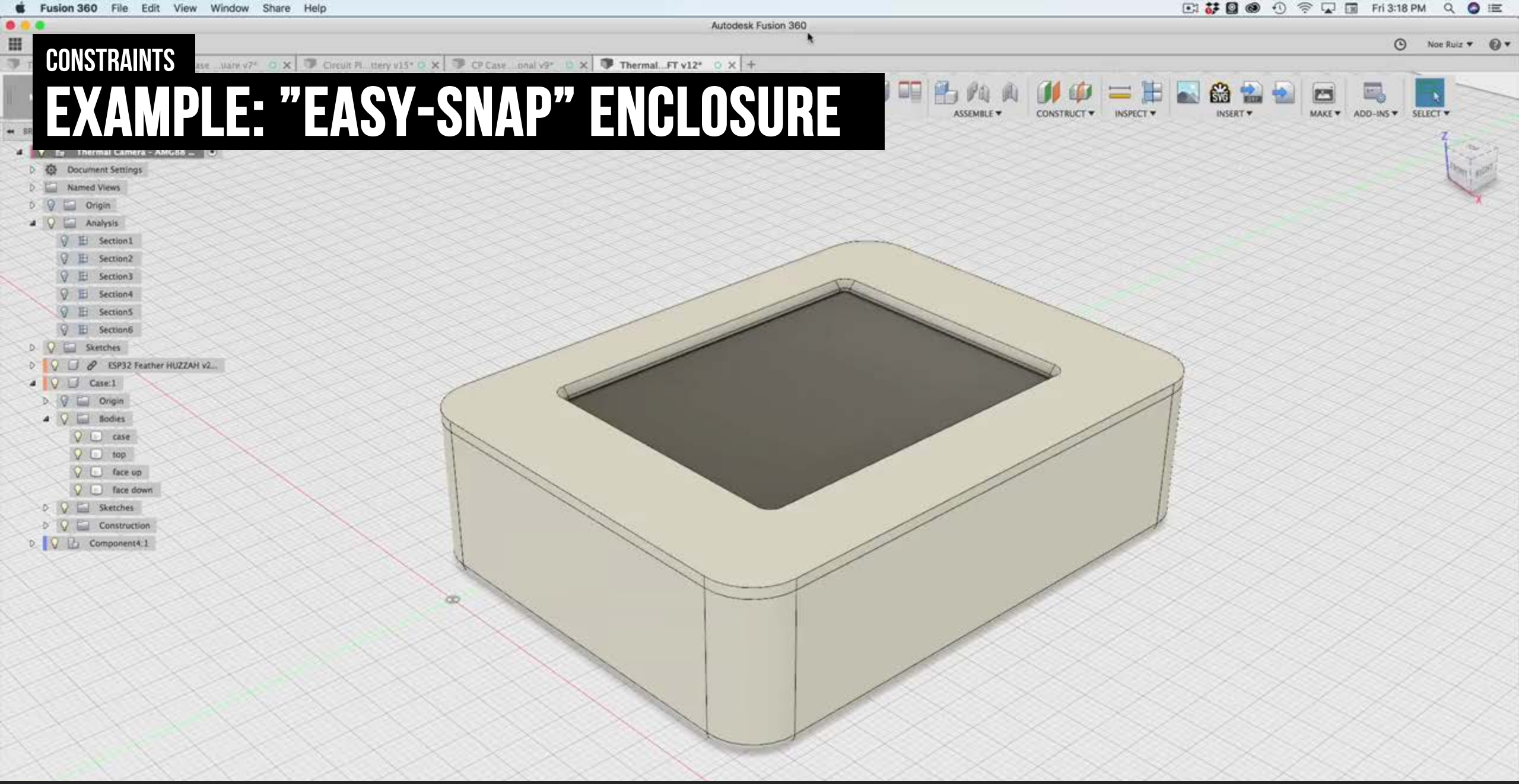


Source: Autodesk Fusion 360 YouTube Channel, https://youtu.be/J_2If5zVp84

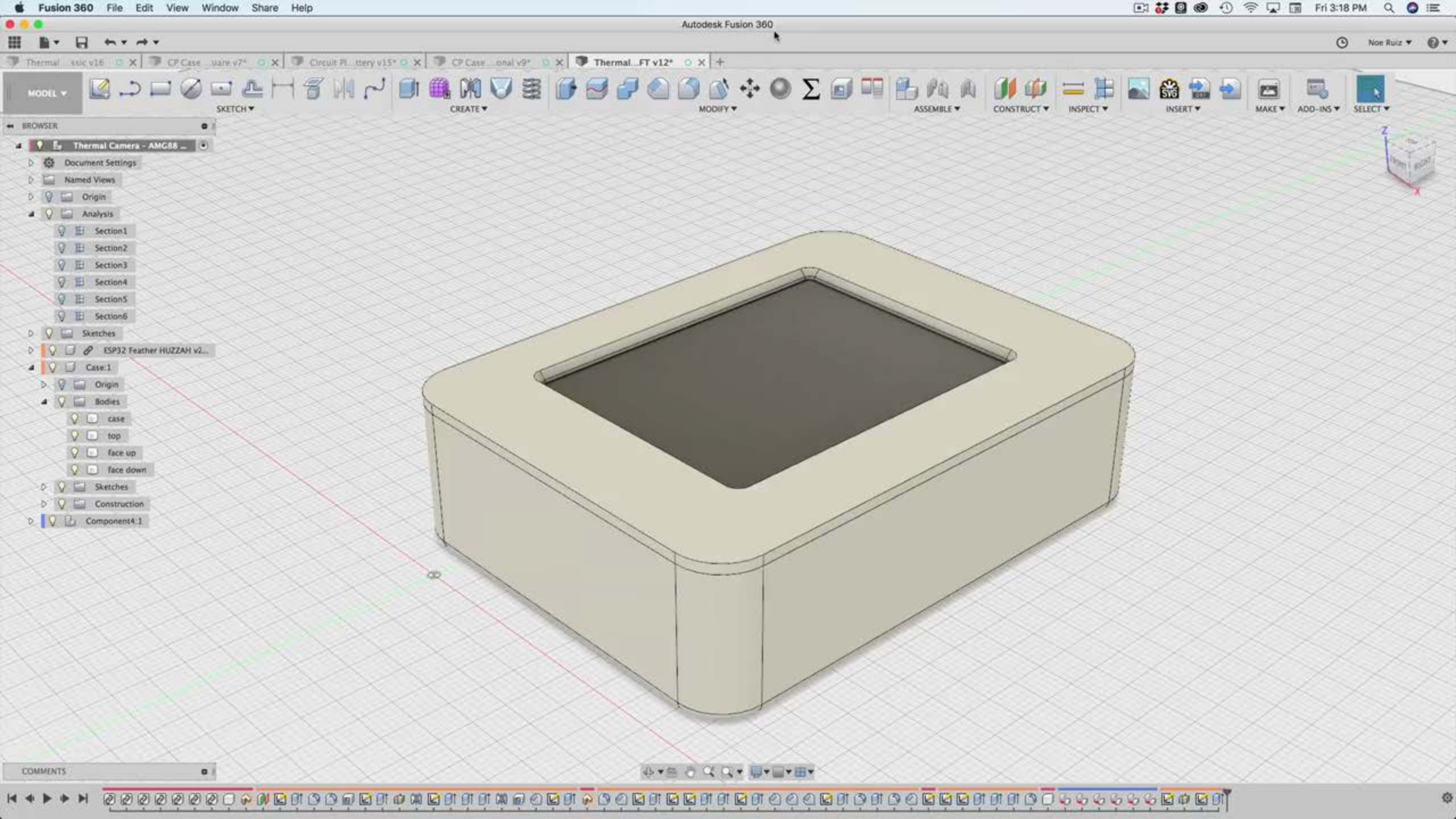

Constraints v1*
Taylor Stein
MODEL
SKETCH
CREATE
MODIFY
ASSEMBLE
CONSTRUCT
INSPECT
INSERT
MAKE
ADD-INS
SELECT
STOP SKETCH
FRONT
BROWSER
Constraints v1
Named Views
Units: mm
Origin
Sketches
SKETCH PALETTE
Options
Look At
Sketch Grid
Snap
Slice
Show Profile
Show Points
Show Constraints
3D Sketch
Constraints
Coincident
Colinear
Concentric
Midpoint
Fix/UnFix
Parallel
Perpendicular
Horizontal/Vertical
Tangent
Smooth
Equal
Symmetry
Stop Sketch

