



2020 State Contest

AUTOMATED MANUFACTURING TECHNOLOGY

Description

CAD, CAM, and CNC are current manufacturing technologies that are making the United States competitive in the world market today. To remain competitive, companies worldwide must be able to access and apply current and emerging technologies in the design and manufacturing process. With today's complex designs and manufacturing problems, no one person can have all the answers, so it is imperative for manufacturers to combine the resources and abilities of a team to resolve problems. Workers in the field of automated manufacturing have found success in the team approach, and as it is our hope to emulate industry whenever possible, we will use the team approach in this competition. We suggest a team consisting of a specialist in each of the following fields: CAD, CAM, and CNC.

Rapid prototyping and concurrent engineering are two of the newest methods that the industry uses to reduce the time and cost it takes to bring a product to market. Rapid prototyping is defined by its title, how quickly you can make a prototype. Concurrent engineering involves the designer and manufacturer working on the design of the product throughout the entire development of the product.

ELIGIBILITY

Open to a team of three active SkillsUSA members enrolled in programs with precision machining, automated manufacturing, or CAD/CAM or CNC as the occupational objective.

TEAM GUIDELINES

1. The team is organized for primary responsibilities and duties.
2. There will be a team leader identified to interact with the judges.
3. Your breaks are based upon team decisions with the exception of the mandatory lunch break.
4. Breaks are to be taken within assigned individual work areas.
5. Team members must notify a technical committee member or a judge before taking a bathroom break. Only one team member is allowed to leave the contest area at a time.
6. **IN CASE OF SOFTWARE, HARDWARE, AND OR A MACHINE FAILURE PROBLEM:**
The team leader will communicate the problem to the judges so that the running time clock can be stopped for that team. In case of a stopped time clock, all work will stop for the entire team until the problem is resolved.

All SkillsUSA California contest projects are subject to change due to any unforeseen facility, staffing or site-related issues. Please use these materials as a reference to prepare students for the potential contest project. SkillsUSA California regional and state contest projects are developed by state technical committee members to align with the national technical standards.



7. The choice of CAD and CAM software is the responsibility of the team. If the software is to be loaded, then a non-team member must load the software. The software must be original copies.
8. You must create a separate file on your CAD system and transport it to your CAM system.

Note: Please check the SkillsUSA National website for updated contest information and the SkillsUSA National Technical Standards

- [SkillsUSA Championships Technical Standards](#)
- [Contest Updates](#)

Clothing Requirements

Class C: Contest Specific — Manufacturing/Construction Khaki Attire

- Official SkillsUSA khaki short-sleeve work shirt and pants
- Black, brown or tan leather work shoes

Note: Safety glasses must have side shield or goggles (prescription glasses may be used, only if they are equipped with side shields. If not, they must be covered with goggles.

[Clothing Classifications](#)

STATEMENT OF PROBLEM: Each automated manufacturing team should first select a company name that should be included on all documentation concerning this problem. **California AMT, Inc.** (hereafter referred to as *The Client*) will present your company with a sketch and perhaps an obsolete example of a part that they wish to have prototyped and manufactured.

The client is dissatisfied with its old supplier, whose antiquated manufacturing processes result in part signatures with unacceptable variance, unreliable quotations, and lead time which is much too long. Rapid prototyping and the ability to meet engineering changes at any point in the process are critically important. The client wishes to find the best shop to have parts prototyped and manufactured. The company will be competing for a lucrative contract with several other firms.

All SkillsUSA California contest projects are subject to change due to any unforeseen facility, staffing or site-related issues. Please use these materials as a reference to prepare students for the potential contest project. SkillsUSA California regional and state contest projects are developed by state technical committee members to align with the national technical standards.



DIRECTIONS

Rapid Prototype:

Build a prototype part from a sketch. The client will provide the prototype material. The client requires that each stage of the CAD/CAM/CNC process be well documented; including a CAD dimensioned print (three-view orthographic). After you cut the prototype and it has passed internal quality control, you will submit it to the client's quality assurance group. The client has specified accuracy, finish, and the turnaround time it takes to complete the process. All drawings should meet the proper guidelines for engineering drawings.

Concurrent Engineering: The client will review the prototype and will require one or more changes.

