

Introduction to Inventor

Designers have used Computer Aided Design (CAD) programs for decades to refine ideas and generate images that manufacturers and other professionals can use to make profitable solutions to problems. The development of three-dimensional CAD solid modeling programs has resulted in significant increases in the quality of complex designs while drastically reducing the amount of time needed to produce those designs.

Instructional Objectives:

The overall goal and objective of this instructional session is as follows:

Using Autodesk Inventor, the sketch tools, and the feature tools available, students will design a three-dimensional computer model of a block from the demonstration sheet.

By completing this objective, the learners will be able to complete the following tasks involved in 3D design.

- Students will become familiar with the Autodesk Inventor user interface.
- Students will be able to effectively use sketch tools to create 2D sketches that will be used to create 3D models
- Students will be able to effectively use feature tools to create 3D models and 3D model features from 2D sketches.
- Using Autodesk Inventor, students will be able to create nine of the eleven objects shown.
- Students will be able to effectively communicate the process of creating a 3D model to a classmate.

Instructional Goals:

By the end of this unit, learners will be able to effectively communicate three dimensional design ideas using a computer program Called Autodesk Inventor. They will be able to create proper sketches that will then be converted into extrusions of three dimensional objects. They will also become familiar to the user interface of the program.

Learner Analysis:

This lesson is designed to be delivered to users of conventional 2D CAD systems. These systems draw in two dimensions with limited three dimensional viewing. It is expected that the users will come into the lesson with minimal knowledge about three dimensional systems, however, they should already be familiar with CAD systems in general.

This unit has been designed to be delivered to users in design firms that are transitioning to a true 3D CAD system, and it is therefore assumed that they are voluntary students. Most users should be familiar with the terms and actions used, but the methods will be new to most.

Organization:

This training is broken into three different lessons. Lesson number 1 introduces students to the basic user interface of Autodesk Inventor. Lesson 2 introduces students to the concept of sketching 2D shapes for later use in modeling. This lesson will be built upon in lesson 3 when students will learn how to turn their 2D sketches into 3D models using the feature tools available.

Instructional Sequence:

Lesson 1 should be able to be completed in 30-40 minutes. The lesson introduces students to the basic user interface of Autodesk Inventor. It also gives the students time to practice very basic skills such as project management and different file types.

Lesson 2 has two components. The first component can be completed in 50-60 minutes and comprises of instruction and introduction to the different sketching tools. The second component can be completed in 1-2 hours, and comprises of practice using the different sketch tools to complete various tasks.

Lesson 3 has two components. The first component can be completed in roughly 60 minutes and comprises of instruction and introduction to the different feature tools. The second component can be completed in 1-2 hours, and comprises of practice using different feature tools to complete various 3D tasks.

Activity Sequence:

1. Introduction to Autodesk Inventor User Interface (1 hour)

Introduction

- Hand out student manual and presentation notes
- Have students open Inventor on computers and wait to see that everyone has the same opening splash screen.

User Interface

- Explain what the different areas of the user interface are used for and have students record the areas in the student manual. The answers have been provided in red.
- Demonstrate features of program user interface

- Demonstrate how to create project folders to save files to
- Have students create project folders

2. 2D Sketching (2-3 hours)

- Demonstrate each of the sketch tools for students on overhead and corresponding slideshow.
- Have students create each sketch after demonstration
- Have students draw each example from the practice sheet using the sketch tools available.

3. 3D Modeling (2-3 hours)

- Describe to students the concept of extruding sketches outward into 3D.
- Discuss with students the importance of additive and subtractive modeling.
- Demonstrate each of the modeling tools available in the modeling area on the overhead and the corresponding slideshow.
- After demonstrating each tool, have students create the feature shown.
- Students will create models from the practice sheet using the different features covered in this lesson

4. Assessment (1-2 hours)

- Students will create nine of the eleven objects located in the student manual using Autodesk Inventor
- Students will create a step by step set of instructions on how to create one of the objects selected by the instructor.
- Students will swap instructions and follow the received instructions to verify that the instructions were written properly.

Materials:

Instructor Guide	Includes information on instructional lessons, procedures and time allotments, reference materials and links to powerpoints.
Student Manual	Instructional text, practice sheets, CD-ROM containing instructional presentations for reference.

(This lesson requires that the instructor/trainer is familiar with the operation of Autodesk Inventor. Information regarding the use of Autodesk Inventor can be found at the [Autodesk Knowledge Base](#))

3D modeling

Instructor Guide

Materials:

LCD Projector
Student Manual
Instruction CD

Time:

30 minutes of instruction on modeling tools. 1-2 hours time on computers to complete models.

