

NX Sketching— Mapping I-deas practices to NX

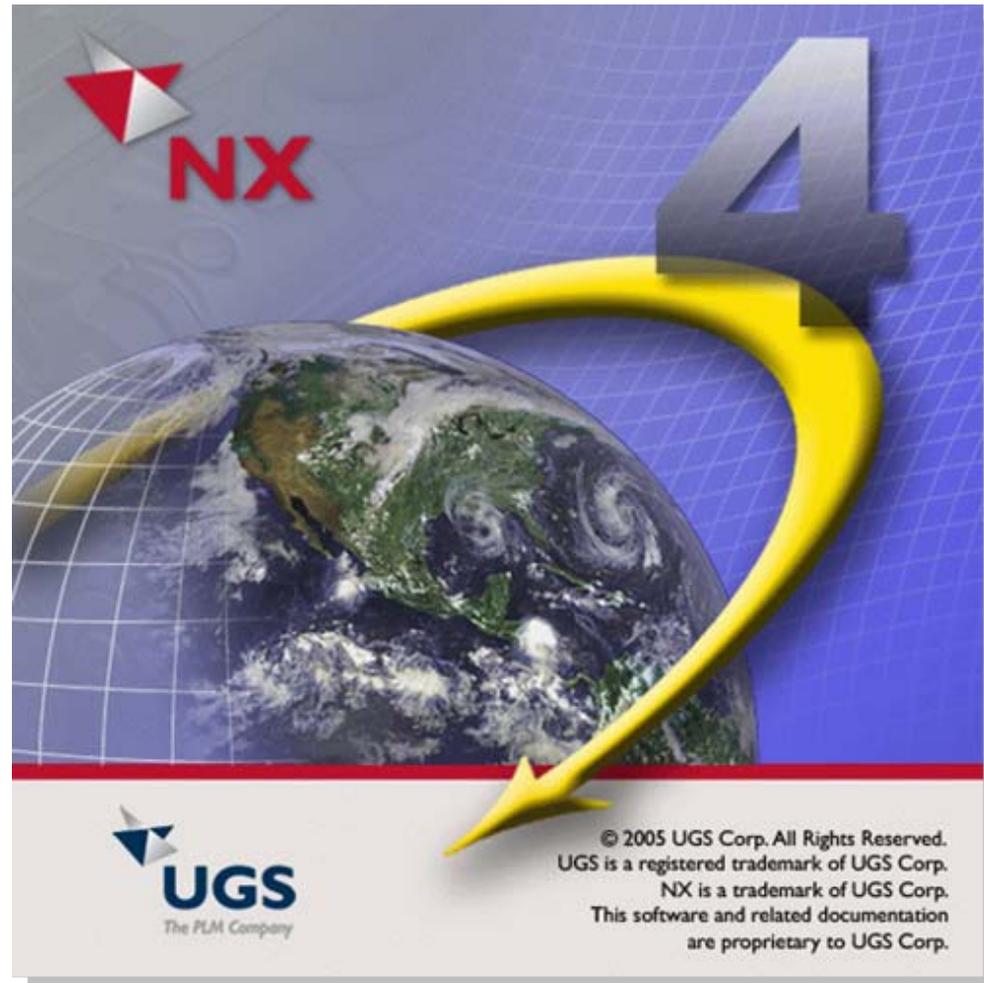




Assumptions



- ▶ Objectives:
 - Map existing I-deas sketch practices into NX
- ▶ This presentation is not:
 - A functional comparison between I-deas and NX
 - A “how to” class
- ▶ Audience:
 - Experienced I-deas users who understand I-deas sketching practices
- ▶ Software:
 - I-deas 12
 - NX 4



© 2005 UGS Corp. All Rights Reserved.
UGS is a registered trademark of UGS Corp.
NX is a trademark of UGS Corp.
This software and related documentation
are proprietary to UGS Corp.