Process – The client will require you to produce the final part with the designated changes and a set of CAD dimensioned drawings (front, top, and right side views) and an isometric view. The client specifies dimensional accuracy, finish, and efficiency (part run time), as the significant issues in this stage.

GUIDELINES: Your engineering project manager has provided the base outline of the materials within this document to begin your planning and manufacturing process. Your success on this project is based on the following criteria:

1. Complete design documentation (drawings)
2. Complete documentation of process plan, tooling, setup, and CNC code
3. Quality assurance documentation (inspection)
4. The adaptability of the team – concurrent engineering from prototyping to production
5. Proper use of technology for the preparation of the product documentation, setups, design, and machining
6. Packaging the complete project with accompanying documentation in an orderly, professional presentation
7. Safety in the manufacturing process
8. Efficient use of time, material and resources
9. Effective use of teamwork in managing the project
10. Attitude, this problem will not be easy and teams are expected to persevere through the duration of the competition.

All SkillsUSA California contest projects are subject to change due to any unforeseen facility, staffing or site-related issues. Please use these materials as a reference to prepare students for the potential contest project. SkillsUSA California regional and state contest projects are developed by state technical committee members to align with the national technical standards.



QA AND DESIGN RESTRICTIONS

A part is considered perfect if it meets the following:

1. Hole locations (+ or - .005")
 2. Hole diameter (+ or - .0025")
 3. Slot diameter (+ or - .005")
 4. Hole depths (+ or - .010")
 5. Slot and shoulder locations (+ or - .010")
-

TEAM GUIDE

1: Contest Overview

1.1: Cutting-edge Technology

Current advances in manufacturing technologies such as CAD, CAM, and CNC, have allowed the United States to remain competitive within the global market. To compete in this evolving field, companies worldwide must remain at the forefront of both current and emerging technologies in design and manufacturing. With today's complex design and manufacturing challenges, no individual is equipped with all the answers, so it is imperative for manufacturers to combine the resources and abilities of a team to resolve problems.

1.2: Your Team

Success in Automated Manufacturing is often found using a team approach. In the interest of the emulating industry, this competition will be structured in this manner. For optimum team efficiency, we suggest your team be comprised of a specialist in each of the following fields:

- Computer-Aided Design (CAD)
- Computer-Aided Manufacturing (CAM)
- Computer Numeric Control (CNC)

All SkillsUSA California contest projects are subject to change due to any unforeseen facility, staffing or site-related issues. Please use these materials as a reference to prepare students for the potential contest project. SkillsUSA California regional and state contest projects are developed by state technical committee members to align with the national technical standards.



1.3: Cost Reduction

Rapid Prototyping and Concurrent Engineering are two of the most efficient methods used by industry to reduce the time and cost of bringing a new product from concept to market. Rapid Prototyping is simply the development of a prototype as quickly as possible. Concurrent Engineering is the pairing of the designer with the manufacturer to simultaneously work on the design of the product throughout the development of the product in its entirety.

1.1: Statement of the Problem

1.1.1: The Client's Needs

D&J Industries, Incorporated (hereafter referred to as The Client) is dissatisfied with its old supplier. They used manual machines causing the part signatures to have an unacceptable variance, their quotations were inaccurate, and their lead-time was unacceptable.

It is critically important that the Client locate a firm able to rapid prototype and meet engineering changes at any point in the prototyping process. The Client wishes to find the best shop to have the 4 cavity cap mold prototyped and manufactured.

As an Automated Manufacturing Technology team, known as Pro Design, Incorporated, your company will be competing for this lucrative contract against several other firms.

1.1.2: Your Assignment

Pro Design has been presented with a sample part drawing that the Client wishes to have mass-produced. Your team will need to prototype the 4 cavity cap mold, incorporate any changes that the client might make, then manufacture the final assembly.

Pro Design's Team Leader is responsible for communication between your company and D&J Industries, Incorporated.

All SkillsUSA California contest projects are subject to change due to any unforeseen facility, staffing or site-related issues. Please use these materials as a reference to prepare students for the potential contest project. SkillsUSA California regional and state contest projects are developed by state technical committee members to align with the national technical standards.



1.2: Instructions

1.2.1: Rapid Prototype

The Client is a manufacturing plant that needs a new product designed and created. Currently, the only information they can supply is a rough concept and drawing for the 4 cavity cap mold. This assembly is made up of three pieces, and the prototype material (Ren board-440) will be provided by the client. Your team's job is to machine this assembly prototype.