CONSTRAINTS

EXAMPLE: ”EASY-SNAP” ENCLOSURE



Source: Adafruit Fusion 360 Tutorial Series, https://youtu.be/VVmOtM60VWw


Fusion 360 File Edit View Window Share Help
Fri 3:18 PM
Autodesk Fusion 360
Noe Ruiz
Thermal...FT v12*
MODEL
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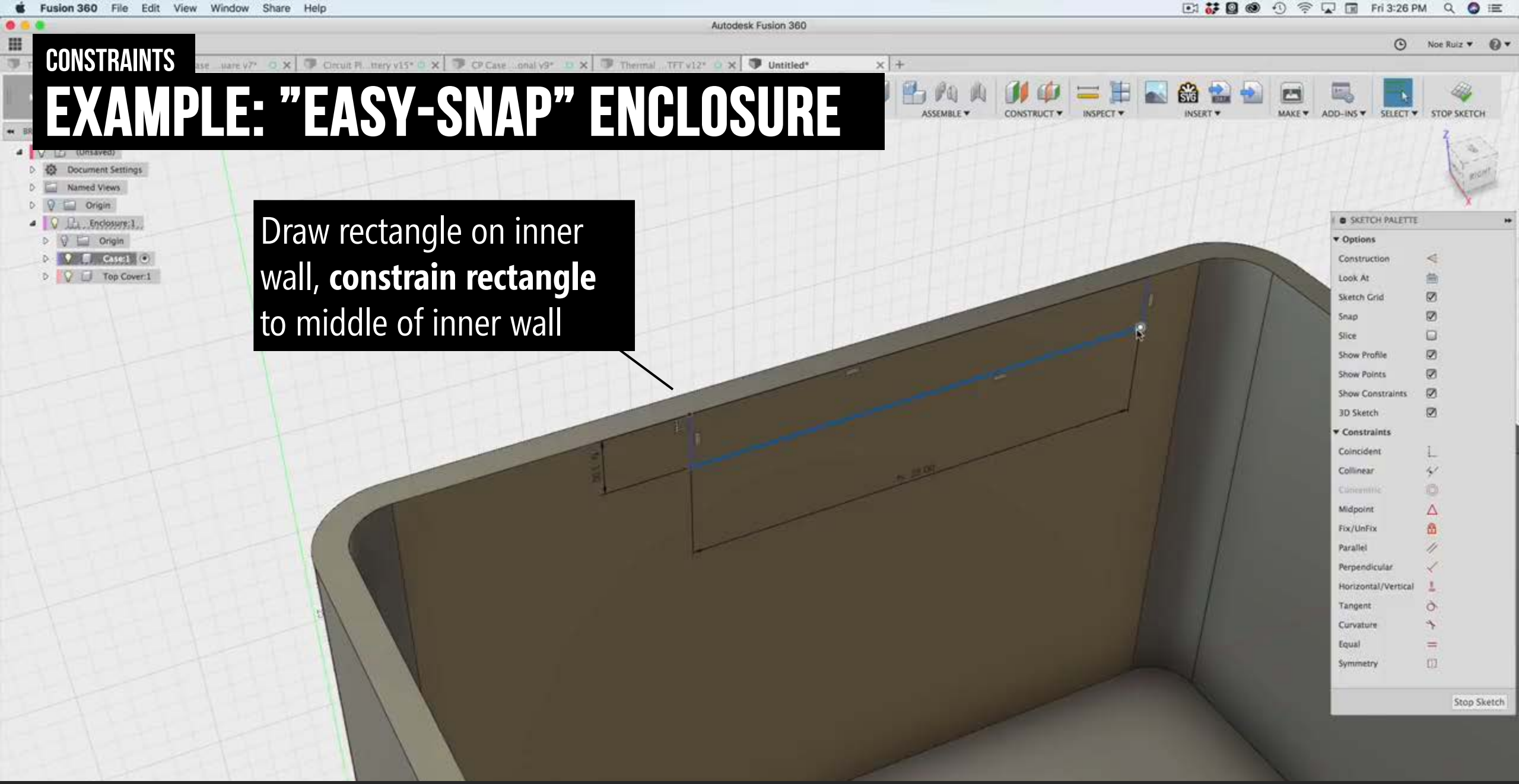
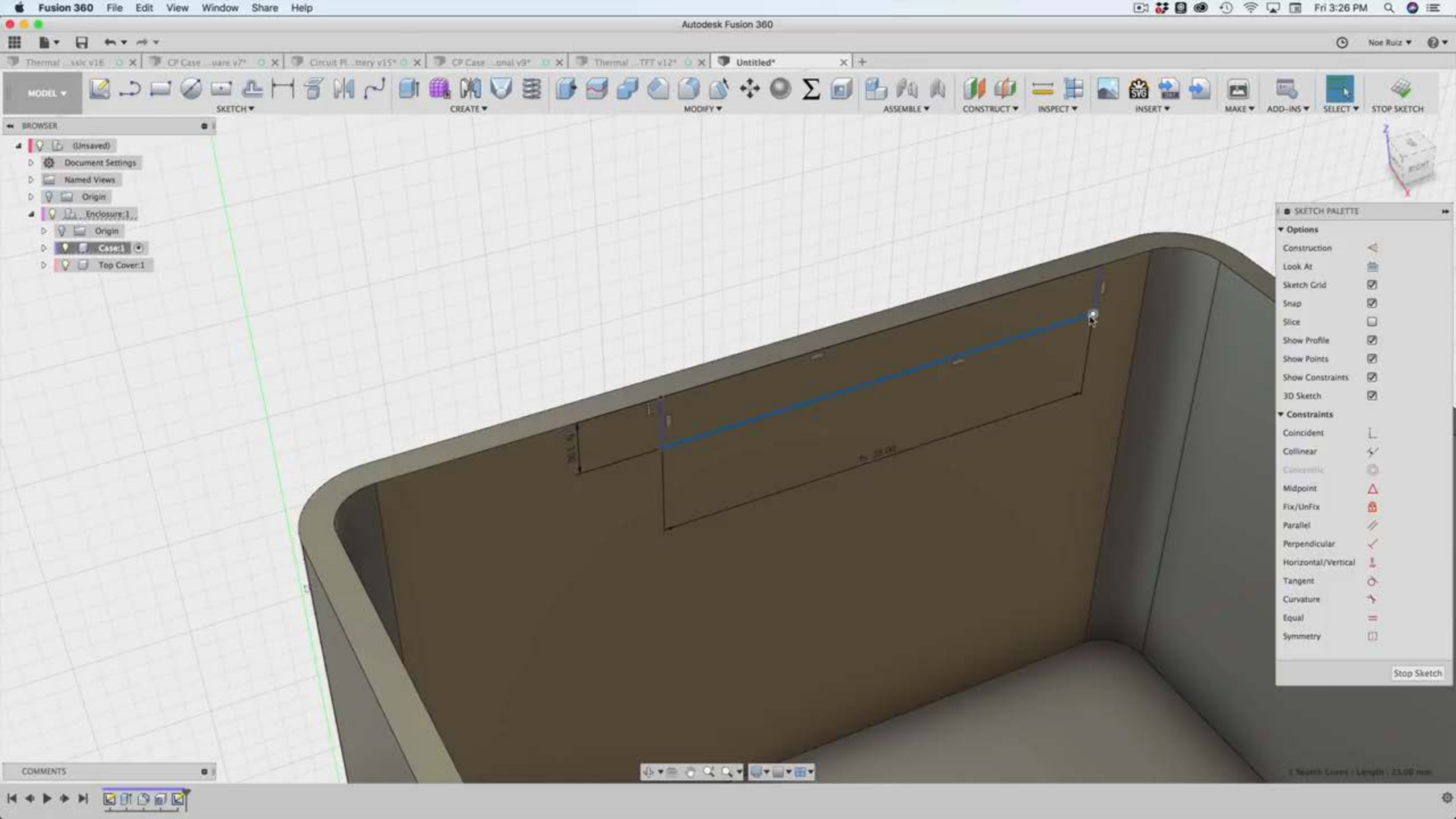
ASSEMBLE
CONSTRUCT
INSPECT
INSERT
MAKE
ADD-INS
SELECT
BROWSER
Thermal Camera - AMG88 ...
Document Settings
Named Views
Origin
Analysis
Section1
Section2
Section3
Section4
Section5
Section6
Sketches
ESP32 Feather HUZZAH v2...
Case:1
Origin
Bodies
case
top
face up
face down
Sketches
Construction
Component4:1
COMMENTS