- ▶ I-deas sketching review
- ▶ NX sketching overview
- ▶ Practices to keep
- ▶ Mapping practices from I-deas to NX
- ▶ New practices to consider
- ▶ Migrated sketches
- ▶ Summary

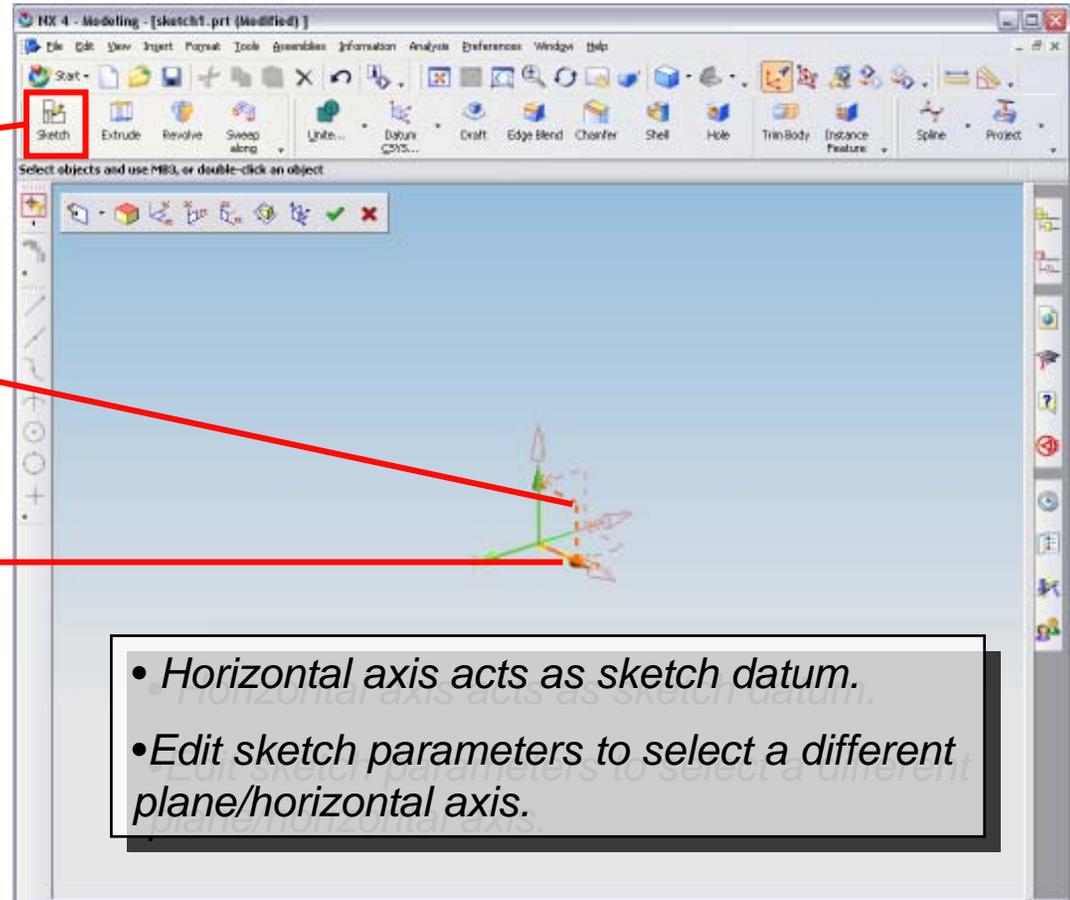


NX sketching overview



Creating a sketch

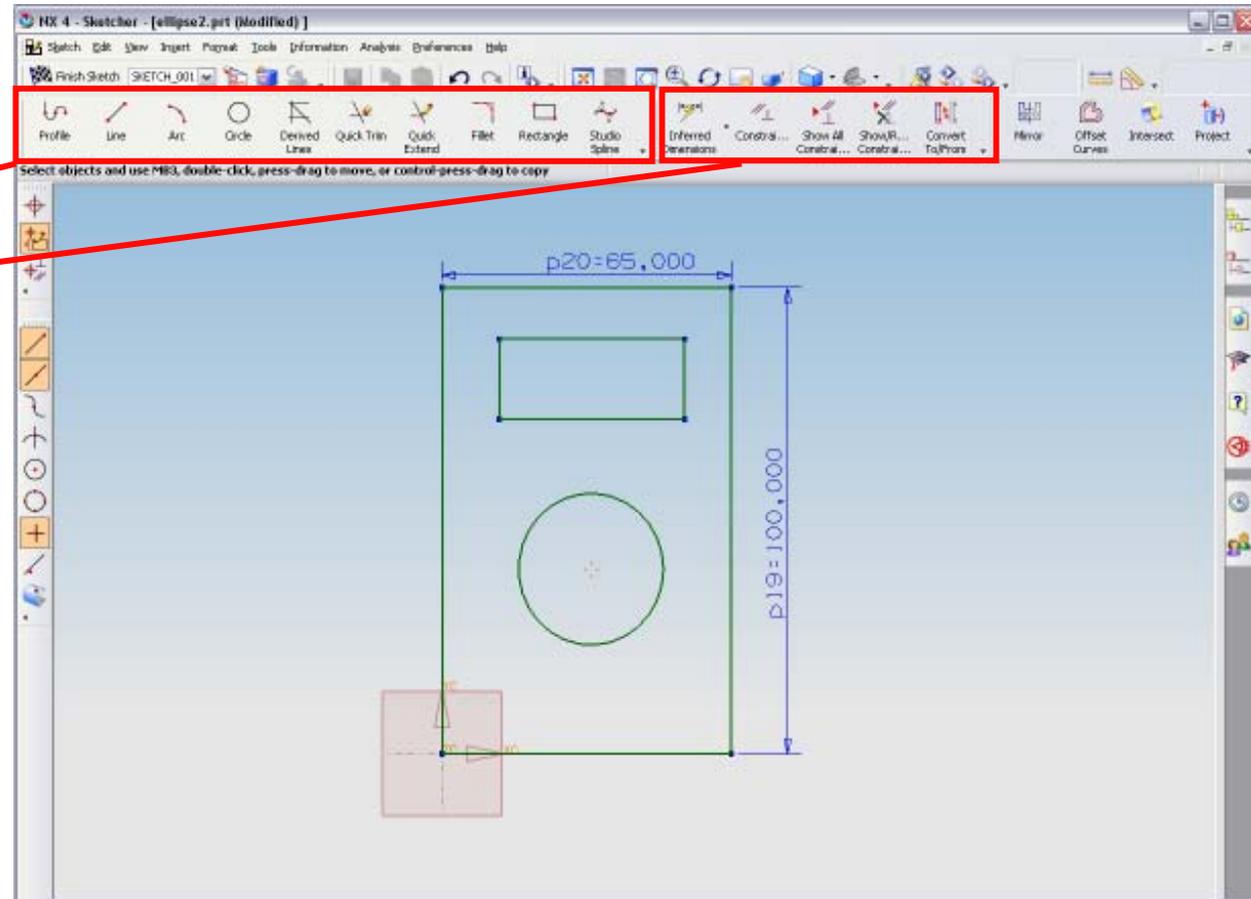
1. Sketch
2. Specify plane
3. Specify horizontal axis