The Client requires that each stage of the CAD/CAM/CNC process be well documented, including a properly dimensioned CAD print for each of the components. All drawings should meet the proper guidelines for engineering drawings.

After your prototype has been cut and has passed your internal quality control, you will submit it to The Client's Quality Assurance Group. The Client has specified accuracy, finish, and the turn-around-time it takes to complete the process.

1.2.2: Concurrent Engineering

The Client will review the prototype and may require one or more changes. The Client requires quick updates to product design throughout the development process. Significant issues in this stage are The Client's specified dimensional accuracy, finish, and efficiency in part programming.

1.3: Guidelines

1.3.1: Requirements

The Client's Engineering Project Manager has provided an outline of materials to begin your planning and manufacturing process. Your success on this project is based upon the following criteria:

1. Provide complete documentation of your design.
2. Provide complete documentation of process plan, tooling, and setup.
3. Provide Quality Assurance on all parts.

All SkillsUSA California contest projects are subject to change due to any unforeseen facility, staffing or site-related issues. Please use these materials as a reference to prepare students for the potential contest project. SkillsUSA California regional and state contest projects are developed by state technical committee members to align with the national technical standards.



4. Use the technology in preparation of documentation, setups, design, and machining properly.
5. Package completed project with accompanying documentation in an orderly, professional presentation.
6. Use teamwork in project management effectively.
7. Take safety precautions in the manufacturing process.
8. Use time, materials, and resources effectively.

1.4: QA and Design Restrictions

1.4.1: Tolerances

The prototype parts are considered perfect if their measurements are within the following tolerances:

1. Hole Locations = + OR. - .005"
2. Hole Diameter = + OR. - .003" on finished holes
3. Slot Dimension = + OR... - .005"
4. Hole Depths = + OR. - .003"
5. Slot and Shoulder Locations = + OR - .005"

1.5: Team Guidelines

1.5.1: Production Guidelines

Your team should follow these guidelines:

1. Primary responsibilities and duties are organized.
2. A team leader is identified to interact with Technical Committee representatives.
3. Your team decides upon appropriate break times with the exception of the mandatory lunch break.
4. Breaks are to be taken within assigned individual work areas.
5. Team members must notify a Technical Committee representative before taking a bathroom break. Only one team member is allowed to leave the contest area at a time.
6. You must create a separate file of your CAD drawing on your CAD computer and transport it to your CAM computer via a USB memory stick.

All SkillsUSA California contest projects are subject to change due to any unforeseen facility, staffing or site-related issues. Please use these materials as a reference to prepare students for the potential contest project. SkillsUSA California regional and state contest projects are developed by state technical committee members to align with the national technical standards.



1.5.2: Equipment Malfunctions

IN THE CASE OF A MACHINE FAILURE: The team leader will communicate the problem to a representative of the Technical Committee. The representative will then notify the Project Manager. If it is determined that it is in fact a machine problem, the running time clock may be stopped for that team. In the case of a stopped time clock, all work will stop for the entire team until the problem is resolved.

IN CASE OF SOFTWARE PROBLEMS: The choice of CAD and CAM software is the responsibility of the team. All software must be original copies. If your team develops a problem with your software, the Technical Committee will work in whatever way it can to resolve the problem but the clock will not be stopped.

2.4.1: Teams and Documentation

1. Teams **MUST** be composed of three members. Teams will demonstrate their ability to perform, utilize the skills and knowledge necessary to complete the project as presented to them by the Technical Committee.
2. Your team is presented with a dimensioned drawing(s) of a part(s) to prototype. When you finish machining the prototype part(s) you will present it to The Client (judges). At this time you will be presented with a new drawing(s); either a change order or an additional part(s) request.
3. Each team will be issued a notebook. This will include all of the necessary information and forms to complete the project. These forms will not be highly specific but will coach the teams. All forms and drawings must be turned in to the judges at the end of the competition.

2.5: Group Organizational Goal

2.5.1: Team Dynamics

The competition should run much like you would expect from the industry; with group members interacting at will. The CAD operator will construct the part geometry, the CAM operator will generate the toolpaths, and the CNC operator will do the setup and

All SkillsUSA California contest projects are subject to change due to any unforeseen facility, staffing or site-related issues. Please use these materials as a reference to prepare students for the potential contest project. SkillsUSA California regional and state contest projects are developed by state technical committee members to align with the national technical standards.



machine the part.