CONSTRAINTS

EXAMPLE: ”EASY-SNAP” ENCLOSURE



Source: Adafruit Fusion 360 Tutorial Series, https://youtu.be/VVmOtM60VWw


Fusion 360 File Edit View Window Share Help
Fri 3:26 PM
Autodesk Fusion 360
Noe Ruiz
Untitled*
MODEL
SKETCH
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MODIFY
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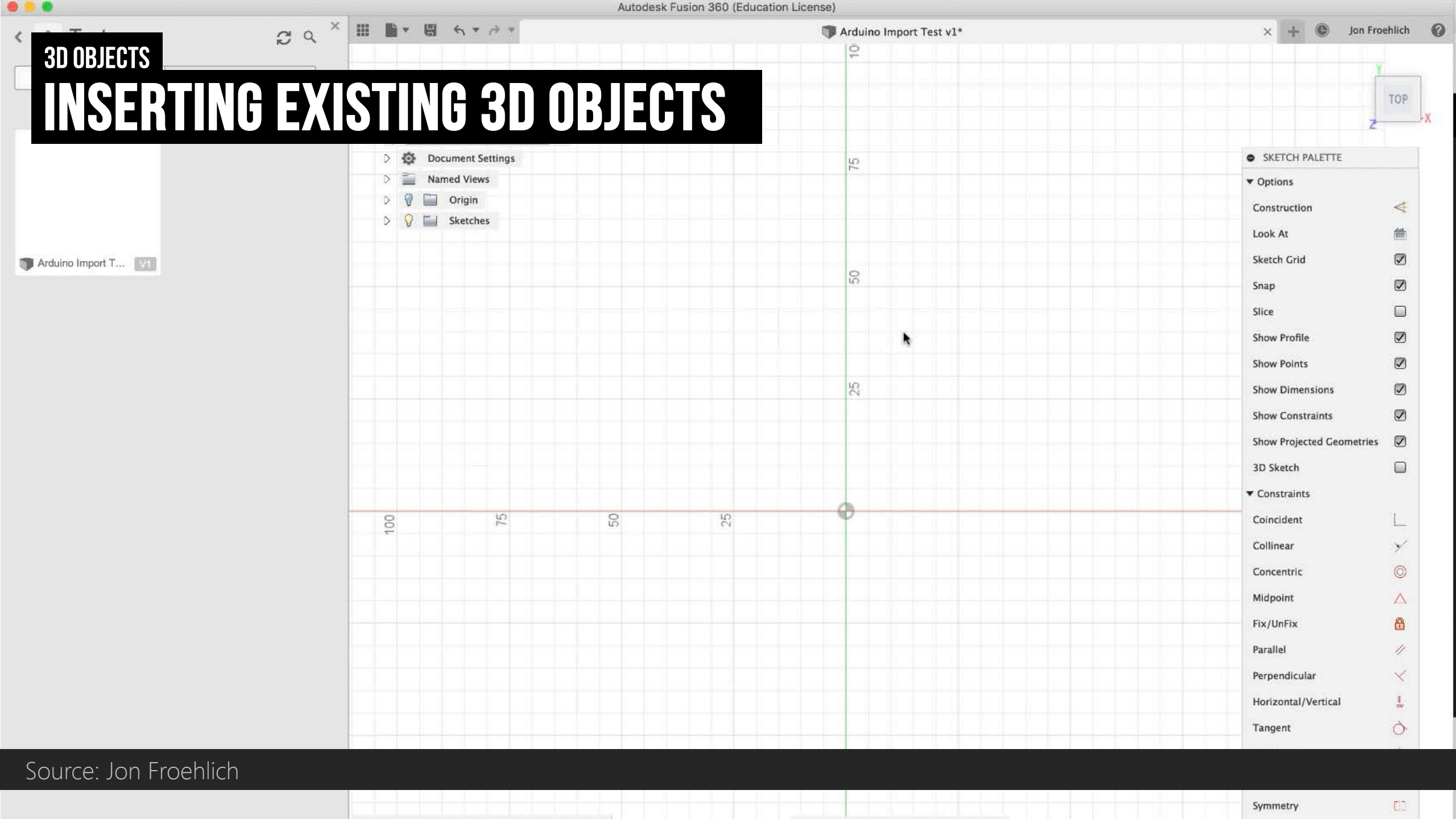
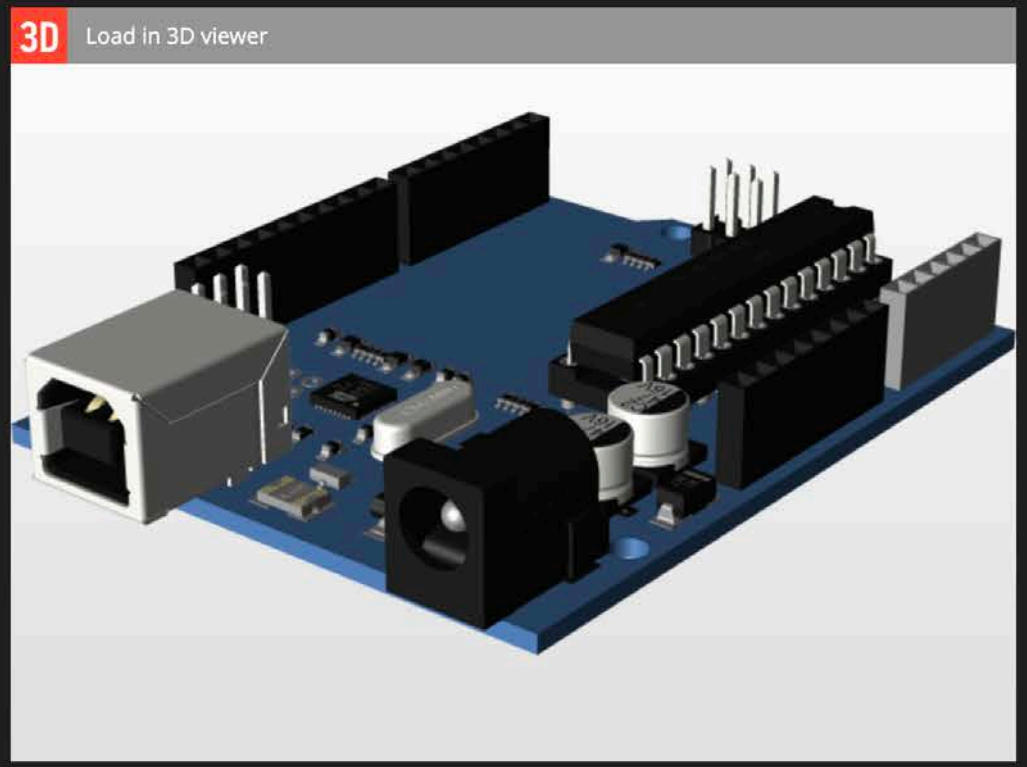
CONSTRUCT
INSPECT
INSERT
MAKE
ADD-INS
SELECT
STOP SKETCH
BROWSER
(Unsaved)
Document Settings
Named Views
Origin
Enclosure:1
Origin
Case:1
Top Cover:1
SKETCH PALETTE
Options
Construction
Look At
Sketch Grid
Snap
Slice
Show Profile
Show Points
Show Constraints
3D Sketch
Constraints
Coincident
Collinear
Midpoint
Fix/UnFix
Parallel
Perpendicular
Horizontal/Vertical
Tangent
Curvature
Equal
Symmetry
Stop Sketch
COMMENTS