Toolbars

- ▶ Sketch Curve
- ▶ Constraints

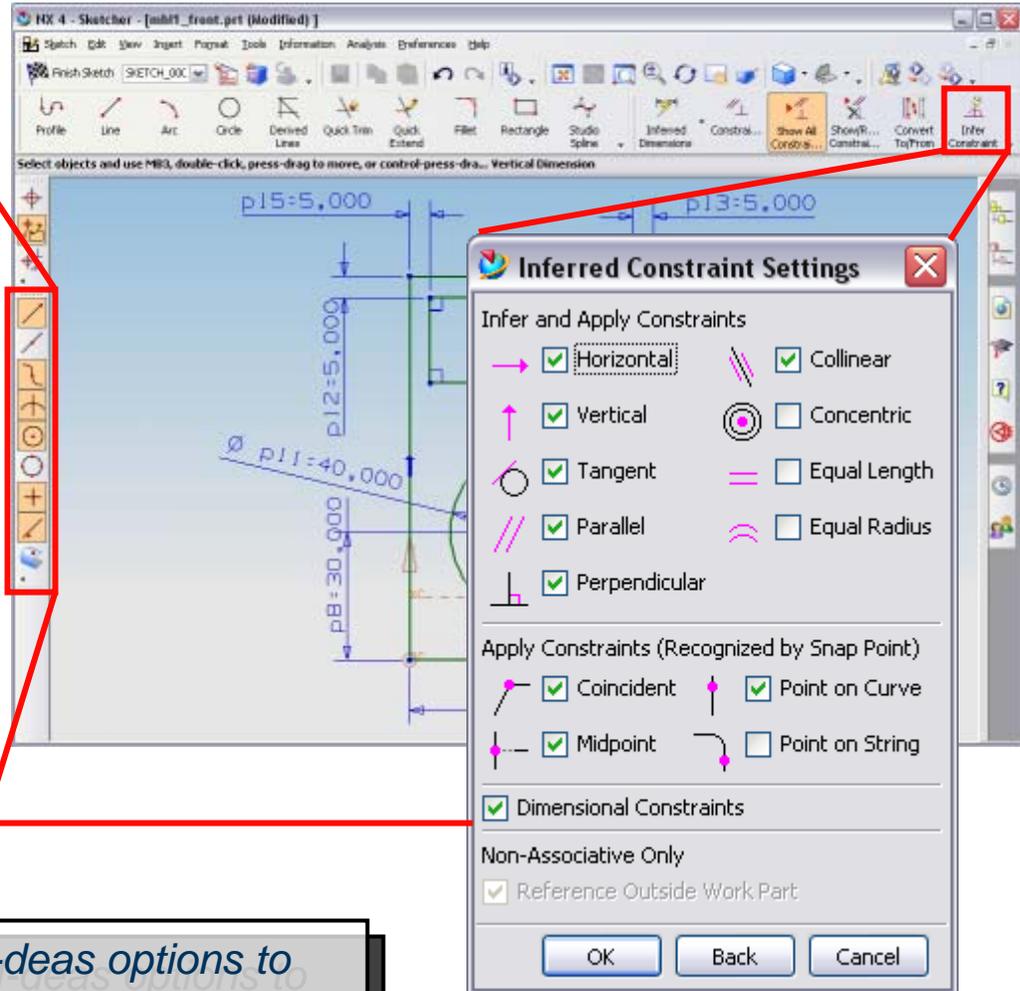
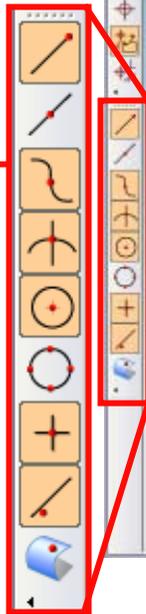




Inferred constraints

► Snap Point toolbar

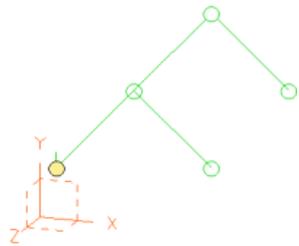
► Inferred Constraint Settings



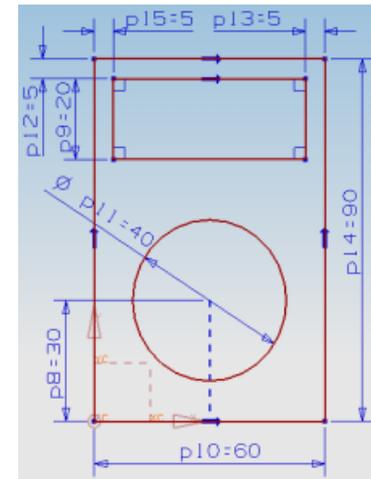
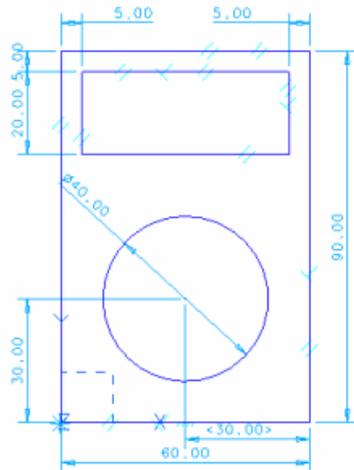
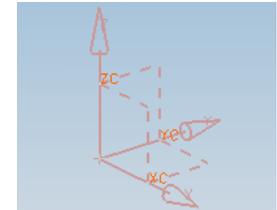
This is similar to I-deas options to recognize and create constraints.