The contest is designed to promote creativity in the organization of production responsibility. Teams should divide duties among all team members. No one individual should dominate by taking responsibility for more than one project specialty. When a team member has spare time, they will help their teammates. All Team members are responsible for double-checking each other's work and quality control.

2.6: General Information

2.6.1: Necessities

The following items are required to compete in this contest:

1. Intelitek's Benchmill 6100 series CNC milling machines and tooling will be provided.
2. Teams must provide two computers, one of which must accept an Ethernet connection.
3. Each team will have licensed versions of CAD/CAM software.
4. Each team will provide a 6" dial or digital Vernier caliper.
5. Dial indicator (i.e. Starrett Last Word Dial Test Indicator, must have 3/8" holding shank)
6. a calculator
7. 6" or 12" steel rule
8. soft face hammer.
9. The Prototype and the finished part will be machined in a prototype material.
10. Each team can provide a 3/8 edge finder.
11. Each team can provide a set of parallels.
12. Each team can provide appropriate sized end mills. 13. Each team must provide a machinist handbook.

2.7: Goals

2.7.1: Team Objectives

1. To have every team complete the competition.
2. To have each team member demonstrate reading and writing skills.
3. To have each team member use their critical

All SkillsUSA California contest projects are subject to change due to any unforeseen facility, staffing or site-related issues. Please use these materials as a reference to prepare students for the potential contest project. SkillsUSA California regional and state contest projects are developed by state technical committee members to align with the national technical standards.



thinking and problem-solving abilities in the contest. 4. To have each team member illustrate responsibility, teamwork, self-management skills, and professionalism.

2.8: Notebook

2.8.1: Supplied Documentation

Each team is issued this notebook and information packet. This will allow the team to display a plot or print of their operation. Required documentation is also included.

2.9: Required Materials

2.9.1: Workstation Components

Teams require the following materials to complete the competition. The Technical Committee provides many of these materials, but the teams must also bring certain items.

AMT Technical Committee provides:

intelitek's Benchmill 6100 CNC Machining Center with:

- Machinist Vise
- Hold-downs and clamps
- Tool holders
- Jog wheel Part(s) design. Competition notebook. Pencils. Prototype Material for machining. Information and furnishings for judges and technical committees.

2.9.2: Team Provided Components

Teams provide:

Two computers:

- One computer loaded with CAD software for the CAD program.
- One computer loaded with software for the CAM program. This computer **MUST** have an open LAN Port (ethernet connection)
- Licensed versions of the above CAD and CAM software must be available at the start of the orientation/practice session for loading onto the technical committee's computer(s).

All SkillsUSA California contest projects are subject to change due to any unforeseen facility, staffing or site-related issues. Please use these materials as a reference to prepare students for the potential contest project. SkillsUSA California regional and state contest projects are developed by state technical committee members to align with the national technical standards.



- One six-inch dial or digital vernier caliper.
- One dial indicator (example: L.S. Starrett Last Word dial test indicator) Dial indicator
- MUST have 3/8" holding shank to fit into tool holder supplied by Technical Committee. One calculator.
- One set of parallels (multiple heights).
- One soft-faced hammer One 6" or 12" steel rule.
- Each team must provide a 3/8 edge finder.
- Each team must provide a machinist handbook.
- Each team can provide appropriate size end mills.
- Two USB memory storage devices (with your team number clearly marked on it)

Note: ONLY the above-listed items will be allowed in the contest area during the competition.