Procedure:

- Describe to students the concept of extruding sketches outward into 3D.
- Discuss with students the importance of additive and subtractive modeling.
- Demonstrate each of the modeling tools available in the modeling area on the overhead and the corresponding slideshow.
- After demonstrating each tool, have students create the feature shown.
- Students will create models from the practice sheet using the different features covered in this lesson

Assessment

Instructor Guide

Objective:

Students will be able to effectively communicate the process of creating a 3D model to a classmate.

Materials:

Computer with Autodesk Inventor installed
Student Manual

Procedure:

- Students will create nine of the eleven objects located in the student manual using Autodesk Inventor
- Students will create a step by step set of instructions on how to create one of the objects selected by the instructor.
- Students will swap instructions and follow the received instructions to verify that the instructions were written properly.

NOTE:

Student answers will vary as there are many different ways to describe the process for building an object in Autodesk Inventor. The instructor should be looking for accurate procedures that another student can follow with ease.

Students may choose any 9 of the 12 pictured objects. Each object should have the correct dimensions according to the grid on the assessment sheet.

3D Modeling

Student Manual

Equipment

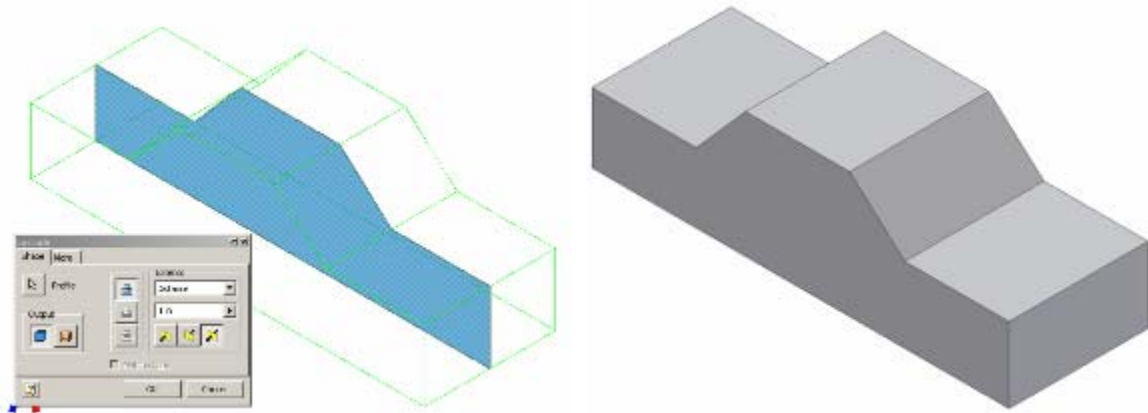
- Computer with Autodesk Inventor installed
- PART files located on Student Resource CD:
 - Mid-plane
 - Bushing
 - CircularPattern
 - RectangularPattern
 - Loft
 - Threaded rod
 - Fillets-chamfers
 - Left half

Procedure

This activity will help you to understand and utilize the feature tools used in Autodesk Inventor.

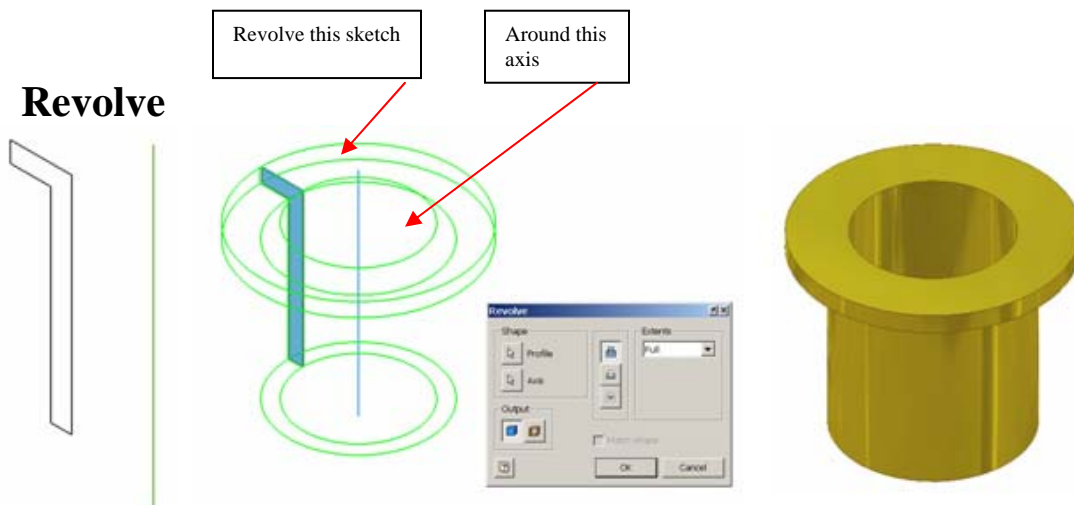
There are 8 exercises in this activity which represent the different feature tools available to use in Autodesk Inventor. You will need to open the files provided from the student resource CD. As you finish each exercise, initial the graphic, save the PART file, document the file name and location on the line provided, and submit this activity to your instructor for evaluation.