Practices to keep



- ▶ Start with a good foundation.
 - BORN (Create New Part) → Datum CSYS
- ▶ Sketch on associative datum planes.
- ▶ Capture design intent in sketches.
 - Use equations to relate values.
 - Use meaningful dimension names.
- ▶ Fully constrain sketches.
 - Focus on origin → Constrain to origin
 - Fully constrained = Blue → Dull Red





Mapping practices from I-deas to NX



Some “best practices” may be based on software behavior, not design intent.



Software differences that may change your sketching practices:

- ▶ Focus
- ▶ Inferred ground constraint
- ▶ Vertical and horizontal constraints
- ▶ Trimming
- ▶ Midpoint constraint
- ▶ Dimensions



Mapping practices from I-deas to NX contd...



Focus

~~Focus~~



- ▶ Change 2D constraint priority.
- ▶ Project 3D geometry to use for constraints.
- ▶ Project 3D geometry curves to include in the sketch.



- ▶ Short list defines constraint priority.
 - “Touch” a line to add it to the list.
- ▶ Constrain directly to 3D edges.
- ▶ **Project** curves to sketch.

Practice:

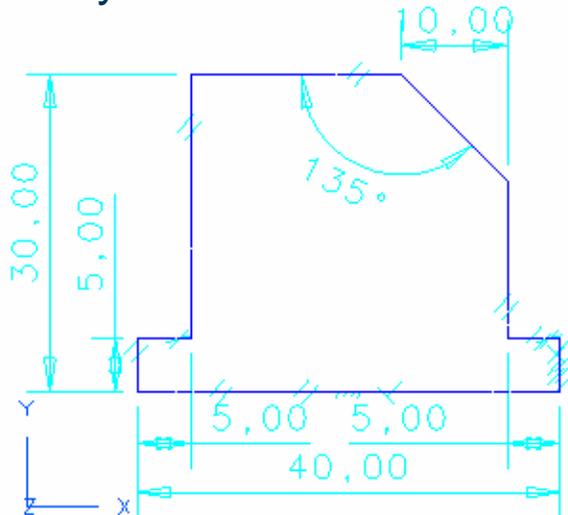
- ▶ *Directly constrain to the origin in NX without **Focus**.*
- ▶ *Directly constrain to 3D edges in NX without **Focus**.*



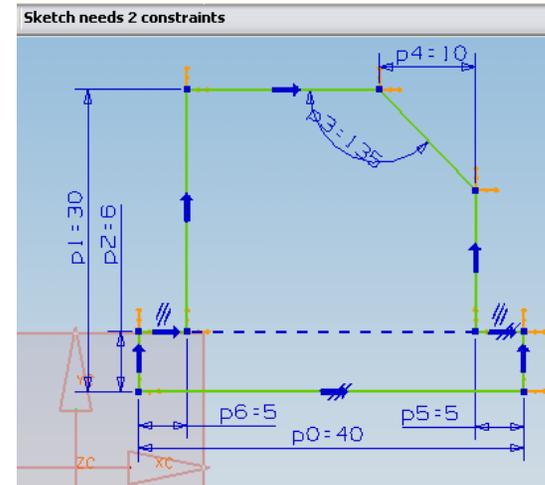
Inferred ground constraint



- ▶ First point inferred ground
- Fully constrained: ?



- ▶ No inferred ground
- 2 DOF Free:



NX Practice:

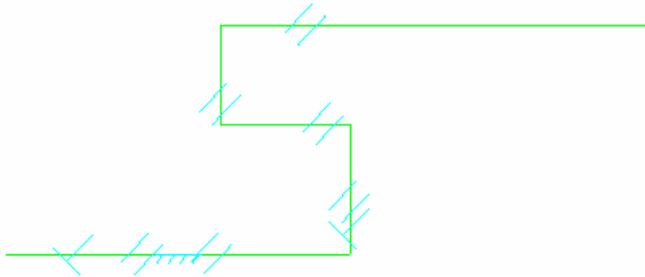
*It is poor practice to rely on this inferred ground in I-deas.
NX doesn't add it.*



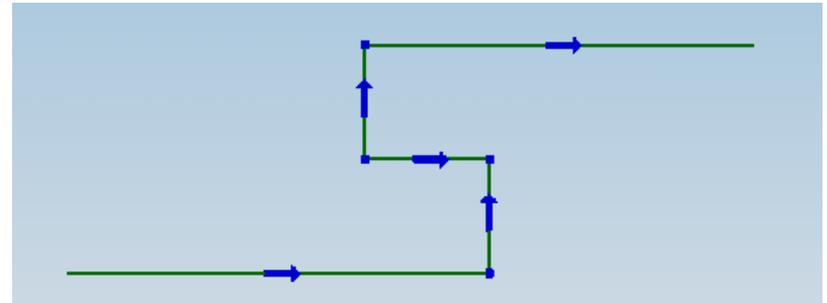
Vertical and horizontal constraints



- ▶ Only the first sketch line is constrained horizontal or vertical.
- ▶ Other lines are constrained parallel or perpendicular to it.