3D OBJECTS

INSERTING EXISTING 3D OBJECTS

Source: Jon Froehlich

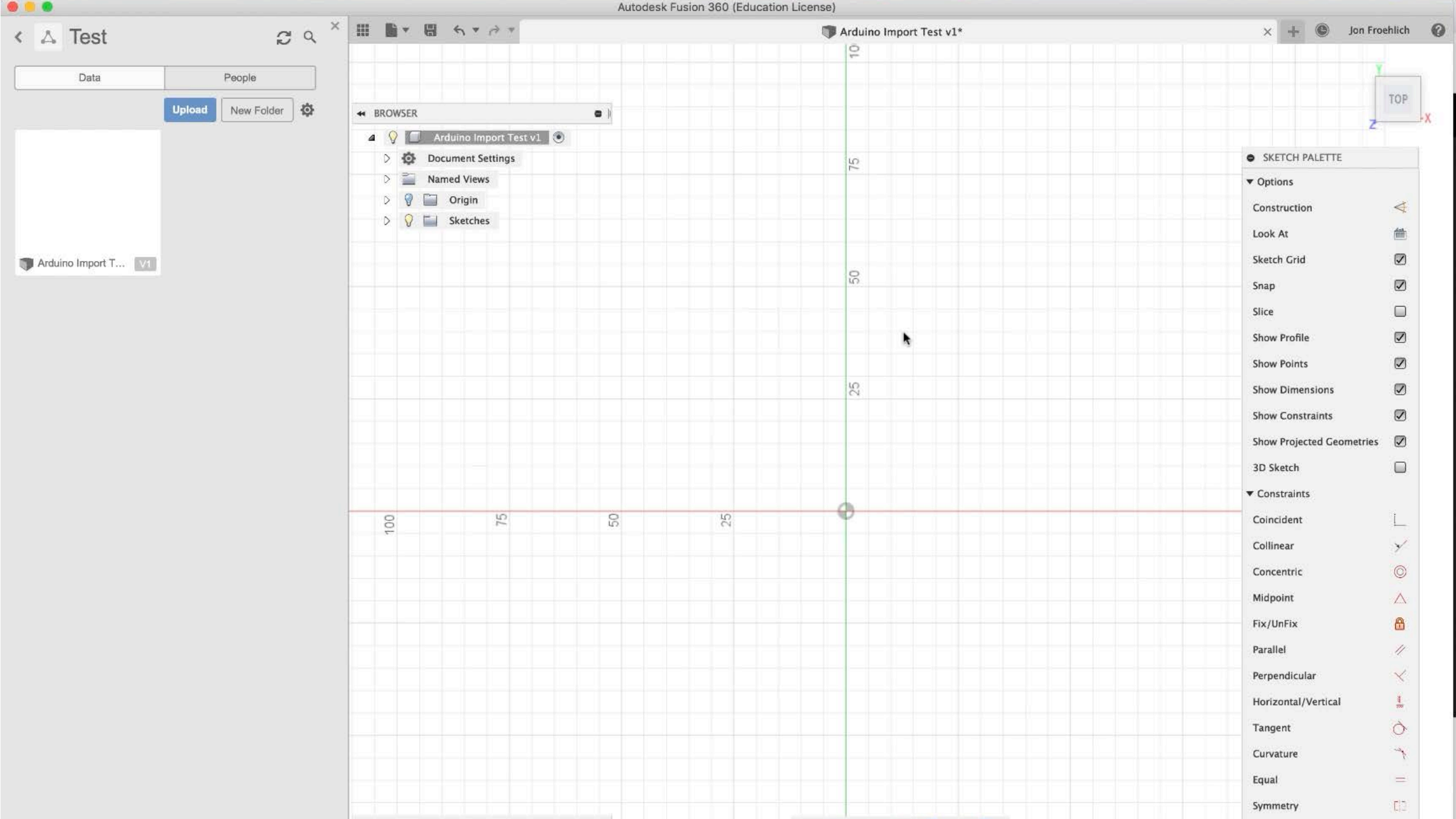


Arduino Uno

Eon Ang
February 20th, 2019

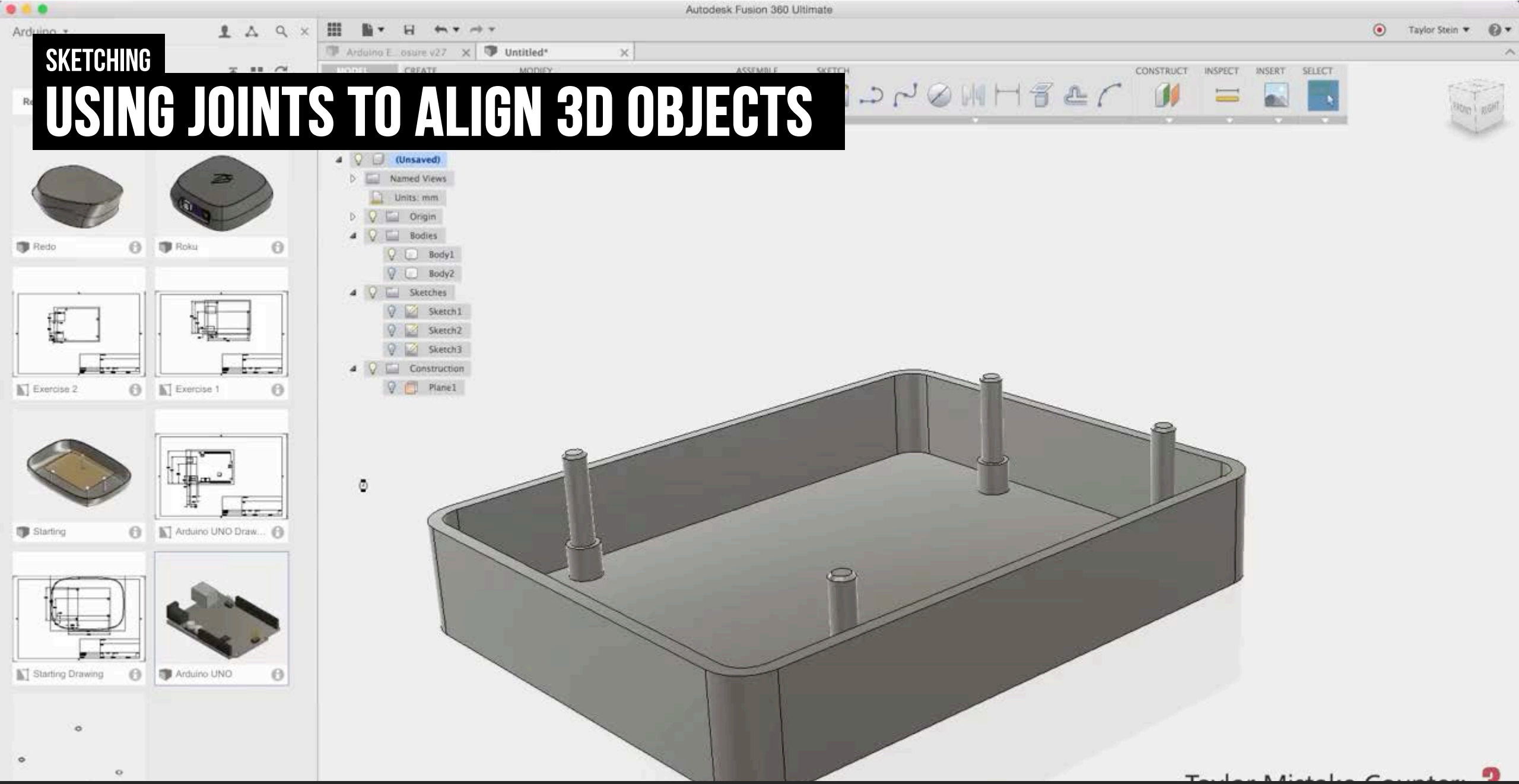
Download files

Like Share

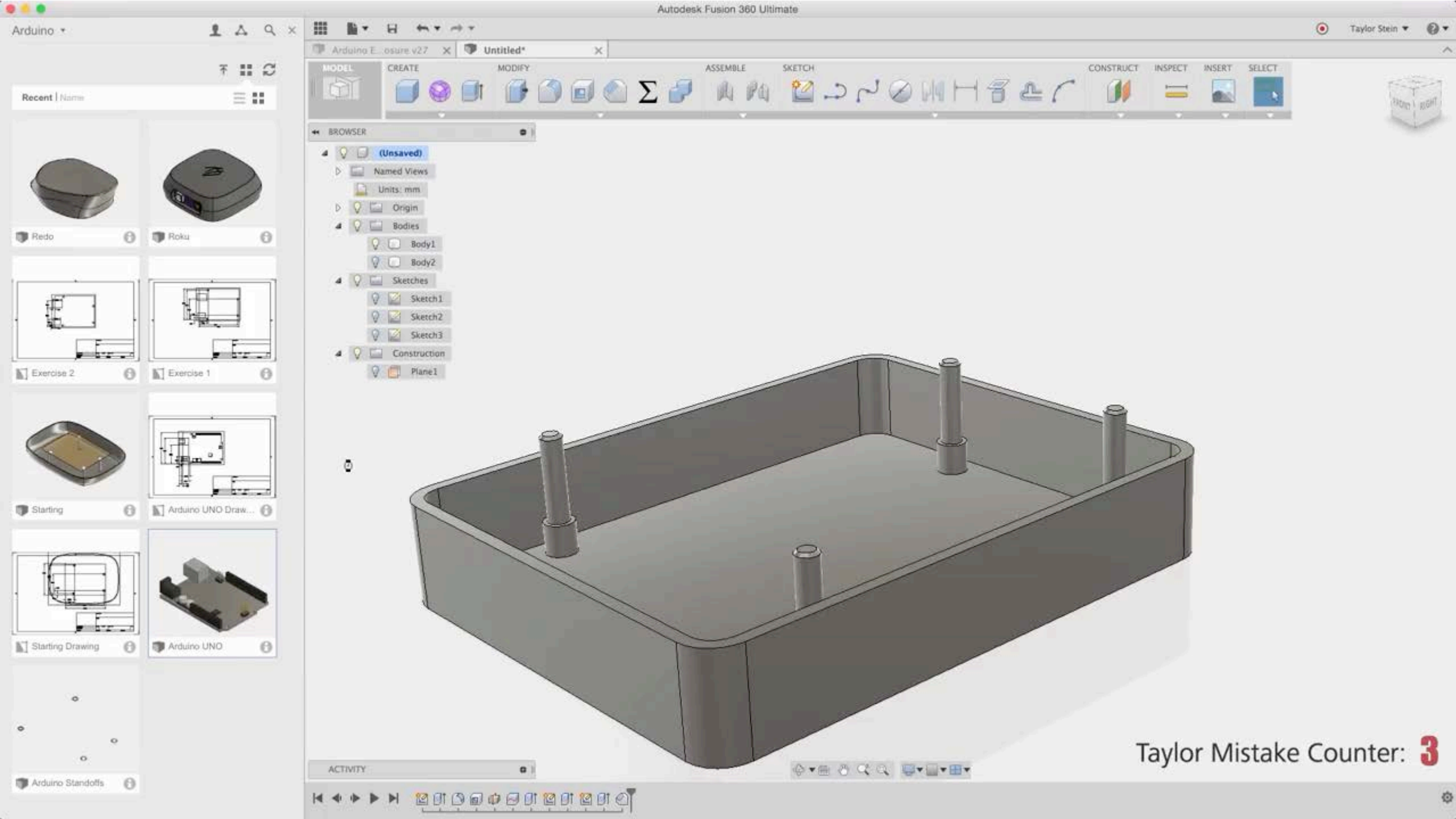

Autodesk Fusion 360 (Education License)
Test
Data
People
Upload
New Folder
Arduino Import T...
V1
Arduino Import Test v1*
Jon Froehlich
BROWSER
Arduino Import Test v1
Document Settings
Named Views
Origin
Sketches
TOP
SKETCH PALETTE
Options
Construction
Look At
Sketch Grid
Snap
Slice
Show Profile
Show Points
Show Dimensions
Show Constraints
Show Projected Geometries
3D Sketch
Constraints
Coincident
Collinear
Concentric
Midpoint
Fix/UnFix
Parallel
Perpendicular
Horizontal/Vertical
Tangent
Curvature
Equal
Symmetry