Mid plane Extrusions



The mid plane extrusion function will join, cut, or intersect the selected sketch equal distances in both directions from the selected profile. Open the file Mid-plane, and perform a 1 inch mid plane extrusion on the sketch. (note: the extrusion can occur in one direction or the other if a mid plane is not desired) Save the file as a different name.

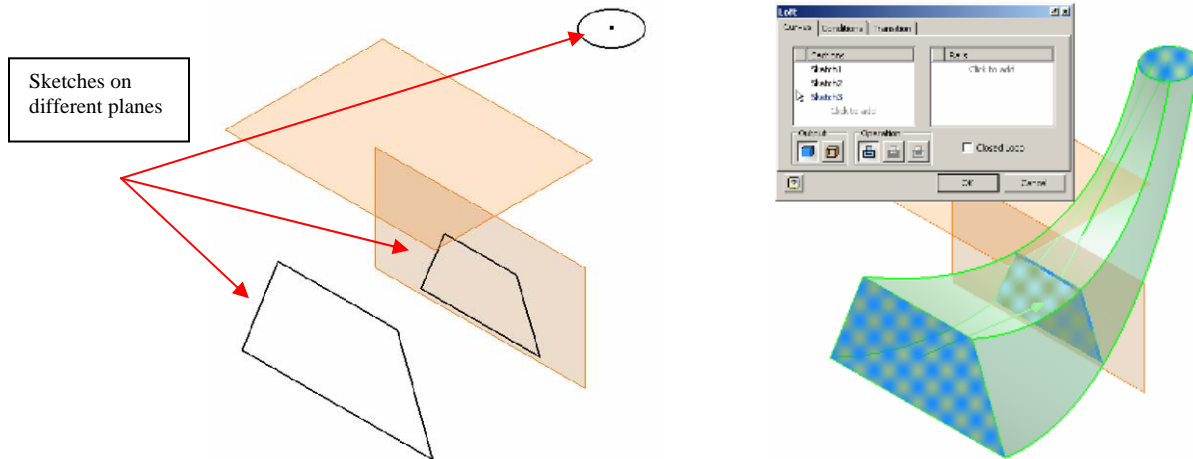
PART file name: _____



Revolve is a function that allows the user to extrude a closed profile around a fixed axis up to 360°. The axis can be part of the profile, an existing edge on a part, or one of the axes of the Cartesian coordinate grid. Grid axes may be selected from the Origin folder located in the Browser bar. Open the file called Bushing. Use the revolve function to revolve the sketch around the existing axis a full 360°. Save the file as a different name.