- ▶ Horizontal or vertical constraints have priority by default.



Practice:

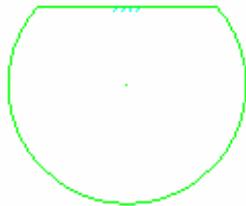
Multiple horizontal and vertical constraints are an acceptable practice in NX, because the sketch horizontal axis can be edited.



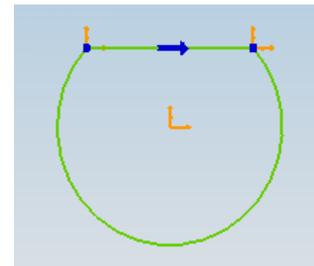
Trimming



- ▶ **Trim/Extend** and **Make Corner** commands do not add constraints to resultant intersections.



- ▶ Constraints are added where curves are trimmed to intersect.



 Practice:

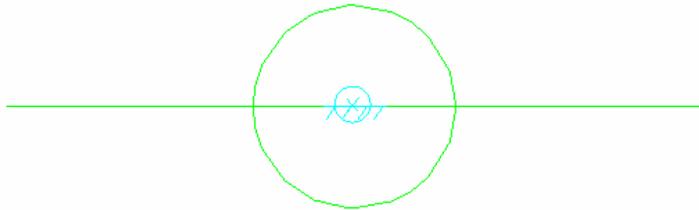
*Although trimming is not required when using **Selection Intent**, consider trimming an acceptable practice in NX.*



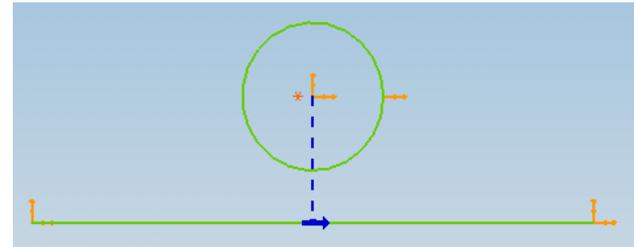
Midpoint constraint



- ▶ **Midpoint** constrains to both the center of a line, and on the line.



- ▶ **Midpoint** constrains to the projection of the line center.
- ▶ **Midpoint** constraint is separate from **On Curve** constraint.



 Practice:

*Center sketch objects using **Midpoint** constraints without using construction lines.*



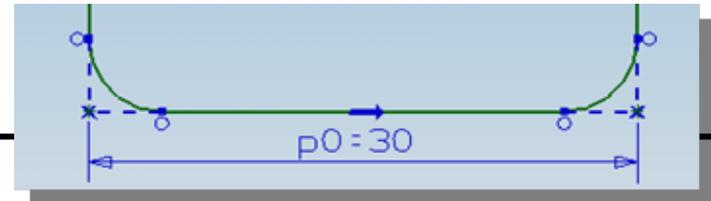
Linear dimensions



- ▶ Line-line dimensions create a parallel constraint.
 - Line-line dimensions preferred over line-point or point-point.
- ▶ Filleting a corner deletes dimensions to the vertex.
 - (This was a reason for the practice of preferring line-line dimensions.)



