COMPUTER AIDED DESIGN (CAD)

1. Complete one of the following two options:
   a. Find a local manufacturing company or design company that is using CAD to design and produce products and arrange to have a tour of the design department.
   b. Get a professional designer or engineer who works with CAD software to come to your Cadet meeting and have him/her explain how they use CAD software and what they can make with CAD software.

Date Completed: **Passed By:**

2. In what decade of the twentieth century was CAD first used? _____

Date Completed: **Passed By:**

3. What CAD software was the first to use Graphic User Interface (GUI) to make the design process easier?

   _____

   _____

Date Completed: **Passed By:**

4. What was the name of the software system written by Dr. Hanratty in 1971 that jump-started the use of CAD in industry? _____

   _____

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Date Completed: **Passed By:**

5. What industries were the first to use CAD software?

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Date Completed: **Passed By:**

6. What 1982 film featured the use of computer animation?

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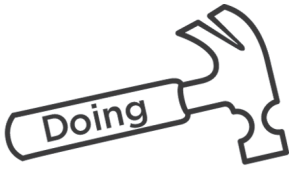
Date Completed: **Passed By:**



1. Select a CAD software for your computer and complete the tutorial for that program.

Date Completed: **Passed By:**

2. Demonstrate the following to your counselor:
   a. Show how to navigate in your software — specifically how to pan, zoom in, zoom out, and zoom extend.
   b. Show that you can draw with your software by creating the following simple objects:
      - 2D: Draw a line, a rectangle, a triangle, a circle,
      - 3D: a square cube and a cylinder.
   c. Show that you know how to use coordinates by creating an object that is of the following dimensions: 3 inches high (y-axis), 4 inches wide (x axis), and 2 inches deep (z-axis).
   d. Show that you understand the keyboard commands for your CAD software by doing the following: Select an object, move an object, copy an object, stretch/enlarge an object, and mirror an object (creates a reflected image of an object).
   e. Explain to your counselor what "annotation" is.
   f. Create a simple object in your CAD software (cube or cylinder) and apply a texture and color to it.

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3. Using your CAD software create 3D renderings of the two objects shown here, and create a rendering of a third object of your choice. We suggest that the third object be something of interest to you, like a pinewood derby car design. Print out your drawings and show them to your counselor.

Figure A

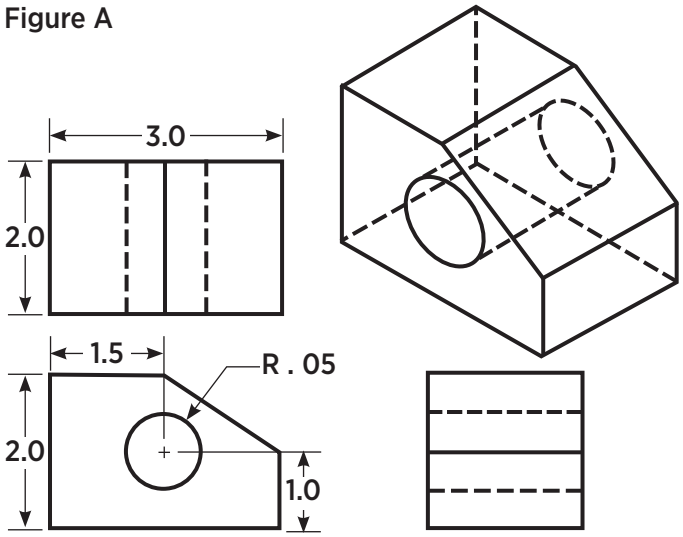
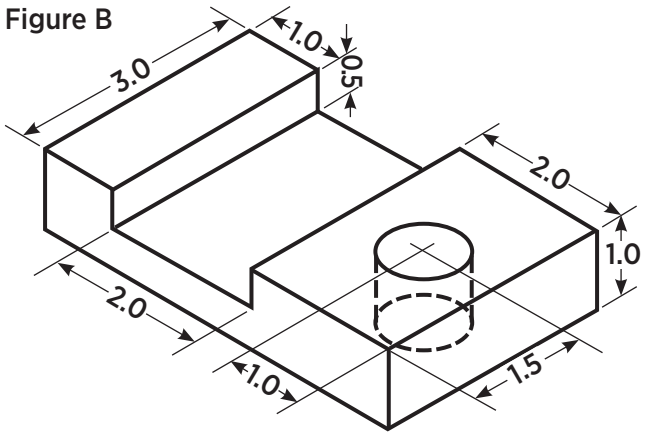


Figure B



Date Completed: **Passed By:**

Badge Approved by: _____

Badge Completed on: _____

Computer Aided Design

PURPOSE

To help your Cadets explore basic CAD skills and tools, and thus begin discovering and developing any God-given abilities in this area.