PART file name: _____

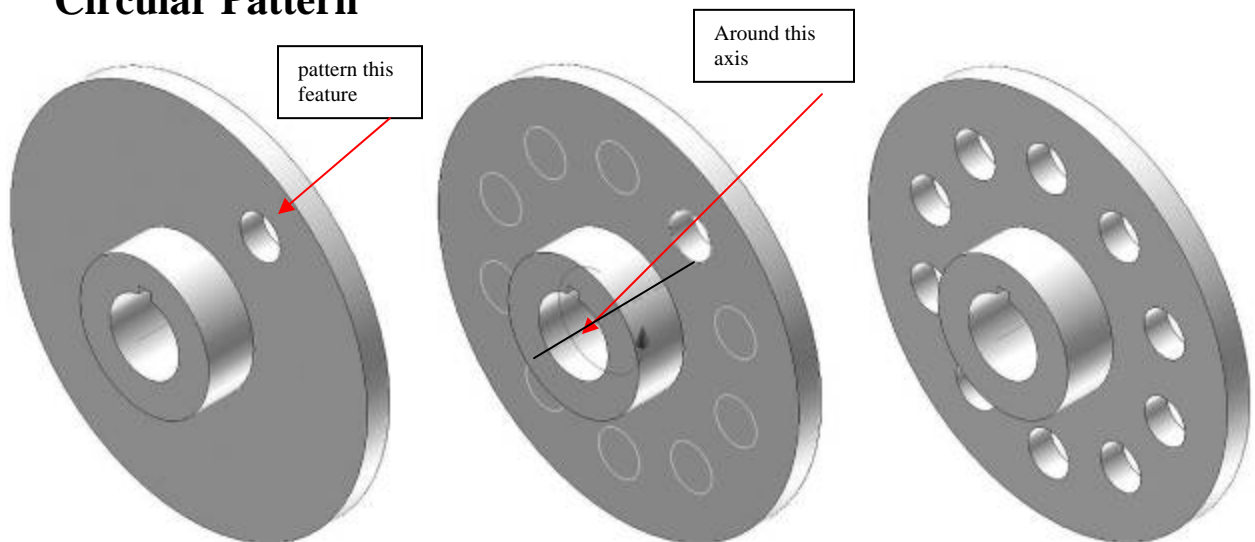
Loft



The loft function allows the user to create a solid by blending two or more closed sketches that are located on different planes. Open the file called Loft. Use the loft function to blend the three sketched profiles into one solid object. Save the file as a different name.

