



onshape®

How to CAD almost anything!

MIT Summer '24

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Session 1

MIT

AEROASTRO



Agenda

- Quick intros!
 - Why Onshape?
- Workshop logistics and important info
 - Overview of sessions and projects
- Session 1:
 - Demo of the session's Onshape commands: *sketches, plane selection, boss extrude/cut, fillet/chamfer, colors, material properties...*
 - Demo of projects: cake, calculator
- Questions?
- Preview of Session 2



Quick Intros!



Me
(Andy)

United A320 Pilots!

- 1) Name, major, year
 - Ex: Andy, AeroAstro, PhD Y1
- 2) Hometown
 - Ex: Buenos Aires, Argentina
- 3) Spirit animal
 - Ex: Angus Aberdeen cow
- 4) Why CAD almost anything?
 - Ex: I think it's cool to look at a random object and imagine how to cad it

Why Onshape?

- Open source, fully free (with all the capabilities).
 - Although the free plan makes documents “public”, that is, anyone can see them (and copy the models) – however, unlimited data storage!
- Google-drive kind of format.
 - Cloud-based, only needs an internet connection.
 - Can be used from anywhere in the world, no need to install a software/license, and regardless of computer and software!
 - Files are stored all in the web; no need to save nor back up files.
 - Easy to share files, and have multiple users working on them (which can be useful in team projects)
- Relatively similar interface to Solidworks'.
- Note: Fusion 360 is also free, but the equivalent version does not include the same capabilities as Onshape's.

Why Onshape?

Custom Features

Use custom features created by the Onshape community, or write your own with FeatureScript: the same programming language used by Onshape developers to develop all native Onshape features.

[WATCH THE VIDEO](#)

The screenshot shows the Onshape interface. On the left, a code editor displays FeatureScript code for a "Custom Table Example". The code defines a table type and its columns. On the right, a 3D model of a knot is shown, with a callout box labeled "Freeform Spline". Below the model, a text box provides a brief description of the custom feature.

```
FeatureScript 1605;
import(path : "onshape/std/table.fs", version : "1605.0");

annotation { "Table Type Name" : "Part Info" }
export const partInfo = defineTable(function(context is Context, definition is map) returns Table
  precondition
  {
    // Define the parameters of the table type
  }
  {
    var columnDefinitions = [tableColumnDefinition("name", "Part Name"),
      tableColumnDefinition("description", "Description"),
      tableColumnDefinition("volume", "Volume"),
      table];
    table
    tableColumnDefinition function
    tableColumnDefinition function
    tableColumnDefinition function
    tableColumnDefinition function
    tableRow
    tableRow
    tableArray
    tableCellError
  });
  table
  tableColumnDefinition function
  tableColumnDefinition function
  tableColumnDefinition function
  tableColumnDefinition function
  tableRow
  tableRow
  tableArray
  tableCellError
```

Freeform Spline

This custom feature allows you to create a spline in three dimensions by defining their vertexes with reference points or dimensions in the global coordinate system

- **FeatureScript!**
 - This is a tool within Onshape that allows users to code very specific features
 - Website:
<https://www.onshape.com/en/features/custom-features>

A large green callout box contains the text "BUILDING A COMPLETE CUSTOM FEATURE" in white. To the right of the callout, a portion of the Onshape interface is visible, showing a FeatureScript code editor with code related to a "Dome" feature.

```
FeatureScript 1746;
import(path : "onshape/std/geometry.fs", version : "1746.0");
featureIcon import(path : "onshape/std/icon/icon.fs", version : "a677099d01");

export enum ConnectionType
{
  TANGENT,
  POSITION
}

annotation { "Feature Type Name" : "Dome", "Icon" : featureIcon::BLOB_DATA,
  "TUTORIAL" : true
}
export const myFeature = defineFeature(function(context is Context, id is Id
  precondition
  {
    annotation { "Name" : "Face", "Filter" : {EntityType::FACE && Constraints::IS_CONSTRAINED_BY(id) && definition.face.isQuery}
  });
  annotation { "Name" : "Face", "Filter" : {EntityType::FACE && Constraints::IS_CONSTRAINED_BY(id) && definition.face.isQuery}
});
```

**BUILDING
A COMPLETE
CUSTOM FEATURE**

TUTORIAL

Welcome!