2.10: Division of Duties

2.10.1: Department Contributions

Process Documentation Notebook Possible Division of Duties

CAD Department CAD Engineer

Stage 1 - Rapid Prototype All CAD system import and export Original print Creating part geometry CAD dimensioned views necessary to detail part completely Exporting necessary geometry to the CAM system

Dimensioning parts

Stage 2 - Finish Part Production Plots Change order Receive change order CAD dimensioned print (views necessary to detail Communication of changes to team part completely) and pictorial view Update all CAD files All drawings should meet guidelines for engineering drawings

CAM Department CAM Engineer

Stage 1 - Rapid Prototype All CAM system input and output Process documentation to include the selection of Importing CAD geometry tools, machining order, etc. Creating

All SkillsUSA California contest projects are subject to change due to any unforeseen facility, staffing or site-related issues. Please use these materials as a reference to prepare students for the potential contest project. SkillsUSA California regional and state contest projects are developed by state technical committee members to align with the national technical standards.



tool paths Generate NC code Process sequencing Tool selection

Stage 2 - Finish Part Production Creating NC code Develop new process plan Program new toolpath Generate NC code

CNC Department CNC Engineer

Stage 1 - Rapid Prototype All CNC setup and operation Fixturing description CNC control software input Tool description Fixturing stock, tool offsets Tool setup Fixture and set-up

Stage 2 - Finish Part Production Finish ECO part production

Quality Control Department Quality Control

Stage 1 - Rapid Prototype All Members Part inspection sheet, all team members sign-off All members check positions, tolerances, etc.

Stage 2 - Finish Part Production Part inspection sheet, all members sign All members double-check work, clean-up

2.11: Suggested Organizational Flow

2.11.1: RECEIVE THE PART DRAWING

A. CAD operator confers with the CAM operator and draws only what is necessary for the CAM operator to

program a toolpath. Once that drawing is ready, the drawing is transferred to the CAM operator.

B. CAM operator, after consulting with the CAD operator, consults with the CNC operator and fills out the Job

Sequence Plan, defining machining order, tool paths, tool definitions, and sequencing.

C. CNC operator squares up the vise and the CNC operator confers with the CAM operator on tool definition and sequencing. The CNC operator sets and mounts selected tools in holders and sets tool length offsets in the CNC control software. The CNC operator then sketches the fixture.

All SkillsUSA California contest projects are subject to change due to any unforeseen facility, staffing or site-related issues. Please use these materials as a reference to prepare students for the potential contest project. SkillsUSA California regional and state contest projects are developed by state technical committee members to align with the national technical standards.



2.11.2: CAD OPERATOR TRANSFERS FILE TO CAM

- A. CAD operator copies the CAM transfer file to USB to be transferred to the CAM operator, then begins work on documenting the part with all necessary views.
- B. CAM operator transfers in the CAD file and double-checks against the supplied drawing. The CAM operator begins programming tool paths and, if necessary, documents any changes to the Job Process Plan.
- C. CNC operator helps either the CAD or CAM operator, staying aware of CAM toolpath sequencing and tool changes. CNC operators could also study part for most efficient tool paths.

2.11.3: TRANSFER OF NC-CODE TO CNC MACHINE

- A. CAD operator continues to document part and prints the dimensioned CAD drawing.
- B. CAM operator transfers NC-Code to the CNC operator.
- C. CNC operator loads the program, runs a simulation, sets the touch-off point, and then runs the program.

2.11.4: PROTOTYPE COMPLETE, QUALITY CONTROL

- A. Each team member inspects the part and fills out the inspection sheet. If errors are found, they are documented and the part is submitted.

2.11.5: RECEIVE CHANGE ORDER

- A. CAD operator revises CAD drawing and produces new-dimensioned drawings for plotting assurance.
- B. CAM operator and the CNC operator review the change order and develop a new Job Process Plan, as deemed necessary.
- C. CNC operator loads the program, runs a simulation, sets the touch-off point, and then runs the program.

All SkillsUSA California contest projects are subject to change due to any unforeseen facility, staffing or site-related issues. Please use these materials as a reference to prepare students for the potential contest project. SkillsUSA California regional and state contest projects are developed by state technical committee members to align with the national technical standards.



2.11.6: MANUFACTURE FINISHED PART

- A. CAD operator completes all part documentation and hard copies.
- B. CAM operator assembles part documentation booklet and assists CAD and CNC operators.
- C. CNC operator manufactures and inspects part.

2.11.7: QUALITY CONTROL AND FINAL HAND-IN

- A. CAD, CAM, and CNC operators complete part inspection, documentation, and work area cleanup.

3: Safety

3.1: Importance of Safety

To maintain an effective and competitive company, it is in the best interest of both employer and employee to maintain a safe work environment. When a company's history of incidents resulting in injury is minimal, the company increases its likelihood of reduced insurance rates and workman compensation fees.