SKETCHING

USING JOINTS TO ALIGN 3D OBJECTS



Source: Autodesk Fusion 360 Tutorial Series, https://youtu.be/E0bhdr84FNU


Autodesk Fusion 360 Ultimate
Arduino
Recent | Name
Redo
Roku
Exercise 2
Exercise 1
Starting
Arduino UNO Draw...
Starting Drawing
Arduino UNO
Arduino Standoffs
Arduino E...osure v27
Untitled*
Taylor Stein
MODEL
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ASSEMBLE
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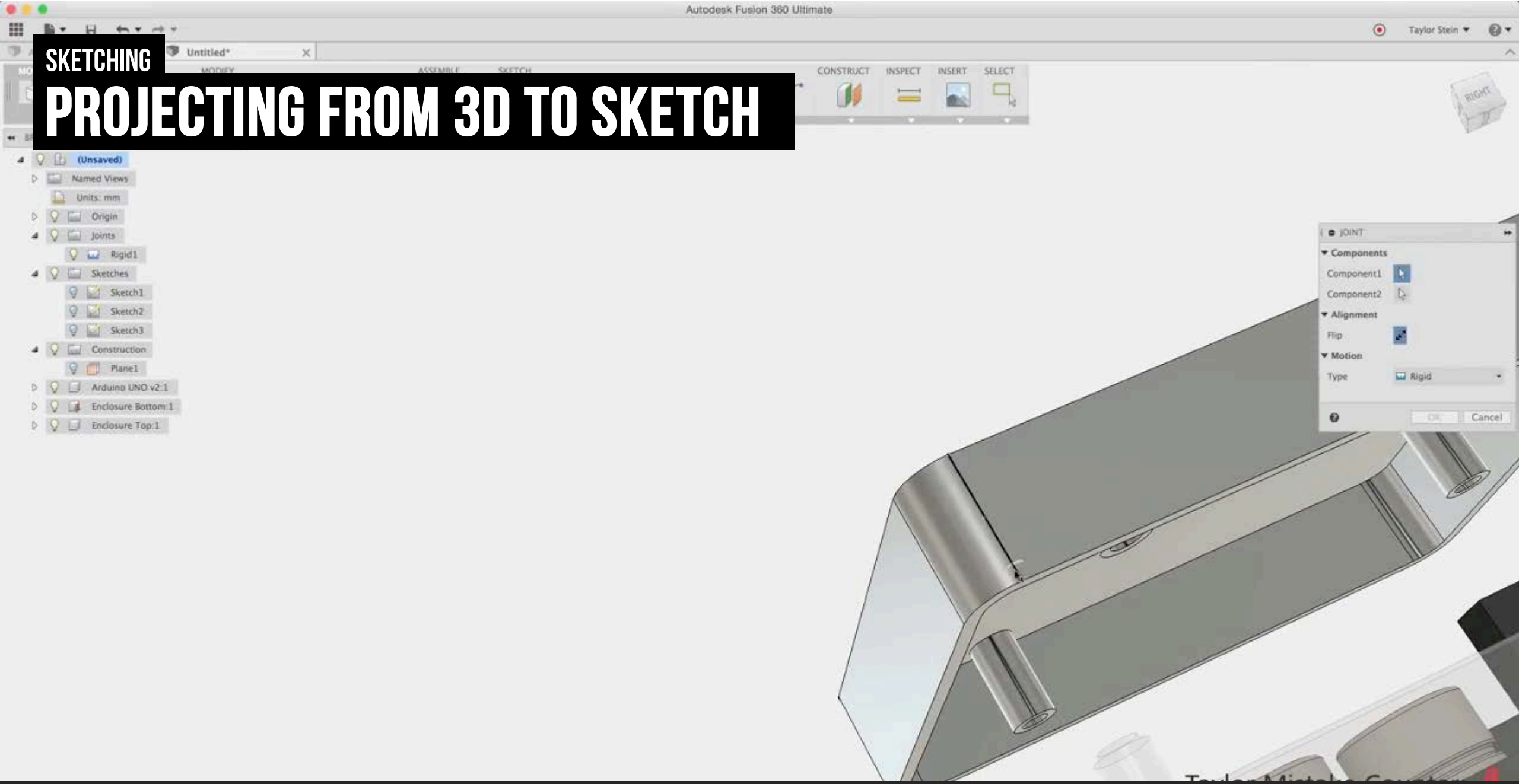
Named Views
Units: mm
Origin
Bodies
Body1
Body2
Sketches
Sketch1
Sketch2
Sketch3
Construction
Plane1
ACTIVITY
Taylor Mistake Counter: 3

SKETCHING

PROJECTING FROM 3D TO SKETCH



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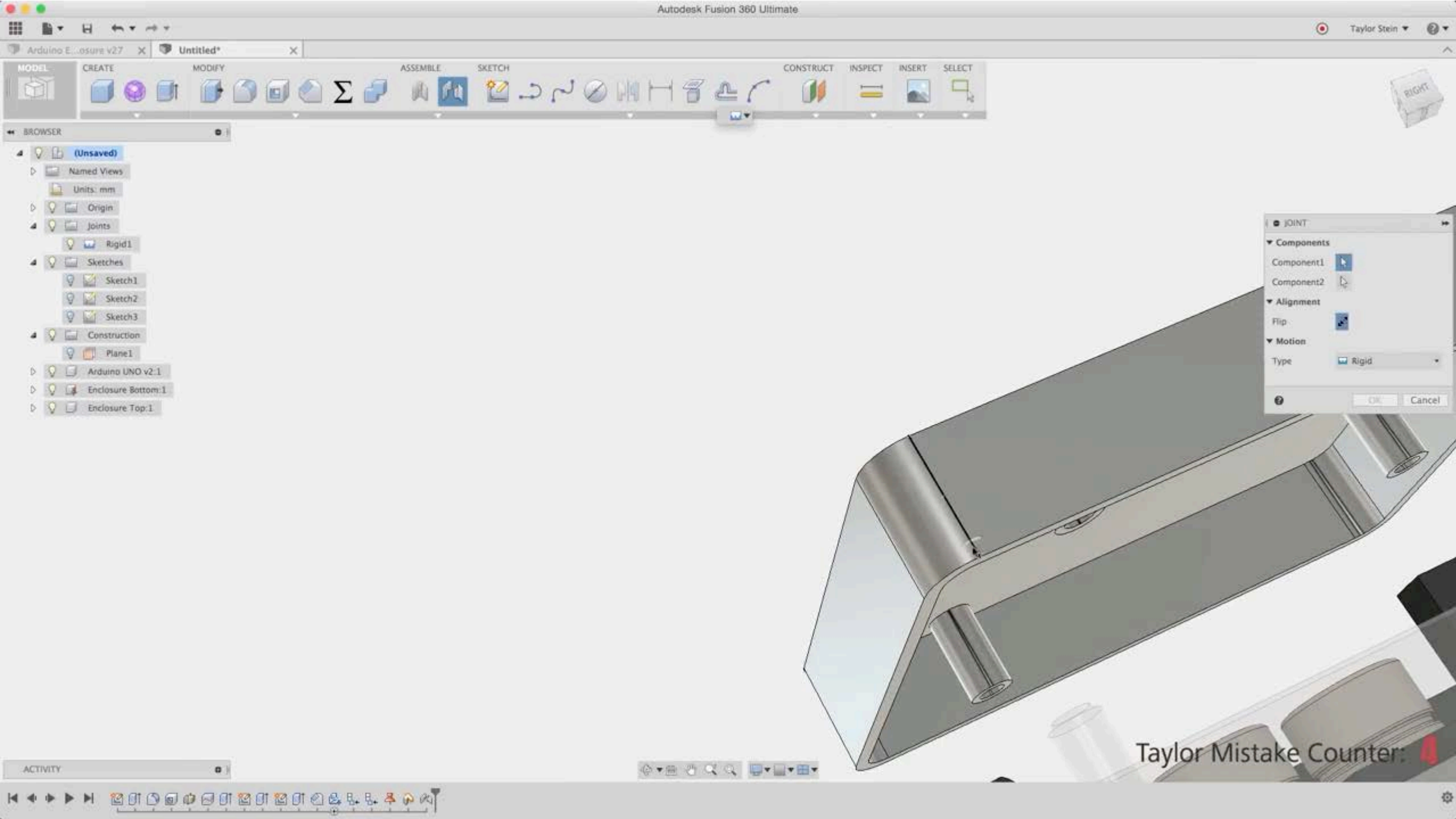
Autodesk Fusion 360 Ultimate
Taylor Stein
Arduino E...osure v27
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MODEL
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INSERT
SELECT
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(Unsaved)
Named Views
Units: mm
Origin
Joints
Rigid1
Sketches
Sketch1
Sketch2
Sketch3
Construction
Plane1
Arduino UNO v2:1
Enclosure Bottom:1
Enclosure Top:1
JOINT
Components
Component1
Component2
Alignment
Flip
Motion
Type
Rigid
OK
Cancel
RIGHT
ACTIVITY
Taylor Mistake Counter:

TIPS

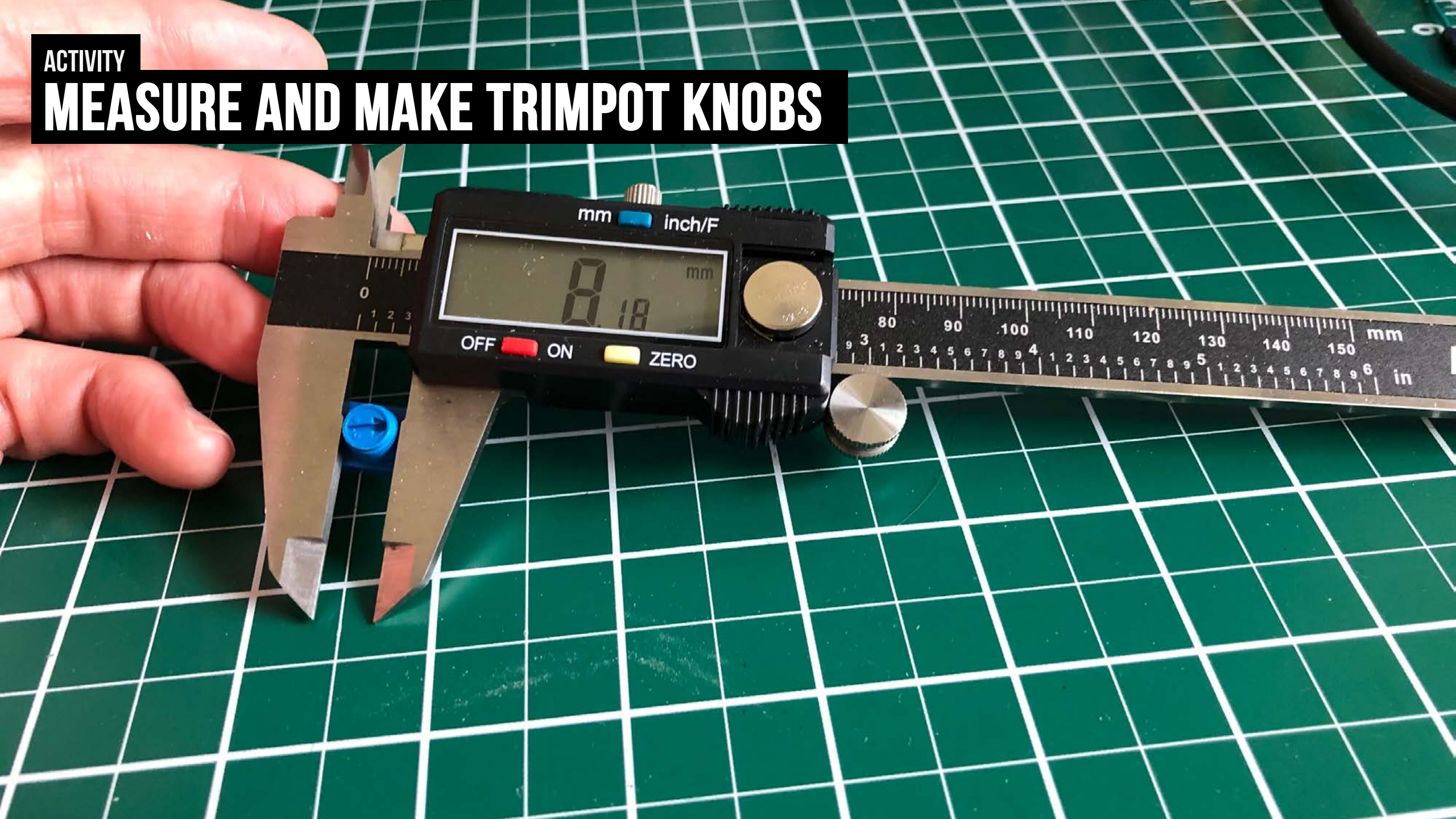
WHEN I CLICK EDIT SKETCH, MY BODIES DISAPPEAR. WHY?

It's because Fusion rewinds your timeline to the time when you made this sketch

If you want to sketch on top of a body, create a new sketch

ACTIVITY

MEASURE AND MAKE TRIMPOT KNOBS



Autodesk Fusion 360 (Education License)

Trimpot Knob

Data | People

Upload | New Folder

10 KILO-OHM B... V1

Building Around ... V2

CSE599Playgro... V2

InClassExercise V1

InClassExercise V1

Initial Design V3

Revolved Star K... V1

Star Knob V1

Star Knob v1

InClassExercise v1

Jon Froehlich

MODEL | SKETCH | CREATE | MODIFY | ASSEMBLE | CONSTRUCT | INSPECT | INSERT | MAKE | ADD-INS | SELECT

BROWSER

InClassExercise v1

Document Settings

Named Views

Origin

Bodies

Sketches

Star Knobs M8 Thread Throu...
amazon.com

10Pcs Female Thread Star Kn...
amazon.com

2pcs Star Knob M6/M8/M10/...
aliexpress.com

Axminster Star Knobs - Handl...
axminster.co.uk

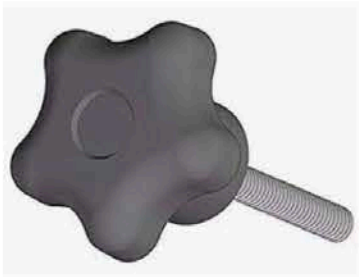
Amazon.com: Star Knobs - K...
amazon.com

5pcs M10 x 40mm Female Th...
aliexpress.com

DCT® Star Knobs 5/16"-18 Cl...
ebay.com

20 Pcs Star Knobs Grips M6x1...
walmart.com

6336.5 Technopolymer Plas...
jwwinco.com



Star Knob, 2, 1 3/4 In, 5/16-18 ...
amazon.com

Star Knobs at Rs 8 /piece | ...
indiamart.com

Solid Five-Lobed Knobs ...
jwwinco.com

SK7404T Star knobs with he...
sankq.en.alibaba.com

Navy Star Knobs | Pottery Barn...
potterybarnkids.com

Grips M12x60mm Male Thre...
walmart.com

Long Bolt; With Star Knob
infinitytools.com

DIN 6335 | Star knobs
elesa.com

Grip Handle M6 Diameter Br...
overstock.com

Knobs M8 Star Shaped Head ...
amazon.com

Item # PHK-4820, Metric Sta...
workholdingcomponents.mort...

Black Rosette Thumb Screw...
ebay.com

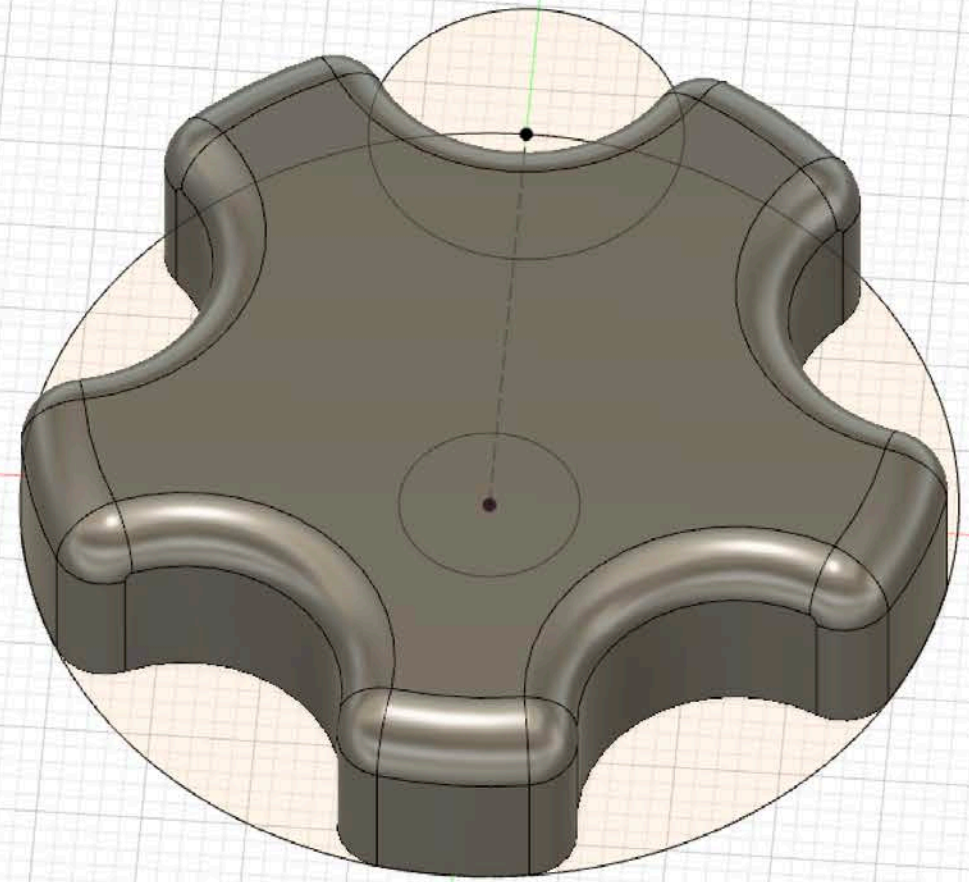
Grip Handle M10 Diameter B...
overstock.com

