# Machining 1

## Exam Information

**Exam number**
580

**Items**
50

**Points**
53

**Prerequisites**
None

**Recommended course length**
One semester

**National Career Cluster**
Agriculture, Food, & Natural Resources
Manufacturing

**Performance standards**
Included (Optional)

**Certificate available**
Yes

## Description

The Machining 1 industry certification exam assesses technical knowledge and skills related to planning and manufacturing projects using machine lathes, mills, drill presses, and other equipment in safe working conditions to promote the manufacturing industries.

## Exam Blueprint

| Standard | Percentage of exam |
|---|---|
| 1. Personal Development | 2% |
| 2. Workplace Readiness | 2% |
| 3. Safe Practices and Procedures | 15% |
| 4. Mathematical Concepts | 15% |
| 5. Engineering Documents | 9% |
| 6. Measurement Inspections | 11% |
| 7. Manufacturing Materials and Processes | 15% |
| 8. Grinding Machines and Bandsaws | 8% |
| 9. Metal Lathes | 23% |

## Standard 1

Student will participate in personal and leadership development activities through SkillsUSA or another appropriate career and technical student organization.

**Objective 1** Student will use communication skills to effectively communicate with others.

1. Understand when it is appropriate to listen and to speak.
2. Understand and follow verbal and written instructions for classroom and laboratory activities.

**Objective 2** Student will effectively use teamwork to respectfully work with others.

1. Identify and understand different roles in working with a team.

**Objective 3** Student will use critical thinking and problem-solving skills.

1. Good Documentation (don't scribble)
2. Develop a solution to address the problem
3. Record Keeping

**Objective 4** Student will be dependable, reliable, steady, trustworthy, and consistent in performance and behavior.

1. Set and meet goals on attendance and punctuality.
2. Personal Hygiene
3. Prioritize, plan, and manage work to complete assignments and projects on time.

**Standard 1 Performance Evaluation included below (Optional)**

## Standard 2

Student will participate in workplace readiness activities.

**Objective 1** Student will demonstrate employability skills.

1. Use a career search network to find career choices.
2. Write a resume including a list of demonstrated skills.
3. Write a letter of application.
4. Complete a job application.
5. Participate in an actual or simulated job interview.

**Standard 2 Performance Evaluation included below (Optional)**

## Standard 3

Students will be able to understand safe practices and professional machine shop procedures.

**Objective 1** Follow safety manuals and all safety regulations and requirements.

**Objective 2** Use PPE (personal protective equipment) and protective shields.

1. Wear PPE as recommended by OSHA, UOSHA, and the Utah State Risk Management Office.
2. Maintain and use appropriate protective guards and equipment on machinery.

**Objective 3** Follow safe operating procedures for hand and power machine tools.

1. Identify and understand safe machine operating procedures.
2. Demonstrate safe machine operations at all times.

**Objective 4** Maintain a clean and safe work environment.

1. Keep work areas clean.
2. Clean machine and hand tools when work is completed.
3. Put tools away when work is finished.
4. Keep aisles clear of equipment and materials.
5. Perform preventive maintenance as required.
6. Understand chemical hazards and the use of Safety Data Sheets (MSDS).
7. Basics of 5S standard (sort, sustain, standardize, shine, set in order).

**Objective 5** Each student should earn a score of 100% on a required safety exam relating to general shop safety and each machine tool he/she will be operating.

**Standard 3 Performance Evaluation included below (Optional)**

## Standard 4

Students will be able to apply mathematical concepts.

**Objective 1** Perform basic arithmetic functions.

1. Add, subtract, multiply, and divide whole numbers.
2. Add, subtract, multiply, and divide fractions.
3. Add, subtract, multiply, and divide decimals.

**Objective 2** Convert fractions to decimal equivalents.

1. Convert fractions to decimal equivalents.
2. Convert decimal values to nearest fraction equivalent.
3. Use Decimal Equivalent Chart for conversions.

**Objective 3** Calculate speeds and feeds for machining.

1. Given appropriate reference materials, calculate RPM for various metals and tools.

**Standard 4 Performance Evaluation included below (Optional)**

## Standard 5

Students will be able to interpret engineering drawings and control documents.

**Objective 1** Identify basic layout of drawings.

1. Identify types of lines within a drawing.

**Objective 2** Identify basic types of drawings.

1. Identify orthographic views.
2. Identify positions of views (top, front, side, and auxiliary).
3. Identify and describe the purpose of orthographic (three views) drawings.
4. Recognize out-of-date blueprints and know appropriate related procedures.

**Standard 5 Performance Evaluation included below (Optional)**

## Standard 6

Students will be able to properly measure and inspect parts according to drawing and document specifications.

**Objective 1** Select proper measurement tools as they best relate to part characteristics and specified accuracy.

1. Discuss how measurement tool selection can contribute to part accuracy/inaccuracy.
2. Demonstrate proper use and care of precision measuring tools.