Safety considerations are taken into account during judging to further replicate a professional industrial environment.

3.2: Safety Violations

If a team or a team member violates a safety rule or operates their work cell in an unsafe manner, the following penalties will be enforced:

1st Violation:

The team will be issued a written warning.

2nd Violation

The team will have 50 points deducted from their total score.

All SkillsUSA California contest projects are subject to change due to any unforeseen facility, staffing or site-related issues. Please use these materials as a reference to prepare students for the potential contest project. SkillsUSA California regional and state contest projects are developed by state technical committee members to align with the national technical standards.



3rd Violation

The team will be disqualified.

3.3: Avoiding Safety Hazards

Some safety issues:

1. Team members must keep their work area reasonably clean. Clean workplaces promote efficient and safe working conditions.
2. Team members must keep their teammates and other teams aware of possible dangerous situations, such as flying chips, noise, possible tool breakage, etc.
3. Safety guards must be in place and properly interlocked during machining and when the spindle is turning.
4. Team members must wear safety glasses when they are in the proximity of the machine during setup as well as during machining.
5. The spindle must NOT be in motion during a tool change.
6. Tampering with or dismantling of any part of the supporting equipment (ie: computers, printers, etc.) is a direct safety violation, and can be grounds for immediate disqualification.

4: Additional Forms

4.1: Document Submission

The following documentation must be prepared by teams for judging. These sheets are included on the following pages of this team information packet:

- Notebook Judging Form
- Process Plan
- Fixturing Description
- Quality Assurance
- Mathematics Problem
- Concurrent Engineering Process Plan

All SkillsUSA California contest projects are subject to change due to any unforeseen facility, staffing or site-related issues. Please use these materials as a reference to prepare students for the potential contest project. SkillsUSA California regional and state contest projects are developed by state technical committee members to align with the national technical standards.



4.2: Judge Prepared Documentation

Judges will prepare the following documentation for each team:

- CAD Evaluation
- Surface Finish/ Dimensional Accuracy
- Hand-In Time Run
- Concurrent Engineering CAD Evaluation
- Concurrent Engineering Surface Finish/ Dimensional Accuracy
- Area Clean-Up
- Safety Violations (if applicable)

All SkillsUSA California contest projects are subject to change due to any unforeseen facility, staffing or site-related issues. Please use these materials as a reference to prepare students for the potential contest project. SkillsUSA California regional and state contest projects are developed by state technical committee members to align with the national technical standards.



SKILLS USA AUTOMATED MANUFACTURING TECHNOLOGY NOTEBOOK JUDGING

MAXIMUM POINTS AWARDED CAD Rapid Prototype

1. Dimensioned Print of Prototype, Hardcopy 170
2. Prototype Contest Drawing 25

CAD Subtotal 195

CAM Rapid Prototype

1. Process Plan Form 100

CAM Subtotal 100

CNC Rapid Prototype

1. Fixturing Description Form 80
2. Quality Assurance Form 50
3. Surface Finish/Dimensional Accuracy 150
4. Hand-In-Time 100

CNC Subtotal 380

Concurrent Engineering

1. Engineering Change Order Drawing 25
2. Process Plan Form 30
3. CAD Drawing (top, front, side & pictorial), Hard Copy 70
4. Surface Finish/Dimensional Accuracy 100
5. Area Clean-up 50

Concurrent Engineering

Subtotal 275

Math Problem 50

Safety (deductions)

GRAND TOTAL 1000 pts

All SkillsUSA California contest projects are subject to change due to any unforeseen facility, staffing or site-related issues. Please use these materials as a reference to prepare students for the potential contest project. SkillsUSA California regional and state contest projects are developed by state technical committee members to align with the national technical standards.



AUTOMATED MANUFACTURING TECHNOLOGY AMT PROCESS PLAN

TEAM NUMBER

CUSTOMER

COMPLETED BY

DATE PART DUE DATE

PART NAME

PART NUMBER CNC MACHINE

BLANK SIZE MATERIAL

Operation # Operation Description Tool #

Description

Spindle

Feed

Plunge Speed

Rate

Rate

NOTES

Possible Pts. 100 Total _____

Team # _____

All SkillsUSA California contest projects are subject to change due to any unforeseen facility, staffing or site-related issues. Please use these materials as a reference to prepare students for the potential contest project. SkillsUSA California regional and state contest projects are developed by state technical committee members to align with the national technical standards.