How to CAD almost

anything!

MIT Summer '24



Workshop logistics

Session 1: June 5	Session 4: June 26	Session 7: July 31
Sketches, basic feature commands, editing and defining sketches, coloring parts, changing material properties	<ul style="list-style-type: none">• Cake• MS-80B Loft, sweep	<ul style="list-style-type: none">• Marble run• Banana! Sketch/feature names, equations, design table, configurations
Session 2: June 12	Session 5: July 17	Session 8: August 14
Spline tool, sketch picture	<ul style="list-style-type: none">• Safety Card• Logo keychain Review of all commands + wrap, renders	<ul style="list-style-type: none">• Diet coke bottle• Ariane V Engineering drawings, GD&T
Session 3: June 18	Session 6: July 24	<ul style="list-style-type: none">• Wooden airplane• Drawings
Revolve, mirror, circular pattern, plane creation	<ul style="list-style-type: none">• Fidget spinne Assemblies, exploded view, animations	<ul style="list-style-type: none">• Lego 2x4 block• Lego 2x4 plate• Lego boat

Important info

- Two cohorts (MWF):
 - Wednesdays: 10:00am – 12:00pm
- GIS & Data Lab (Retch Lib)
 - Open M – F: 10:00am – 6:00pm
 - 16 computers (which have Solidworks on them).
- Online resources:
 - GitHub
<https://github.com/andyeske/How-to-CAD-Onshape/tree/main>.
 - Onshape [folder](#).

How to CAD almost anything!

Summer 2024 – AeroAstro Workshop

A compressed yet rewarding introduction to the parametric design software Onshape, for beginners (no experience at all) and pro-users alike. Come learn how to CAD (computer-aided design) essentially almost anything!



Yes, this could be YOU at the end of the workshop! You'll be equipped with the tools to design cool looking things such as a bicycle, a chess set, a Chinese violin (Er Hu), a model train, a mug and even a Trumpet!

Workshop Details

Subject Title: How to CAD almost anything!

Prerequisites: Willingness to have fun and think outside the box!

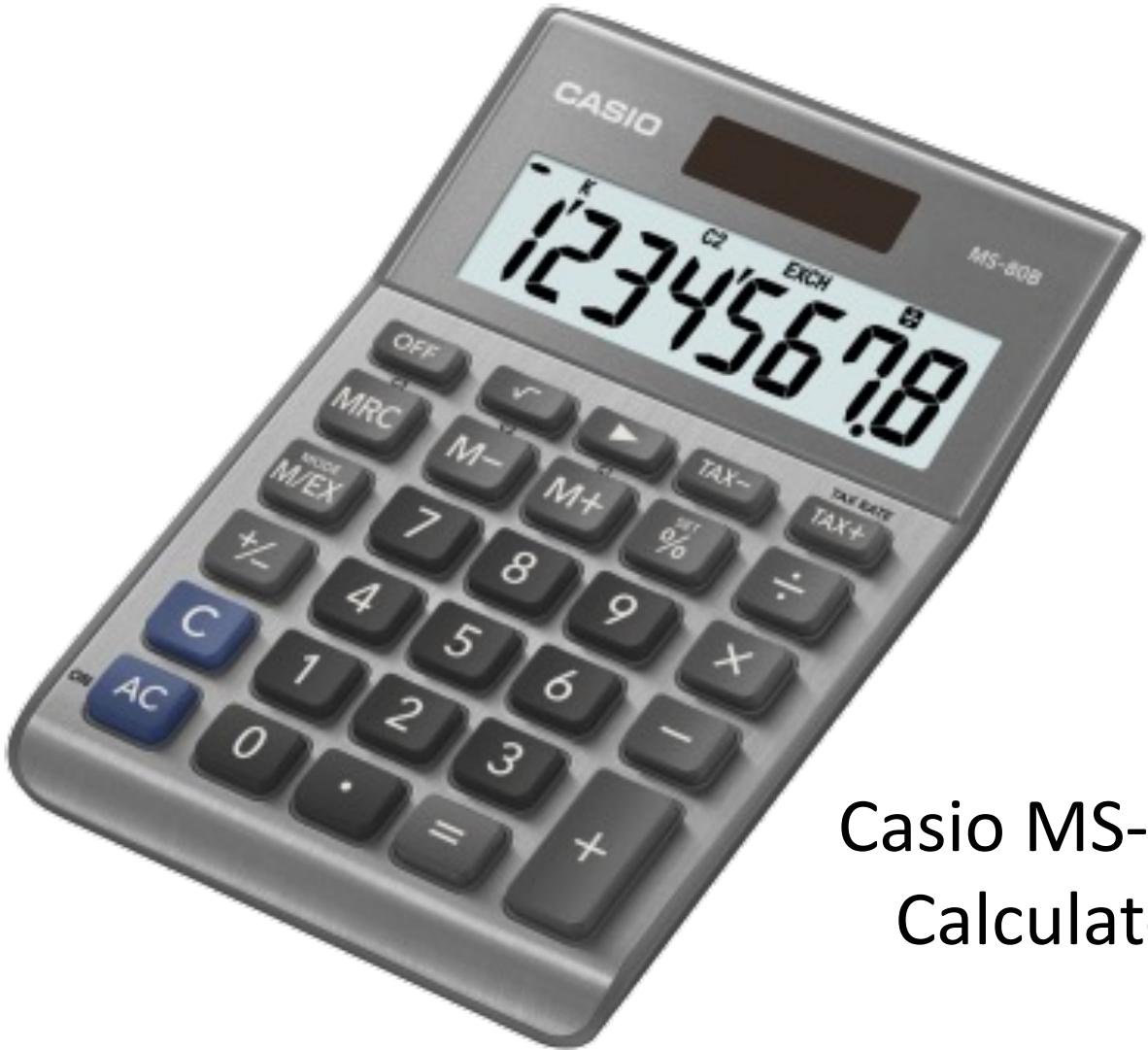
Enrollment: Unlimited.