5pcs M8 x 50mm Thread 40...
aliexpress.com

Thread Dia Black Star Knobs Handl...
newegg.com

ACTIVITY

USING REPEATING PATTERNS TO CREATE A STAR KNOB



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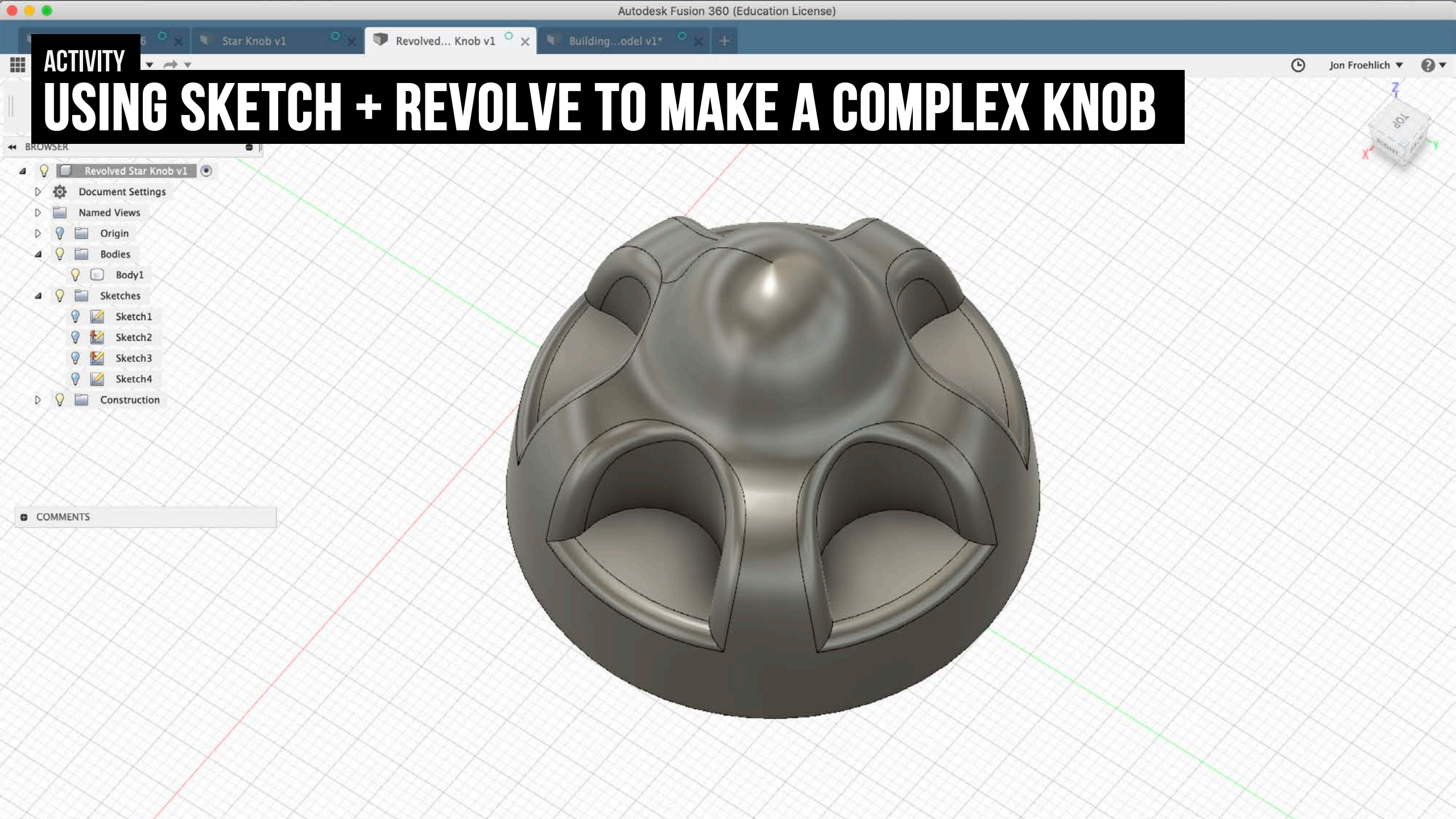
COMMENTS