- ▶ Dimension types:
 - Horizontal (point-point)
 - Vertical (point-point)
 - Parallel (point-point)
 - Perpendicular (line-point)
- ▶ Filleting a corner maintains a vertex for dimensions:



 Practice: *Consider design intent of dimensions.*

- ▶ *For a dimension parallel to a line, just select the line.*
- ▶ *For a dimension perpendicular to a line, select a line then a line endpoint.*



New practices to consider



The screenshot shows the NX Sketcher environment. The title bar reads "NX 4 - Sketcher - [solid_frust.prt (Modified)]". The menu bar includes Sketch, Edit, View, Insert, Format, Tools, Information, Analysis, Enhancements, and Help. The toolbar contains various sketching tools such as Profile, Line, Arc, Circle, Derived Lines, Quick Trim, Quick Extend, Fillet, Rectangle, Studio Splines, Inferred Dimensions, Constraint, Show All Constraints, Show R... Constraint..., Convert To/From, and Infer Constraint. The main workspace displays a 2D sketch of a circle with several dimension lines and constraint symbols. The dimensions shown are $P10.160$ and $P14.140$. The text "Select curves to create constraints" and "Datum Axis" is visible at the top of the workspace area.

New practices based on NX functionality:

- ▶ Internal/external sketches
- ▶ Reference Curves
- ▶ Dimensioning to arcs
- ▶ Reusing sketches
- ▶ Form Features



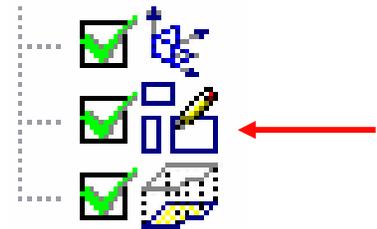
Internal/external sketches



- ▶ Sketches are “absorbed” into features.
- ▶ Create reference curves to reuse sketches in multiple features.



- ▶ Sketches can be “internal” or “external” to features.
- ▶ External sketches appear as separate features in the **Part Navigator**.



Practice:

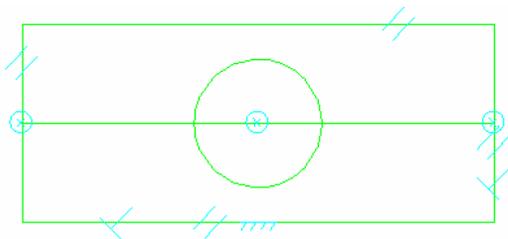
- ▶ *Keep sketches external to use them in multiple features.*
- ▶ *Make sketches internal so the feature “absorbs” them, similar to I-deas.*



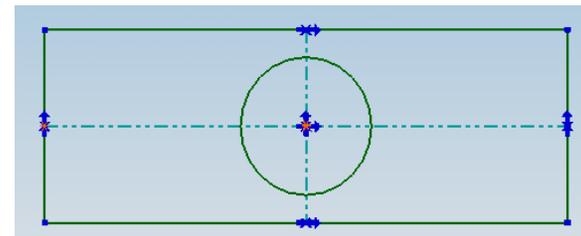
Construction lines / Reference curves



- ▶ Construction lines used for constraints require the use of **Selection Intent** options such as **Stop at Intersections**.



- ▶ **Reference Curves** are part of the sketch, but won't be included in the feature sections
(This is not the same term as "reference curves" in I-deas.)



Practice:

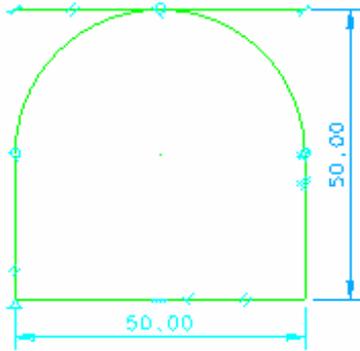
*Convert construction lines to reference curves in NX to convey design intent and minimize the need for **Selection Intent**.*



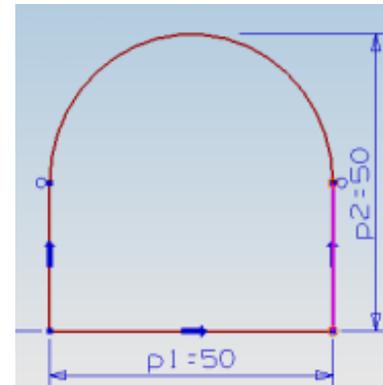
Dimensioning to arcs



- Requires extra construction line to dimension to arc



- Dimension to arc tangent



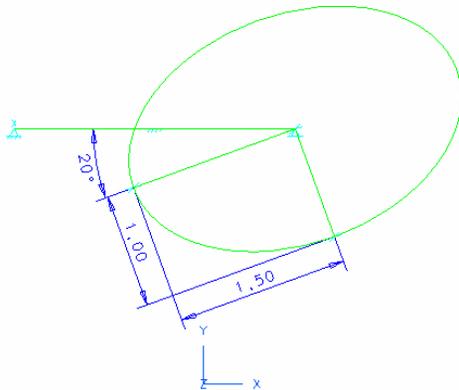
Create dimensions to arcs without construction lines.