Check out the syllabus if you have more questions!

Session 1



Cake



Casio MS-80B
Calculator

Cake



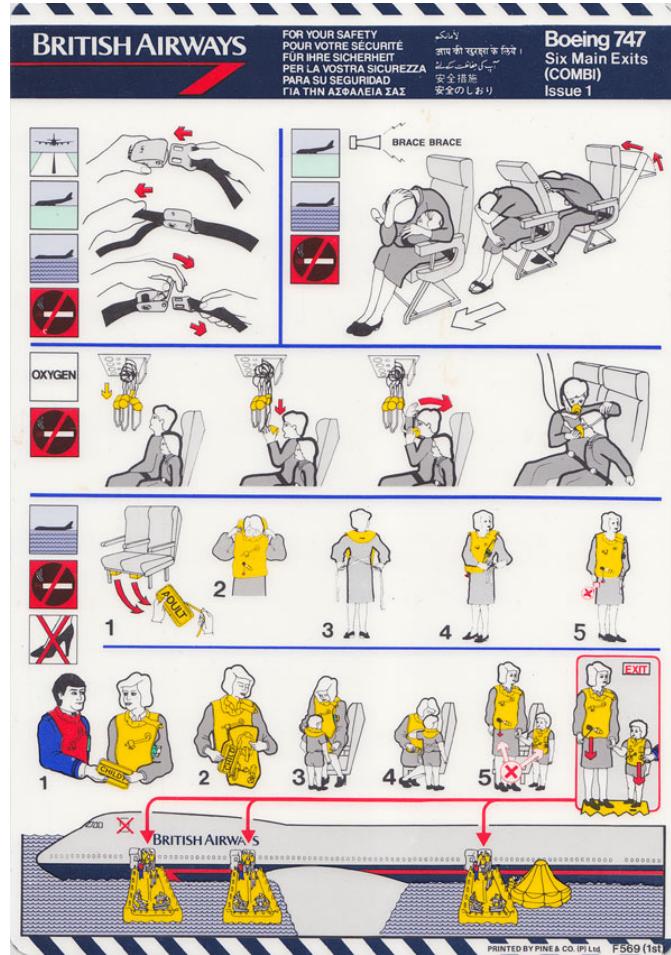
Casio MS-80B Calculator





Questions?

Preview into Session 2



An airline safety card????

Logo keychains