PART file name: _____

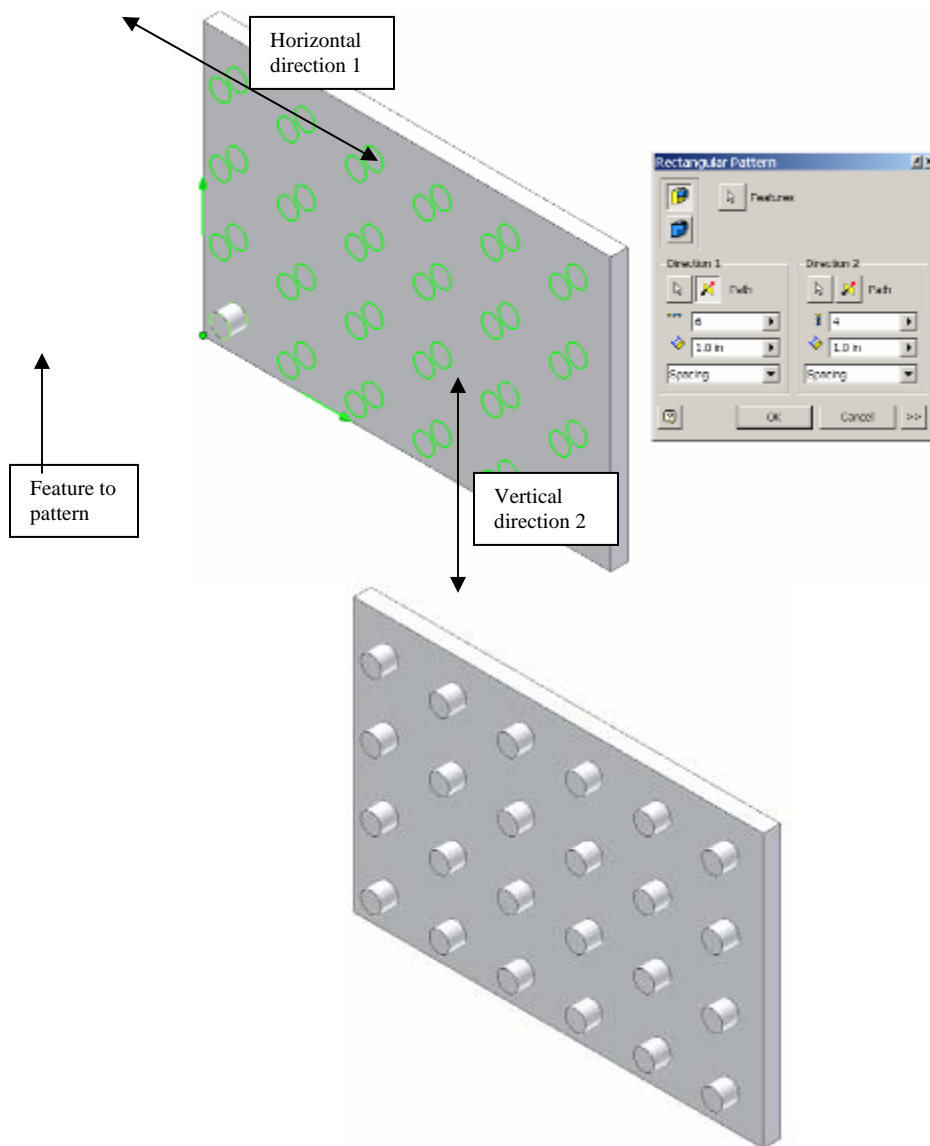
Circular Pattern



The pattern function allows the user to make multiple copies of an existing feature in one of three ways. A circular pattern is often used to pattern a hole around a center axis. An edge on an existing feature can also serve as the center axis. Open the file called CircularPattern, and use the circular pattern function to copy the existing hole on the flange plate a total of 10 times (the first hole must be represented in the count) around the existing axis. Save the file as a different name.

PART file name: _____

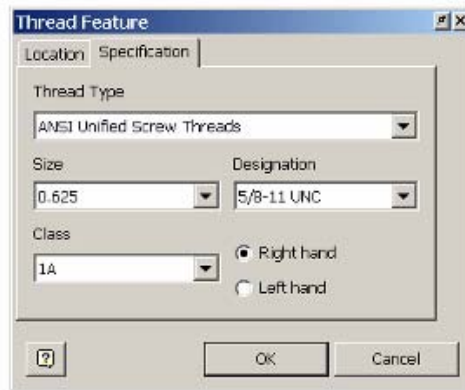
Rectangular Pattern



The rectangular pattern function allows the user to make copies of an existing feature in one direction, or two directions simultaneously. Existing edges must be selected to identify the desired direction(s). Open the file called RectangularPattern. Use the rectangular pattern to copy the existing cylindrical extrusion six times in the horizontal direction and four times in the vertical direction. Save the file as a different name.

PART file name: _____

Thread

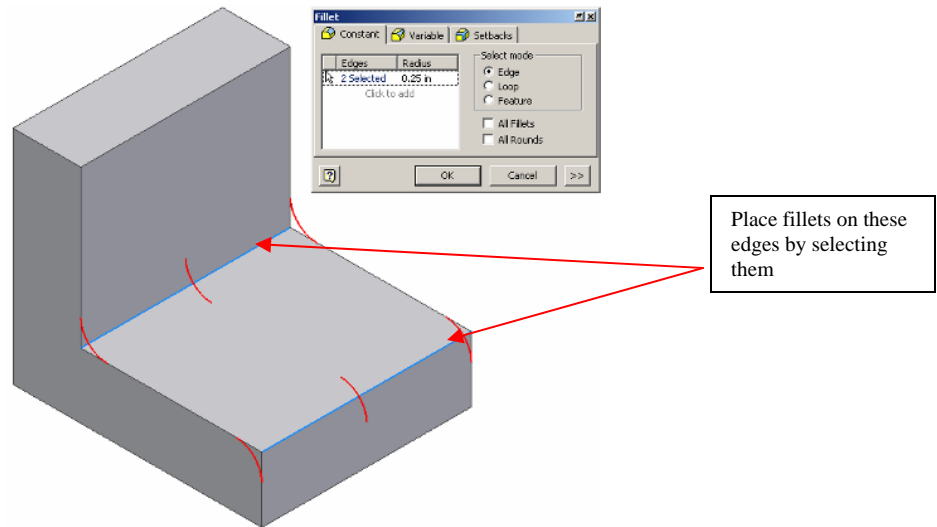


Click on the face of the cylinder

The thread function allows the user to simulate the appearance of threads on the curved surface of either a cylinder or a hole. This will aid in calling out the dimensions later in the documentation process. The diameter of the cylinder or hole must match the nominal diameter of the desired thread form. Open the file called ThreadedRod. Use the thread function to place a right-hand 5/8-11 UNC thread along the entire length of the cylinder's curved face. Save the file as a different name.