**AUTOMATED MANUFACTURING TECHNOLOGY AMT
FIXTURING DESCRIPTION**

TEAM NUMBER

CUSTOMER

DRAWN BY

DATE PART DUE DATE

PART NAME

PART NUMBER

SKETCH FIXTURE WITH TOOL TOUCH-OFF INDICATED

Possible Pts. 80 Total _____

Team # _____

**AUTOMATED MANUFACTURING TECHNOLOGY AMT
QUALITY ASSURANCE FORM**

TEAM NUMBER

CUSTOMER

COMPLETED BY

DATE PART DUE DATE

PART NAME

PART NUMBER CNC MACHINE

BLANK SIZE MATERIAL

All SkillsUSA California contest projects are subject to change due to any unforeseen facility, staffing or site-related issues. Please use these materials as a reference to prepare students for the potential contest project. SkillsUSA California regional and state contest projects are developed by state technical committee members to align with the national technical standards.



Object #

Description

Amount Off

Finish Yes No

Errors Yes No

Identify errors on the picture

NOTES

_____ Signature

_____ Signature

_____ Signature

Possible Pts. 50 Total _____

Team# _____

**AUTOMATED MANUFACTURING TECHNOLOGY
CONCURRENT ENGINEERING
PROCESS PLAN**

TEAM NUMBER

CUSTOMER

COMPLETED BY

DATE PART DUE DATE

PART NAME

PART NUMBER CNC MACHINE

BLANK SIZE MATERIAL

Operation # Operation Description Tool # ^{Tool}

All SkillsUSA California contest projects are subject to change due to any unforeseen facility, staffing or site-related issues. Please use these materials as a reference to prepare students for the potential contest project. SkillsUSA California regional and state contest projects are developed by state technical committee members to align with the national technical standards.



Description

Spindle

Feed

Plunge Speed

Rate

Rate

Possible Pts. 30 Total _____

Team # _____

Automated Manufacturing Technology Math Problem

Pro Design, Inc, a rapid prototyping and manufacturing organization, employ your team. The growth of the company can be attributed to the expertise within the organization to quickly respond and provide quality products to client organizations.

The research and development department has asked you to provide a prototype for a new game that has been designed by a new client. The client requires that you provide 100 prototypes of the game to be sent to 100 different sites throughout the United States for market testing. The client wishes to obtain the results of the market studies before investing in a mold that will be manufactured if the market studies show high demand for the game.

The game has a base, cover, and 5 game pieces. The base and cover each require Ren Board that is 4"x 4" x 2" thick. The 5 game pieces require a 1 3/8" x 1 3/8" x 2" thick piece of Ren Board for each piece. The Ren Board is supplied in sheets measuring 48"x 48" x 2" each costing \$100.00 per sheet.

NOTE: The math problems do not resemble the dimensions of your prototype parts, made in the AMT competition. Please answer the following questions. Each question is worth 10 points.

1. How many prototype games does the client require?
2. Are you required to manufacture a mold?

All SkillsUSA California contest projects are subject to change due to any unforeseen facility, staffing or site-related issues. Please use these materials as a reference to prepare students for the potential contest project. SkillsUSA California regional and state contest projects are developed by state technical committee members to align with the national technical standards.



3. How many square inches of Ren Board are in a sheet?
4. How many 4"x 4" x 2" pieces of Ren Board do you need to make the cover and the base?
5. How many 1 3/8"x 1 3/8" x 2" pieces of Ren Board do you need to make the game pieces for the prototypes required by the client?
6. How many sq. in. Are the Ren Board required for the base?
7. How many sq. in. of Ren Board are required for the cover?
8. How many sq. in. Is the Ren Board required to manufacture 1 game piece?
9. How many sq. in. of Ren Board is required to manufacture all the game pieces required for the client?
10. Assuming that you must purchase the Ren Board in full sheets will two sheets of Ren Board be enough to complete the job?

All SkillsUSA California contest projects are subject to change due to any unforeseen facility, staffing or site-related issues. Please use these materials as a reference to prepare students for the potential contest project. SkillsUSA California regional and state contest projects are developed by state technical committee members to align with the national technical standards.