**Objective 2** Apply proper measuring techniques.

1. Discuss factors affecting accurate measurement (dirt, temperature, improper measuring, tool
2. calibration, burrs, etc.).
3. Demonstrate how to check basic calibration of various precision instruments.

**Objective 3** Accurately perform measurements with hand-held instruments.

1. Read a micrometer to .001”.
2. Read a steel rule.
3. Read a dial/digital caliper to .001”.
4. Thread measurements using wire gage, go/no go gage, and a mating part
5. Read and use Dial Indicators to an accuracy of .001”

**Standard 6 Performance Evaluation included below (Optional)**

## Standard 7

Students will be able to understand planning, use hand tools, and recognize different manufacturing materials and processes.

**Objective 1** Prepare and plan for machining operations.

1. Read and interpret blueprints.
2. Plan machining operations

**Objective 2** Demonstrate proper use of hand tools.

1. Select the most appropriate hand file and properly demonstrate its use.
2. Correctly identify and use.
3. Identify common hand tools and describe and perform their basic applications.

**Objective 3** Identify common materials and explain basic properties.

1. Describe the general characteristics of carbon steels, tool steels, stainless steels, structural steels, cast irons, aluminum, and other commonly used metals.

**Standard 7 Performance Evaluation included below (Optional)**

## Standard 8

Students will be able to understand and demonstrate the proper use of bench grinding machines and bandsaws.

**Objective 1** Demonstrate proper use of grinding (abrasive) machines.

1. Demonstrate the proper use and care of bench and pedestal grinders.
2. Demonstrate the proper selection and usage of PPE while operating grinding machines.

**Objective 2** Demonstrate proper use of bandsaws.

1. Demonstrate the proper use and care of bandsaws.
2. Demonstrate the ability to select appropriate speeds and feeds for the bandsaw.

**Standard 8 Performance Evaluation included below (Optional)**

## Standard 9

Students will be able to understand and demonstrate the use of conventional lathes.

**Objective 1** Demonstrate proper use of metal lathes.

1. Demonstrate the proper cleaning, lubrication, and care of the conventional lathe.
2. Identify common parts and demonstrate the proper use of basic controls and adjustments on the
3. conventional lathe.
4. Identify and demonstrate the proper installation and application of standard tools and tool holders for the conventional lathe.
5. Identify common chucks and demonstrate proper selection and use of those chucks.

6. Demonstrate the ability to dial in a workpiece within .001” TIR
7. Demonstrate the proper procedure for facing a part within .005” TIR
8. Demonstrate the proper setup and procedure for drilling a hole on the conventional lathe.
9. Demonstrate the proper setup and procedure for boring on the conventional lathe.
10. Demonstrate proper setup and technique for tapping a hole on a conventional lathe.
11. Demonstrate proper setup and procedure for turning a diameter with an accuracy of .001”.
12. Demonstrate proper setup and procedure for turning a 90 degree shoulder.
13. Demonstrate the proper setup and procedure for cutting chamfers and or tapers using the compound rest.
14. Demonstrate proper setup and procedure for single point cutting of threads.
15. Demonstrate the proper procedure for grinding a High Speed Steel cutter.

**Standard 9 Performance Evaluation included below (Optional)**

## Machining 1

Performance assessments may be completed and evaluated at any time during the course. The following performance skills are to be used in connection with the associated standards and exam. To pass the performance standard the student must attain a performance standard average of 8 or higher on the rating scale. Students may be encouraged to repeat the objectives until they average 8 or higher.

**Student’s Name:** _____

**Class:** _____

## Performance standards rating scale

| 0 | Limited skills | 2 | → | 4 | Moderate skills | 6 | → | 8 | High skills | 10 |
|---|---|---|---|---|---|---|---|---|---|---|

**Performance Skills** **Score:**

- Use PPE - personal protective equipment.
- Maintain a clean and safe work environment.
- Each student should earn a score of 100% on a required safety exam relating to general shop safety and
- each machine tool he/she will be operating
- Convert fractions to decimal equivalents as needed.
- Calculate speeds and feeds for machining.
- Identify basic layout of drawings.
- Identify basic types of drawings.
- Select proper measurement tools as they best relate to part characteristics and specified accuracy.
- Apply proper measuring techniques for accuracy based off the blueprint specifications.
- Accurately perform measurements with hand-held instruments.
- Demonstrate proper use of hand tools.
- Demonstrate proper use of grinding (abrasive) machines.
- Demonstrate proper use of band saws.
- Demonstrate proper use of conventional lathes.
- Demonstrate the ability to use the Machinery Handbook as a reference for technical information related to turning and drilling.

## Performance standard average score:

**Evaluator Name:** _____

**Evaluator Title:** _____

**Evaluator Signature:** _____

**Date:** _____