

# Autodesk Certified Professional in Inventor for Mechanical Design

## Exam objectives

### Target audience

The Autodesk Certified Professional (ACP) certification is designed for candidates who have advanced skills and can solve complex challenges in workflow and design. This type of experience typically comes from having worked with the software on a regular basis for at least two years, or equivalent to approximately 400 hours (minimum) to 1,200 hours (recommended) of Autodesk software experience. Certification at this level demonstrates a comprehensive skill set that provides an opportunity for individuals to stand out in a competitive job market.

Candidates who obtain this certification will have demonstrated advanced skills in Inventor and will be knowledgeable in relevant workflows, processes, and project objectives. The candidate will have been reasonably self-sufficient and able to apply basic CAD principles using the product. They will have also performed routine tasks involved in their job role with limited assistance from peers, product documentation, and support services. The minimally qualified candidate will have worked in collaboration with colleagues and is able to work with minimum supervision.

### Prerequisite skills

It's expected that candidates will already know how to:

- Navigate the user interface.
- Identify areas of the browser.
- Transition through various environments.
- Know the available file types.
- Display a part or assembly.
- Create basic sketches.
- Extrude, hole, and revolve features.
- Identify various planes and axes.

- Understand dimensions, parameters, and constraints.
- Create and modify basic placed features.
- Fully constrain assembly parts.
- Draw and modify objects.
- Create primitives.
- Create patterns.
- Mirror features.
- Use the Sweep and Loft tools.
- Identify the minimum distance between parts and component.

## Exam objectives

Here are some topics and software features that may be covered in the exam.

### **1. Configuration and administration**

#### **1.1. Configure project files**

- 1.1.a Describe characteristics of the library and workspace search paths
- 1.1.b Define standards for templates, design data, content center
- 1.1.c Define standards for materials and appearances

#### **1.2. Configure document settings**

- 1.2.a Specify units for documents
- 1.2.b Validate that part tolerance and precision is appropriate to units used
- 1.2.c Change part tolerance (not parameter tolerance)
- 1.2.d Define the bill of materials (BOM) state of components

#### **1.3. Optimize application options**

- 1.3.a Optimize Undo File size, Display, and Hardware for the hardware and job requirements
- 1.3.b Specify the Undo File folder

#### **1.4. Create and modify styles in documents**

- 1.4.a Create styles
- 1.4.b Access and modify existing styles

### **2. Design automation techniques**

#### **2.1. Simplify workflow by using iParts, iFeatures, iMates, and iAssemblies**

2.1.a Describe the prerequisites for creating iParts, iFeatures, iMates, and iAssemblies

i. May include knowing whether a part can be table driven.

2.1.b Explain the workflow to create an iPart, iFeature, iMate, or iAssembly

2.1.c Convert iFeatures to table-driven iFeatures

2.1.d Assign keys, part numbers, member names, materials, and appearance

2.1.e Manipulate the iPart, iFeature, or iAssembly table

2.1.f Suppress features in an iPart

2.1.g Exclude components in an iAssembly

i. May include identifying the workflow to convert a custom feature to an iFeature; creating a new row in an iAssembly table; and identifying the differences between factory scope and member scope.

2.1.h Constrain components using iMates

2.1.i Combine multiple iMates into a group

## **2.2. Use Frame Generator to create and edit frames**

2.2.a Set up assemblies and reference models to support frame generation

2.2.b Describe the purposes of the Insert, Lengthen, Miter, Notch, and Reuse tools

## **2.3. Describe the benefits of using Design Accelerators to create bolted connections**

i. May include determining if bolted connections modify the parts they attach to; and whether you can pattern bolted connections on parts created from iParts.

## **3. Standard part modeling**

### **3.1. Describe the characteristics of models that fulfill design intent**

3.1.a Use parameters

3.1.b Create functions on parameters

3.1.c Create models by using equations and/or units

3.1.d Recognize when geometric constraints are preferable to dimensional constraints

3.1.e Use driven dimensions

3.1.f Define the benefits of Feature Reorder

### **3.2. Demonstrate the effective use of feature patterns on parts in assemblies**

3.2.a Describe when to use patterns

i. May include circle patterns, rectangle patterns, sketch-driven patterns, and mirror.

3.2.b Describe benefits and drawbacks of patterns

3.2.c Describe the effects of using patterns

### **3.3. Identify advanced uses of work features**

- i. May include the User Coordinate System, work planes, work points, and work axes.
- ii. May include knowing how you can create a 2D sketch from a part with nonplanar faces.