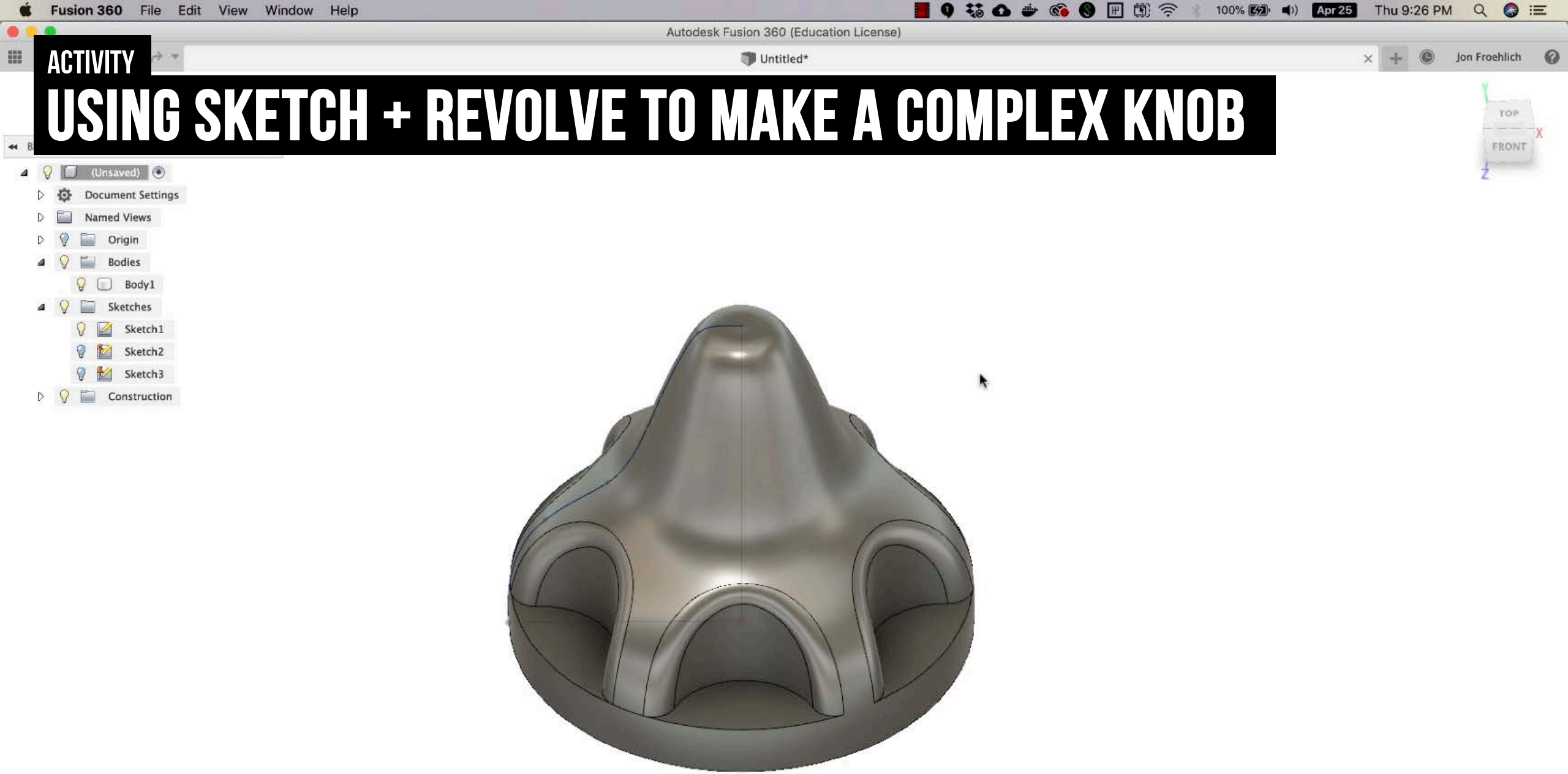
ACTIVITY

USING SKETCH + REVOLVE TO MAKE A COMPLEX KNOB

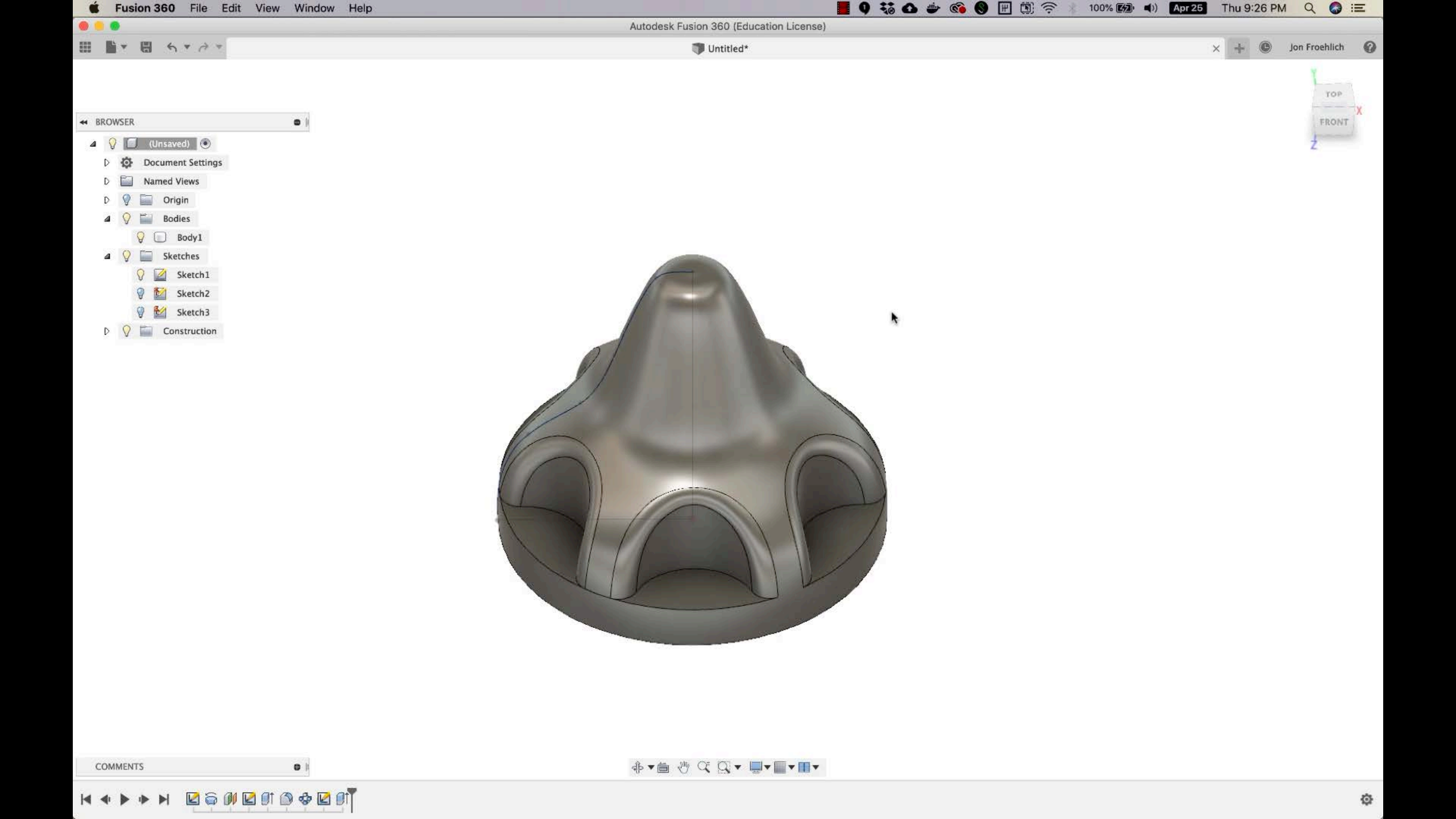


ACTIVITY

USING SKETCH + REVOLVE TO MAKE A COMPLEX KNOB



Video by: Jon Froehlich, https://youtu.be/1Yz9DDb4QnI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Autodesk Fusion 360 (Education License)
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Jon Froehlich
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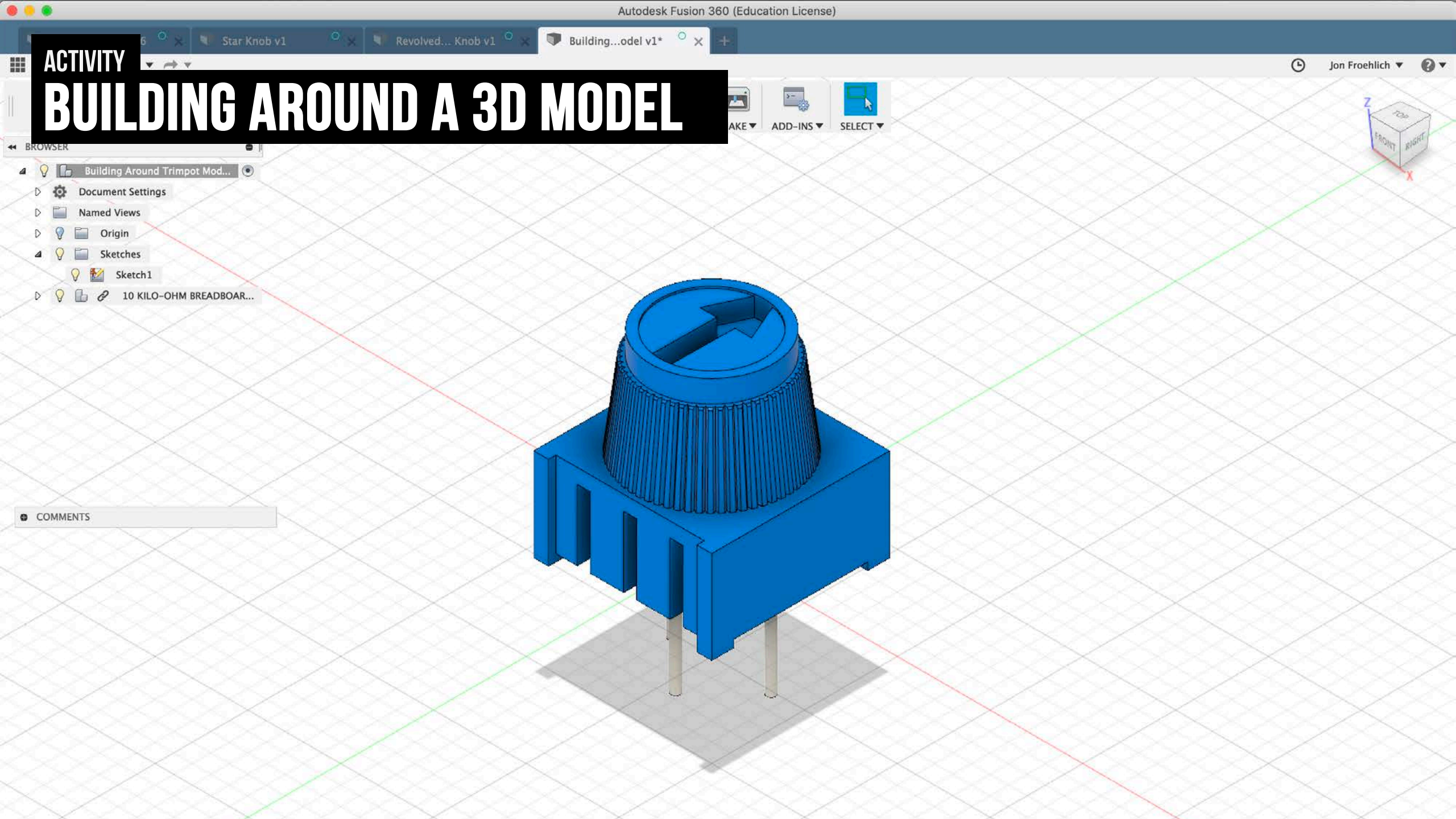
Document Settings
Named Views
Origin
Bodies
Body1
Sketches
Sketch1
Sketch2
Sketch3
Construction
TOP
FRONT
COMMENTS

ACTIVITY

BUILDING AROUND A 3D MODEL



LEARNING GOALS

FUSION 360

Sketching: How to **move** objects

Sketching: How to **resize** objects

Sketching: What are **construction** lines?

Sketching: How to use **constraints**

3D: How to **import** 3D objects

3D: How to **project** from 3D to 2D

3D: How to use **revolve** and **circular patterns**

PROTOTYPING FORM 2: FUSION 360

CSE 599 Prototyping Interactive Systems | Lecture 8 | April 25

Jon Froehlich • Jasper Tran O'Leary (TA)

DESIGN USE BUILD

MAKEABILITY LAB

PAUL G. ALLEN SCHOOL
OF COMPUTER SCIENCE & ENGINEERING

UNIVERSITY of WASHINGTON