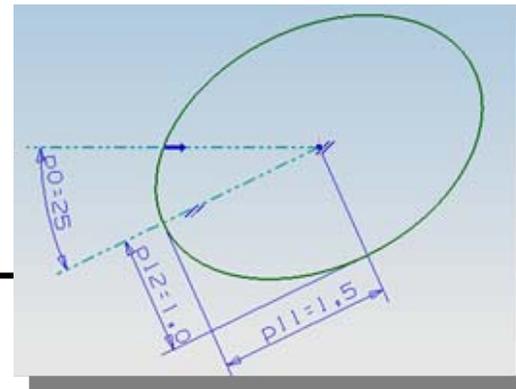
Fully constraining an ellipse



- ▶ Extra geometry used to “box in” the ellipse for constraints.



- ▶ To control size, dimension to tangent points of ellipse.
- ▶ To control the angle, constrain the axis of the ellipse parallel to a line.



Practice:

- ▶ *Less construction geometry is required to fully constrain an ellipse.*
- ▶ *To constrain angle, constrain ellipse parallel to a line.*



Reusing sketches across parts



Non-associative copy:

1. Extract
2. Align
3. Attach
4. Constrain



Associative or non-associative copy:



1. Copy
2. Paste

 **NX** Practice:

- ▶ *Copy and paste sketches within a part or part-to-part, with or without associativity using **Copy/Paste**.*
- ▶ *Also use **Wave Geometry Linker** similar to **ACF**.*



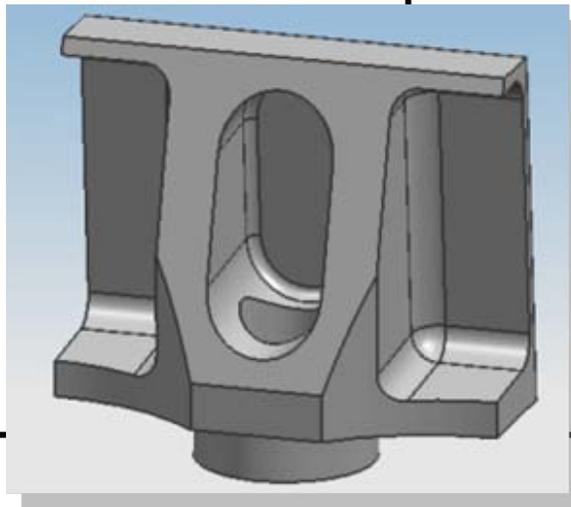
Form features



All features are sketched.



Form features (such as **Hole** and **Slot**):



- ▶ Don't require a sketch
- ▶ Hole type can be edited:
 - Simple
 - Counterbore
 - Countersunk
- ▶ Capture manufacturing intent

 **NX Practice:**

- ▶ Use **Hole** features because they can be converted to **Counterbore**, **Countersunk**.
- ▶ They can also display notation on a drawing.
- ▶ Consider using **Slot** features instead of using a sketch.



Mapping of migrated sketches



- ▶ Midpoint constraints
- ▶ Inferred ground constraint
- ▶ Focus to reference datum
- ▶ Focus to cylinder centerline



- ▶ Midpoint + Point on Curve.
- ▶ 2 DOF left free.
- ▶ Datum is projected. Length of projected line may be left free.
- ▶ Nonassociative wireframe geometry may be projected.

Practice:

- ▶ *Check design intent when editing the model.*
- ▶ *Be cautious with design intent based on inferred behavior.*



Summary



- ▶ Big picture:
 - Keep most of your I-deas sketching best practices
- ▶ Understand why existing practices were adopted:
 - Design practice, or software behavior?
- ▶ New sketch practices in NX:
 - Convert construction lines to reference curves.
 - Use the same external sketch for multiple features.
 - **Copy** and **Paste** sketches with or without associativity.
 - Use **Hole** and **Slot** form features without a sketch.