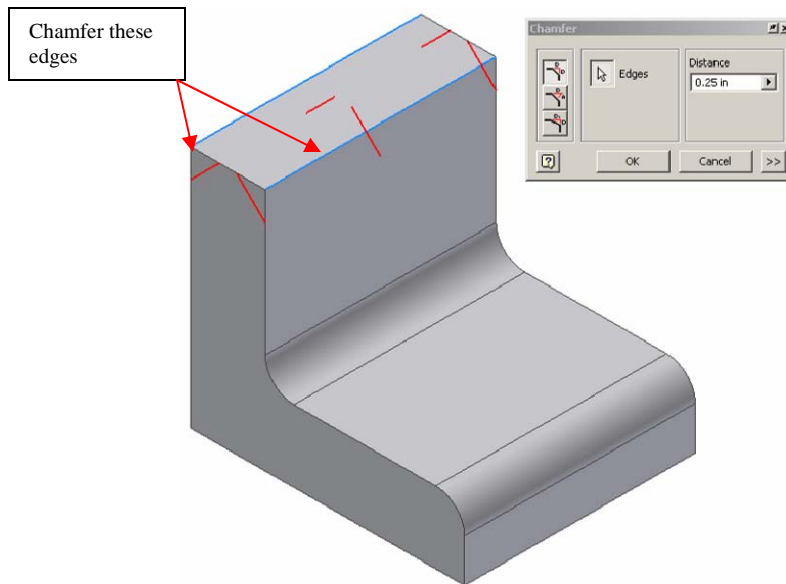
PART file name: _____

Fillet



Fillet is a function that allows the user to create a rounded edge where two surfaces meet to form an edge. It should be noted that on an exterior corner, the resulting feature is known as a round. On an interior corner, the resulting feature is known as a fillet. The fillet tool is used for both features. Open the file called Fillets Chamfers. Use the fillet function to apply a .25 radius to the corners shown above. This model will be used in the next exercise.

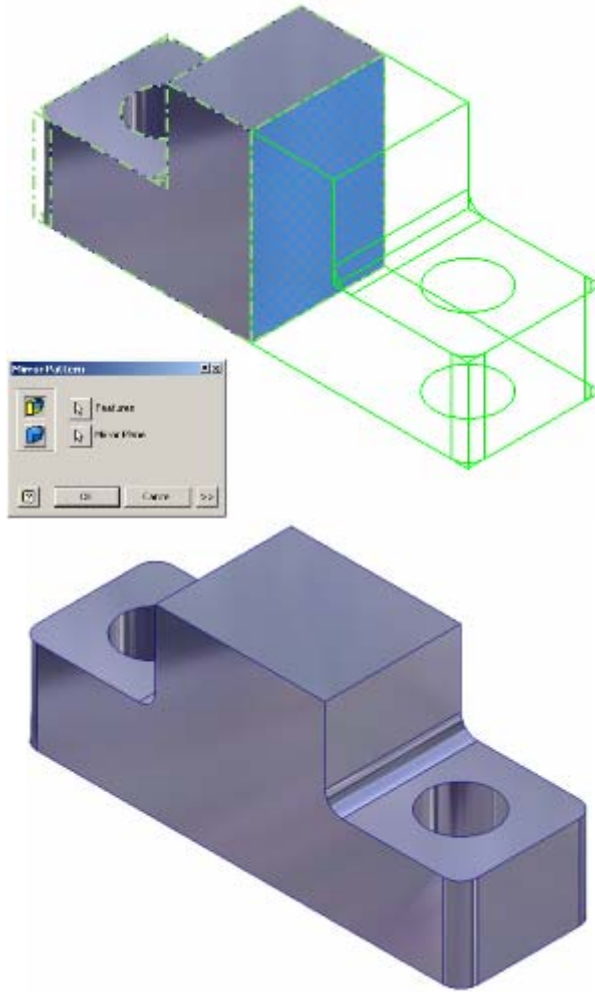
Chamfer



Chamfer is a function that allows the user to apply an angle surface where two existing surfaces meet to form an edge. Use the chamfer function to apply a .25 inch x 45° chamfer to the edges shown above on the file from before. Save the file as a different name.

PART file name: _____

Mirror



Mirror is a function that allows the user to create a mirror image of existing geometry. This function requires an existing feature(s) and a surface or work plane to serve as the mid-plane of symmetry. Open the file called LeftHalf. Use the mirror function to add a duplicate mirror image of the existing geometry on the other side of the right face of the object. Save the file as a different name.

PART file name: _____

Assessment

Student Guide

Materials:

Computer with Autodesk Inventor installed
Student Manual

Procedure:

In this assessment, you will create computer models of different objects. You will write step-by-step instructions on how to create one of your objects and give them to a classmate to create from your instructions. The teacher will assign the object for which you will need to write the directions.

- Create nine of the eleven objects located below using Autodesk Inventor.
- Create a set of step-by-step instructions on how an object was created using Autodesk Inventor. The instructor will determine the object for which you will write the instructions.
- Trade your instructions with a classmate and create his or her object.