LEARNING

1. This is self-explanatory.
   Some things you should learn about CAD while doing this question: What is CAD? CAD (Computer Aided Design) is the use of a computer to assist in the creation of designs for print, machining, or other manufacturing. Example: If a furniture company wants to produce a new chair they design the chair on the computer using CAD software and then the software can print the design on paper or output the computer information to a machine that can actually cut or mill the parts for the chair. Current technology also allows home users to create 3D models with the use of 3D printers that "build" the design with heated plastic that sets as soon as it is extruded from the print head.
2. The first primitive versions of CAD were developed in the early 1950's.
3. A milestone in the development of CAD systems was a software called Sketchpad that was created at MIT (Massachusetts Institute of Technology) in 1962. This software had the rudimentary elements of Graphics User Interface (GUI) that made it easier for the computer user to interact with the computer through visual cues rather than to type in code.
4. One of the most influential events in the development of CAD was the founding of Manufacturing and Consulting Services Inc. (MCS) in 1971 by Dr. P. J. Hanratty, who wrote the system Automated Drafting And Machining (ADAM), but more importantly supplied code to companies such as McDonnell Douglas (Unigraphics), Computervision (CADDS), Calma, Gerber, Autotrol, and Control Data.
5. By the mid 1960's large corporations, such as automotive, aircraft, and electronics companies, who could afford expensive computer systems were using CAD to design their products.

   In the 1980's when personal computers came to the general consumer market, the use and development of CAD software grew exponentially. Many medium and small companies that had large drafting departments (using pencil and paper to draw designs) replaced them with CAD systems.
6. The 1980's also saw the advent of CAD type systems being used in the entertainment industry. Computer animation made it's first serious debut in the 1982 feature film called Tron.

   Today, CAD and it's "cousins" — Computer Animation, CGI (Computer Generated Imagery), Desktop Publishing, Multimedia Development, and Vector Illustration are the normal practices for any design work.

DOING

1. This can be challenging to assist a Cadet on CAD projects since there are many CAD software programs available and they are constantly being updated. Your best course for helping a boy complete this badge (if you have no CAD experience yourself) is to find someone in your congregation, or in your circle of friends who has some expertise in this area and is familiar with the software that the Cadet would like to use and have them assist the Cadet.

   Many CAD software packages include instructional videos that teach the basics of the software. Make sure the Cadet uses this resource or help him find other on-line resources so that he can learn to use his CAD software.
2. Projects — These exercises are designed to make sure the boy is familiar with the CAD software he is using. How they function is different depending on the software so we will provide just some basic explanations here. The Cadet will have to demonstrate that he knows about the following:
   a. Navigation: Can the Cadet move and scale (change size) of the object or move around the object in space?
   b. Drawing Tools: Can the Cadet draw basic design elements?
   c. Coordinates: Does the Cadet understand that coordinates are used to determine where an object is located in space? There is an origin where it begins counting from. This point is (0,0). Every object is located in relation to the origin. If you were to draw a line straight out to the right from the origin, this would be considered the positive X-axis. If you were to draw a line straight up, this would be the positive Y-axis. 3D work adds the Z-axis — depth.
   d. Commands: Does the Cadet know how to use these basic commands? These commands are used frequently by CAD designers.
   e. Annotation: Does the Cadet understand that annotation is information about the object such as title, description, dimensions, how it is to be assembled, etc. — in other words, any information other than the geometry of the piece itself?
   f. Styles: Can the Cadet add surface textures, colors, and shading to the object.
3. If you are not familiar with CAD, have a CAD user look over the completed projects to check for accuracy. A great incentive for a Cadet would be to find someone local who has a 3D printer that will actually print out one of his designs.