### **3.4. Identify scenarios in which to use Direct Edit**

- 3.4.a Manipulate imported step files
- 3.4.b Rescale parts
- 3.4.c Create editable parameter names

### **3.5. Create and modify complex sketches**

- 3.5.a Use shared sketches to create or modify additional features
- 3.5.b Create 2D sketches using the Project Cut Edges tool
- 3.5.c Relax constraints

### **3.6. Analyze the implications of adaptive parts**

- 3.6.a Explain how adaptive parts impact the performance of assemblies
- 3.6.b Explain how to apply states of adaptivity to assembly components
- 3.6.c Describe the process of using projected geometry to create adaptive or non-adaptive parts

## **4. Advanced part modeling**

### **4.1. Create 3D sketches**

- 4.1.a Create 3D sketches from work features, sketches, surfaces
- 4.1.b Use work geometry or work features to define 3D points
- 4.1.c Create intersection curves, silhouette curves, or curves on faces
- 4.1.d Constrain 3D sketches
- 4.1.e Control vertices

### **4.2. Apply 3D features**

- 4.2.a Create a feature using Decal, Emboss, or Rib
- 4.2.b Create a part derived from an existing part

### **4.3. Create and use multibody parts**

- 4.3.a Determine appropriate use of multibody parts
- 4.3.b Understand benefits and drawbacks of multibody parts
- 4.3.c Import objects as bodies from step files
- 4.3.d Combine multi-body parts
- 4.3.e Position multi-body parts

4.3.f Make parts or components from bodies

#### **4.4. Create and edit surfaces**

4.4.a Unwrap part faces

4.4.b Edit surfaces by using the Patch, Repair, Sculpt, Stitch, and Trim tools

#### **4.5. Develop free-form models**

4.5.a Use free-form modeling to create solids

4.5.b Use free-form modeling to create organic shapes

4.5.c Convert geometry to free-form models

#### **4.6. Apply topology optimization principles**

4.6.a Explain how the Shape Generator can optimize design

4.6.b Define loads, constraints, materials, boundaries, and keep outs

### **5. Assembly modeling**

#### **5.1. Modify the Bill of Materials in the BOM Editor**

5.1.a Modify the BOM structure

i. May include changing materials and appearances, filling out multiple iProperties, including BOM information in the part file.

ii. May include working with merged rows (show, clear, and unmerge).

5.1.b Control item number assignment

#### **5.2. Import, link, and export files or point clouds**

5.2.a Import, link, and translate files into Inventor

5.2.b Export Inventor files

5.2.c Import point clouds

5.2.d Describe the point cloud import process

i. May include knowing what point cloud file types can be imported into Inventor and how to manipulate a point cloud when attaching it.

#### **5.3. Describe and use Shrinkwrap**

5.3.a Describe the purpose of Shrinkwrap

i. May include converting assemblies to parts, reducing file size, and suppressing links to base assemblies.

ii. May include understanding why you should use shrinkwrap and the benefits of using it.

5.3.b Given a scenario, identify the correct Shrinkwrap style

#### **5.4. Optimize component relationships in an assembly**

i. May include rigid joints, rotational joints, angle constraints, flush constraints, insert constraints, mate constraints, motion constraints, and constraint sets.

## **5.5. Create and manage representations**

5.5.a Create and manage levels of detail (LODs), Design views, and positional representations

5.5.b Filter parts list content by creating Design views

## **5.6. Restructure components and views in the browser**

5.6.a Demote components to create subassemblies

5.6.b Promote components of subassemblies

5.6.c Filter components within assembly folders

## **5.7. Understand the key workflows for large assembly management**

5.7.a Access and use selection filters

5.7.b Utilize Express Mode to open large assemblies

5.7.c Understand specific modeling techniques that affect performance

## **6. Deliverables**

### **6.1. Use breakout and overlay views, and Geometric Dimensioning and Tolerancing (GD&T) to create 2D documentation**

6.1.a Use Breakout view to communicate drawing detail

6.1.b Use Overlay view

6.1.c Annotate drawings to communicate GD&T

i. May include knowing what to you need to create different views.

### **6.2. Generate files and views for collaboration and digital fabrication**

6.2.a Create, validate, and annotate 3D PDFs, A360, DWG files, and files for 3D printing

6.2.b Share views of components and project files

## **7. Sheet metal**

### **7.1. Use the Sheet Metal environment to create features**

7.1.a Unfold sheet metal features

7.1.b Refold sheet metal features

7.1.c Bend sheet metal features

7.1.d Create Corner Fillets

7.1.e Define bend order, bend direction, bend notes, area, sheet metal extents, and bend table in drawings

i. May include identifying the requirements for using specific sheet metal features

## **8. Weldments**

### **8.1. Create models and deliverables in the Weldment environment**

#### 8.1.a Create models

- i. May include weld prep, welds, and machining.

#### 8.1.b Create deliverables

- i. May include assembled, preweld Conditions, welding, and post-weld machining.